

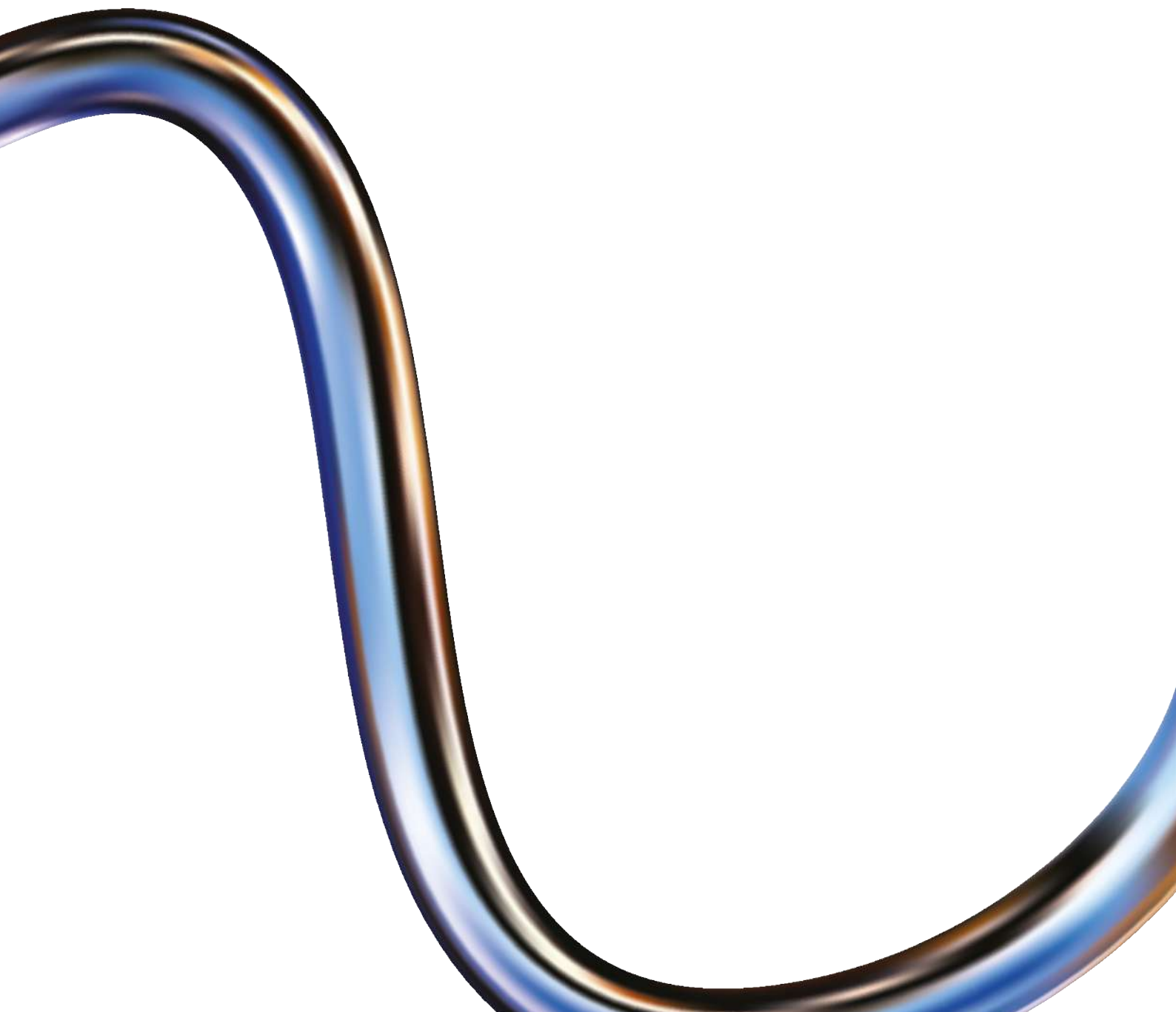


RESEARCH ECOSYSTEM

2025



UNIVERSIDAD
Panamericana





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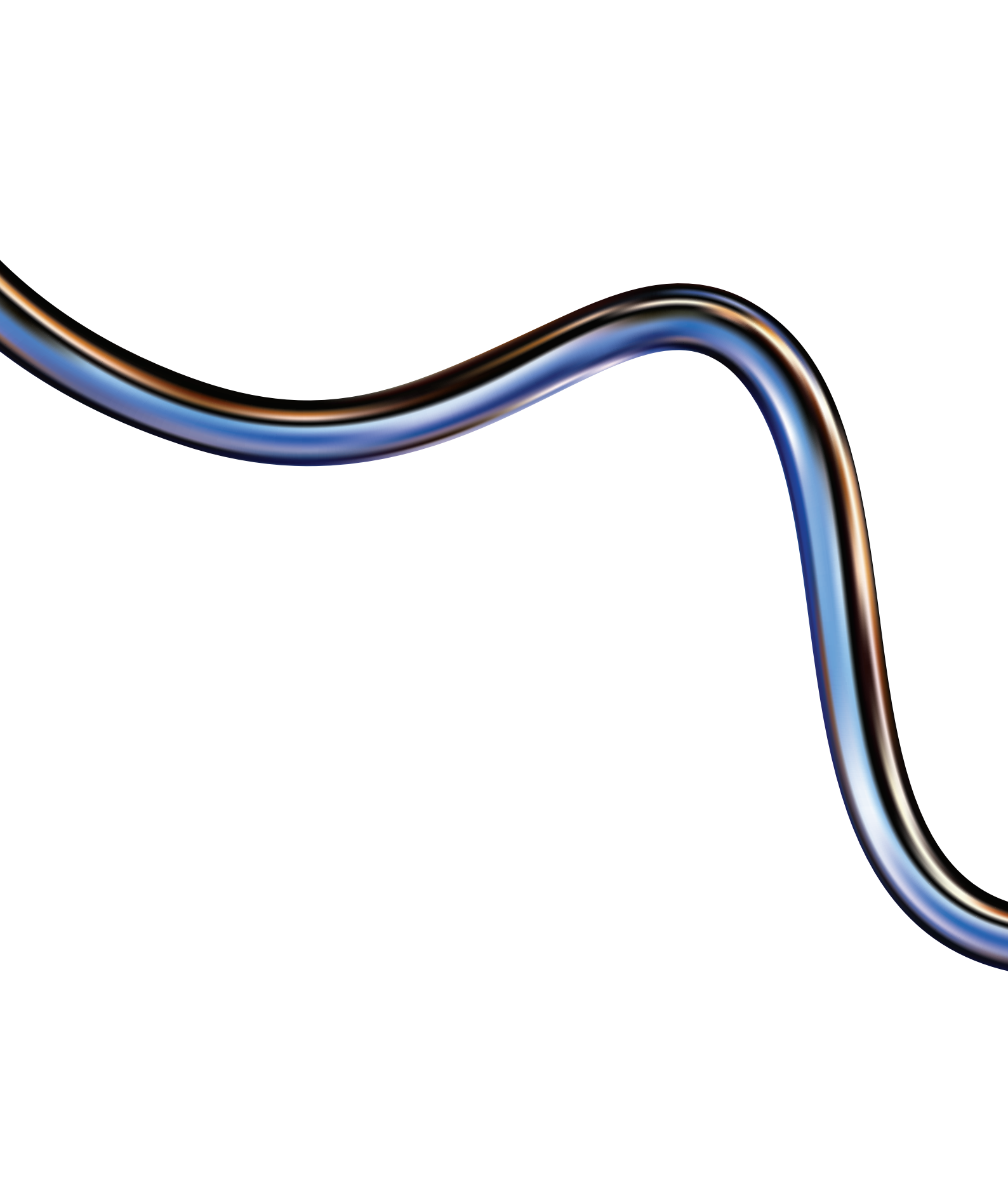
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PRESENTATION

Dear campus members,

It is with great satisfaction that we present our Research Ecosystem 2025, a publication that reflects the sustained growth and strategic maturation of research at Universidad Panamericana.

This edition builds on an increasingly comprehensive vision of university research, one in which technology transfer and innovation, institutional funding for research, and international rankings positioning affirm themselves as complementary pillars of our scientific activity.

Our scientific production maintains its commitment to quality, with more than 50% of our indexed publications appearing in high-impact Q1 and Q2 journals. This year's report also introduces, for the first time, a dedicated section on copyright and industrial models alongside patents, reflecting the growing diversity and maturity of our intellectual property portfolio, now spanning areas as varied as aeronautics, semiconductor technology, healthcare devices, and sustainable materials.

The breadth of our externally funded research has expanded notably, drawing support from the European Commission through Erasmus+ and COST Action, Mexico's Secretaría de Ciencia, Humanidades, Tecnología e Innovación (SECIHTI), "Fundación Carolina", the Max Planck Institute, and regional programs such as Consejo Estatal de Ciencia y Tecnología (COECyTJAL). The launch of the UP-Universidad de la Sabana Bilateral Fund further extends our commitment to collaborative, internationally connected inquiry. In the area of rankings, Universidad Panamericana has advanced to the Top 15 in Latin America, consolidating its position as a benchmark among private universities in the region.

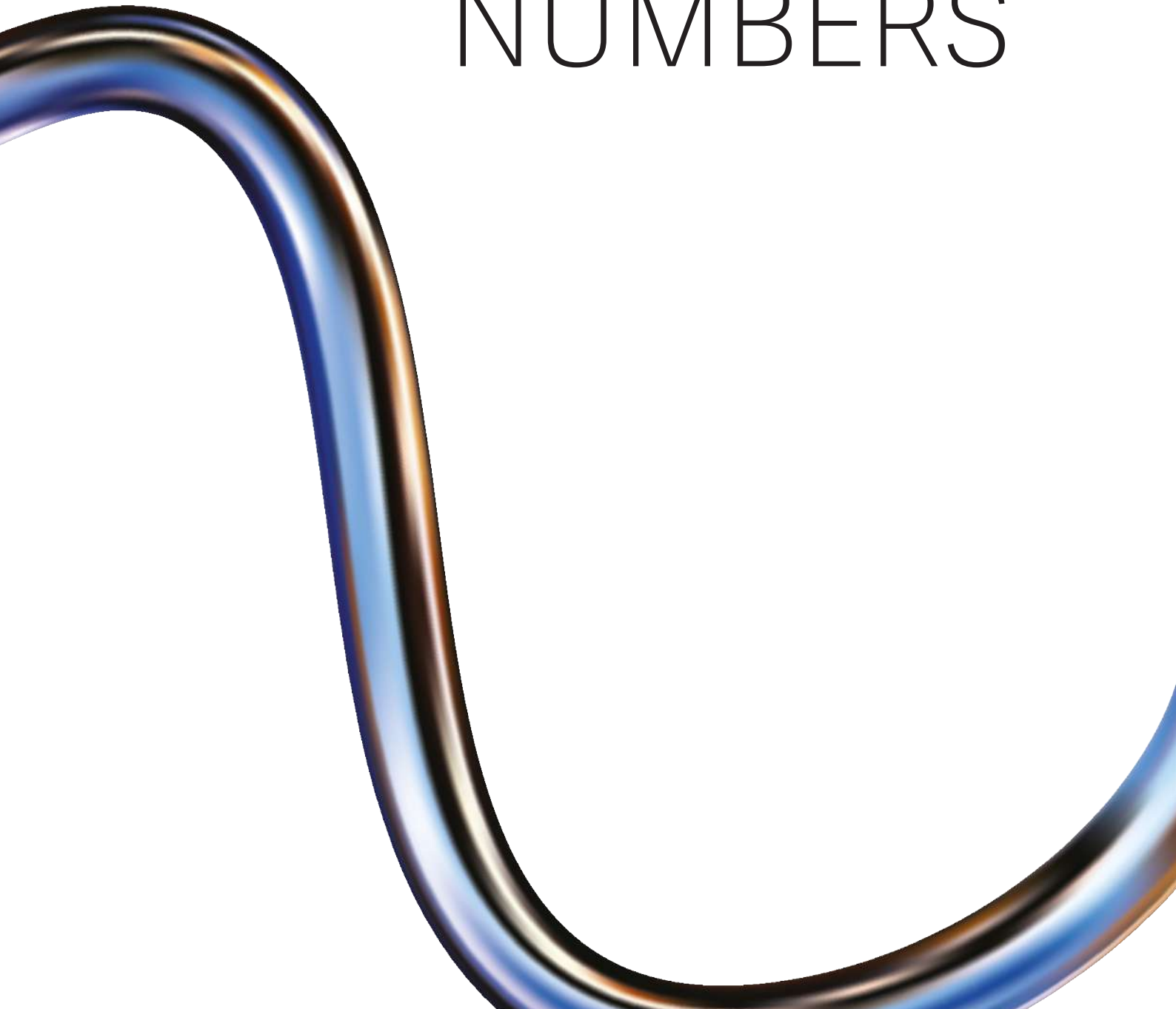
We are grateful to our entire community for the dedication and excellence that make these achievements possible.



Dr. Sergio Velázquez Rodríguez
Vice President for Research
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IMPACT IN NUMBERS



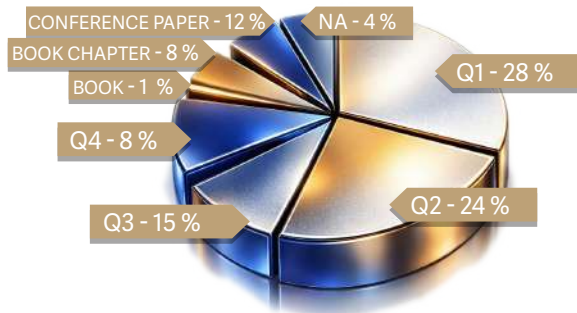
2025 NUMBERS

The information presented corresponds to the period from January 1st, 2025 - January 3rd, 2026

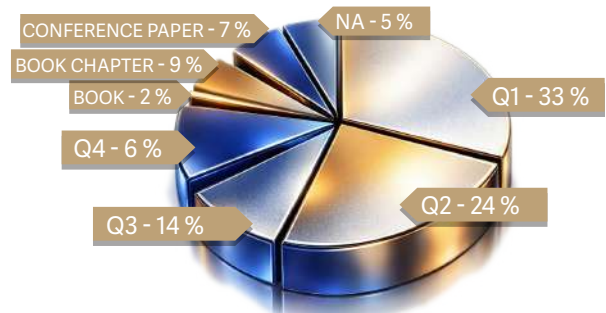
QUALITY 2024 & 2025

Source: own preparation with data from Scopus

2024



2025



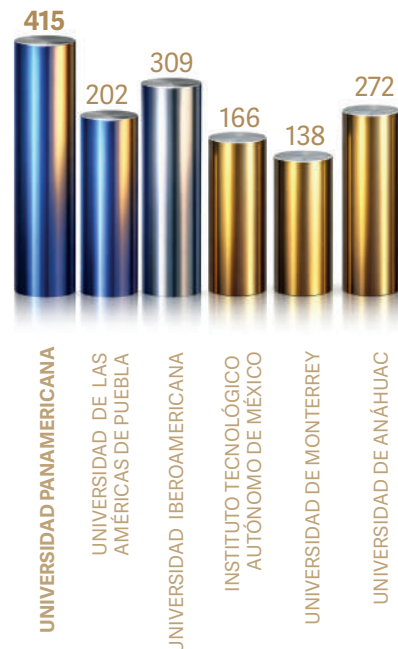
BENCHMARK PUBLICATIONS

Source: Scopus private universities with less than 1000 publications per year

2024

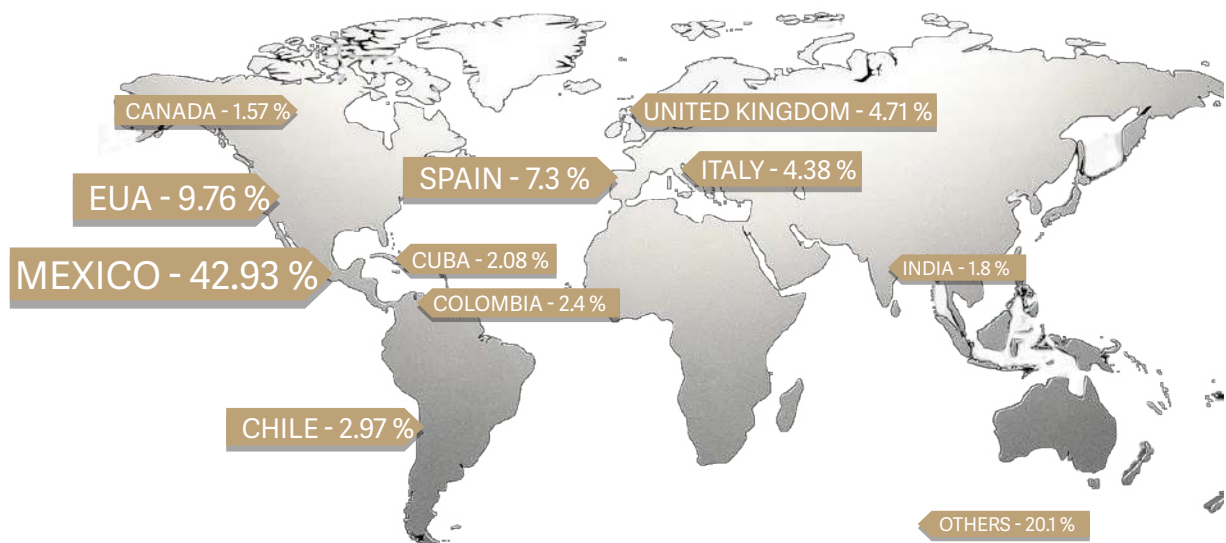


2025



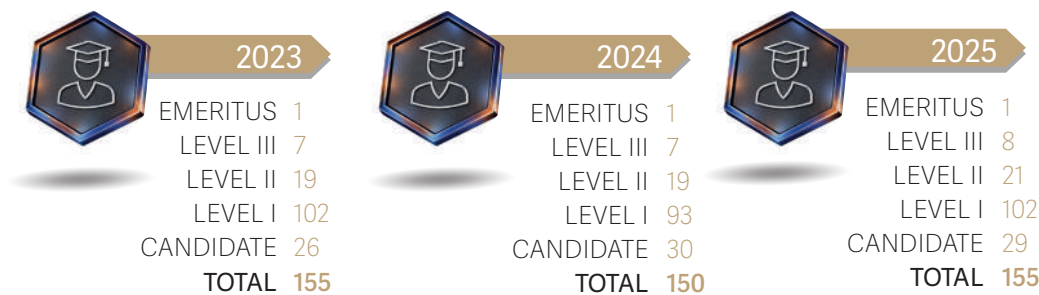
DOCUMENTS BY COUNTRY

Distribution by country affiliation of co-authors, international collaboration documents



MEMBERS OF THE NATIONAL SYSTEM OF RESEARCHERS

Source: own preparation



INTERNATIONAL RECOGNITION IN RANKINGS

Between January 1st - December 31st, 2025



2026 Edition

- 3° in México (overall)
- 2° private MX university
- Top 15 in LATAM



2026 Edition

- 59 regional
- 5° private MX university



2026 Edition

- 3° private MX university



Private MX Universities 2025

- 1° Philosophy, best in LATAM
- 3° Hospitality
- 3° Law
- 3° Business & Management
- 2° Computer Science
- 3° Economics & Econometrics



**World
University
Rankings**

2026 Edition

- 2° private MX university
- 2° private MX university in Teaching



**Interdisciplinary
Science Rankings**

2026 Edition

- 10° in México (overall)
- 2° private MX university



**Latin America
University
Rankings**

2026 Edition

- 3° private MX university



**World University
Rankings
by Subject**

Private MX Universities 2026

- 2° Arts & Humanities
- 2° Business & Economics
- 2° Engineering
- 2° Social Sciences



Private MX Universities 2025

- 2° No Poverty
- 5° Good Health and Well-Being
- 2° Quality Education
- 2° Industry, Innovation and Infrastructure
- 3° Partnerships for the Goals



Edition 2025

- Top 163 worldwide

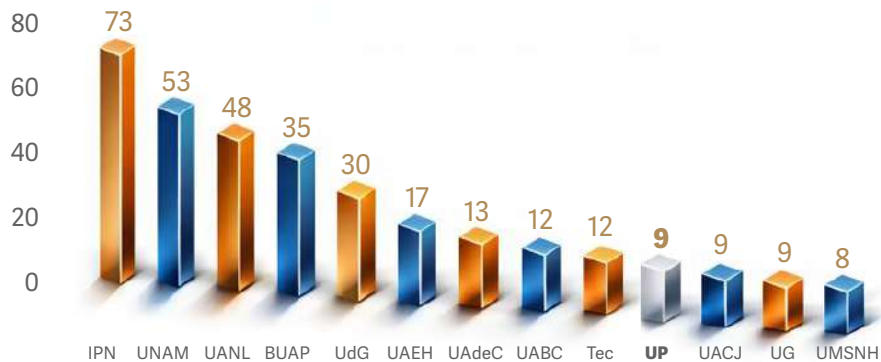


Edition 2025

- 2° private MX university

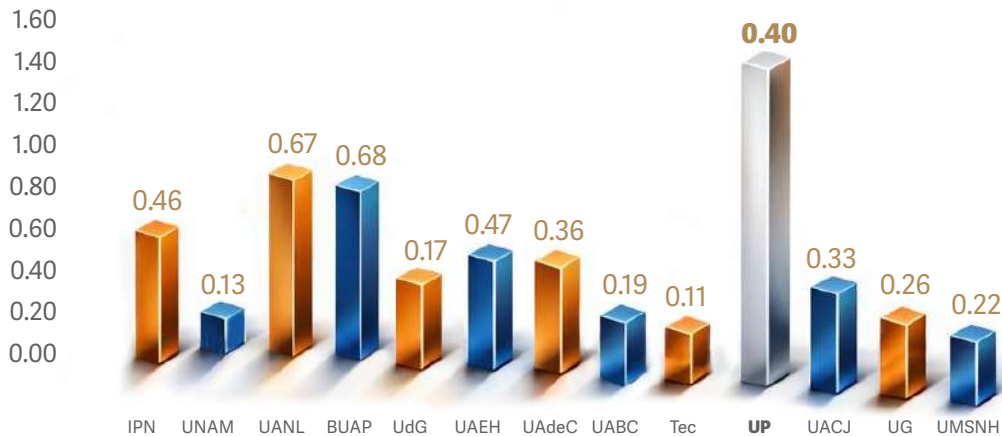
FOR PATENTS GRANTED

PATENTS GRANTED TO HEIS IN 2025



Universidad Panamericana ranks 10th among HEIs and is the second-largest private institution in Mexico in terms of patents granted*

TERMS OF PRODUCTIVITY PER 100 FACULTY MEMBERS



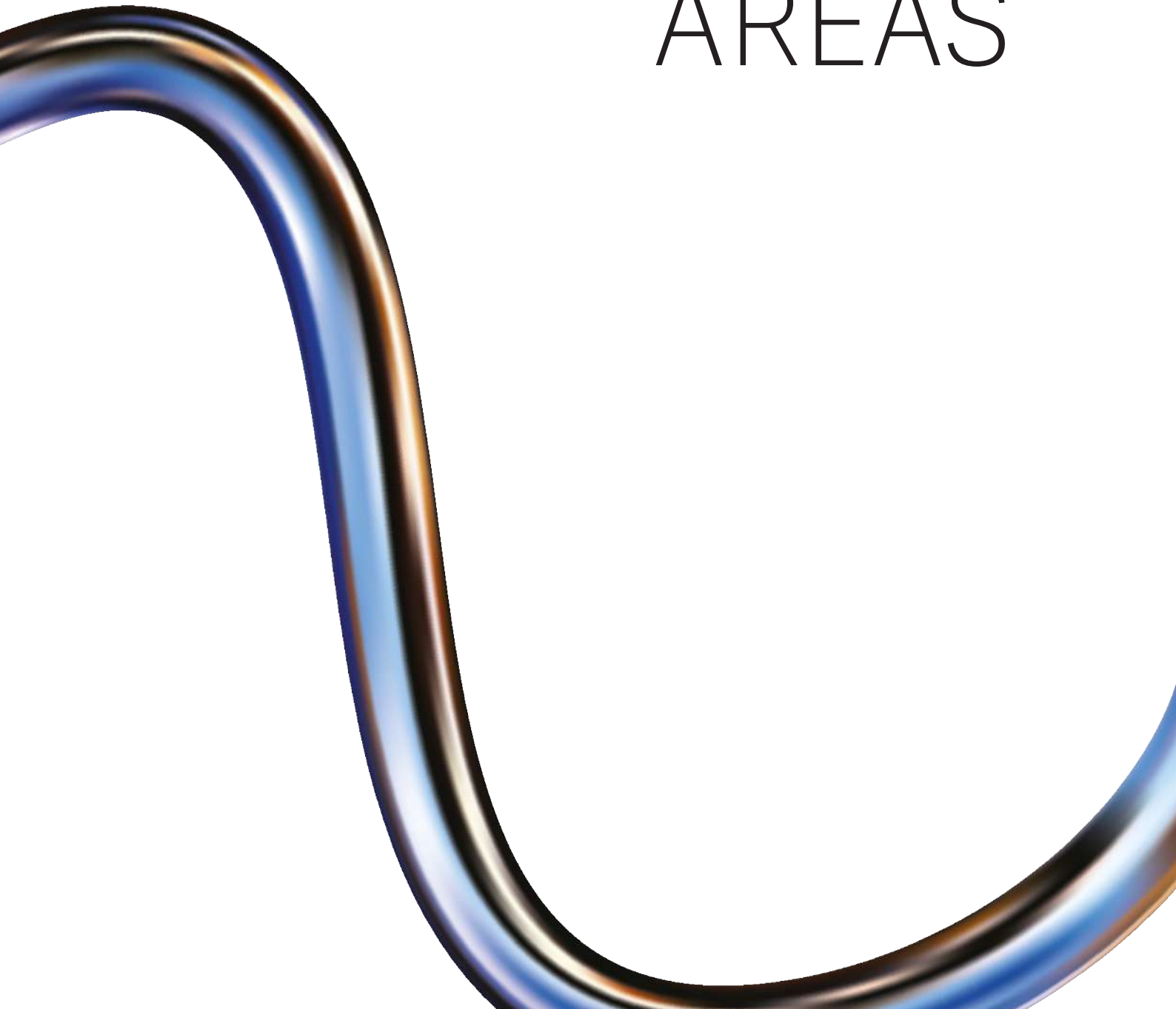
Universidad Panamericana ranks 1st among HEIs in Mexico in terms of productivity per 100 faculty members, with a rate twice as high as that of the next-highest-ranking universities

Technical Note – Interpretation of the Indicator for Patents Granted

The number of patents granted in a specific period can fluctuate significantly due to factors beyond the control of Higher Education Institutions (HEIs). Within this framework, the result achieved by **Universidad Panamericana in 2025** is not merely quantitative, but rather a **milestone of great relevance** that demonstrates the leadership and strength of its technology portfolio. As of 2026, with the evolution of regulatory frameworks, it is not surprising to expect variations in the volume of patents granted in the years to come. It is essential to clarify that such fluctuations do not, under any circumstances, represent a decline in the institutions' capabilities for innovation. Therefore, this indicator must always be interpreted through a rigorous analysis of the context and conditions of the innovation ecosystem prevailing at the time of each metric.

* Information from the Instituto Mexicano de la Propiedad Industrial, through its electronic portal for viewing industrial property documents (ViDoc), and from the Industrial Property Gazette Information System.

RESEARCH AREAS



INSTITUTE OF HUMANITIES

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 SCIENTIFIC PRODUCTION

 INTELLECTUAL PROPERTY

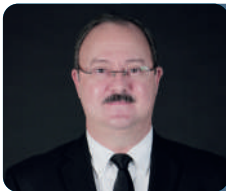
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SCHOOL OF COMMUNICATION

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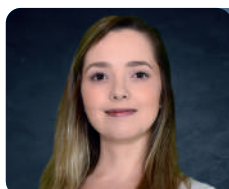
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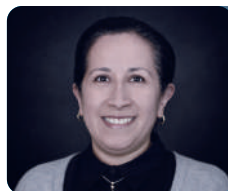
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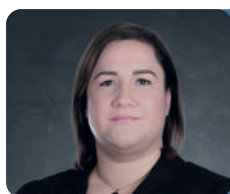



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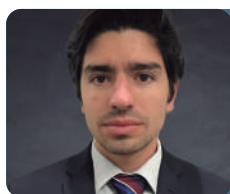

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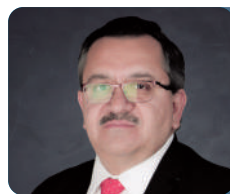
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SCHOOL OF FOOD BUSINESS MANAGEMENT

ICON KEY



SCIENTIFIC PRODUCTION



INTELLECTUAL PROPERTY



FUNDED RESEARCH PROJECT



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SCHOOL OF HEALTH SCIENCES

ICON KEY

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-  INTELLECTUAL PROPERTY
-  FUNDED RESEARCH PROJECT



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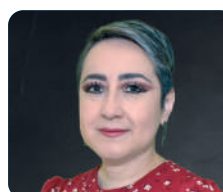
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SCHOOL OF LAW

ICON KEY



SCIENTIFIC PRODUCTION



INTELLECTUAL PROPERTY



FUNDED RESEARCH PROJECT



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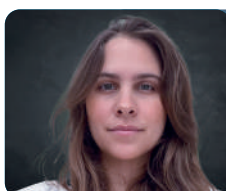
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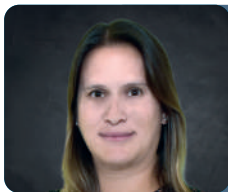
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SCHOOL OF MANAGEMENT OF INSTITUTIONS (ESDAI)

ICON KEY



SCIENTIFIC PRODUCTION



INTELLECTUAL PROPERTY

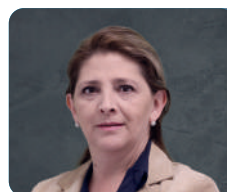


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-  INTELLECTUAL PROPERTY
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ICON KEY

- SCIENTIFIC PRODUCTION
- INTELLECTUAL PROPERTY
- FUNDED RESEARCH PROJECT



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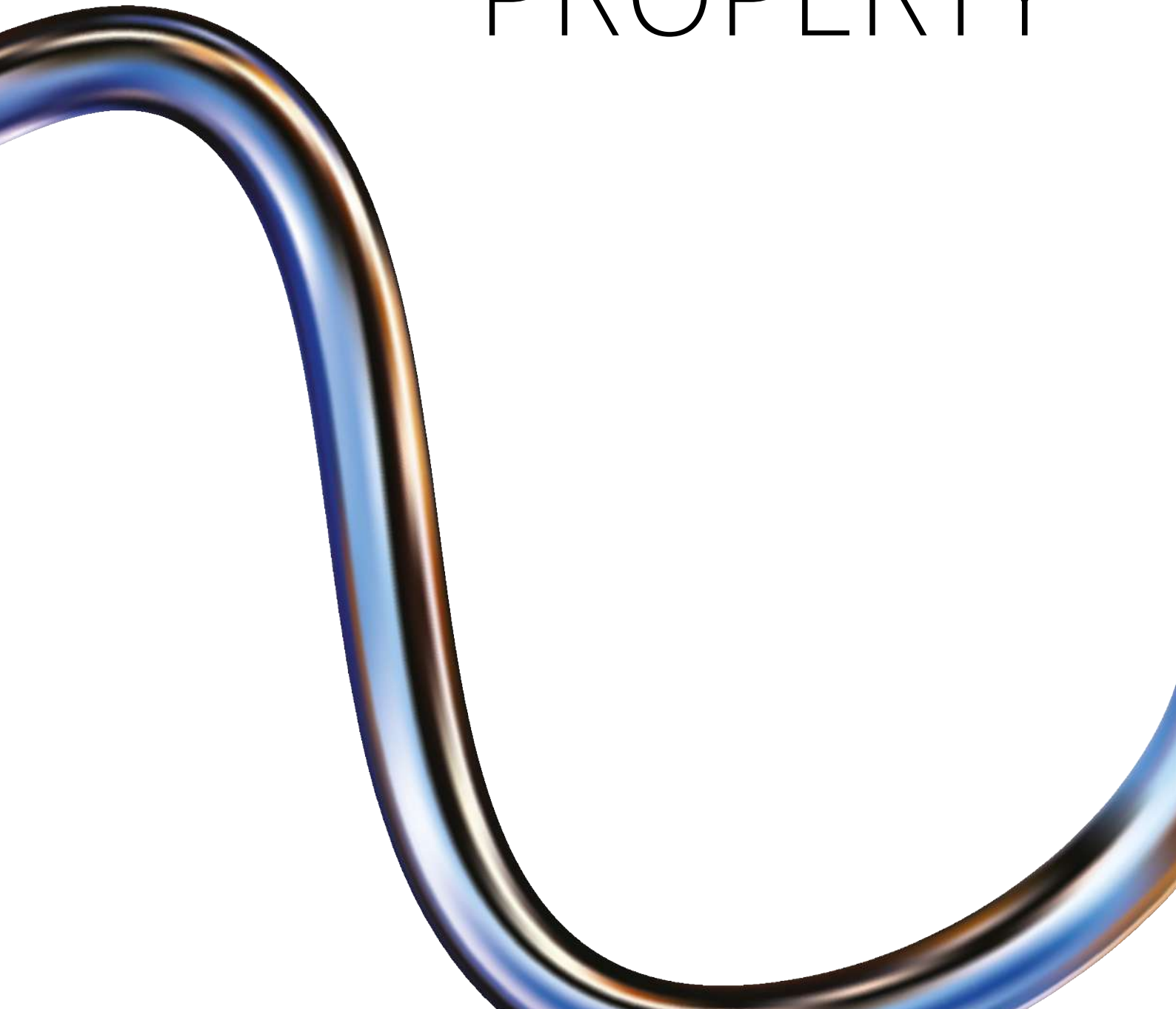


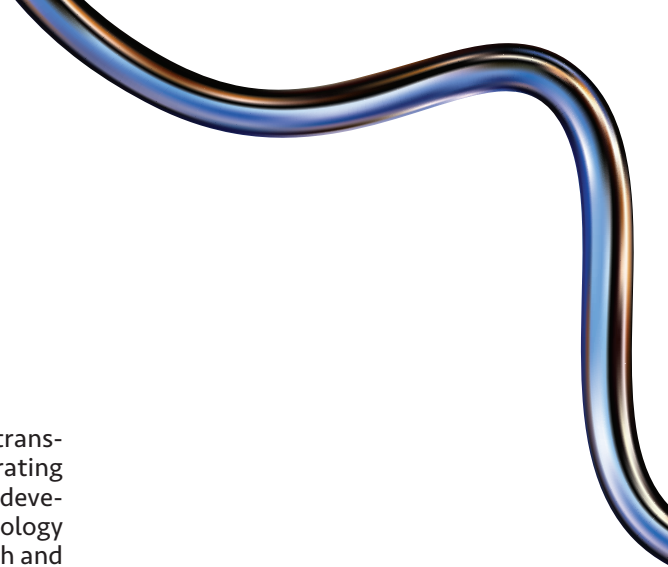
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INTELLECTUAL PROPERTY





Universities around the world have come to recognize that transferring knowledge is just as vital to their mission as generating knowledge. In this context, Universidad Panamericana has developed a comprehensive strategy for intellectual property and technology transfer, resulting in a robust portfolio aligned with the needs of high and medium-high technology sectors.

Since the establishment of its Corporate Directorate of Innovation and Transfer in 2021, UP has successfully shifted to a model where research is seen as a high-value intangible asset that extends beyond academia. By the end of this reporting period, the university had achieved 14 new inventions, increasing its catalog to a total of 43 cutting-edge projects. These projects include granted patents, utility models, and software registrations protected by copyright law. Notably, this technological offering has significant industrial relevance, with over 90% of the developments focused on critical sectors such as aerospace, digital health, biotechnology, and power electronics.

The relevance of this portfolio to the productive sector is underscored by its close alignment with the innovation trajectories of leading global companies. A longitudinal study by UP identifies technological overlaps with more than 25 international corporations, including major players like Boeing, Airbus, Ford, Samsung, Philips, Bimbo, and Novartis. This strategic enhancement not only ensures legal protection for Pan-American scientific advancements but also positions the university as a vital technological partner in transforming Mexico's productive and social landscape.

As a result of these achievements, by 2025, Universidad Panamericana is projected to rank tenth among higher education institutions in Mexico and become the second-largest private institution in the country in terms of patents granted.

PATENTS

ICON KEY

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a/2021/013313

PORTABLE EXPULSION STRETCHER FOR MIDWIVES



ABSTRACT: A portable expulsion stretcher for midwives, consisting of a backrest, a lower back support, a footrest, two side handles, a top handle, a carrying case, a foldable base, a waste bag, four wheels, and a cover. The stretcher allows for attending births in locations where healthcare centers are not available, ensuring hygiene and facilitating transport by the midwife, while providing the mother with an appropriate expulsion system to give birth under optimal conditions.



TECHNICAL PROBLEM: This innovative solution ensures safe and hygienic childbirth in areas without access to healthcare centers or in vulnerable communities. It reduces the risk of infections and complications thanks to its adaptable and portable design, which facilitates transport. This technology improves maternal and child healthcare by guaranteeing optimal conditions for both mother and baby.

FIELD OF APPLICATION: Healthcare.

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- Mariana Ascencio Murillo
- Julieta Ramirez Reynoso
- Mariana Díaz Pinal
- Carlos Raymundo Garnier Ortiz



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BIODEGRADABLE BIOPLASTIC FROM ORANGE PEEL AS A MATERIAL FOR THE MANUFACTURE OF CONTAINERS

ABSTRACT: The planet faces a dual environmental crisis: the loss of ecosystems due to plastic pollution (containers made from petrochemical by-products) and the waste of 30% of global food, with agro-industrial by-products being discarded. In response to this pressing challenge, this research culminates in an innovative patented solution: a biodegradable bio-plastic made from orange peel, starch, chitin, and activated carbon. This invention not only offers an alternative to conventional plastic but also revalorizes organic waste.

TECHNICAL PROBLEM: Plastic pollution (petrochemical) and massive food waste (30% globally). This technology addresses the underutilization of orange by-products.

FIELD OF APPLICATION: Renewable Bioplastics.

INVENTORS:

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INFLUENCE OF THE POLYMERIC MATRIX ON THE OPTICAL AND ELECTRICAL PROPERTIES OF PORPHINE-BASED SEMICONDUCTING HYBRID FILMS

ABSTRACT: New generation of organic films and coatings with semiconducting properties for use in next-generation electronic devices, such as flexible displays and advanced sensors. These films are composed of copper porphine embedded in polymeric matrices of polymethyl methacrylate and polystyrene. The combination of the semiconducting and optical properties of porphine with the mechanical properties and environmental stability of the polymers used as the matrix yields low-cost hybrid films, with the innovative feature that, under this combination of materials, it is possible to modulate their properties. In these hybrid films, stable performance against physical deformation, mechanical stress, and humidity conditions can be ensured.

TECHNICAL PROBLEM: Currently, there is a global shortage of semiconductors such as silicon. This innovation lies in the generation of organic semiconductor materials, which can support silicon-based electronic technology at a very low cost and with lower environmental impact. The material ensures functional relevance by protecting electrical performance against humidity and deformation, resulting in a durable and cost-effective component that facilitates the transition toward industrial prototypes and national technological autonomy based on organic semiconductors.

FIELD OF APPLICATION: Electronics.

INVENTORS:

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- María Elena Sánchez Vergara



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FALL DETECTION SYSTEM FOR DIFFERENT REGIONS

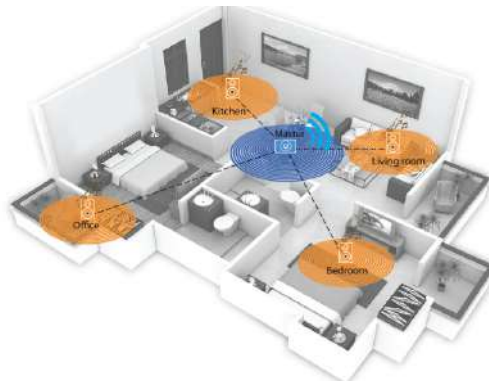
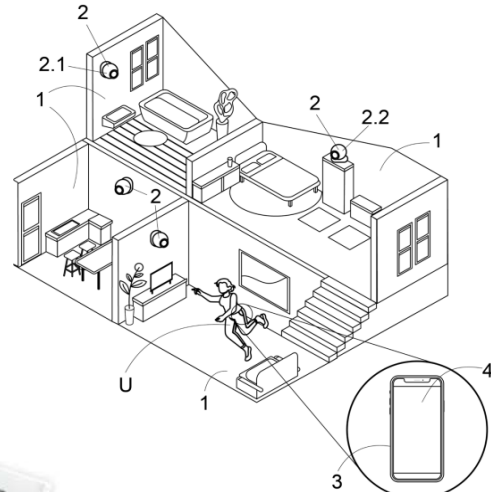
ABSTRACT: The present invention relates to a system for detecting and classifying falls and physical activities inside a house with multiple rooms (regions). The system comprises a methodology for detecting and classifying falls and physical activities through machine learning, a mobile phone with built-in accelerometer and gyroscope, a set of wirelessly connected video cameras, and a mobile application that executes the methodology and links the cameras to the mobile phone. Through said methodology, the system is capable of customizing itself for a user, collecting information from data sources, extracting and merging information, as well as carrying out the detection phase.

TECHNICAL PROBLEM: This system detects falls and monitors physical activities at home using a mobile phone and cameras with artificial intelligence. Ideal for older adults, it avoids the need for additional devices, reduces false alarms, and alerts in emergencies, improving their safety in a practical and accessible way.

FIELD OF APPLICATION: Healthcare.

INVENTORS:

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SOUND EVENT DETECTION USING AN EMBEDDED SYSTEM WITH ARTIFICIAL HYDROCARBON NETWORKS

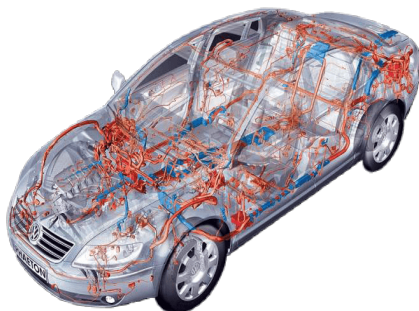
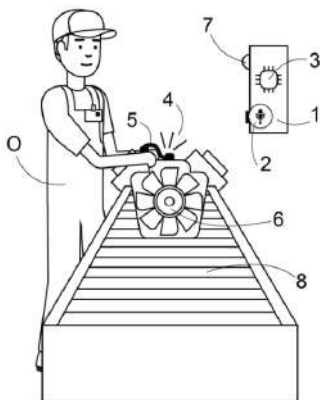
ABSTRACT: Embedded system that uses machine learning for detecting click sound events in electrical harnesses to ensure the correct coupling of connectors, referred to as electrical harnesses, for assembly in motor vehicles. When correctly connected, a sound and vibration are produced, which are captured by the system to verify and confirm proper assembly. The system includes a sound sensor capable of detecting frequencies up to 20,000 Hz, after which the corresponding phases of noise reduction, feature extraction, and inference are executed by means of an embedded device. The detection phase of the invention is carried out using a machine learning algorithm called Artificial Hydrocarbon Networks.

TECHNICAL PROBLEM: This technology solves the problem of ensuring the correct and verifiable assembly of connectors in a vehicle's electrical harnesses. It replaces manual verification—which is subject to human error—with an automatic system that detects the characteristic “click” of a successful coupling. It uses a sound sensor and artificial intelligence to analyze the auditory signal, objectively and reliably confirming that the connection has been properly made.

FIELD OF APPLICATION: Electrical, electronics.

INVENTORS:

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SISTEMA ALA-BASCULANTE AUTÓNOMO PARA BALANCE EN VUELO VERTICAL Y HORIZONTAL

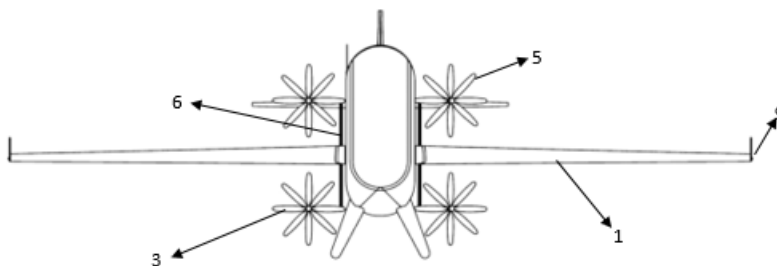
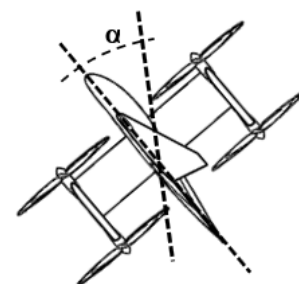
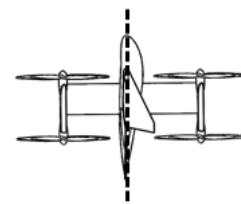
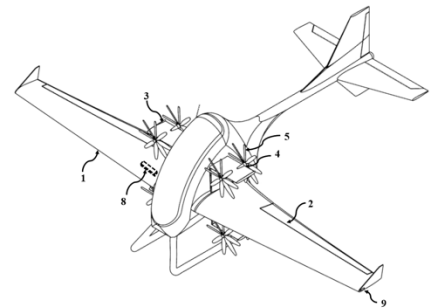
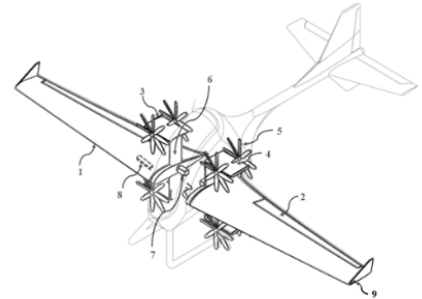
ABSTRACT: An autonomous flight system for maintaining balance during vertical and horizontal flight, designed for the transport of personnel and/or cargo. The system enables the vehicle to take off, fly, and land both vertically and horizontally, making it suitable for use within urban centers as a new, cleaner mode of conventional transportation.

FIELD OF APPLICATION: Aeronautics, Aviation Safety.

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- Ignacio Turrubiarres Alvarado
- Javier Félix Rendón
- Leticia Gaytan Hernández Magro
- Luis Alberto Barroso Moreno
- Ulises Montiel Pichardo

PATENT HOLDER: Centros Culturales de México, A.C. (Universidad Panamericana)



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a/2020/002490

SOLAR COLLECTOR WITH INDEPENDENT MOVEMENT IN EACH PANEL AND EACH BASE

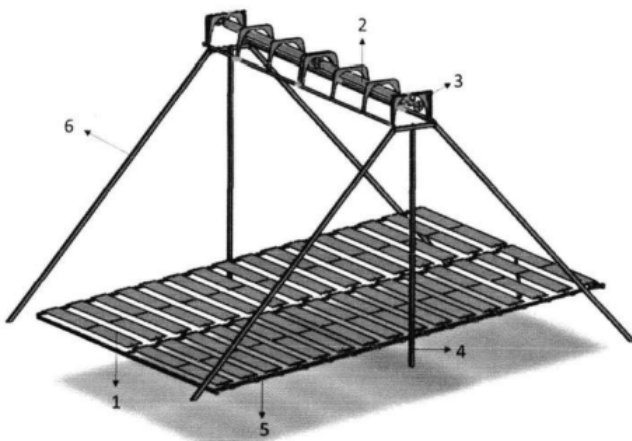
ABSTRACT: A structure comprising “n” independent movable mirrors arranged on a base and positioned beneath a receiver tube having a reflective involute that redirects solar rays to the tube even when they are not directly incident thereon. A linear actuator adjusts the height of the mirrors as a function of sunlight, thereby minimizing energy losses due to dispersion and optimizing power generation.

TECHNICAL PROBLEM: This technology optimizes the capture and use of solar energy by minimizing the loss of reflected rays. A collector with independent movement in each panel and base optimizes energy generation by reducing the inadequate dispersion of solar rays. It uses a series of bed-shaped mirrors with independent movement.

FIELD OF APPLICATION: Renewable Energy.

INVENTORS:

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a/2021/006334

ARTIFICIAL NURSERY BED FOR PUPPY PROTECTION

ABSTRACT: A shell-shaped bed that maintains the temperature of puppies through heaters, sensors, and control mechanisms. The puppies are fed and hydrated by means of automated drippers that adjust the food supply as needed. At the same time, their weight and development are measured automatically and remotely, allowing for the storage and monitoring of their information from the moment they are placed in the nursery bed for protection until they are in optimal condition to be removed.

TECHNICAL PROBLEM: Automated nursery bed for newborn puppies that regulates their temperature, feeding, hydration, and development through sensors, drippers, and remote control systems, allowing continuous monitoring from admission until they reach optimal conditions for release.

FIELD OF APPLICATION: Electrical, Animal Care.

INVENTORS:

- 🔗 Carolina del Valle Soto
- 🔗 Leonardo de Jesús Valdivia Parga
- 🔗 Luis Alberto Rosa Sierra



Carolina del Valle Soto
Senior Researcher D, SNII Level I

Luis Alberto Rosa Sierra
SNII Level II

Leonardo Jesús Valdivia Parga
Senior Researcher C, SNII Level I

a/2021/006337

SEMI-AUTOMATIC MEASURING BED FOR ANIMAL STERILIZATION

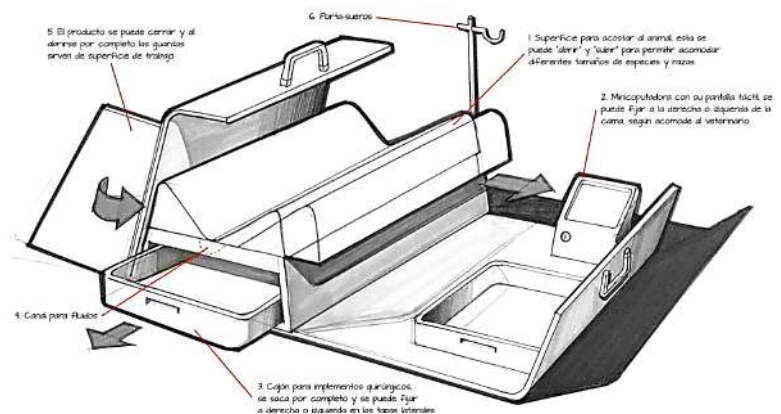
ABSTRACT: The invention relates to a semi-automatic measuring bed for animal sterilization and its process of use, which comprises a bed capable of automatically measuring weight and temperature through sensors, providing the exact amount of anesthesia to be used in the sterilization process. Furthermore, it is equipped with oxygenation and heart rate sensors to monitor the animal's vital signs and report them on a touch screen that features LEDs and sound, which activate as an alert in case these signs approach the parameters —high or low— set according to the species, breed, and gender of the animal to be sterilized. The bed is provided with step-by-step instructions for its correct and efficient use, in addition to being designed as a foldable unit for field work and easy transport.

TECHNICAL PROBLEM: The semi-automatic animal sterilization bed automates anesthesia dosage based on weight and temperature, monitors vital signs (heart rate, oxygenation), and alerts in case of anomalies. Its portable design and step-by-step guide enable its use in mass campaigns, improving precision and safety under limited-resource conditions.

FIELD OF APPLICATION: Healthcare.

INVENTORS:

Carolina del Valle Soto
Luis Alberto Rosa Sierra
Leonardo de Jesús Valdivia Parga



Eduardo de la Vega Segura

SNII Candidate Level

Alfredo Pedroza Díaz

Research Professor

a/2022/014272

FLEXIBLE AGRICULTURAL WEEDER FOR SHORT ROW SPACINGS

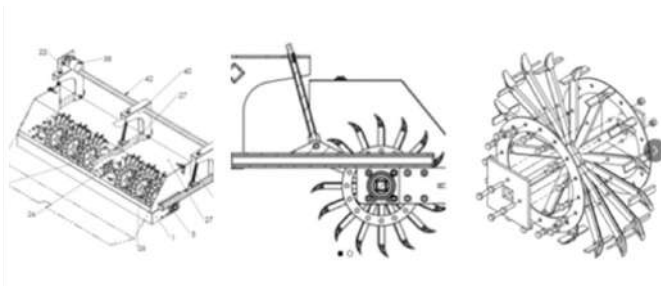
ABSTRACT: A flexible weeder for plantings of one or more rows with short spacings of 5 to 7 cm between rows, and up to 20 cm for different crops. It is powered by hydraulic motors connected to the tractor's hydraulic system. The tip of the cutting discs penetrates the soil sufficiently to remove and loosen roots at the optimal weeding time, or tills the ground enough to expose the roots of unwanted vegetation to the sun.

TECHNICAL PROBLEM: Performing efficient and precise weeding in crops with one or more rows planted very close together, where conventional tools are ineffective or damaging to the desired plants. In these cropping systems with narrow spacings of between 5 and 7 cm, it is essential to have machinery capable of eliminating weeds without compromising crop integrity, adapting to different types of terrain and configurations. This need is intensified in agricultural contexts that require high productivity, reduced manual labor, and crop protection, demanding a mechanical solution that combines flexibility, power, and precision in root cutting and soil removal.

FIELD OF APPLICATION: Agriculture.

INVENTORS:

- 🌾 Eduardo de la Vega Segura
- 🌾 Alfredo Pedroza Díaz
- Edgar Jair Marín Calzada
- Miguel Ángel Santiago Martínez



Centros Culturales de México, A.C.

a/2021/013383

COMPACT RELEASE MECHANISM FOR NANOSATELLITE



ABSTRACT: Compact release mechanism for a nanosatellite designed to hold a test mass, in the form of a sphere, inside a chamber where an experiment is conducted. In addition to holding it, the mechanism protects it from any physical phenomena that may occur during the launch of the nanosatellite, the forces to which it is subjected, the effect of vacuum in space, and temperature changes. The test mass is held by means of two movable walls, belonging to the upper and lower faces of the chamber, which move simultaneously in opposite directions to hold and position the sphere at the center of the chamber at all times. The mechanism consists of two lead screws that rotate in opposite directions to each other by means of a DC motor and a gear system. These lead screws are threaded into the upper and lower walls of the chamber, so their rotation results in the simultaneous translational displacement of the walls in opposite directions to compress and release the sphere.

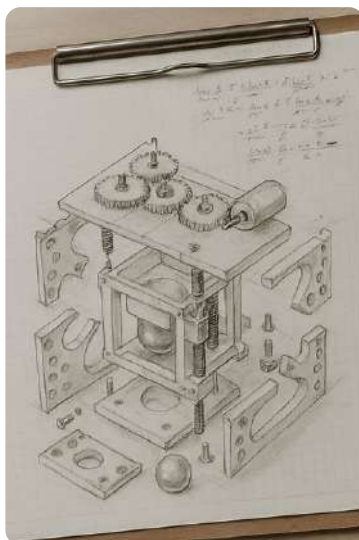
TECHNICAL PROBLEM: This technology solves the problem of how to precisely hold, protect, and release a spherical test mass inside a nanosatellite, ensuring its integrity against the extreme conditions of launch and the space environment. The mechanism ensures that the sphere remains centered within the chamber throughout the entire process, preventing displacement due to vibrations, mechanical forces, vacuum, or temperature variations. It enables controlled release through a compact system of lead screws and gears driven by a DC motor. This results in a reliable and efficient device that ensures the correct execution of in-orbit experiments, maintaining the stability and protection of the test mass until the exact moment of its release.

FIELD OF APPLICATION: Electronics.

INVENTORS:

- Carlos Daniel Laguna Juárez
- José Manuel Vega Hernández
- Samir Alejandro Ruiz Mafud
- Lorenzo Aizpuru Gutiérrez

PATENT HOLDER: Centros Culturales de México, A.C. (Universidad Panamericana)



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ICON KEY

Universidad Panamericana Inventor

Félix Orlando Martínez Ríos
Senior Researcher C, SNII Level I
Yovani Marrero Ponce
SNII Level III

03-2025-081211251300-01

MÖSSBAUER DECONVOLUTION PROGRAM

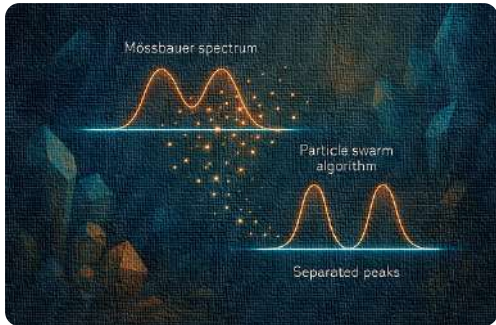
ABSTRACT: A novel algorithm inspired by particle swarm optimization for the deconvolution of Mössbauer spectra. The algorithm applies new nature-inspired heuristics to solve a problem that conventionally required more complex algorithms.

TECHNICAL PROBLEM: The Mössbauer Deconvolution program addresses the critical need to optimize the analysis of Mössbauer spectra, a fundamental process in materials characterization that traditionally relied on complex and computationally demanding algorithms for spectral deconvolution. By implementing an innovative algorithm inspired by the collective behavior of particle swarms, this solution replaces conventional methods with more efficient and natural bio-inspired heuristics. This approach not only significantly simplifies the procedure for separating overlapping peaks in spectra but also improves the accessibility and accuracy of the analysis, offering researchers in materials science and geology a robust and elegant tool for identifying mineral phases, oxidation states, and magnetic properties with lower computational requirements.

FIELD OF APPLICATION: Industry 4.0.

INVENTORS:

Félix Orlando Martínez Ríos
Yovani Marrero Ponce



Félix Orlando Martínez Ríos
Senior Researcher C, SNII Level I

Yovani Marrero Ponce
SNII Level III

03-2025-081211233000-01

PACKING HEURISTIC ALGORITHM

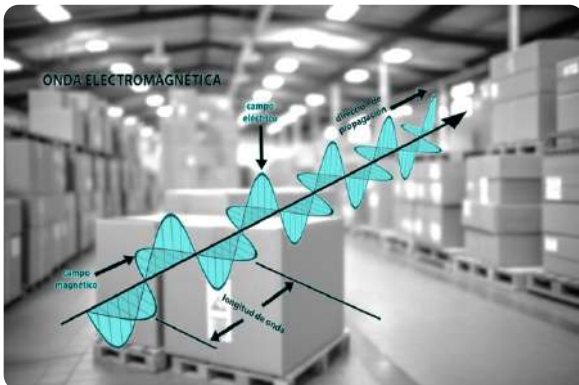
ABSTRACT: A novel algorithm based on electromagnetic fields and inspired by nature for solving optimization or packing problems. The algorithm quickly and optimally determines how to place objects within predefined containers.

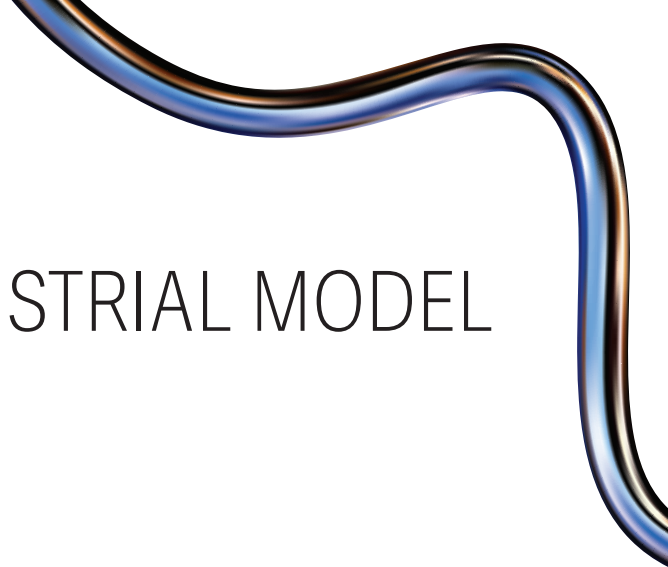
TECHNICAL PROBLEM: The Packing Heuristic Algorithm addresses the fundamental and complex need to optimize space in logistics and industrial operations, solving the classic packing problem of arranging objects of various sizes and shapes within containers or limited areas in the most efficient way possible. Through an innovative algorithm that simulates the behavior of electromagnetic fields, where elements behave as particles with charges that attract or repel each other, the system finds optimal stacking and arrangement configurations, minimizing wasted space and maximizing storage capacity. This solution benefits the parcel industry, as well as cargo transportation, warehouse management, and manufacturing, offering a viable heuristic solution to a computationally complex optimization problem.

FIELD OF APPLICATION: Industry 4.0.

INVENTORS:

🔗 Félix Orlando Martínez Ríos
🔗 Yovani Marrero Ponce





INDUSTRIAL MODEL

Bona Terra, A.C.

f/2023/002753

MODELO INDUSTRIAL DE ESTACIÓN DE VEHÍCULOS MODULAR
MULTIFUNCIONAL PARA EL TRANSPORTE SEGURO Y CÓMODO
DE PEATONES

ABSTRACT: The present invention relates to an industrial model of a multifunctional modular vehicle station for the safe and comfortable transport of pedestrians, being completely different from known stations. It is characterized by its special shape, which provides it with a unique and distinctive appearance.

FIELD OF APPLICATION: Transportation, Modular Vehicle Station.

INVENTORS:

- Alejandro Zarza Martínez
- Ramón Barraza Venegas
- Fernando Peña Hernández

PATENT HOLDER: Bona Terra, A.C. (Universidad Panamericana)



FUNDED RESEARCH PROJECTS



EXTERNAL FUNDINGS

ICON KEY

 Universidad Panamericana Researcher

Project Roles and Definitions:

Leader (Project Leader / Coordinating Institution):

The institution or researcher that assumes overall responsibility for the project, leading its coordination, managing the allocated resources, and ensuring the achievement of objectives and compliance with the funding framework.

Partner (Project Partner / Participating Institution):

The institution or researcher that contributes to the execution of a funded project through defined activities, receiving allocated resources and supporting the achievement of the project's objectives under the coordination of the lead institution.

SCHOOL OF COMMUNICATION

Mariano Emmanuel Navarro Arroyo
Senior Researcher A, SNII Level I

Partner

PROJECT TITLE:

ERASMUS+ KA171 MYKOLAS ROMERIS UNIVERSITY - LITHUANIA

DESCRIPTION: This project, funded with the support of the European Commission through the Erasmus+ program, aims to promote international mobility and strengthen the internationalization of research and academic collaboration in the field of communication and social studies. Within this framework, a joint initiative has been established with the International Relations and Projects Office of the Faculty of Human and Social Studies, involving the participation of Mariano Emmanuel Navarro Arroyo from the School of Communication as the principal investigator. The initiative will support academic mobility focused on fostering scholarly exchange and collaborative activities, thereby enhancing the quality, visibility, and international impact of academic cooperation in the field of communication.

COLLABORATORS:

- Mykolas Romeris University - Lithuania

FUNDER: Erasmus+.

SCHOOL OF ECONOMIC AND BUSINESS SCIENCES

Aura Andrea Díaz Duarte
Research Professor

Partner

PROJECT TITLE:

COST ACTION CA23157 - EUROPEAN NETWORK FOR MULTIPLE
VIEW LIFE CYCLE SUSTAINABILITY ASSESSMENT (MULTIVIEWLCSA)

DESCRIPTION: COST Action CA23157 (MultiViewLCSA) is a European scientific collaboration network that seeks to strengthen the conceptual and methodological development of Life Cycle Sustainability Assessment (LCSA) from a multidimensional perspective. Its approach integrates environmental, social, and economic dimensions to provide more robust and comparable analytical frameworks for the comprehensive evaluation of the impacts of products, services, and business models.

The network promotes interdisciplinary exchange among researchers from diverse fields, the development of harmonized methodologies, and the generation of recommendations to support sustainability-oriented decision-making. It also fosters the training of early-career researchers, academic mobility, and collaborative scientific production, contributing to the advancement of sustainability assessment in both business and public policy contexts.

COLLABORATORS:

- Wei Wang

FUNDER: COST Action.

Ángeles Montserrat Govea Franco
SNII Level C

Partner

PROJECT TITLE:

COST ACTION CA23104, MAINSTREAMING WATER REUSE
INTO THE CIRCULAR ECONOMY PARADIGM (WATER4REUSE)

DESCRIPTION: Water4Reuse aims to integrate, through an interdisciplinary and intersectoral approach, the entire wastewater treatment chain in order to improve water management and promote the recycling and reuse of treated water and its by-products, considering territorial, health, social, economic, and environmental constraints. The initiative adopts a multi-actor approach that seeks to develop innovative tools and methods, such as advanced biorefineries, capable of meeting diverse water uses and strengthening reuse within the circular economy paradigm.

The project promotes a comprehensive and multidisciplinary vision of wastewater reuse, recognizing it as a key element in the water energy food nexus, particularly in urban and peri-urban contexts. Water4Reuse mobilizes complementary competencies, starting from the needs expressed by key stakeholders and end users including farmers, local authorities, industries, and service providers, rather than relying solely on a technical inventory. It also incorporates assessment models to manage risks and overcome barriers that hinder the widespread adoption of water reuse.

In this way, the project contributes to resource preservation, the reduction of treatment costs and use-related conflicts, and social well-being, promoting human development in a context of climate change, sustainability, and future territorial resilience.

COLLABORATORS:

- Jérôme Harmand

FUNDER: COST Action.

Marco Eliseo Rivera Martínez
Research Professor

Partner

PROJECT TITLE:

VISITING PROFESSORSHIP PROGRAM – NGU

DESCRIPTION: This project was carried out within the Visiting Professorship Program at Nürtingen-Geislingen University (NGU), Germany, with the objective of strengthening the academic internationalization of Universidad Panamericana through teaching and applied work in global marketing and sustainability. During the program, sessions were delivered in International Marketing and Marketing & Sustainability, integrating project-based learning, market analysis, and tools for competitive strategy and responsible communication.

The integrative axis of the stay consisted of an applied European market entry case for a Mexican company (Empacadora San Francisco), developed in binational teams. This approach enabled students to contrast theoretical frameworks with real strategic decisions regarding segmentation, positioning, distribution channels, and sustainability narrative. The expected academic impact included the participation of 7th-semester Marketing students from Universidad Panamericana, who developed a commercial distribution diagnosis for Empacadora San Francisco and presented their findings in person to two NGU professors at the UP Bonaterra campus, thereby fostering international academic collaboration and experiential learning.

COLLABORATORS:

- Iris Ramme
- Dennis Koehler

FUNDER: Nürtingen-Geislingen University.

Marisol Velázquez Salazar
Senior Researcher D, SNII Level I

Leader

PROJECT TITLE:

DIAGNÓSTICO DE BUENAS PRÁCTICAS FUNDEMEX

DESCRIPTION: The project “Diagnóstico de buenas prácticas en proyectos sociales con acompañamiento empresarial en México”, led by Dr. Marisol Velázquez Salazar, aims to identify, document, and analyze five successful cases of social projects that receive investment and support from the business sector, focused on strengthening employment, labor inclusion, and the social economy. Through a mixed qualitative-quantitative methodology based on the systematization of experiences, cases in different regions of the country will be studied to identify success factors, lessons learned, and replicable models.

COLLABORATORS:

- 👤 Claudia Fabiola Ortega Barba
- 👤 Aura Andrea Díaz Duarte
- 👤 Akito Kamei
- 👤 Claudia Ariadna Acero Ortega
- 👤 Lorenza Alcocer Flores
- 👤 Sergio Erick García Barrón
- 👤 Ana Gabriela Ramírez Gutiérrez
- 👤 Griselda Dávila Aragón
- 👤 María Lorena de la Torre Díaz
- 👤 Rajesh Ranjan
- 👤 Román Rodríguez Aguilar
- 👤 Salvador Rivas Aceves
- 👤 Julieta Domínguez Soberanes
- 👤 Antonieta Teodora Martínez Velasco
- 👤 Claudia Yohana Arias Portela
- 👤 David Ernesto Salinas Navarro
- 👤 Isabel Joaquína Niembro García
- 👤 Sara Elvira de Jesús Galbán Lozano

FUNDER: FUNDEMEX.

Marisol Velázquez Salazar
Senior Researcher D, SNII Level I

Partner

PROJECT TITLE:

ERASMUS+ KA171 - IBS BULGARIA

DESCRIPTION: This project, funded with the support of the European Commission through the Erasmus+ program under Action KA171 (Erasmus+ KA171 – IBS Bulgaria), aims to promote international mobility and strengthen the internationalization of research in the field of business and management. Within this framework, a joint agreement has been established with IBS Bulgaria, involving the participation of Dr. Marisol Velazquez-Salazar from the Faculty of Business as the principal investigator. The initiative will support academic mobility aimed at fostering scholarly exchange and collaborative research activities, thereby enhancing the quality, visibility, and international impact of research and academic cooperation in the field of business.

COLLABORATORS:

- IBS Bulgaria

FUNDER: Erasmus+.

Marisol Velázquez Salazar
Senior Researcher D, SNII Level I

Partner

PROJECT TITLE:

ERASMUS+ KA171 - UNISRSIDAD DE ROVIRI E VIRGILI BARCELONA

DESCRIPTION: This project, funded with the support of the European Commission through the Erasmus+ program under Action KA171, aims to promote international mobility and strengthen the internationalization of research in the field of business and management. Within this framework, a joint agreement has been established with the Universitat Rovira i Virgili (URV), involving the participation of Dr. Marisol Velazquez-Salazar from the Faculty of Business as the principal investigator. The initiative will support academic mobility aimed at fostering scholarly exchange and collaborative research activities, thereby enhancing the quality, visibility, and international impact of research and academic cooperation in the field of business.

COLLABORATORS:

- Rovira i Virgili University

FUNDER: Erasmus+.

SCHOOL OF ENGINEERING

Yovani Marrero Ponce
SNII Level III

Leader

PROJECT TITLE:

DESCUBRIMIENTO DE INHIBIDORES MULTIDIANAS
DE LA MELANOGÉNESIS DIRIGIDOS A TYR, TRP-1, TRP-2 Y MITF
CON APLICACIONES ANTITUMORALES Y DESPIGMENTANTES

DESCRIPTION: This project aims to develop innovative treatments for melanoma and cutaneous hyperpigmentation. Currently, available drugs target a single enzyme, tyrosinase, which limits their effectiveness. The main innovation of this project lies in the discovery of bioactive compounds capable of simultaneously inhibiting four key therapeutic targets: the enzymes TYR, TRP-1, TRP-2, and the oncogene MITF.

To achieve this, the project follows a two-phase methodology: 1) Computational Phase (DRY): Artificial intelligence and virtual screening tools are used to analyze large databases. A notable component is an "in silico ethnobotanical expedition" aimed at identifying active metabolites in plant species native to Mexico; 2) Experimental Phase (WET): The most promising candidate compounds will be biologically validated through in vitro assays using cell lines and in vivo testing employing zebrafish embryos.

In addition to proposing a new generation of safer drugs for the medical and cosmetic industries, the project will develop open-source, cross-platform software to automate the discovery process of multi-target agents, strongly promoting open science.

COLLABORATORS:

-  **Félix Orlando Martínez Ríos**
- Luis Antonio García González

FUNDER: SECIHTI–Ciencias Básicas y de Frontera.

Samuel Moisés Nucamendi Guillén
Senior Researcher D, SNII Level I

Partner

PROJECT TITLE:

**METAHEURISTIC ALGORITHMS FOR SUSTAINABLE
WASTE COLLECTION ROUTING OPTIMIZATION**

DESCRIPTION: Urban waste management is one of the major challenges currently faced by cities, as it directly impacts the environment, the economy, and the population's quality of life. Low recycling rates, the constant increase in waste generation, and the inefficient use of logistical resources lead to higher operational costs and increased pollutant emissions. In addition, the diversity of waste streams and the use of heterogeneous fleets, including electric and diesel vehicles with different capacities, make collection route planning increasingly complex.

This project proposes the use of advanced optimization tools to design more efficient and sustainable collection routes. Through mathematical models and metaheuristic algorithms, the research aims to reduce operational costs, fuel consumption, and CO₂ emissions while maintaining high service levels. Different strategies will be compared to determine which provides the best balance between economic efficiency and environmental performance.

The ultimate objective is to deliver practical solutions that can be implemented in real cities, promoting smarter and more competitive waste management aligned with the principles of green logistics and sustainable development.

COLLABORATORS:

- José Marcos Moreno Vega

FUNDER: Fundación Carolina.

Héctor Rogelio Robles Campos
SNII Level I

Partner

PROJECT TITLE:

CENTRO DE INTELIGENCIA ENERGÍA EN JALISCO (CIEJ)

DESCRIPTION: The Centro de Inteligencia en Energía de Jalisco (CIEJ) is a strategic initiative led by Universidad Panamericana in collaboration with CIATEQ and other institutions, aimed at strengthening energy planning, improving the efficiency and reliability of the electrical system, and promoting the transition toward clean energy sources, particularly solar energy, within the state. Through a comprehensive diagnostic assessment and the development of demand forecasts, CIEJ seeks to generate key information to support government decision-making, contribute to the sustainable and economic development of Jalisco, and foster scientific research and student engagement in innovative energy solutions.

COLLABORATORS:

 **Francisco Moreno Abril** - Centro de Tecnología Avanzada (CIATEQ)

FUNDER: COECyTJAL-FODECIJAL.

Leonardo Jesús Valdivia Parga
Senior Researcher C, SNII Level I

Leader

PROJECT TITLE:

**PLATAFORMA IOT INDUSTRIAL INTEGRADA A DISPOSITIVO
MODULAR DE ADQUISICIÓN DE DATOS**

DESCRIPTION: The main objective of the project is to develop a digital platform for real-time visualization and management of industrial data, integrated with previously developed modular Internet of Things data acquisition devices. This platform will enable small and medium-sized manufacturing enterprises to monitor critical variables in their production processes, access historical records, detect anomalies, and export information in open formats, facilitating data-driven decision-making without requiring costly or specialized infrastructure.

The expected impact in Jalisco is significant, as the project aims to close the technological gap that currently limits the competitiveness of small and medium-sized enterprises compared to large corporations. By democratizing access to Industry 4.0 tools, the solution will contribute to reducing waste, improving operational efficiency, and enhancing the quality of manufactured products in the state. Furthermore, as a scalable, interoperable platform designed for operational simplicity, it is expected to encourage adoption across diverse industrial sectors. This will promote the modernization of Jalisco's productive base, strengthen local technological capabilities, and facilitate companies' integration into national and international value chains, generating a sustainable impact on the state's competitiveness.

COLLABORATORS:

-  **Carolina del Valle Soto**
-  **Orlando Montoya Márquez**
-  **Leonardo Jesús Valdivia Parga**
 - Quantra Systems

FUNDER: COECyTJAL-PROINNJAL, Desarrollo Tecnológico.

Carolina del Valle Soto
Senior Researcher D, SNII Level I

Leader

PROJECT TITLE:

PLATAFORMA INTELIGENTE DE MONITOREO Y OPTIMIZACIÓN DE FLOTAS PARA LA MOVILIDAD SOSTENIBLE EN JALISCO, MEDIANTE ANALÍTICA AVANZADA

DESCRIPTION: The project seeks to address severe traffic congestion, operational inefficiencies, and the negative environmental impact of freight transportation in the Guadalajara Metropolitan Area. Currently, local companies show limited adoption of advanced technologies, relying primarily on basic GPS tracking systems that do not leverage data from the vehicle's communication bus. To address this gap, an advanced analytics and artificial intelligence platform will be developed, integrating industrial telematics devices to monitor engine parameters, predict mechanical failures, and quantify carbon footprint. The expected outcome is a validated technology that progresses from Technology Readiness Level (TRL) 3 to TRL 4, demonstrating functionality in a controlled environment through data bus simulators and cloud-based architecture.

Impact: 1) Knowledge generation: The project goes beyond current commercial offerings by integrating granular vehicle communication bus data into cloud environments; 2) Strengthening the local innovation ecosystem: It establishes effective collaboration among the academic, technological, and productive sectors of Jalisco, creating experimental protocols and specialized laboratories that serve as a foundation for future research lines in smart mobility and the Internet of Things; 3) Technological sovereignty and maturation: Advancing the project from TRL 3 to TRL 4 enables the development of local technical capabilities in advanced analytics, reducing dependence on foreign solutions and positioning Jalisco at the technological frontier of connected vehicles and smart cities.

COLLABORATORS:

 **Leonardo Jesús Valdivia Parga**
 **Orlando Montoya Márquez**

FUNDER: COECyTJAL–FODECIJAL.

SCHOOL OF MANAGEMENT OF INSTITUTIONS (ESDAI)

Claudia Ariadna Acero Ortega
Research Professor

Partner

PROJECT TITLE:

COST ACTION CA21149 - REDUCING ACRYLAMIDE EXPOSURE
OF CONSUMERS BY A CEREALS SUPPLY-CHAIN APPROACH
TARGETING ASPARAGINE (ACRYRED)

DESCRIPTION: This project, funded by COST Action, aims to assess the potential for mitigating acrylamide formation in grain-based foods by establishing a multidisciplinary network that brings together plant breeders, grain producers, global grain traders, European food processors, toxicologists, academic researchers from relevant disciplines, public regulators, and consumer and health interest groups. In addition, the Action will develop new approaches to inform the catering and hospitality sectors, as well as consumers, about responsible cooking practices for cereal-based foods. The central challenge of ACRYRED is to establish a multidisciplinary research and communication network focused on reducing acrylamide formation, involving the entire value chain from grain production to consumer products. By reducing asparagine levels through improved crop varieties and optimized farming practices, downstream acrylamide formation in cereal-based products can be significantly reduced. Ultimately, the project is expected to contribute to improved food safety, reduced consumer exposure to acrylamide, and stronger alignment between agricultural practices, food processing, and public health objectives across Europe.

COLLABORATORS:

- Nigel Harford

FUNDER: COST Actions.

SCHOOL OF PHILOSOPHY

Eduardo Óscar Charpenel Elorduy
Senior Researcher B, SNII Level II

Partner

PROJECT TITLE:

HERMETISMO Y SACRALIDAD. LAS OTRAS TRADICIONES
CLÁSICAS

DESCRIPTION: This project seeks to examine a set of classical philosophical and religious traditions that, having been classified as hermetic, mystical, or belonging to registers not strictly rational, have frequently been marginalized within canonical accounts of the history of philosophy. Far from constituting marginal or purely esoteric currents, these traditions have nonetheless operated as decisive interlocutors, whether explicit or implicit, for numerous modern and contemporary thinkers.

The project is based on the hypothesis that figures and texts associated with hermeticism, late Neoplatonism, certain Gnostic currents, or philosophical mysticism not only influenced the configuration of central concepts of modernity, but also actively contributed to the reformulation of notions such as sacredness, reason, nature, symbol, and history. Through a historical conceptual analysis, the research aims to reconstruct the lines of connection linking these traditions with modern and contemporary authors, showing how what was excluded under the label of the “irrational” or the “esoteric” in fact plays a structural role in the genesis of certain forms of philosophical thought. In this way, the project seeks to broaden the interpretative framework through which the classical heritage in later philosophy is understood.

FUNDER: IIFL-UNAM-PAPIIT.

André Laks

Senior Researcher D, Research Professor

Partner

PROJECT TITLE:

NIETZSCHE EN LA HISTORIA DE LA FILOLÓGICA CLÁSICA

DESCRIPTION: The project results from an invitation as a Visiting Senior Research Fellow by the team of the Max Planck Institute for the History of Science (MPIWG, Berlin) directed by Dr. Katja Krause ("Experience in the Premodern Sciences of Soul and Body"). It aims at assessing critics that have been levelled against Aristotle's paradigmatic story of early, pre-Aristotelian philosophy in the first book of the *Metaphysics* as being dependent on teleological presuppositions and doubtful hermeneutical principles. The project is exploring not only the hermeneutical presuppositions that are at stake in Aristotle's own view and assessments about his predecessors, which are more refined and more solid than commonly thought, but also the historiographical and philosophical principles that are explicitly or implicitly guiding the positive counterparts that have been offered, at various historical stages, to make for the rejection of the Aristotelian model. In the present project, I intend to explore the crucial role of young Nietzsche's fight, in the name of 'life', against Aristotle's philosophical treatment of the Presocratics, starting from an analysis of his unpublished fragment *Philosophy in the Tragic Age of the Greeks*.

FUNDER: Max Planck Institut.

INTERNAL FUNDINGS

ICON KEY

 Universidad Panamericana Researcher

RESEARCH SEED FUNDING

INSTITUTE OF HUMANITIES

Cecilia María Coronado Angulo

Senior Researcher C, SNII Level I

PROJECT TITLE:

RACIONALIDAD, ACCIÓN Y VITALIDAD
DE LAS INSTITUCIONES SOCIALES

DESCRIPTION: The project examines the role of institutions in structuring social life, analyzing how institutional rationality can contribute to social justice or, conversely, reinforce dynamics of exclusion and denial of recognition. Its objective is to develop concrete proposals and a theoretical and methodological framework to achieve institutional revitalization in the contemporary and digital context.

COLLABORATORS:

-  **Hugo Saúl Ramírez García**
-  **Luis Xavier López Farjeat**
-  **Mariano Emmanuel Navarro Arroyo**
 - María Guadalupe Martínez Fisher
-  **Juan Francisco Díez Spelz**
 - Montserrat Herrero
 - Benno Herzog
-  **Philippe Prince Tritto**
 - Bernardo Franco
 - Gerardo Corral
 - Mercedes Espinosa

Project Code: UP-CI-2025-MX-09-HUM

Alejandro Sada Mier y Terán
SNII Candidate Level

PROJECT TITLE:

**COLABORACIÓN ENTRE FILOSOFÍA Y TEOLOGÍA
EN EL PENSAMIENTO DE JOSEPH RATZINGER**

DESCRIPTION: This project constitutes the third phase of a research initiative launched in 2021 and aims to complete the editing, translation into Spanish, and publication of the volume Joseph Ratzinger in Dialogue with Philosophical Traditions: From Aristotle to Žižek. The study focuses on exploring concrete forms of reciprocal collaboration between philosophy and theology in order to address the major questions of human existence in an integrated manner while respecting the identity of each discipline.

COLLABORATORS:

-  **Luis Pesquera**
- Julián Arturo López Amozurrutia
 - Claudia Carbonell
 - Euclides Eslava
 - Michael Dominic Taylor
 - Michael Hanby
 - Tomas V. Gourlay
 - Esther Gómez de Pedro
 - Emery de Gaál
 - Jacob Phillips
 - Josef Zöhrer
 - Julio Borges Junyent
 - Davide De Caprio
 - Donald Wallenfang
 - Stephan Kampowski
 - Jaroslaw Kupczak
 - Tracey Rowland
 - Matthew Tan
 - Matthew Levering
 - Maurice Ashley Agbaw-Ebai
 - Mariano Crespo
 - Michaela Christine Hastetter

Project Code: UP-CI-2025-MX-04-HUM

SCHOOL OF COMMUNICATION

Mindaugas Briedis
SNII Level I

PROJECT TITLE:

EMBODIED COGNITION AND MEDIA ECOLOGIES:
AN INTERDISCIPLINARY PROJECT IN PHILOSOPHY
AND COMMUNICATION STUDIES

DESCRIPTION: The project seeks to fill an academic gap by integrating embodied cognition with media ecology. Its main objective is to publish an edited volume that not only applies concepts of *cognición corporeizada* to media environments, but also demonstrates how media practices can enrich the theoretical scope of this discipline, exploring topics such as phenomenology, affectivity, artificial intelligence, and posthumanism.

COLLABORATORS:

 **Laura Trujillo Liñán**

Project Code: UP-CI-2025-MX-07-COM

SCHOOL OF ECONOMIC AND BUSINESS SCIENCES

Alejandro Lome Hurtado

SNII Level I

PROJECT TITLE:

ÍNDICE DE RIESGO CIUDADANO Y SU ASOCIACIÓN
CON LOS NIVELES DE BIENESTAR Y DE SALUD MENTAL

DESCRIPTION: This project seeks to create a citizen risk index for the city of Guadalajara that encompasses factors such as socioeconomic disadvantage, environmental pollution, social networks, and public safety. The objective is to jointly examine how exposure to these adverse conditions is associated with and affects individuals' subjective well-being and mental health.

COLLABORATORS:

 **María del Pilar Sánchez Barajas**

- María Concepción Cisneros Plazola

Project Code: UP-CI-2025-GDL-01-EMP

Juan Enrique Núñez Ríos

Senior Researcher B, SNII Level I

PROJECT TITLE:

IDENTIFICACIÓN TEMPRANA DEL RIESGO DE DESERCIÓN
UNIVERSITARIA MEDIANTE ANÁLISIS DE REDES Y DEEP LEARNING

DESCRIPTION: It proposes the design and implementation of a socio-technical predictive system that combines deep neural networks and network analysis to process academic, socioeconomic, and behavioral information. The purpose is to identify students at risk of dropping out of university at an early stage in order to enable timely intervention.

COLLABORATORS:

- Jacqueline Yvette Sánchez García

 **José Alberto del Puerto Flores**

- Roberto Palacios Rodríguez
- Alán Rodrigo Díaz Rizo
- Francisco R. Castillo Soria

Project Code: UP-CI-2025-GDL-04-EMP

Germán Roberto Scalzo
Senior Researcher D, SNII Level I

PROJECT TITLE:

EL FUTURO DEL TRABAJO: CLAVES PARA
EL DESARROLLO HUMANO EN LA ERA DIGITAL

DESCRIPTION: It reflects in an interdisciplinary manner on the challenges posed by digital transformation and the Fourth Industrial Revolution, including artificial intelligence, automation, and robotics, for the future of work. It seeks to explore the philosophical, anthropological, and ethical foundations necessary to rethink the organization of human labor, aspiring to an integral development of individuals and communities beyond the mere production of material wealth.

COLLABORATORS:

-  **Sandra Anchondo Pavón**
-  **Griselda Dávila Aragón**
-  **Santiago García Álvarez**
-  **Antonieta Teodora Martínez Velasco**
-  **Héctor Xavier Ramírez Pérez**
-  **Fernando Rey Castillo Villar**
-  **Pablo Ignacio Sahagún Kunhardt**
-  **Antonia Terán Bustamante**
- Kleio Akrivou
- Javier Pinto-Garay
- Raquel Lázaro-Cantero
- Antonio Moreno-Almárcegui
- Gregory Robson
- John Sikorski
- Ulf Thoene
- Idoya Zorroza

Project Code: UP-CI-2025-MX-14-EMP

SCHOOL OF ENGINEERING

Avelina Alejo Reyes

SNII Level I

PROJECT TITLE:

INVESTIGACIÓN DE RELACIONES INTERGENERACIONALES
EN EL AULA UNIVERSITARIA: UN ANÁLISIS DE PERCEPCIONES
CRUZADAS

DESCRIPTION: The study analyzes cross-perceptions between engineering professors and students from different generations in order to identify affinities, interaction patterns, and areas of disconnection in the classroom. It evaluates how generational differences influence the educational relationship, also considering teaching styles and faculty personality.

COLLABORATORS:

 **Mónica Camargo Martínez**

 **Ligia García Béjar**

 **Julio Cesar Rosas Caro**

Project Code: UP-CI-2025-GDL-03-ING

Jorge Eduardo Brieva Rico

Senior Researcher D, SNII Level I

PROJECT TITLE:

DETECCIÓN Y CUANTIFICACIÓN DE ESTENOSIS EN IMÁGENES DE
ANGIOGRAFÍA CARDÍACA MEDIANTE ALGORITMOS DE VISIÓN E
INTELIGENCIA ARTIFICIAL

DESCRIPTION: It proposes the development of a computer-assisted medical diagnosis support system to detect, locate, and quantify the degree of coronary stenosis in X-ray cardiac angiograms. To achieve this, it will integrate bio-inspired image processing methods and machine learning models based on artificial intelligence.

COLLABORATORS:

 **Ernesto Moya Albor**

• Sandra Luz Gómez Coronel

• Diego Renza Torres

• Eduardo Romero Castro

Project Code: UP-CI-2025-MX-05-ING

Crisdolith Cachutt Alvarado
Senior Researcher A

PROJECT TITLE:

MODELO PREDICTIVO DE PRODUCTIVIDAD LABORAL A PARTIR DEL BIENESTAR Y FACTORES CONTEXTUALES: APLICACIÓN EN MÉXICO Y COLOMBIA

DESCRIPTION: The research seeks to design and validate a predictive model, supported by artificial intelligence and mathematical analysis, that explains employee labor productivity by combining personal, organizational, family, and well-being factors, including mental health, work-family balance, and work modality. The aim is to provide business leaders in Mexico and Colombia with a data-driven tool to support better decision-making and promote healthier and more sustainable work environments.

COLLABORATORS:

- Victoria Eugenia Cabrera García
- Lina María Acuña Arango
- Fernando Riveros Munévar
- Ángela Ximena Campos García
- Jonás Velasco Álvarez
- Ignacio Méndez Gómez Humarán

Project Code: UP-CI-2025-AGS-01-ING

Gabriela Michel Durán Aguilar
SNII Level C

PROJECT TITLE:

DESARROLLO E IMPRESIÓN 3D DE VASOS LINFÁTICOS ARTIFICIALES PARA EVALUACIÓN PRECLÍNICA EN MODELOS ANIMALES

DESCRIPTION: This project focuses on the design, high-resolution 3D nano-printing using a biocompatible polymer known as OrmoBio®, and preclinical validation of a prototype artificial lymphatic vessel. It seeks to develop a device capable of replicating the mechanical and biological function of the lymphatic system, thereby offering an innovative and permanent therapeutic alternative for patients suffering from chronic upper limb lymphedema as a consequence of breast cancer treatments.

COLLABORATORS:

- 👤 **Luis Alberto Rosa Sierra**
- César Omar Balderrama Armendáriz
- Rita Q. Fuentes Aguilar

Project Code: UP-CI-2025-AGS-03-ING

Ricardo Abel Espinosa Loera
Research Professor

PROJECT TITLE:

REGISTRO BASADO EN VISIÓN DE CLIPS PARA ANEURISMAS EN
APLICACIONES NEUROQUIRÚRGICAS

DESCRIPTION: This project proposes the development of an intelligent real-time visual tracking system that, through deep learning algorithms based on artificial intelligence and RGB imaging, automatically detects and aligns the metallic clips used during intracranial aneurysm surgery. The objective is to provide a precise and accessible surgical navigation tool that dynamically adapts during the procedure without requiring invasive hardware, thereby enhancing patient safety.

COLLABORATORS:

- Nazim Haouchine
- 👤 **Hiram Eredín Ponce Espinosa**
- Gilberto Ochoa Ruiz

Project Code: UP-CI-2025-AGS-02-ING

Orlando Montoya Márquez
Research Professor

PROJECT TITLE:

SISTEMA DE INSPECCIÓN DE CALIDAD AUTOMATIZADA CON EDGE
AI Y VISIÓN ARTIFICIAL: ENFOQUE TECNOLÓGICO Y CONTEXTUAL

DESCRIPTION: The project develops an intelligent visual quality control system for production lines using computer vision, artificial intelligence, and edge computing based on low-cost, low-latency devices. In addition to its technical innovation, it includes a socioeconomic analysis to ensure that automation is affordable, scalable, and responsible within the labor context of Mexican small and medium-sized enterprises.

COLLABORATORS:

- 👤 **María Dolores Luquín García**
- 👤 **Lourdes Patricia Maisterrena González**
- 👤 **Alejandro Esteban Rodríguez Sánchez**

Project Code: UP-CI-2025-GDL-06-ING

Elías Olivares Benítez
Senior Researcher D, SNII Level II

PROJECT TITLE:

LOGÍSTICA PARA LA SALUD PÚBLICA Y ATENCIÓN DE EMERGENCIAS

DESCRIPTION: It develops advanced mathematical models, including metaheuristic, matheuristic, and fuzzy methods, to solve complex logistics optimization problems. It focuses on three main scenarios: routing assignment for home-based healthcare services, vehicle routing to deliver priority supplies in disaster areas, and the location of care centers to maximize coverage in emergencies.

COLLABORATORS:

-  **Samuel Moisés Nucamendi Guillén**
-  **Abraham Mendoza Andrade**
-  **Alfredo Segismundo Ramos Jiménez**
-  **Guillermo Sosa Gómez**
-  **Omar Guillermo Rojas Altamirano**
 - William Javier Guerrero Rueda
 - Jairo Rafael Montoya Torres
 - Elena Valentina Gutiérrez Gutiérrez

Project Code: UP-CI-2025-GDL-09-ING

David Ernesto Salinas Navarro
Research Professor

PROJECT TITLE:

LA PRODUCCIÓN DE QUESO TRADICIONAL MEXICANO EN CADENAS CORTAS DE ALIMENTOS: EL CASO DEL QUESO TENATE

DESCRIPTION: The research aims to study the role of short food supply chains (SFCs) in improving the sustainability and commercial viability of traditional cheese production in Mexico, using the artisanal cheese “tenate” as a case study. The project seeks to help small producers overcome challenges such as competition from industrialized cheeses, ensure food safety and quality, including the handling of raw milk, improve market access, and promote collective organization. To achieve this, it adopts an interdisciplinary approach that combines food technology, operations modeling, artificial intelligence, and rural development.

COLLABORATORS:

-  **Claudia Ariadna Acero Ortega**
-  **Julieta Domínguez Soberanes**
-  **Claudia Yohana Arias Portela**
-  **Antonieta Teodora Martínez Velasco**

Project Code: UP-CI-2025-MX-11-ING

Carolina del Valle Soto
Senior Researcher D, SNII Level I

PROJECT TITLE:

NEUROWEAVE: DETECCIÓN TEMPRANA DE ALTERACIONES NEUROFISIOLÓGICAS MEDIANTE WEARABLES E INTEGRACIÓN DE MODELOS PREDICTIVOS BASADOS EN INTELIGENCIA ARTIFICIAL Y NEUROTELEMETRÍA

DESCRIPTION: This project seeks to design and validate an interdisciplinary preventive platform to anticipate potential neurological disorders in individuals with risk factors. It operates by combining two approaches: the use of wearable sensors for continuous and non-invasive monitoring of vital signs, and the use of the iMotions platform to analyze cognitive and neuroemotional responses. The collected data are processed through explainable artificial intelligence (XAI) models to detect early anomalies and generate personalized therapeutic recommendations, all within a strict ethical framework and with the protection of sensitive data centered on patient dignity.

COLLABORATORS:

-  **Alba Violeta Corona Cabrera**
-  **Yurixhi Gallardo Martínez**
-  **Ramón Alejandro Briseño Martínez**
-  **Leonardo Jesús Valdivia Parga**
- José Luis Villa López

Project Code: UP-CI-2025-GDL-08-ING

SCHOOL OF PEDAGOGY

Sara Elvira de Jesús Galbán Lozano

Senior Researcher B, SNII Level I

PROJECT TITLE:

ALFABETIZACIÓN DIGITAL DE LOS COMERCIANTES
DE MERCADOS PÚBLICOS DE LA CIUDAD DE MÉXICO

DESCRIPTION: The project aims to determine the level of digital literacy among vendors in the public markets of Mexico City. Through an interdisciplinary approach involving pedagogy, business, and law, it seeks to understand how digitalization and the short food supply chain model can help these vendors address market challenges, competition, and new consumption patterns.

COLLABORATORS:

-  **Claudia Fabiola Ortega Barba**
-  **Mónica del Carmen Meza Mejía**
-  **Marisol Velázquez Salazar**
-  **María Lorena de la Torre Díaz**
-  **Clara Luz Álvarez González de Castilla**
-  **Javier Fernández de Castro de León**

Project Code: UP-CI-2025-MX-08-PED

SCHOOL OF PHILOSOPHY

David Xavier Levystone
SNII Level I

PROJECT TITLE:

EL PENSAMIENTO ECONÓMICO DE JENOFONTE Y SU INFLUENCIA

DESCRIPTION: This research examines the economic thought of the classical author Xenophon and its profound influence on the modern era. It brings together experts in classics, philosophy, economics, and history to identify connections between ancient economic reflections, including resource management, division of labor, and the ethics of wealth, and contemporary economic theories and challenges.

COLLABORATORS:

- Emily Baragwanath
- Etienne Helmer
- Rodrigo Illarraga
- 👤 **María Elena García Peláez**
- Valeria Sonna

Project Code: UP-CI-2025-MX-10-FIL

Héctor Jesús Zagal Arreguín
Senior Researcher D, SNII Level III

PROJECT TITLE:

LAS MANIFESTACIONES CULTURALES DEL BARROCO:
HERMENÉUTICA DE UNA CATEGORÍA CULTURAL

DESCRIPTION: The project critically examines the expansion and current use of the term “Baroque” in order to determine whether the concept has become trivialized. It seeks to establish clear hermeneutic criteria to distinguish when the use of the term is legitimate, whether as a historical artistic phenomenon or as a cultural category, and when it functions as an empty label. Particular attention is given to the development and specificity of the Baroque in Latin America and New Spain.

COLLABORATORS:

- 👤 **Virginia Aspe Armella**
- 👤 **Leonardo Ruiz Gómez**
- 👤 **Mauricio Lecón Rosales**

Project Code: UP-CI-2025-MX-12-FIL

Investigadores invitados:

- Raquel Masmano Llobregat
- María Estela Muñoz Espinosa
- Dominique Courcelles
- Norma Campos Vera
- 👤 **Laura Yadira Munguía Ochoa**
- 👤 **Rómulo Ramírez Daza**
- Joaquín García Huidobro
- José Manuel Cuéllar Moreno
- Mauricio Hardie Beuchot Puente

SCHOOL OF ECONOMIC AND BUSINESS SCIENCES

María Concepción Atristain Suárez

*Research Professor
Universidad Panamericana*

Luis Alfredo Paipa Galeano

Universidad de la Sabana

PROJECT TITLE:

NEUROTECNOLOGÍA APLICADA: EVALUACIÓN Y ENTRENAMIENTO
COGNITIVO PARA EL DESARROLLO DEL CAPITAL HUMANO

DESCRIPTION: Development and validation of technological applications, Bloom and Pollen, based on virtual reality to assess and train executive functions and enhance human capital performance in educational and industrial environments.

COLLABORATORS:

-  **Elizabeth Martínez Orozco**
-  **David Escobar Castillejos**
 - Andrea Milena García Becerra
 - Luis Mauricio Agudelo Otalora

Project Code: F05-UPUS-2025

SCHOOL OF ENGINEERING

Julieta Domínguez Soberanes

Senior Researcher A, SNII Level I

Universidad Panamericana

María Ximena Quintanilla Carvajal

Universidad de la Sabana

PROJECT TITLE:

CONDUCTA Y SEGURIDAD ALIMENTARIA ASOCIADA A ALIMENTOS
FERMENTADOS EN MÉXICO Y COLOMBIA Y ESTUDIO DE
SU POTENCIAL PROBIÓTICO

DESCRIPTION: It analyzes the factors that influence the consumption of traditional fermented foods, assessing their probiotic potential and developing sustainable and inclusive supply chain models.

COLLABORATORS:

-  **Friné Velázquez Contreras**
-  **Alba Violeta Corona Cabrera**
-  **Claudia Ariadna Acero Ortega**
-  **Antonieta Teodora Martínez Velasco**
-  **Claudia Yohana Arias Portela**
-  **Sergio Erick García Barrón**
-  **David Ernesto Salinas Navarro**
- Eric Rodríguez
- Gonzalo Mejía
- Katherine Bauer
- Annamaría Filomena

Project Code: F07-UPUS-2025

Yovani Marrero Ponce*SNII Level III**Universidad Panamericana*

Luis Eduardo Díaz Barrera*Universidad de la Sabana***PROJECT TITLE:**

DESCUBRIMIENTO COMPUTACIONAL Y VALIDACIÓN IN VITRO DE NUEVOS INHIBIDORES DE TIROSINASA CON APLICACIONES EN LAS INDUSTRIAS COSMÉTICA Y FARMACÉUTICA

DESCRIPTION: It combines computational techniques, including artificial intelligence and machine learning, with in vitro assays to discover new, more potent and less toxic compounds that inhibit tyrosinase for industrial and clinical use.

COLLABORATORS:

-  **Félix Orlando Martínez Ríos**
- Ricardo Hilario Guerrero Lara
 - Jorge Eduardo Cortázar Gómez

Project Code: F13-UPUS-2025

Alejandro Esteban Rodríguez Sánchez*SNII Level I**Universidad Panamericana*

Mario Jesús Juha*Universidad de la Sabana***PROJECT TITLE:**

INNOVACIÓN EDUCATIVA EN INGENIERÍA: ESTRATEGIAS PARA LA ENSEÑANZA DE LA MECÁNICA DE FRACTURA Y SU IMPACTO EN LA TRANSICIÓN ENERGÉTICA EN COLOMBIA Y MÉXICO

DESCRIPTION: It addresses the lack of instruction in fracture mechanics through experiential learning methodologies and curriculum updates aimed at meeting the challenges of the energy transition, particularly in hydrogen transportation.

COLLABORATORS:

- Diego Fernando Becerra Rodríguez
- Maribel Herrera

Project Code: F04-UPUS-2025

SCHOOL OF PEDAGOGY

María Teresa Hernández Herrera
Research Professor
Universidad Panamericana

Laura Fonseca Durán
Universidad de la Sabana

PROJECT TITLE:

PROYECTO EDUCATIVO PARA TERRITORIOS RURALES:
EDUCACIÓN, CAMPO Y RECONCILIACIÓN (EDUCARE)

DESCRIPTION: Consolidation of a participatory rural education project at the primary and secondary levels that strengthens community leadership, fosters peacebuilding, and promotes local rootedness.

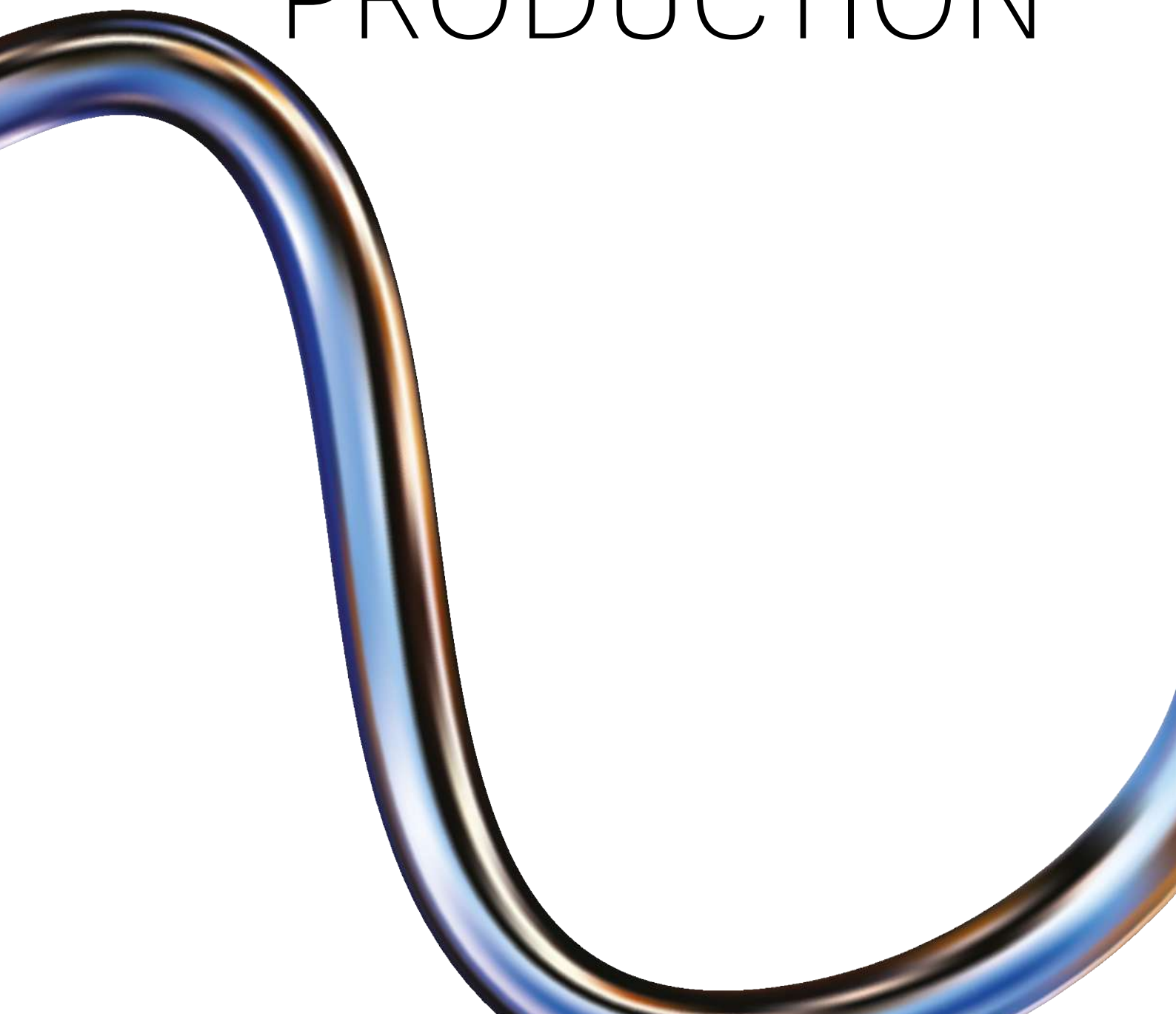
COLLABORATORS:

- Martha Rocío González Bernal
- Nicolás Garzón Rodríguez

Project Code: F09-UPUS-2025



SCIENTIFIC PRODUCTION



Sandra Anchondo Pavón

Research Professor

HEALING ACTION, TECHNIFICATION AND CRISIS: TOWARDS A PERSONAL MEDICINE

ABSTRACT: El presente artículo presenta algunas claves para situar a la medicina en referencia a la persona a partir de la antropología trascendental de Leonardo Polo. En la primera parte introduce la situación en la que se encuentra la medicina moderna tomando como ejemplo paradigmático la emergencia sanitaria de importancia internacional declarada en 2020. En un segundo momento, se realiza un diagnóstico a partir de las críticas hacia la excesiva tecnificación y formalización de la ciencia en general, y de la medicina en particular. En la tercera parte, señala las ventajas asociadas al enfoque personal de la medicina para cerrar con un apartado descubre las dualidades antropológicas en torno a la actividad médica como base de un nuevo paradigma médico que ponga al ser personal en el centro.

Anchondo-Pavón, S. & Vargas-Pérez, A. I. Healing action, technification and crisis: Towards a personal medicine. *Studia Poliana*, (27), 177-201. 10.15581/013.27.177-201. Article.

Mónica Apango Partida

Research Professor

TIMES OF TRANSITION: THE CRISIS OF A UNIPOLAR ORDER AND THE EMERGENCE OF BRICS ON THE WORLD STAGE

ABSTRACT: This book delves into the evolving world order within International Relations (IR), highlighting the international system's ongoing historical and structural crisis. As the "old order" declines and transitions towards a new one, the international system operates abnormally, causing significant turbulence among states, international organizations, and non-state actors, resulting in heightened global tensions. In this regard, this book offers a comprehensive overview of IR in this transitional era, covering the current geopolitical landscape, the state's role in areas such as cybersecurity or sport, and a detailed and reflective look at the challenges faced by Latin America in the contemporary global scenario.

Aimed at academics, students, and professionals, the book's multidisciplinary approach makes it accessible to a diverse readership. By presenting stimulating questions and innovative viewpoints, this book encourages readers to challenge their assumptions and consider new perspectives of analysis, emphasizing the

need for informed and thoughtful approaches to addressing global challenges effectively.

Apango, M. (2025). Times of transition: the crisis of a unipolar order and the emergence of BRICS on the world stage. In D. Morales, & C. Pulleiro (Eds.), *International Relations in Times of Transition: Concepts, Debates and Regional Perspectives* (pp. 25-47). Nova. <https://doi.org/10.52305/EGWI4050>. Book Chapter.

José Enrique Ávila Palet

Senior Researcher B, SNII Level I

HISTORIOGRAPHICAL STUDY OF ANTIJUDAISM IN THE KINGDOM OF NAVARRE IN THE FOURTEENTH CENTURY

ABSTRACT: The phenomenon of persecution against the Jewish community during the 14th century is well known, which the most traditional and recent historiography has been working on in the Hispanic and European framework, is well known. Apart from the contexts and situations that motivated this phenomenon, the object of the present work proposes a historiographical investigation of the sources and bibliography published on the anti-Jewish conflict based on the nature of the documentation preserved mainly in the archives of the Navarre archives. To this purpose, the objective is to observe how the written memory of the period reflected their processes of persecution and social and economic degradation, looking at what image was constructed the texts and what type of language was used to allude to developments contrary to the flourishing of these families in the urban environment and in the circles of the royal power.

Ávila Palet, E. (2025). Historiographical study of antijudaism in the Kingdom of Navarre in the fourteenth century. *Cuadernos Medievales*, 38(1), 62-84. <https://fh.mdp.edu.ar/revistas/index.php/cm/article/view/8014/html>. Article.

Federico Nassim Bravo Jordán

Senior Researcher B, SNII Level I

THE CONFLICT BETWEEN THE OLD AND THE NEW SOAP-CELLARS AND KIERKEGAARD'S RELATION WITH SPECULATIVE THOUGHT

ABSTRACT: In this article I offer a historical analysis of Kierkegaard's early, unpublished theatrical work, *The Conflict between the Old and the New Soap-Cellars*. In this comedy, it is possible to trace a number of expressions that ridicule the philosophical view of Martensen, which in turn is associated with Hegelianism and speculative thought. However, I wish to argue that, if one pays close attention to some passages in Kierkegaard's early journals in the 1830s, specifically the so-called journal of Gilleleje, one notes that he actually seems to agree with Martensen on several points. In my view, this would show that, despite Kierkegaard's hostility towards Martensen in the Soap-Cellars, he was actually sympathetic to some of the latter's ideas. This analysis would help us to better understand the philosophical position of young Kierkegaard, who, as it turns out, had a more favorable opinion of speculative thinking than is often thought.

Bravo, N. (2025). The conflict between the old and the new soap-cellars and Kierkegaard's relation with speculative thought. *Filozofia*, 80(4), 482-496. <https://doi.org/10.31577/filozofia.2025.80.4.2>. Article.

Claudio César Calabrese Ruíz
Senior Researcher D, SNII Level II

THE ARISTOTELIAN PRINCIPLE ESSE IN SUBIECTO IN THE DEMONSTRATION OF THE IMMORTALITY OF THE SOUL. THE DE IMMORTALITATE ANIMAE OF SAINT AUGUSTINE

ABSTRACT: Saint Augustine's encounter with Aristotelianism had two paths: on the one hand, the Latin translations of the commentators, who sought the integration of Plato and Aristotle, although they pointed out the primacy of the Athenian; thus, Aristotelianism reached a new rise, but under the conceptual direction of Neoplatonism. On the other hand, the reading of the Categories, in some of the Latin translations that were circulating at that time. In this double framework of reception, we postulate the presence of the Aristotelian principle *esse in subiecto*, in the argument about the immortality of the soul, and we discern the consequences of this resource. Although the theory of reminiscence explained the origin of knowledge as the truest memory, it was an insuperable difficulty for a creationist mentality; we consider that the Aristotelian element acts on this Platonic structure: the experience of things is not memory, but evocation. Using the Aristotelian principle, Saint Augustine transmutes the immateriality of the Platonic-Aristotelian soul into spirituality.

Calabrese, C. C. (2024). The Aristotelian principle *esse in subiecto* in the demonstration of the immortality of the soul. The *De immortalitate animae* of Saint Augustine. *Pensamiento*, 80(311), 1791-1809. <https://doi.org/10.14422/pen.v80.i311.y2024.034>. Article.

Claudio César Calabrese Ruíz
Senior Researcher D, SNII Level II

Ethel Beatriz Junco de Calabrese
Senior Researcher D, SNII Level I

DIALOGUE BETWEEN MANICHAISM, LITERATURE AND PHILOSOPHY IN THE YOUNG AUGUSTINE

ABSTRACT: We work on the dialogue between literature, philosophy, and Manichaeism in Book IV of Confessions; we refer to the pact that sustains an autobiographical account and its different levels of the narrator and (already as a first contribution on our part) to the ways in which the religious experience of an absolute dualism required a philosophical dualism that expressed the principles of the mythical account. The rhetorical device of a self-reflexive narrator allows us to move from the consideration of the present implied by the Confessions to the past of his nineteen years (Liberal Arts –Stoicism, Pythagoreanism, Virgil, Cicero and Aristotle– and Manichaeism), *et retour*, starting from the horizon of eternity that is God; the second part of our contribution lies in following the way in which this temporal structure is embodied in the story (recourse to the adverb *tunc* and the imperfect tense), with reference to *De Pulchro et Apto*). From the methodological point of view, we carry out a philological analysis, that is, a reading of the narrative disposition in reference to Late Antiquity's cultural contents.

Calabrese, C., & Junco, E. B. (2025). Dialogue between Manichaeism, literature and philosophy in the young Augustine. *Logos: Revista de Lingüística, Filosofía y Literatura*, 35(1), 247-261. <https://doi.org/10.15443/RL3518>. Article.

Cecilia María Coronado Angulo
Senior Researcher C, SNII Level I

VIOLENCE AND LEGITIMACY: CRITICAL ANALYSIS OF "SYSTEMIC VIOLENCE" IN THEODOR ADORNO AND MARX HORKHEIMER

ABSTRACT: Systemic violence consists of aggressive treatment perpetually and subtly inflicted on individuals by individuals or groups. Such violence negatively affects the development of different social spheres. Since systemic violence is the result of rational planning, it is not perceived in its complexity either by those affected or by external agents. The purpose of the text is to discuss the reasons why this type of violence remains implicit. To this end, we will first discuss systemic violence and its types. In a second moment it will be argued that the reasons why this type of violence appears are due to the continued exercise of "instrumental reason" and "authoritarianism" (under the perspective of Theodor Adorno

and Max Horkheimer). And, finally, it will be reviewed whether such analysis serves to understand the reasons for the occurrence of both types of systemic violence or only one of them.

Coronado, C. (2025). Violence and legitimacy: Critical analysis of “systemic violence” in Theodor Adorno and Max Horkheimer. *Civitas*, 25(1), e44138. <https://doi.org/10.15448/1984-7289.2025.1.44138>. Article.

María Teresa Enríquez Gómez
Associate Researcher, Research Professor

RECOVERY THE GOOD: RECOVERING HOPE; RECUPERAR EL BIEN: RECUPERAR ESPERANZA

ABSTRACT: This article demonstrates, through a hermeneutic-systematic study, how the transformation that hope has undergone in the modernization of the Western world, as explained by Benedict XVI in *Spe Salvi*, can be understood through the three malaises of modernity identified by Charles Taylor: individualism, the primacy of instrumental reason, and the growing subordination of personal freedom to the dictates of political systems. Taylor’s ethics, which call for the recovery of the good through the recognition of strong valuations, also reveal a path for the recovery of hope. The conclusion points toward opening a hopeful Christian path through the recovery of the good. In this way, the individualism characteristic of instrumental reason and autonomous freedom is also overcome.

Enríquez, M. T., & Salgado, R. (2025). Recovery the good: Recovering hope. *Perspectiva Teológica*, 57(2). <https://doi.org/10.20911/21768757v57n2e06036/2025>. Article.

María Teresa Enríquez Gómez
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THE IMPERIUM: SUÁREZ AFTER AQUINAS

ABSTRACT: With the aim of clarifying the mutual influence of reason and will concerning “*imperium*,” the texts of both authors (the *Summa Theologica* and Suárez’s respective commentary) were exhaustively examined, leading to the following conclusions. The articulation of the four senses of causality, stemming from the Aristotelian root, in the analysis of commanded voluntary acts developed by Aquinas, appears to have been received by Suárez with significant variations. The “*imperium*,” as an act of practical reason, which in Aquinas is primarily causative of an order derived from purpose, the object of the will, and secondarily expressive of volition, is in Suárez primarily the latter. In Suárez’s perspective, the “*imperium*” of reason arises once the execution is completed, and the “*imperium*” of the will disappears in the face of “*usum*.” In both cases, the

primacy of the final cause in the metaphysical structure of human action is lost.

Enríquez, M. T. (2024). The imperium: Suárez after Aquinas. *Cauriensia*, 19, 679-706. <https://doi.org/10.17398/2340-4256.19.679>. Article.

Pablo Galindo Cruz
Research Professor

KÓRIMA: AN EPISTEMOLOGY OF CHARITY FROM THE SIERRA TARAHUMARA; KÓRIMA: UNA EPISTEMOLOGÍA DE LA CARIDAD DESDE LA SIERRA TARAHUMARA

ABSTRACT: In this article, I present the testimony of the indigenous people of the Sierra Tarahumara, in Chihuahua, Mexico. My analysis is informed by an interview with Father Enrique Mireles, a Jesuit priest and director of the *Complejo Asistencial Clínica Santa Teresita* (CACSTAC), a work begun by Father Luis Verplancken, S.J. in 1963. Based on the interview with the priest, I will discuss the similarities between Christian morality and Raramuri practice, to propose the concept of *korima* as a way of understanding and teaching Charity, a central element of Christian-Raramuri theology. To this end, I will also turn to the formulation of the Scottish philosopher Alasdair MacIntyre, specifically to what is presented in his work *Dependent rational animals* (1999), and his incorporation of the Lakota culture as a referent of the virtue of *just generosity*.

Galindo Cruz, P. (2025). Kórima: An epistemology of charity from the Sierra Tarahumara. *Perspectiva Teológica*, 57(2), e05675. <https://doi.org/10.20911/21768757v57n2e05675/2025>. Article.

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Senior Researcher D, SNII Level I

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A MYTH OF WATER: FROM THE STYX LAGOON TO SPANISH-AMERICAN POETRY

ABSTRACT: In accordance with a myth-critical perspective, we treat the topic of water in Alfonsina Storni’s literature as a lyrical anticipation of the idea of personal death, based on the analogical model of the waters of the Estigia lagoon; we will observe that the poetic recreation bases its effect on the emotional intensity latent in the common imagination and whose representation comes from the Greco-Roman tradition. We present the mythical topic to under-

line its dominant notes; then, we synthesize its reference value; finally, we select the most conclusive examples of Storni's poetry in which the semantic field of the word "water" appears, directly evoking the idea of death to verify the symbolic content attributed to the natural element.

Junco, E. B., & Calabrese, C. C. (2025). A myth of water: From the Styx lagoon to Spanish-American poetry. *Agua y Territorio*, (26), 129-142. <https://doi.org/10.17561/at.26.8221>. Article.

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MARÍA ZAMBRANO AND THE ANTIHEROIC FORM OF KNOWLEDGE. THE POETICS OF DECENTERING THROUGH ANTIGONE, PERSEPHONE, DIOTIMA AND CASSANDRA

ABSTRACT: This article explores the configuration of female figures with an antiheroic function in the philosophical-poetic work of María Zambrano, in dialogue with classical Greek myths. Through a comparative and symbolic approach, it analyzes how Zambrano inaugurates a poetics of decentering that subverts the traditional heroic logic. It is argued that the feminine in her thought does not negate heroic action, but rather transforms it into an experience of loss, descent, mediation, and active waiting. The figures of Antigone, Persephone, Diotima, and Cassandra are presented as symbols of a torn subjectivity that acquires knowledge through wounding and interiority. Each of them embodies alternative forms of resistance and knowledge that destabilize the Western heroic paradigm, proposing a more open vision of truth and power. This study contributes to the reflection on non-epic modes of feminine subjectivity and their relevance to Zambrano's notion of poetic reason, highlighting their potential to rethink knowledge and ethics from a symbolic perspective not enclosed in the conceptual.

Junco, E. B., & Calabrese, C. C. (2025). María Zambrano and the antiheroic form of knowledge. The poetics of decentering through Antigone, Persephone, Diotima and Cassandra. *Humanidades*, (18), e187. <https://doi.org/10.25185/18.7>. Article.

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METAPHORS FOR THINKING: FORMS OF KNOWLEDGE IN MARÍA ZAMBRANO; METÁFORAS PARA PENSAR: FORMAS DEL CONOCIMIENTO EN MARÍA ZAMBRANO

ABSTRACT: Under the premise that the notion of poetic reason, a distinctive contribution of the philosopher María Zambrano, would not be possible without a language perspective, we approach the reading of three texts separated in time: "Hacia un saber sobre el alma", from 1934, "La metáfora del corazón", from 1944 and, with the same name, but with expanded content, "La metáfora del corazón", from 1965. The objective is to trace the type of cognitive function of the essential images of her poetics incorporated in the essay as a theoretical format; after developing a methodological device based on metaphor, the author formulates two ideas of philosophical value, namely, soul and heart, as principles of knowledge. Such notions exceed the conceptualizing pretension of philosophy and approach a knowledge of revelation. On both, she lays the foundations of a structure that challenges the monolithic format of nineteenth-century and early twentieth-century rationalism, expanding the horizon of what is accepted as knowledge. In the analysis we consider the value of the essay with a philosophical nature, and the germinal character of the chosen texts, whose postulates radiate throughout the author's entire production. The conclusion vindicates the value of metaphor for the integral expression of thought.

Junco, E. B., & Calabrese, C. C. (2025). Metaphors for thinking: Forms of knowledge in María Zambrano. *En-Claves del Pensamiento*, (38), 126-149. <https://doi.org/10.46530/ecdp.v0i38.703>. Article.

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THE EXPERIENCE OF AIDÓS AS A CONDITION OF PIETY ACCORDING TO MARÍA ZAMBRANO; A EXPERIÊNCIA DO AIDÓS COMO CONDIÇÃO DE PIEDADE EM MARÍA ZAMBRANO; LA EXPERIENCIA DEL AIDÓS COMO CONDICIÓN DE PIEDAD EN MARÍA ZAMBRANO

ABSTRACT: The text will expose the basis of the notion of piety postulated by Maria Zambrano in relation to the Greek idea of *aidós*; for this purpose, we will start from a minimal description of *aidós* in two classical examples, namely, the Apollo-Hector relationship in book XXIV of the *Iliad* and the Artemis-Hippolytus relationship in Euripides' *Hippolytus*. Once the concept is framed, we will move on to Maria Zambrano's approach in *El hombre y lo divino*; we will make a description of the structure of the work up to the point where it deals with the notion of piety, in Greek seat from the texts of the first Plato and according to the treatment linked to the mission of Socrates in the city. Finally, we will describe the religious function of tragedy as an "office of piety". Having presented the concept in a philosophical and religious context, we will now move on to analyze the author's approach to the space that piety occupies in philosophy, its original belonging, but its historical disengagement. As a coda, the author exemplifies this uprooting of the original vision in *La tumba de Antígona*. In this work Zambrano points out the explanations of the Sophoclean myth and exposes her own interpretation about piety.

Junco, E. B., & Calabrese, C. C. (2025). The experience of *aidós* as a condition of piety according to María Zambrano. *Universon*, 40(1), 213-230. <https://doi.org/10.4067/s0718-23762025000100213>. Article.

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ZAMBRANO AND ELIADE IN SEARCH OF THE SACRED CENTER; ZAMBRANO Y ELIADE TRAS EL CENTRO SAGRADO

ABSTRACT: This paper aims to explore the points of convergence between the work of María Zambrano and Mircea Eliade regarding forms of knowledge linked to the sacred, in contrast to modern rationality. The central theme focuses on the model of access to meaning as a circumambulation of the center, understood not only as an archaic ritual form (Eliade) but also as an epistemological structure that Zambrano revives in her concept of poetic reason. The methodology consists of a hermeneutic-comparative analysis of selected texts, emphasizing their conceptions of the sacred center and knowledge as a transformative experience. Both thinkers share a radical critique of instrumental reason and recover archaic modes of knowing as a path toward spiritual regeneration.

Junco, E. B., & Calabrese, C. C. (2025). Zambrano and Eliade in search of the sacred center. *Isidorianum*, 34(2), 291-315. <https://doi.org/10.46543/ISID.2534.1063>. Article.

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ARTIFICIAL NEURAL NETWORKS (ANN) IN THE LIGHT OF THE RELATIONSHIPS BETWEEN HUMAN INTELLIGENCE AND THE WILL IN SAINT THOMAS AQUINAS

ABSTRACT: Human knowledge is a difficult reality to address, as it involves different faculties, both cognitive and appetitive, in which biological and spiritual processes are involved. In recent times, however, human beings have tried to emulate, through computational models, the brain functions that underlie human knowledge. This is what within Artificial Intelligence (AI) has been called artificial neural networks (ANN). Nonetheless, it is necessary to examine to what extent neural networks coincide with human cognitive processes. The objective of this work is to study innovative neural networks in light of the relationships between human intellect and the will in the process of knowledge. We have considered it appropriate to do so from the perspective of Saint Thomas Aquinas because he is an author who collects, synthesizes and develops the entire classical and medieval cultural heritage around the topic of knowledge.

Ocampo, M. (2025). Artificial neural networks (ANN) in the light of the relationships between human intelligence and the will in Saint Thomas Aquinas. *Perseitas*, 13, 310-334. <https://doi.org/10.21501/23461780.5006>. Article.

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PHILOSOPHY AND CONVERSION IN JOSEPH RATZINGER'S DOCTORAL DISSERTATION ON SAINT AUGUSTINE

ABSTRACT: In Ratzinger's dissertation on Augustine it can be seen that the idea of philosophy underlying the text has two general meanings: firstly, philosophy is understood as a very intimate and existential activity, close to the subject, in the first person; secondly, a more objective conception that points towards a metaphysical understanding of reality makes its way. In the present study I analyze the first sense, in which the idea of philosophy remains very close to its etymological meaning. I suggest that Augustine's Christian conversion can be interpreted as a philosophical conversion, for the search for *sapientia* is always the constant that motivates the whole movement. His commitment to truth leads him to discover the value of authority, but always with a view to attaining wisdom, as reflected in his famous *crede, ut intelligas*.

Sada, A. (2024). Philosophy and conversion in Joseph Ratzinger's doctoral dissertation on Saint Augustine. *Pensamiento*, 80(311), 1521-1546. <https://doi.org/10.14422/pen.v80.i311.y2024.021>. Article.

Pablo Ignacio Sahagún Kunhardt
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¿HUMAN TYPE OR SPECIMEN? LEONARDO POLO IN DIALOGUE WITH EDITH STEIN

ABSTRACT: The relationship of the species to the individual is generally understood on the assumption that individuals are identical specimens of their species. Edith Stein develops an anthropology in which each individual represents its own species (last or inferior). Leonardo Polo explains that the human species is typified in such a way that each person is a different type. In this article, the equivalence of both positions is presented as a thesis, also pointing out the points of disagreement.

Sahagún-Kunhardt, P. I. (2025). ¿Human type or specimen? Leonardo Polo in dialogue with Edith Stein. *Studia Poliana*, (27), 137-158. <https://doi.org/10.15581/013.27.137-158>. Article.

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THE ESSENCE OF HOSPITALITY EXTRACTED FROM THE ODYSSEY OF HOMER: ITS RELEVANCE FOR HOSPITALITY PROFESSIONALS TODAY

ABSTRACT: It seems an undeniable fact that hospitality as the generous action of receiving someone, usually a stranger, in the home has been a millenary practice. This may have to do with the fact that man possesses the capability to move around the earth, and therefore when he is in a foreign land, he may need shelter or refuge. In this context, many authors have considered Homer's poem, the Odyssey, a good setting to study this phenomenon, since it is the remotest testimony of a great journey, in Western Literature, one in which Odysseus takes 10 years to return home. An author that complements the study of Homer is Aristotle, since his theory of virtue offers a possible conception of hospitality as a human trait that is acquired through effort and models a person's moral character towards the good. This chapter tries to unite both Greek authors to find the essence of hospitality and, from there, the possible implications for today's hospitality professionals.

Saul, F. (2022). The essence of hospitality extracted from the Odyssey of Homer: Its relevance for hospitality professionals

today. In K. Ogunyemi, E. Okoye, & O. Ogunyemi (Eds.), *Humanistic perspectives in hospitality and tourism, CSR and Person-Centred Care* (Vol. 2, pp. 19-39). Palgrave Macmillan. https://doi.org/10.1007/978-3-030-95585-4_2. Book Chapter.

Laura Trujillo Liñán
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BETWEEN CONNECTION AND EXHAUSTION: RECONSIDERING THE HUMAN-TECHNOLOGY BOND IN MODERN SOCIETY

ABSTRACT: Starting in 2019, the COVID-19 pandemic accelerated the adoption of online programs and remote work worldwide. Millions of people had to adapt to prolonged lockdowns and digital interactions. While this brought new possibilities for remote study and work, it also had negative consequences. This article investigates the paradoxical nature of technological progress, focusing on its capacity to induce widespread social fatigue. Methodology: Through a qualitative analysis of contemporary philosophical texts, especially those of Byung-Chul Han, the study examines how continuous interaction with technology affects the physical, psychological, and social dimensions of the human being. Results and Discussion: The findings suggest that while technology promises better connection, it can foster alienation, especially in social media, where digital interactions replace genuine human contact. Furthermore, the immediacy of digital communication promotes superficial exchanges, weakening the capacity for deep understanding and critical thinking. Conclusions: The document argues that the interaction between technological advances and social exhaustion challenges the human condition, requiring a critical reevaluation of our relationship with technology. A balanced approach is suggested, promoting a sustainable and empathetic integration of technology into everyday life.

Trujillo-Liñán, L. (2024). Between connection and exhaustion: Reconsidering the human-technology bond in modern society. *European Public and Social Innovation Review*, 9. <https://doi.org/10.31637/epsir-2024-983>. Article.

Laura Trujillo Liñán
Senior Researcher B, SNII Level I

CONSTRUCTION AND DECONSTRUCTION OF REALITY: PHILOSOPHICAL PERSPECTIVES ON PERCEPTION AND MEDIA

ABSTRACT: Introduction: Human beings have developed over the years through interaction with the world and their social environ-

ment. This process has allowed the transformation of the environment through learning from others, raising questions about the faculties that enable this development. This work explores the nature of knowledge acquisition in humans through their senses and experiences, integrating perspectives from Aristotle, Marshall McLuhan, and Humberto Maturana. Methodology: A theoretical analysis is adopted that combines bibliographic review with philosophical and theoretical interpretation. Key texts such as Aristotle's "De Anima," McLuhan's "Understanding Media," and Maturana's "The Tree of Knowledge" are reviewed, applying them to contemporary examples that illustrate the interaction between perception, media, and experience. Results and Discussion: Aristotle emphasizes the senses as the beginning of knowledge, Maturana views cognition as a biological process, and McLuhan suggests that technological media reconfigure this process. These theories help explain how technological tools affect human knowledge and how media contexts can shape or distort perception. Conclusion: The interaction between biology and communication technologies creates a dynamic field where reality is continuously constructed and deconstructed, highlighting the importance of understanding how media influences our perception of the world.

Trujillo-Liñán, L. (2025). Construction and deconstruction of reality: Philosophical perspectives on perception and media. *European Public and Social Innovation Review*, 10, 1-12. <https://doi.org/10.31637/epsir-2025-1521>. Article.

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Senior Researcher B, SNII Level I

DIGITAL MEDIA AND HUMAN RIGHTS: CHALLENGES AND OPPORTUNITIES IN THE CONNECTED SOCIETY

ABSTRACT: Introduction: Human nature grants inalienable rights to individuals, essential for fulfilling their role in the world and understanding their obligations to themselves and others. These rights must be respected by individuals and societies to maintain balance in social interactions. Objectives: To show how the current use of social media goes against human rights because, through algorithms, individuals are manipulated in decision-making across different areas. Methodology: This study employs a qualitative approach, based on a literature review and analysis of previous studies on the impact of technology and digital media on human rights. Academic sources, reports on algorithm usage, and the effect of social media on interpersonal communication were analyzed. Results and Discussion: Findings suggest that the proliferation of technologies and digital platforms has decreased verbal communication and weakened personal relationships. Furthermore, the use of algorithms to personalize content compromises users' freedom, as they are unaware of how their online interactions are being

manipulated. Conclusions: Digital media have a significant impact on human rights, particularly on individual freedom and the quality of personal relationships. This work emphasizes the importance of ensuring that technology fosters a safe and favorable environment for humans, aligned with human rights principles.

Trujillo-Liñán, L., & Meneses-Trujillo, R. (2025). Digital media and human rights: Challenges and opportunities in the connected society. *European Public and Social Innovation Review*, 10, 1-13. <https://doi.org/10.31637/epsir-2025-1709>. Article.

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Senior Researcher B, SNII Level I

ETHICAL AND REGULATORY CHALLENGES OF GENERATIVE AI IN EDUCATION: A SYSTEMATIC REVIEW

ABSTRACT: Introduction: Generative Artificial Intelligence (GenAI) is transforming education by enabling personalized learning and more efficient teaching practices. However, it raises critical ethical concerns, including data privacy, algorithmic bias, and educational inequality, requiring comprehensive regulatory frameworks and pedagogical strategies. Methods: A Systematic Literature Review (SLR) was conducted, analyzing 53 peer-reviewed articles published between 2020 and 2024. The search was performed in Scopus and Web of Science using defined inclusion criteria focused on GenAI applications in education. Data were synthesized thematically and supported by theoretical frameworks from ethics, regulation, and learning sciences. Results: The findings reveal that while GenAI enhances personalized feedback, instructional automation, and learning accessibility, it simultaneously introduces risks such as loss of cognitive autonomy, institutional misuse of student data, and lack of regulatory oversight. Case studies from Stanford and the University of Toronto illustrate both opportunities and limitations of GenAI adoption in higher education. Discussion: GenAI can benefit education if implemented within ethical, legal, and pedagogical boundaries. The study highlights the urgency of designing inclusive regulatory frameworks, strengthening digital literacy, and integrating GenAI tools with constructivist and self-determined learning models. This review offers practical recommendations for educators, policymakers, and technologists aiming to use GenAI responsibly in educational environments.

García-López, I. M., & Trujillo-Liñán, L. (2025). Ethical and regulatory challenges of Generative AI in education: A systematic review. *Frontiers in Education*, 10, 1565938. <https://doi.org/10.3389/educ.2025.1565938>. Article.

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Senior Researcher B, SNII Level I

FROM ARISTOTLE VIA AQUINAS: UNDERSTANDING FORMAL CAUSE IN MARSHALL MCLUHAN'S PHILOSOPHY

ABSTRACT: This book brings together a number of prominent scholars to explore a relatively under-studied area of Marshall McLuhan's thought: his idea of formal cause and the role that formal cause plays in the emergence of new technologies and in structuring societal relations.

Trujillo-Liñán, L., (2017). From Aristotle via Aquinas: Understanding formal cause in Marshall McLuhan's philosophy. In R. K. Logan & C. Scolari (Eds.), *Taking up McLuhan's cause: Perspectives on media and formal causality* (pp. 85-92). Intellect Books. <https://www.intellectbooks.com/taking-up-mcluhans-cause>. Book Chapter.

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LITERATURE MAPPING ON THE ETHICAL REGULATION OF OLLMS IN HIGHER EDUCATION: TRANSPARENCY, PRIVACY, AND FAIRNESS

ABSTRACT: Open Large Language Models (OLLMs) has sparked a growing debate about their ethical and legal implications, particularly in the context of higher education institutions. This study, based on a literature mapping, explores the evolution of OLLMs regulation and governance in academia, highlighting challenges related to transparency, privacy, and fairness. The central objective of this analysis is to identify the main trends in the literature that address the ethical regulation of OLLMs in education, with emphasis on the evolution of regulatory frameworks and proposed strategies for effective governance. Through the examination of 51 indexed academic articles, a thematic classification was carried out based on three key research questions, which made it possible to identify patterns in the academic discussion and visualize the findings through graphical representations. The results suggest that the ethical governance of OLLMs is a determining factor in their responsible implementation. The literature emphasizes the need to strengthen regulations around algorithmic transparency, student data protection, and equity in access to these technologies. In addition, the importance of interdisciplinary approaches that integrate perspectives from law, ethics, and technology for the development of inclusive and sustainable policies has been found.

García-López, I. M., & Trujillo-Liñán, L. (2025). Literature mapping on the ethical regulation of OLLMs in higher education: Transparency, privacy, and fairness. In *Artificial intelligence. COMIA 2025. Communications in Computer and Information Science (CCIS)* (Vol. 2252, pp. 285-293). Springer. https://doi.org/10.1007/978-3-031-97907-1_22. Conference paper.

SCHOOL OF COMMUNICATION

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BLACK IDENTITIES: A HISTORICAL AND CURRENT REVIEW OF REPRESENTATION IN THE FASHION INDUSTRY

ABSTRACT: This article examines the construction of black identities through male fashion, tracing its evolution from the eighteenth century African diaspora to contemporary black designers. The study explores black dandyism, which combined African and European aesthetics, as both a personal and political statement to assert individuality. Employing a literature review methodology, the study is structured into two main sections. The first provides a historical analysis of the origin and evolution of black dandyism and its influence on the identity formation of Afro-descendant communities in the nineteenth and early twentieth century. The second section focuses on the contributions of designers such as Stephen Burrows, Virgil Abloh, Pharell Williams, and Kanye West, whose work integrates Black heritage into global fashion narratives. By contextualizing these contributions, the article highlights the role of fashion as a powerful tool for cultural representation, affirming the transformative influence of black identities on the fashion industry while fostering conversation about self-expression, identity formation, and visibility. This study contributes an academic approach on current discussions leading up to the Met Gala 2025 exhibition "Superfine: Tailoring Black Style".

Ambás, G., & Gárgoles, G. (2026). Black identities: A historical and current review of representation in the fashion industry. In *Fashion Communication in the Digital Age. FACTUM 2025. Springer Proceedings in Business and Economics (SPBE)* (pp. 151-164). Springer. https://doi.org/10.1007/978-3-031-99481-4_12. Conference Paper.

Gabriela Ambás Sosa
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Paula Gárgoles Saes
Research Professor

FASHIONING SOCIETY: AN EXPLORATION OF COLLECTIVE BEHAVIOUR AND CULTURAL CHANGE THROUGH SYMBOLIC INTERACTIONISM

ABSTRACT: The intersection of fashion, collective behaviour and the philosophical tradition of symbolic interactionism (SI) is explored through this article, highlighting how fashion serves as a key mechanism in social interaction and cultural change. Drawing from the intellectual tradition of SI, developed by Mead and Blumer, this study demonstrates how fashion facilitates collective adaptation and construction of meaning in a cultural landscape that is continually changing. Fashion is analysed not only as a vehicle for individual expression but as a significant social object that embodies symbols, signs and shared meanings. Through social interaction, these meanings are constructed, deconstructed, and continuously reshaped, influencing both personal identities and broader social structures. By analysing fashion's role in collective selection and its potential for societal transformation, the findings of this article reveal fashion's capacity to introduce new cultural models, challenge established norms, and guide upcoming social dynamics. These insights highlight how fashion holds a relevant influence in shaping cultural imaginaries, constructing collective meanings, and driving social change.

Ambás, G., & Gárgoles, G (2025). Fashioning society: An exploration of collective behaviour and cultural change through symbolic interactionism. *Filosofija, Sociologija*, 36(1), 50-59. <https://doi.org/10.6001/fil-soc.2025.36.1.6>. Article.

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THE BELARUSIAN MIGRANT CRISIS (2021) TOLD BY EURONEWS AND SPUTNIK: A COMPARATIVE FRAMING ANALYSIS BASED ON CITATIONS OF POLITICAL SOURCES

ABSTRACT: The coverage of Euronews and Sputnik of the migration crisis on the Polish-Belarus border in November 2021 is comparatively analyzed, carrying out a content and framing analysis based on the sources cited. The results show biases towards the European or Belarusian side of the conflict, but both media also give voice to the opposing positions. A simple and replicable framing analysis system is offered.

Azpíroz, M. L. (2024). The Belarusian migrant crisis (2021) told by Euronews and Sputnik: A comparative framing analysis based on citations of political sources. *IC Revista Científica de Información y Comunicación*, (21), 279-302. <https://doi.org/10.12795/IC.2024.121.13>. Article.

Mindaugas Briedis
SNII Level I

Juan Carlos Carrillo Cal y Mayor
Research Professor

ENACTON OF MESTIZO IDENTITY IN PEDRO PÁRAMO: TRANSGRESSION AS CARE FOR THE EMBODIED SOUL

ABSTRACT: Juan Rulfo's *Pedro Páramo* (1994 [1955]) is one of the milestones of Mexican literature and it holds an important place in the global canon of the twentieth century. Despite the wide spectrum of interpretative possibilities it offers, there are almost no studies of this important novel from the perspective of embodied cognition. This article draws on the vocabulary of contemporary philosophy to address this critical gap, deconstructing the full range of traditional binary oppositions articulated by Rulfo, which includes: body and mind, cognitive and moral, imaginative and perceptual, mystical and lived, freedom and responsibility, individual and social. However, to establish the relevancy of our chosen conceptual apparatus, we return to Aristotle to offer a novel interpretation which also allows us to situate and correlate both the universal (human) and particular (mestizo) projects laid out by the author of *Páramo*. We demonstrate both the usefulness of Aristotle's universal descriptions of the human being and the shortcomings of their rationalism and optimism in the context of the postcolonial world. To modify and extend this adaptation we reflect further on the specific 'movements' of the mestizo soul, which privilege embodied moments of cognition and transgression as the proper care for the soul, a soul that embraces both individual and socio-cultural aspects. This finally allows us to address the question of how the post-logocentric enaction and mediation of mestizo identity is possible.

Briedis, M., & Carrillo, J. C. (2025). Enaction of mestizo identity in Pedro Páramo: Transgression as care for the embodied soul. *Filosofia Unisinos*, 26(2), 1-18. <https://doi.org/10.4013/fsu.2025.262.11>. Article.

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SNII Level I

GNOSIS AND PISTIS IN TILlich'S AND KIERKEGAARD'S PHILOSOPHICAL THEOLOGY

ABSTRACT: The article analyzes and compares the philosophical theology of Kierkegaard and Tillich. They are usually represented as exponents of the same (existentialist- Protestant) tradition, but a different perception of the main questions and possibilities for philosophical theology to answer them guides these philosophers to radically different conclusions regarding the philosophy of religion. A closer look at how they understand faith (pistis) unlocks new possibilities to interpret the ideas of Kierkegaard and Tillich rather than to accept "chrestomathic" analyses. Tillich's implicit loyalty to Platonic and Hegelian ideas subordinates the existential aspects of his system to answers, which can be described as a "gnostic" understanding of faith and knowledge. This violates the limits for theoretical knowledge set by Kierkegaard. Such a Tillichian ontological loyalty explains that an ontological search is implicated in every religious experience. This basic presupposition of interaction with the sacred for Tillich lets us view Kierkegaard's famous interpretation of biblical myths critically, and to argue that these stories do not mean that the only possible faith is "blind" faith. This opens a path for Tillich to rationalize every aspect of Christianity and to talk about "true God," God beyond the gods of actual religions.

Briedis, M. (2025). Gnosis and pistis in Tillich's and Kierkegaard's philosophical theology. *Phainomena*, 34(132-133), 119-135. <https://doi.org/10.32022/PHI34.2025.132-133.7>. Article.

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PHENOMENOLOGY OF EMPATHY VIA THE ENACTION OF RADIOLOGY IMAGING: STATIC-DEPICTIVE SIMILARITY OR DYNAMIC-EMBODIED SYNCHRONIZATION?

ABSTRACT: This article explores the fundamental experience of empathy, combining the theoretical perspectives of phenomenology and enactivism with exemplary cases from radiology praxis. It is shown that the phenomenological tradition includes different conceptualisations of empathy. The problem of empathy in phenomenology can no longer be viewed only from Husserl's perspective, and further developments must be introduced. However, the analysis of Husserl's scattered work on biological phenomena clears the way to apply insights on Image consciousness, categorial intuition, and other projects in order to grasp the specific causality at play in the nexus of biological processes beyond anthropomorphism

and the principle of similarity. This in turn reveals the transcendental status of the self-organizing and sense-making capacities of biological systems and presents them as affordances for skillful diagnostic action. Hence, we demonstrate how life-regulation processes generate forms of meaning or sense-making that underlie and motivate human conceptual cognition.

Briedis, M. (2025). Phenomenology of empathy via the enaction of radiology imaging: Static-depictive similarity or dynamic-embodied synchronization? *Epoché*, 29(2), 321-339. <https://doi.org/10.5840/epoche202534264>. Article.

Mindaugas Briedis
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Mariano Emmanuel Navarro Arroyo
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SITUATING SKILLS: EMERGENT DYNAMIC RECONFIGURATIONS OF ACTIVITIES IN THE TRANSITION FROM A LEARNING ENVIRONMENT TO ANOTHER

ABSTRACT: The paper aims to provide a broad construct for understanding skills, what they are, and the ways in which they are situated, i.e., dependent on the conditions for their exercise. Adding to Hinchliffe's approach, we made skills' transferability not only a key aspect of their conceptualization but also a way of exploring their deeply embodied nature and their intricate relation with complex situations. While there is a growing body of research regarding concrete aspects of embodied cognition in learning environments, little attention is given to skilful performances while transferring them into different (mediatized and non-mediatized) learning environments. Our theoretical and empirical investigation offers a preliminary picture of how skills are reconfigured and redeployed in transitioning from one learning environment to another. Regarding the structure of skill, we enlarged Hinchliffe's approach, integrating the perspective of conversational analysis. The structure of skills can be made explicit if we follow their build-up from simple abilities and their integration into larger structures. According to our view, being skilful means that one can cope with scripted and unscripted interactions and move easily between them.

Copoeru, I., Ionescu, T., Rejtő, R., Briedis, M., & Navarro, M. (2025). Situating skills: Emergent dynamic reconfigurations of activities in the transition from a learning environment to another. *Meta*, 17(1), 99-126. https://www.metajournal.org/articles_pdf/99-126-copoeru-ionescu-rejto-briedis-meta17-1.pdf. Article.

Mindaugas Briedis

SNII Level I

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Senior Researcher A, SNII Level I

THE ENACTION OF EMBODIED METAPHORS IN DANTE'S PHENOMENOLOGY OF EVIL

ABSTRACT: Recent developments in metaphor theory stress its embodied character. This article brings together these transformational insights and considers them through the lenses of Dante's approach, which we may call proto-phenomenological, to the phenomenon of evil. Despite the substantial work on different aspects of Dante's oeuvre, concerning philosophy, theology and poetry, there has been little reflection on his specific phenomenological hermeneutics of the body and its importance for the whole poetic project. The article responds to this neglect with an analysis of the logic of embodied metaphor in relation to a specific, pre-modern context. Hence, the conceptual apparatus of embodied cognition and enactive phenomenology is used here as a method to support the thesis that the language of embodied metaphors grounds a new approach to ontological, epistemological and ethical aspects regarding the phenomenon of evil, which are already apparent in Dante's work. Therefore, another important outcome of this research is the validation of the primacy of poetry on the grounds of this new (embodied) epistemology.

Briedis, M., & Navarro, M. (2025). The enaction of embodied metaphors in Dante's phenomenology of evil. *Filosofija, Sociologija*, 36(1), 33-41. <https://doi.org/10.6001/fil-soc.2025.36.1.4>. Article.

María del Carmen Camacho Gómez

Associate Researcher, SNII Candidate Level

Alma Delia Zamorano Rojas

SNII Level I

Claudia Ivett Romero Delgado

Associate Researcher, SNII Level I

POP JUSTICE AND VIRAL SHAME: VERNACULAR VIGILANTISM IN MEXICO'S LORDS AND LADYS

ABSTRACT: This article examines the phenomenon of *balconeo* in Mexico, a culturally form of digital vigilantism characterized by the viral exposure and shaming of individuals labeled as "Lords" and "Ladys." Captured via smartphones and rapidly circulated on platforms such as TikTok, Twitter, and YouTube, these incidents generate affective publics engaged in what this study conceptualizes as "pop justice." Drawing from affect theory, meme studies, and digital culture, this article analyzes ten emblematic *balconeo*

cases (2015–2025) combining narrative reconstruction, discourse analysis, and meme semiotics. Memes function as affective technologies that frame deviance and regulate classed and gendered behaviors through ironic repetition and visual performance. Women are disproportionately subjected to extended cycles of symbolic punishment and gendered ridicule, while men are often framed through aggression or impunity. Situating *balconeo* as a participatory surveillance and moral pedagogy, the article contributes to debates on viral culture, affective publics, and informal justice in global digital contexts.

Camacho-Gómez, M. del C., Zamorano-Rojas, A. D., & Romero-Delgado, C. I. (2025). Pop justice and viral shame: Vernacular vigilantism in Mexico's Lords and Ladys. *Popular Communication*. <https://doi.org/10.1080/15405702.2025.2605991>. Article.

Gabriel Domínguez Partida

SNII Level I

BETWEEN EFFICIENCY AND MISINFORMATION: THE INTEGRATION OF ARTIFICIAL INTELLIGENCE IN MEXICAN JOURNALISM

ABSTRACT: The impact of artificial intelligence (AI) on journalism varies across socioeconomic and cultural contexts, and Mexico is no exception. This study analyzes technology adoption patterns through in-depth interviews with ten digital media outlets recognized for their credibility in understanding how Mexican media integrate AI tools into their processes. AI integration primarily optimizes tasks and, to a lesser extent, contributes to content generation. Despite these initiatives, AI adoption in Mexico faces multiple barriers, including high implementation costs, skepticism toward AI tools, and a lack of technical training, all limiting its widespread use. This reception contrasts with other regions where media organizations extensively employ AI to create automated content for specific audiences. Another critical challenge involves the risk of misinformation, as AI's ability to generate hyper-realistic content enables manipulation. Although AI technologies enhance efficiency, the Mexican media emphasize the need for rigorous human supervision to ensure accuracy and uphold journalistic ethics. In this context, the findings reveal a paradox: While AI can potentially transform journalism, economic, ethical, and technological tensions influence its adoption. Overcoming these barriers requires investment in infrastructure, training, and regulations that promote responsible AI use in journalism.

Domínguez-Partida, G., & García-Félix, E. M. (2025). Between efficiency and misinformation: The integration of artificial intelligence in Mexican journalism. *Estudios sobre el Mensaje Periodístico*, 31(1), 167-177. <https://doi.org/10.5209/emp.99504>. Article.

Gabriel Domínguez Partida

SNII Level I

TRANSLATION AND VALIDATION OF THE VIDEO GAME DEMAND SCALE TO SPANISH

ABSTRACT: With efforts to investigate the role of interactivity on user psychology in video games, scholars have demonstrated that interactivity may induce cognitive, emotional, physical (controller and exertional), and social demands of global gamers. However, existing studies are missing Latin American gamers as critical yet understudied gaming communities. Drawing on the interactivity-as-demand model, we conducted a mixed-method online survey to test measurement validity on localized versions of the video game demand scale (VGDS) for Spanish-speaking gamers (N = 195). Results showed that the Spanish-translated scale replicated the *a priori* five-factor structure of VGDS. Emergent themes from gamers' comments mirrored VGDS factors, with additional insights into the cognitive demand of creative thinking, emotional demand of feeling nostalgia, physical demand of being precise, and social demand of interacting with non-player characters. These findings provide a pancultural perspective of Spanish-speaking gamers' perceptions of their gaming while offering nuanced insights into their experiences for future research.

Lee, H., Domínguez Partida, G., Bowman, N. D., & de Villemor Chauveau, P. (2025). Translation and validation of the video game demand scale to Spanish. In *Proceedings of the 2025 CHI Conference on Human Factors in Computing Systems (CHI '25)*, Article 339. Association for Computing Machinery. <https://doi.org/10.1145/3706598.3713216>. Conference Paper.

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Mindaugas Briedis

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CHALLENGING HUMAN CREATIVITY: AN EXERCISE OF CO-CREATION WITH GENERATIVE ARTIFICIAL INTELLIGENCE

ABSTRACT: This paper explores the collaborative potential between humans and generative artificial intelligence in creative contexts through a co-creation framework. The study uses ChatGPT to develop narrative elements such as slogans, taglines, and claims for university marketing programs, comparing human-generated and artificial intelligence-generated content to evaluate effectiveness and engagement. Results indicate that while artificial intelligence can contribute useful and creative content, human participants still prefer human-generated narratives in many instances. The study also highlights how generative artificial intelligence can enhance

creative processes by accelerating ideation and reducing cognitive load, but it raises concerns regarding the originality and diversity of artificial intelligence-generated content. This research provides insights into the integration of artificial intelligence in collaborative creative work and suggests best practices for leveraging artificial intelligence tools in marketing and communication strategies.

Flores Heymann, B., & Briedis, M. (2025). Challenging human creativity: An exercise of co-creation with generative artificial intelligence. *Creativity Studies*, 18(2), 570-583. <https://doi.org/10.3846/cs.2025.21139>. Article.

Laura Mariana Garduño Espinosa

Research Professor

SYSTEM OVER LEBENSWELT IN COMMUNICATIVE ACTION: INNER MECHANISMS OF THE INSTITUTIONALISATION OF ADVERTISING

ABSTRACT: Drawing from Habermas' distinction between the system and life-world, the article explores and analyses how advertising operates within both domains, influencing not only the institutional structure but also everyday social interactions, thus providing the framework for the institutionalisation of advertising as a social actor and force in contemporary society. Using Super Bowl commercials to explain the way that they reflect and shape dominant cultural values, and based on George Ritzer's McDonaldisation, Shoshana Zuboff's surveillance capitalism, Manuel Castells' social capital and power dynamics, and Pierre Bourdieu's concepts of symbolic capital and habitus, the article examines how advertising has evolved beyond its commercial role to become a central institution that shapes behaviours, identities and cultural norms. It highlights the role of advertising in reinforcing social power and cultural capital, which can be identified by the data driven personalisation, narrative control and standardisation that brands use to leverage their power through their commercial narratives. It also addresses critiques of the institutionalisation of advertising which provides an understanding on how advertising functions as a powerful institution that reflects and shapes social realities in the digital and mass consumption era.

Garduño, M. (2025). System over Lebenswelt in communicative action: Inner mechanisms of the institutionalisation of advertising. *Filosofija, Sociologija*, 36(3), 333-343. Article.

Paula Gárgoles Saes
Research Professor

EXPLORING VIDEO PODCASTING IN FASHION BRANDING: A COMPARATIVE STUDY OF CHANEL AND NUDE PROJECT

ABSTRACT: Video podcasting has become an integral component of digital marketing strategies, particularly in the fashion industry, where brands strive to create immersive and engaging content. This study investigates the use of video podcasting as a branded content strategy through an analysis of two contrasting cases: Chanel and Nude Project. Using quantitative metrics such as episode frequency, duration, and audience engagement (e.g., views, comments, likes), alongside qualitative analyses of narrative frames, the study identifies key strategies employed by these brands. Chanel's podcast, CHANEL Connects, focuses on cultural and artistic inspiration, reflecting the brand's luxury ethos through minimalist production and intellectual discourse. In contrast, Nude Project's podcast adopts a dynamic and prescriptive tone interviewing experts and placing emphasis on personal growth and community-building to resonate with its youthful audience. Despite their differences, both brands utilize video podcasts to enhance their narratives, showcase products, and engage their target demographics. The findings underscore the unique potential of video podcasting to bridge the gap between entertainment and marketing, offering measurable engagement and visual storytelling opportunities. This paper concludes that video podcasting is not merely a trend but a transformative medium for strengthening brand identity and fostering deeper consumer connections in the digital age.

Gargoles, P., & Garcia, I. (2026). Exploring video podcasting in fashion branding: A comparative study of Chanel and Nude Project. In *Fashion Communication in the Digital Age. FAC-TUM 2025. Springer Proceedings in Business and Economics (SPBE)* (pp. 125-138). Springer. https://doi.org/10.1007/978-3-031-99481-4_10. Conference Paper.

María Elena Gutiérrez Rentería
Senior Researcher B, Research Professor

Carlos Eduardo López Hernández
Senior Researcher B, SNII Level I

MEDIA MANAGEMENT IN LATIN AMERICA

ABSTRACT: The Rowman & Littlefield Handbook of Media Management and Business connects research and industry practice to offer a strategic guide for aspiring and current media professionals in convergent environments. As a comprehensive one-stop reference for understanding business issues that drive the production and distribution of content that informs, entertains, and persuades

audiences, aims to inspire and inform forward-thinking media management leaders. The handbook examines media management and business through a convergent media approach, rather than focusing on medium-specific strategies. By reflecting media management issues in the information, entertainment, sports, gaming industries, contributed chapters explore the unique opportunities and challenges brought by media convergence, while highlighting the fundamental philosophy, concepts, and practices unchanged in such a dynamic environment. This handbook examines media management through a global perspective, and encourages readers to connect their own diverse development to a broader global context. It is an important addition to the growing literature in media management, with a focus on new media technologies, business management, and internationalization.

Gutiérrez-Rentería, M. E., & López, C. E. (2020). Media management in Latin America. In L. M. Mahoney, & T. Tang (Eds.), *The Rowman & Littlefield handbook of media management and business* (pp. 227-240). Rowman & Littlefield. <https://www.bloomsbury.com/us/rowman--littlefield-handbook-of-media-management-and-business-9781538174111/>. Book Chapter.

María Elena Gutiérrez Rentería
Senior Researcher B, Research Professor

NAVIGATING THE STORM: BOOSTING AUDIENCE ENGAGEMENT IN AN AGE OF NEWS AVOIDANCE

ABSTRACT: This book outlines the need for media companies to embrace an audience-centric approach to thrive in today's fiercely competitive global market. Chapters in this book cover different media sectors such as audiovisual, news and user-generated content (UGC), media branding and reputation, and include experiences from Europe, Latin America, Asia, the Middle East, and the United States. To enable readers to assess and compare contexts, the book supplements theoretical discussions with real-world examples related to legacy and new media from international markets and companies. It also explores the dynamic role of technology and its transformative impact on audience media consumption habits. In doing so, the book provides strategies that foster emotional connections and engagement between media companies and their audiences and offers innovative solutions to face challenges such as news avoidance, eroding media trust, declining audience shares, and content oversaturation. With a thorough exploration of how media companies try to attract their audiences, this book will be of interest to scholars, students, and professionals in the field of media management, media economics, media analytics, and marketing.

Vara-Miguel, A., & Gutiérrez-Rentería, M. E. (2025). Navigating the storm: Boosting audience engagement in an age of news avoidance. In M. Medina, & D. Kimber (Eds.), *Media engage-*

ment: *Connecting with audiences in media markets* (pp. 58-71). Routledge. <https://doi.org/10.4324/9781003585671-8>. Book Chapter.

José Luis López Aguirre

Research Professor

INNOVATING TALENT MANAGEMENT: COMMUNICATION STRATEGIES FOR ENGAGING GENERATION Z IN DIGITAL ERA ORGANIZATIONS

ABSTRACT: Framed within the broader landscape of digital transformation and innovation in organizations, this chapter examines one of the major challenges in the business sector: the transformation of traditional methods for attracting and retaining skilled talent. In Mexico, public and private organizations alike are urged to revamp their recruitment processes and the integration of recent graduates from prestigious universities. To address this issue and meet the employment needs of this new generation of university-educated youth, who desire more than just a competitive salary, a series of strategic communication recommendations are offered. These recommendations are specifically designed for Generation Z, who are on the verge of entering the job market. Notably, these suggestions, based on thorough empirical research and aimed primarily at human resources and capital departments, propose an innovative communication strategy that highlights the management of multimedia content on social networks.

Sosa, L. S., López, J. L., & López, S. (2025). Innovating talent management: Communication strategies for engaging Generation Z in digital era organizations. In A. Teran-Bustamante, & M. Velázquez Salazar (Eds.), *Digital transformation and innovation in organizations: A Latin American perspective* (pp. 129-159). Palgrave Macmillan. https://doi.org/10.1007/978-3-031-90794-4_6. Book Chapter.

Mariano Emmanuel Navarro Arroyo

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Mindaugas Briedis

SNII Level I

A CRITICAL-EMBODIED PHENOMENOLOGY OF MESTIZO IDENTITY: CORPOREALITY IN THE ECOLOGICAL OF MEXICAN MURALISM

ABSTRACT: In this article, we consider Mexican Muralism, specifically the works of Diego Rivera, as a prominent manifestation of artistic media ecologies that provide affordances for conversations and interactions which amplify social beliefs and turn subjective

judgements into intersubjective reality. We analyse this reality from the perspectives of embodied cognition and critical phenomenology. We use this conceptual apparatus to examine the genesis of mestizo identity in the specific medium of Mexican Muralism. We aim to clarify the particular lived experience of the mestizo subaltern condition and its relation to the origins of mestizo subjectivity. This article argues that Rivera's murals, understood through a framework of critical phenomenology and media ecology, offer embodied, spatial strategies that disrupt colonized forms of perception and imagination, thereby contributing to a reconfiguration of subjectivity. Moreover, we examine how visible markers of social identity – such as gender, race and class – are mediated by murals and thus inform the personal awareness and experience of inequality.

Navarro, M., & Briedis, M. (2025). A critical-embodied phenomenology of Mestizo identity: Corporeality in the ecology of Mexican Muralism. *Explorations in Media Ecology*, 24(3), 301-316. https://doi.org/10.1386/eme_00259_1. Article.

Mariano Emmanuel Navarro Arroyo

Senior Researcher A, SNII Level I

WE THE DEFEATED PEOPLE

ABSTRACT: In 1959, Mexican anthropologist and historian Miguel León-Portilla first published *The Broken Spears: An Aztec Account of the Conquest of Mexico*, a work featuring several unpublished Aztec sources from the Conquest of the Mexican territory and its aftermath (León-Portilla, 1962). Two of the many fascinating things in that book stand out; the first is the first-hand account of how the Mexica experienced the crumbling of the only world they knew. But the second is riveting and intricate and refers to the fact that it took more than 400 years to add the voice of the defeated to the accounts of those historical events.¹ Adding to the shock, let's not forget that such 400 years of overlooking the Aztec's version was done precisely by a cultural milieu that, in many ways, prided itself on being their inheritors. *Broken Spears'* original title in Spanish is "La visión de los vencidos," that is, "The vision of the defeated," and in the face of an event that accomplished the obliteration of a political entity, it is not hard to perceive on which side the defeated stood.

Navarro, M. (2024). We the defeated people. *Journal of Communication*, 74(6), 505-508. <https://doi.org/10.1093/joc/jqae027>. Article.

Cecilia Sada Garibay
Research Professor

GRANDPARENTS AND CHILDREN'S MEDIA USE IN THE USA: SCREEN TIME, MEDIATION PRACTICES, AND RELATIONSHIP OUTCOMES

ABSTRACT: Grandparents are playing an increasingly important role as caregivers for their grandchildren, which includes managing their media use. However, research about grandparents and children's media use is very limited, particularly in the U.S.A. and including grandfathers. To address this scarcity of research, the present study looked at children's screen time under their grandparents' watch; grandparental media mediation strategies and their predictors, and how grandparents' beliefs about media relate to disagreement with their adult child and grandparent-parent relationship satisfaction. Through a survey among 350 American grandparents who regularly care for at least one grandchild aged between 2 and 10 years, results showed that grandchildren's screen time represented 49% of the total time they spent under their grandparents' care; that, to manage their grandchild's media use, grandparents favor supervision, over instructive and restrictive mediation, with co-use/viewing the least used strategy, and that grandparents' digital skills consistently predicted more media mediation. Additionally, it was found that grandparents' negative attitudes toward media predicted media-related disagreements with their adult children and that these disagreements were related to lower grandparent-parent relationship satisfaction.

Sada Garibay, C., & Lapierre, M. A. (2025). Grandparents and children's media use in the USA: Screen time, mediation practices, and relationship outcomes. *Journal of Children and Media*, 19(4), 845-863. <https://doi.org/10.1080/17482798.2025.2480088>. Article.

Cecilia Sada Garibay
Research Professor

PARENTAL MEDIATION OF MOBILE/DIGITAL DEVICES AND CHILDREN'S CONSUMER BEHAVIOR: EXAMINING THE ROLE OF PARENTAL UNDERSTANDING OF MOBILE/DIGITAL ADVERTISING

ABSTRACT: Purpose: This study aims to explore how American parents' familiarity and knowledge of mobile advertising are linked to mediational tactics across three mobile media devices (laptops, tablets, smartphones). This study further tests whether advertising knowledge, familiarity and parental media mediation are associated with children's consumer behavior. Design/methodology/approach:

The approach adopted was a cross-sectional survey of 500 American parents with at least one child between the ages of 5 to 14 who were recruited via Qualtrics. Parents were asked about their familiarity with mobile/digital advertising and their knowledge of such material. They were also asked how they mediated their children's media experience on the three mobile devices, how often their children asked for consumer goods and how often they argued with their children over the purchase of consumer goods. Findings: Results showed differences regarding how parents' advertising knowledge and familiarity were linked to their mediational practices and their child's consumer behavior. Specifically, advertising familiarity was associated with increased mediation across devices and increased purchase requests/conflict. Conversely, advertising knowledge was only associated with co-use/viewing mediation, but this relationship was negative; moreover, knowledge was negatively associated with children's consumer behavior. Originality/value: The results of this study offer insights into how knowledge and familiarity with mobile advertising shape parents' mediational approaches to children. This study provides crucial data linking mediational approaches with children's consumer behavior.

Sada Garibay, C., Choi, E., & Lapierre, M. A. (2025). Parental mediation of mobile/digital devices and children's consumer behavior: Examining the role of parental understanding of mobile/digital advertising. *Young Consumers*, 26(1), 79-95. <https://doi.org/10.1108/YC-03-2024-2019>. Article.

María Fernanda Vidal Correa
SNII Level I

LEGISLATING GENDER JUSTICE: CONTRASTING APPROACHES TO MEDIA AND CYBER VIOLENCE IN MEXICO'S CONGRESS

ABSTRACT: This study examines the legislative approaches of the Mexican Chamber of Deputies to gender stereotypes, media violence and cyber violence, focusing on the influence of deputy gender and political affiliation on legislative priorities and strategies. Analysing 43 bills introduced between 1997 and 2024, the research employs qualitative content analysis using NVivo software to explore legislative definitions, preventive strategies and punitive measures.

The findings reveal that legislative efforts reflect broader feminist debates on the systemic versus individual nature of gendered violence. Female legislators, particularly from progressive parties like MORENA and PRD, emphasise the structural roots of media and cyber violence, advocating for reforms that integrate prevention through media regulation and education. Conversely, male deputies and conservative parties like PAN and PRI tend to frame these issues in terms of individual responsibility, focusing on puni-

tive measures such as criminalisation and fines, often neglecting the systemic and cultural drivers of violence.

The contrasting legislative approaches mirror feminist discussions surrounding the conceptualisation of violence and the balance between structural reform and accountability. While significant progress has been made in addressing technology-facilitated violence, challenges remain in achieving cohesive and effective legal frameworks that balance prevention, accountability and the dismantling of systemic gender inequalities.

Vidal-Correa, F. (2025). Legislating gender justice: Contrasting approaches to media and cyber violence in Mexico's Congress. *Journal of Gender-Based Violence*, 9(4), 576-597. <https://doi.org/10.1332/23986808Y2025D000000095>. Article.

María Fernanda Vidal Correa

SNII Level I

LEGISLATIVE PATHWAYS FOR TACKLING VIOLENCE AGAINST WOMEN IN MEXICO

ABSTRACT: Violence against women (VAW) remains an insidious global challenge, impacting millions of women annually. Federal legislation in Mexico has sought to combat this scourge. As stipulated by the Convention on the Elimination of All Forms of Discrimination against Women (CEDAW), VAW constitutes a profound form of discrimination that severely impedes women's ability to enjoy their rights and freedoms on an equal footing with men. CEDAW mandates that states must undertake measures to prevent, address, eradicate, and ultimately eliminate this violence. In Mexico, the increased political representation of women has been instrumental in advancing legislative reforms aimed at protecting women's rights. Notably, the General Law on Women's Access to a Life Free of Violence (2007) was a landmark statute that recognized femicide violence and feminicide as distinct legal categories from its inception.

Vidal-Correa, F. (2025). Legislative pathways for tackling violence against women in Mexico. In F. Vidal-Correa (Ed.), *Women as builders of parity democracy in Mexico* (pp. 201-231). Routledge. <https://doi.org/10.4324/9781003631828-11>. Book Chapter.

María Fernanda Vidal Correa

SNII Level I

WOMEN IN MEXICAN POLITICS: A STUDY OF REPRESENTATION IN A RENEWED FEDERAL AND DEMOCRATIC STATE

ABSTRACT: This book offers an analysis of how women's participation is conducted in Mexico's political sphere. Federalization and decentralization processes can have a significant impact on women's participation and discrimination. By questioning the form in which a democratic state is built (that is, the degree of (de)centralization) the book looks to a set of forms and processes affecting women's political life. A decentralized form of state-government implies three levels of government in which women (or any other group of people) can have active participation: central-federal government, state-regional-province government, and local (municipalities) government. This book offers an analysis of how gender discrimination operates in a different way in each of these levels of government and the corresponding political activity. Policies that fight against gender discrimination and promote women's participation, in both administration and political parties, do not always operate cooperatively, and often exist in contradiction with each other.

Vidal Correa, F. (2017). *Women in Mexican politics: A study of representation in a renewed federal and democratic state*. Lexington Books. https://unipan.primo.exlibrisgroup.com/permalink/52UNIPAN_INST/1r1590p/alma994235148304971. Book.

Norman Aguilar Gallegos

SNII Level I

META-ANALYSIS OF SCIENTIFIC INFORMATION ON THE SPECIES CARLUDOVICA PALMATA RUÍZ & PAVÓN

ABSTRACT: Carludovica palmata Ruiz & Pavón is a palm species with great potential in the manufacture of handicrafts, but with limited agricultural management. It is native to Ecuador, and in Mexico it is only distributed in Campeche in the southeast of the country; it serves as raw material for manufacturing Jipi palm hats. The objective of this work is to analyze the spatio-temporal evolution of research published in scientific articles where the species was studied, using bibliometric techniques to identify areas of opportunity in research that have been little developed. We found 78 texts from 1961 to 2022 whose spatio-temporal evolution showed an exponential growth that concentrated in countries of America: Colombia (38), Mexico (11) and Ecuador (8). The most recurrent research topics were botany of the species (20), transformation of its fibers into handicrafts (18), traditional production (in situ cultivation) (17) and commercialization of handicrafts (15). However, a null development of propagation techniques of the species was found, a problem that is accentuated if one considers the high demand for its specimens for the manufacture of handicrafts. Therefore, little explored areas of research such as in vitro propagation can contribute to the supply of the raw material of an emerging market on products and by-products of the jipi palm. In the case of Mexico, the research focused on the southeast, which coincides with the region where the species is cultivated, but which showed a lack of development in techniques on its propagation.

Perera-Hau, L. A., Santillán-Fernandez, A., Aguilar-Gallegos, N., Alamilla-Magaña, J. C., Gonzales-Estrada, T. A., & Caamal-Velázquez, J. H. (2025). Meta-analysis of scientific information on the species Carludovica palmata Ruiz & Pavón. *La Granja: Revista de Ciencias de la Vida*, 42(2), 120-133. <https://doi.org/10.17163/lgr.n42.2025.08>. Article.

Norman Aguilar Gallegos

SNII Level I

SUSTAINABLE AGRI-FOOD SYSTEM IN MEXICO TO PROMOTE HEALTHY AND NUTRITIOUS EATING

ABSTRACT: Background: Developing operational methodological frameworks for the study of Sustainable Agri-food Systems is a challenge. Objective: To identify the impact of the Mexican National Agri-food System on public health. Methodology: Data from international, national, and government sources were consulted, apparent consumption was estimated, and indicators of population health and water footprint were used to conduct a correlational study using a Sustainable Agri-food System approach. Results: The limited number of plant and animal species that underpin the current National Agri-food System is associated to the increase in non-communicable diseases such as overweight and obesity in adults, children, and adolescents. The low average monthly income of vulnerable groups exacerbates existing health problems, as they are unable to access healthy and nutritious food. Insufficient physical activity amplifies the health conditions identified. Implications. It is essential to conduct specific studies at the species level, because generalized analyses at the national level can obscure the demonstrated impact that the consumption of specific species within the National Agri-Food System has on the environment, society, health, and the economy. Conclusions: The availability of Healthy and Sustainable Food Guidelines, along with water footprint indicators for different food products, should improve the food, nutritional, and environmental conditions of the National Agri-food System, by promoting responsible production and consumption, through the adoption of more efficient technologies to reduce the water footprint and support the transition towards Sustainable Agri-food Systems.

Reyes-Gómez, H., Martínez-González, E. G., Aguilar-Ávila, J., & Aguilar-Gallegos, N. (2025). Sustainable agri-food system in Mexico to promote healthy and nutritious eating. *Tropical and Subtropical Agroecosystems*, 28(3). <https://doi.org/10.56369/tsaes.6554>. Article.

Norman Aguilar Gallegos

SNII Level I

Leticia Elizabeth Romero García

Research Professor

Yurixhi Gallardo Martínez

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A BIBLIOMETRIC ANALYSIS OF ETHICS IN THE SCHOLARLY AND SCIENTIFIC RESEARCH AND PUBLICATION: A GENDER PERSPECTIVE

ABSTRACT: This research examines a comprehensive overview of the state of the literature on ethics in scholarly and scientific research and publication by applying a gender perspective. To achieve this aim, a bibliometric analysis was conducted using data from Scopus, with 983 articles and reviews that cover the period from 1975 to 2024. The database was cleaned, gender was detected based on Gender-API and authorship credit was determined using a fractional counting method. Performance analysis and science mapping were performed by using Bibliometrix and biblioshiny. The results reveal an increasing tendency of documents published on the theme but, it also detects that male authors have greater participation than female authors in production and collaboration. Authorship by country differs in proportions, but in both cases, the United States ranks first in production, and the Americas show a significant contribution. Finally, thematic areas are unveiled based on the connection and frequency among authors' keywords and their relation with the five main areas within ethics in research and publication, from a gender perspective, in order to stimulate future research.

Romero-García, L. E., Aguilar-Gallegos, N., & Gallardo, Y. (2026). A bibliometric analysis of ethics in the scholarly and scientific research and publication: A gender perspective. *Journal of Academic Ethics*, 24(1), 26. <https://doi.org/10.1007/s10805-025-09698-w>. Article.

María Concepción Atristain Suárez
Research Professor

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ASSERTIVENESS IN THE WORKPLACE: PERSONAL AND BUSINESS COMPETITIVENESS IN EMERGING AND DEVELOPING COUNTRIES

ABSTRACT: Assertiveness is a philosophy of life and a way of conducting business founded on respect and consideration towards others. Relationships based on trust, respect, openness, and sincerity can be forged through assertiveness. This timely work delves into the intricacies of assertiveness and its profound impact on personal and business competitiveness, within the context of emerging and developing countries. In an era marked by globalisation, cultural diversity, and rapidly evolving business landscapes, assertiveness has emerged as a critical skill. This book explores how assertiveness can be harnessed to enhance competitiveness, organisational culture, and professional growth in regions experiencing dynamic economic changes. The book's scope, the theoretical and methodological foundations, the populations targeted, the managerial implications, and the valuable and diverse approaches will appeal to researchers and academics, upper-level postgraduate students, and leaders from private, public, and third-sector companies.

Atristain-Suárez, C., & Castaños-Cervantes, S. (2025). *Assertiveness in the workplace: Personal and business competitiveness in emerging and developing countries*. Emerald Publishing. <https://doi.org/10.1108/978-1-83662-214-7>. Book.

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ASSERTIVENESS IN THE WORKPLACE: PERSONAL AND BUSINESS COMPETITIVENESS IN EMERGING AND DEVELOPING COUNTRIES

ABSTRACT: This chapter examines the role of assertiveness in the workplace, focusing on its significance for personal and business competitiveness in emerging and developing countries. Assertiveness is a critical communication style that promotes clear, direct and respectful expression of opinions, needs and desires. The text highlights the importance of assertiveness in building trust, fostering effective communication, resolving conflicts, enhancing the work environment and contributing to organisational success. Assertiveness is also linked to leadership effectiveness, decision-making, emotional well-being, employee development and self-esteem as it allows individuals to express themselves without fear of being subjugated or exploited. Additionally, the chapter provides a comprehensive overview of the book's objectives, detailing the critical research questions that guide the exploration of assertiveness in the workplace. It also outlines the book's structure organised into three distinct parts. This thoughtfully organised structure enables the book to provide readers with a thorough and practical understanding of assertiveness, encompassing its significance and broader impact on organisational success. By presenting assertiveness comprehensively, the book equips readers with the essential insights and strategies to harness assertiveness to enhance individual and business competitiveness effectively.

Atristain-Suárez, C., & Castaños-Cervantes, S. (2025). *Assertiveness in the workplace: Personal and business competitiveness in emerging and developing countries*. In C. Atristain-Suárez & S. Castaños-Cervantes, *Assertiveness in the workplace: Personal and business competitiveness in emerging and developing countries* (pp. 1-14). Emerald Publishing. <https://doi.org/10.1108/978-1-83662-214-720251003>. Book Chapter.

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ASSERTIVENESS AS THE CATALYST FOR SUSTAINABLE GROWTH AND GLOBAL COMPETITIVENESS: FUTURE PERSPECTIVES AND PRACTICAL IMPLICATIONS

ABSTRACT: This closing chapter celebrates assertiveness as a catalyst for sustainable growth and global competitiveness, not just in theory but as a compelling call to action for future leaders and organisations. Assertiveness emerges as a core principle, enabling individuals and businesses to meet the demands of an interconnected, fast-paced world with confidence, resilience and ethical integrity. For leaders, assertiveness fuels sustainable strategies, cultivates ethical decision-making and fosters inclusive, transparent cultures that empower employees to innovate and excel. It is a powerful tool for individuals' personal growth and career advancement, promoting clear communication, accountability and adaptability in complex professional landscapes. As technology reshapes global business, assertiveness ensures that human values guide innovation, bridging cultural divides and fostering collaboration across borders. Practical insights within this chapter provide tools for implementing assertive organisational strategies through leadership training, open dialogue and feedback. This chapter closes with an invitation to adopt assertiveness as an enduring foundation for building competitive, inclusive and responsible business environments – where sustainable success aligns seamlessly with ethical responsibility.

Atristain-Suárez, C. (2025). Assertiveness as the catalyst for sustainable growth and global competitiveness: Future perspectives and practical implications. In C. Atristain-Suárez & S. Castaños-Cervantes, *Assertiveness in the workplace: Personal and business competitiveness in emerging and developing countries* (pp. 225-237). Emerald Publishing. <https://doi.org/10.1108/978-1-83662-214-720251031>. Book Chapter.

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OPTIMIZING COLD FOOD SUPPLY CHAINS FOR ENHANCED FOOD AVAILABILITY UNDER CLIMATE VARIABILITY

ABSTRACT: Produce supply chains play a critical role in ensuring fruits and vegetables reach consumers efficiently, affordably, and at optimal freshness. In recent decades, hub-and-spoke network models have emerged as valuable tools for optimizing sustainable cold food supply chains. Traditional optimization efforts typically focus on removing inefficiencies, minimizing lead times, refining

inventory management, strengthening supplier relationships, and leveraging technological advancements for better visibility and control. However, the majority of models rely on deterministic approaches that overlook the inherent uncertainties of crop yields, which are further intensified by climate variability. Rising atmospheric CO₂ concentrations, along with shifting temperature patterns and extreme weather events, have a substantial effect on crop productivity and availability. Such uncertainties can prompt distributors to seek alternative sources, increasing costs due to supply chain reconfiguration. This research introduces a stochastic hub-and-spoke network optimization model specifically designed to minimize transportation expenses by determining optimal distribution routes that explicitly account for climate variability effects on crop yields. A use case involving a cold food supply chain (CFSC) was carried out using several weather scenarios based on climate models and real soil data for California. Strawberries were selected as a representative crop, given California's leading role in strawberry production. Simulation results show that scenarios characterized by increased rainfall during growing seasons result in increased yields, allowing distributors to reduce transportation costs by sourcing from nearby farms. Conversely, scenarios with reduced rainfall and lower yields require sourcing from more distant locations, thereby increasing transportation costs. Nonetheless, supply chain configurations may vary depending on the choice of climate models or weather prediction sources, highlighting the importance of regularly updating scenario inputs to ensure robust planning. This tool aids decision-making by planning climate-resilient supply chains, enhancing preparedness and responsiveness to future climate-related disruptions.

Hernandez-Cuellar, D., Castillo-Villar, K. K., & Castillo-Villar, F. R. (2025). Optimizing cold food supply chains for enhanced food availability under climate variability. *Foods*, 14(15), 2725. <https://doi.org/10.3390/foods14152725>. Article.

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ENTREPRENEURIAL ORIENTATION IN SOCIAL ENTREPRENEURSHIP: A SYSTEMATIC LITERATURE REVIEW AND RESEARCH AGENDA

ABSTRACT: This study aims to conduct a systematic literature review on entrepreneurial orientation (EO) in social entrepreneurship to clarify theoretical boundaries, integrate diverse findings, and identify research gaps. The "Theory–Context–Characteristics–Methodology" (TCCM) framework is adopted to analyze 81 articles on EO in social entrepreneurship. The review reveals that the field remains fragmented due to diverse theoretical and empirical contributions. The study highlights the need for future research to adapt theoretical perspectives to understand EO's unique and hybrid

aspects in social entrepreneurship, expand empirical research into under-represented geographical areas, conduct more longitudinal and qualitative studies to track changes in EO over time, and explore new variables that can further our understanding of EO in social entrepreneurship. The novelty of this study lies in the application of the TCCM framework to systematically analyze the literature on EO in social entrepreneurship. This framework facilitates the organization and evaluation of theoretical underpinnings, methodologies, contexts, and variables to identify relevant research gaps and future directions on the topic.

Castillo-Villar, F. R., Cavazos-Arroyo, J., & Castillo-Villar, K. K. (2025). Entrepreneurial orientation in social entrepreneurship: A systematic literature review and research agenda. *Sustainability*, 17(3), 816. <https://doi.org/10.3390/su17030816>. Review.

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FREE ASSOCIATION DATABASE FOR A 62-WORD DATASET INCLUDING EMOTION AND COLOUR TERMS IN ENGLISH, ESTONIAN, FRENCH, GERMAN, ITALIAN, LITHUANIAN, AND SPANISH: DATA FROM 14 COUNTRIES

ABSTRACT: This article presents a free association database containing responses to 62 stimulus words (including colour terms, emotion words, and common nouns) across seven languages: English, Estonian, French, German, Italian, Lithuanian, and Spanish. Data were collected online from 1,439 participants (mean age 31.47 years) across 14 countries, yielding 223,786 responses. All data were cleaned, normalised, and organised for analysis, with both raw and processed datasets available on OSF. This cross-linguistic resource enables research on semantic networks, psycholinguistics, translation studies, and cross-cultural comparisons, providing insights into how meaning is constructed within and across different languages and cultures.

Jonauskaite, D., Epicoco, D., Bouayed Meziane, M., Burton, B., Corona, V., Fonseca-Pedrero, E., González-Dávila, C., Havelka, J., Laurent, E., Lenggenhager, B., Loetscher, T., Lopez Castiñeira, S., Manni, L., Mefoh, P., Oberfeld, D., Oguz, M., Özduvan, R. Y., Perchtold-Stefan, C., Quant, P., ... Mohr, C. (2025). Free association database for a 62-word dataset including emotion and colour terms in English, Estonian, French, German, Italian, Lithuanian, and Spanish: Data from 14 countries. *Journal of Open Psychology Data*, 13(1), 4. <https://doi.org/10.5334/jopd.140>. Article.

Aura Andrea Díaz Duarte

Research Professor

Marco Eliseo Rivera Martínez

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BUSINESS PERFORMANCE AND SUSTAINABILITY OUTCOMES DRIVEN BY CIRCULAR ECONOMY, ECO-INNOVATION, AND SUSTAINABLE MARKETING

ABSTRACT: Sustainable practices are increasingly recognized as critical drivers of business performance in contemporary markets. This study examines the influence of Circular Economy (CE), Eco-Innovation (EI), and Sustainable Marketing (SM) on Business Performance (BP) among micro, small, and medium-sized enterprises (MSMEs) located in Aguascalientes, Mexico, a representative emerging-economy context within Latin America. The relationships among these constructs were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) in SmartPLS 4.0. Results show that CE significantly drives both EI and SM, and that EI positively influences BP. However, the direct effect of SM on BP was marginal, indicating that its contribution to business performance is weaker than that of circular and eco-innovative practices in the analyzed sample. Among CE dimensions, enablers were the strongest driver of circular adoption, while in EI, adoption incentives exerted the greatest influence. This research contributes to the sustainability and management literature by rigorously analyzing and comparing the relative impact of different sustainability-oriented strategies—circular, innovative, and marketing-based—on business performance. By examining how these strategies interact and differ in their effects, the study offers evidence-based guidance for MSMEs with limited resources to prioritize initiatives with greater potential to enhance competitiveness. The proposed integrated CE–EI–SM–BP framework, validated through a predictive PLS-SEM approach (PLSpredict), provides robust empirical evidence from an underexplored emerging-economy context. The results also open avenues for future research to examine contextual or temporal factors influencing the effectiveness of sustainability-based strategies.

Díaz Duarte, A. A., Puron-Cid, G., & Rivera-Martínez, M. E. (2025). Business performance and sustainability outcomes driven by circular economy, eco-innovation, and sustainable marketing. *Sustainability*, 17(21), 9858. <https://doi.org/10.3390/su17219858>. Article.

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THE ROLE OF ICT, INTRAPRENEURSHIP AND COLLABORATIVE MANAGEMENT NETWORKS IN INNOVATION AND BUSINESS COMPETITIVENESS

ABSTRACT: This research analyzes the relationship between intrapreneurship culture, management collaboration networks, and information and communication technologies on innovation performance, as well as their direct and indirect effects on business performance and competitiveness. Using data from MSMEs in Mexico's trade sector, the study tests fifteen hypotheses across three models, each examining the impact of a causal variable on innovation performance through a quantitative analysis using structural equation modeling. The results indicate significant associations between these factors and highlight the role of innovation in enhancing business outcomes. Additionally, the study considers the profound effects of the COVID-19 pandemic, which has exacerbated existing vulnerabilities in Latin American and Caribbean economies, affecting key sectors such as commerce, tourism, and transportation. The conclusions emphasize the varying impact of direct and indirect effects of causal variables (intrapreneurship culture, management collaboration networks, and information and communication technologies) on the mediator variable (innovation performance) and outcome variables (business performance and competitiveness). Across all models, a positive and significant relationship is confirmed between innovation performance and both business performance and competitiveness. However, a stronger association is found between the causal variables and business performance and competitiveness. Based on these findings, the study proposes strategic recommendations for businesses aiming to enhance their performance and competitiveness in dynamic environments.

Díaz-Duarte, A. A., Puron-Cid, G., & Rivera-Martínez, M. E. (2025). The role of ICT, intrapreneurship and collaborative management networks in innovation and business competitiveness. *Retos*, 15(29), 65-85. <https://doi.org/10.17163/ret.n29.2025.04>. Article.

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EYE TRACKING CHARACTERIZATION OF ALGEBRAIC FRACTION SIMPLIFICATIONS

ABSTRACT: Several major studies require that students understand and master the concepts and procedures of mathematics. More specifically, an area of mathematics such as algebra requires students to be able to simplify, operate with, or solve fractions. Many students entering university show numerous shortcomings and errors, especially when simplifying algebraic fractions. This is why we conducted a study using eye-tracking techniques to better understand how students process these types of exercises in attentional terms, comparing students who can handle them successfully against those who show errors in their procedures. For this purpose, we evaluated the eye movements of 64 students from different university majors to characterize the attentional-visual strategies they use to simplify four different algebraic fraction exercises. We found that each type of simplification exercise needs a specific strategy where some parts of the rational algebraic expressions are cognitively relevant. Students with correct answers tend to allocate attention to these elements. Students with incorrect answers tend to find similar expressions with the intention to cancel them out, without applying any metacognitive thinking. The rational algebraic expression needs to be taught in a more conceptual manner than procedural.

Eccius-Wellmann, C., Brofman-Epelbaum, J. J., & Corona, V. (2025). Eye tracking characterization of algebraic fraction simplifications. *Education Sciences*, 15(12), 1710. <https://doi.org/10.3390/educsci15121710>. Article.

Santiago García Álvarez
Rector Campus México, SNII Candidate Level

Héctor Xavier Ramírez Pérez
SNII Candidate Level

Andrée Marie López Fernández
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THE INFLUENCE OF GRADUATE ATTRIBUTES AND HUMANISTIC PRINCIPLES ON LEADERSHIP, SOCIAL RESPONSIBILITY, AND PERFORMANCE

ABSTRACT: Higher education institutions (HEIs) offer educational methods inspired by their mission, vision, and philosophy. Graduate attributes are the resulting skills and competencies that students develop during their learning process and then apply in their professional work. This study analyzes whether a HEI's humanistic philosophy informs graduate attributes and then influences Senior Management alumni's leadership style and social responsibility. The results of this study suggest that HEIs with strong humanistic components favor the development of a person-centered leadership. And, when graduates occupy management positions, this leadership style correlates with the development of socially responsible companies as well as positive organizational performance. Moreover, the longer graduates occupy leadership positions, the greater the positive effect on the organization.

García-Álvarez, S., Ramírez-Pérez, H. X., & López-Fernández, A. M. (2025). The influence of graduate attributes and humanistic principles on leadership, social responsibility, and performance. *Humanities and Social Sciences Communications*, 12(1), 818. <https://doi.org/10.1057/s41599-025-05181-4>. Article.

Alejandro Lome Hurtado
SNII Level I

Manuel Soto Pérez
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MODELLING THE JOINT ASSOCIATION OF SOCIO-ECONOMIC DISADVANTAGE, DIABETES, AND OBESITY ON COVID-19 MORTALITY IN GREATER MEXICO CITY

ABSTRACT: The impact of Coronavirus disease 2019 (COVID-19) has severely affected populations with lower socioeconomic background and with certain comorbidities. Many studies have examined the effect of poor socioeconomic conditions or specific comorbidities separately on COVID-19 mortality. However, it is important to understand the joint effect of deprived socioeconomic conditions and specific comorbidities on COVID-19 mortality. Such a joint effect may play a different role in dying of COVID-19, when compared with the effect of deprived socioeconomic conditions and comorbidities separately. Therefore, this study investigates the joint association of deprived socioeconomic background and severe comorbidities (diabetes and obesity) on COVID-19 mortality, in Greater Mexico City. The study used official Mexican COVID-19 data at the individual and municipal level. The results illustrate significant and positive association of the socioeconomic deprivation index along with diabetes and obesity on COVID-19 mortality. This underscores the need for individualized, targeted, and public interventions that consider the role of lower socioeconomic status and specific comorbidities to reduce mortality.

Lome-Hurtado, A., & Soto-Pérez, M. (2025). Modelling the joint association of socio-economic disadvantage, diabetes, and obesity on COVID-19 mortality in Greater Mexico City. *Scientific Reports*, 15(1), 23983. <https://doi.org/10.1038/s41598-025-08615-w>. Article.

Andrée Marie López Fernández
Senior Researcher D, SNII Level II

LEADERSHIP PARADIGM AFFECTING SGA TO DRIVE ORGANIZATIONAL PERFORMANCE: A STUDY OF COLLABORATOR EMPOWERMENT ACROSS ORGANIZATIONS IN MEXICO

ABSTRACT: Leadership is one of the concepts that have been widely discussed by scholars and practitioners. In the pursuit of desired organizational performance, determined managers around the world have been persistently working towards the most effective style of leadership that may ensure success. A manager's leadership style, be it Democratic, Bureaucratic, or Autocratic, is essential and significantly responsible for collaborators' strategic goal achievement (SGA) or lack thereof; furthermore, collaborators' SGA has a direct impact on the organization's performance. The evaluation of individual performance based on strategic goal achievement commonly includes positive and/or negative reinforcement systems; in organizations operating in Mexico, these systems include recognition and rewards for strategic goal achievement and reprimand and public shaming for completion failure. It is the leaders' response to the effectiveness of strategic goal achievement that shapes collaborators' perceptions of leadership proficiency, satisfaction, and overall performance.

López-Fernández, A. M. (2019). Leadership paradigm affecting SGA to drive organizational performance: A study of collaborator empowerment across organizations in Mexico. In *Human performance technology: Concepts, methodologies, tools, and applications* (pp. 1025-1045). Business Science Reference/IGI Global. <https://doi.org/10.4018/978-1-5225-8356-1.ch050>. Book Chapter.

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THE IMPACT OF SOCIALLY RESPONSIBLE MEDICAL TOURISM FIRMS ON DIGITAL CONSUMER BEHAVIOR

ABSTRACT: Organizations' efforts toward ethics, sustainability, and social responsibility have been increasingly scrutinized by their

stakeholders and, particularly, their consumers as such efforts or lack thereof are determinants in their decision-making process. Advancing medical tourism into Industry 5.0 has a series of implications for business dynamics; the question is, how are digital consumers impacted by medical tourism firms' socially responsible efforts? This study offers a series of propositions and a conceptual model to understand the implications of medical tourism firms engaging in corporate social responsibility (CSR) on digital consumers and contributes to the understanding of the latter regarding Consumers and Industry 5.0.

López-Fernández, A. M., & Arriola, E. (2025). The impact of socially responsible medical tourism firms on digital consumer behavior. In A. Teran-Bustamante, & M. Velázquez Salazar (Eds.), *Digital transformation and innovation in organizations: A Latin American perspective* (pp. 285-307). Palgrave Macmillan. https://doi.org/10.1007/978-3-031-90794-4_11. Book Chapter.

Carlos Eduardo López Hernández
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Elizabeth Martínez Orozco
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Manuel Soto Pérez
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TYPOLOGY OF TEACHING PROFILES: A MODEL FOR IMPROVING THE QUALITY OF UNIVERSITY EDUCATION IN THE CONTEXT OF SUSTAINABLE DEVELOPMENT GOAL 4

ABSTRACT: Developing tools to assess university lecturers on the quality of their teaching practice is a priority for achieving Sustainable Development Goal (SDG) 4. The aim of this research is therefore to propose a typology of teaching profiles and analyse the factors that influence each of them, with a view to proposing a model for identifying lecturers who need support. Based on 10,938 observations made between August 2021 and June 2025, a heuristic method was used to classify all observations into six quadrants according to student academic performance and student evaluations of their teachers. Based on the classification of all observations into six quadrants, called teacher profiles, logistic regressions were performed in Gretl software version 2024c to identify which characteristics inherent to the teacher, the educational context, and the curricular stage explain the classification of the teacher into a particular profile. The results indicate that full-time teachers and those with higher academic qualifications tend to obtain higher scores on the SET, while online or hybrid modalities are associated with lower scores on the SET. In addition, the six teaching profiles obtained an accuracy of over 80% in the logit models, highlighting

significant effects of age, modality, and curricular level ($p < 0.05$) on the probability of belonging to each quadrant. It is concluded that factors related to curricular advancement, the educational context, and those inherent to the teacher can explain the proposed typology. This typology could serve as a management tool to identify teachers who need specific support to move towards profiles that are ideal for the university institution. Among the main limitations of this study are the heuristic methodology and the fact that the data were obtained from a single educational institution.

López-Hernández, C., Martínez-Orozco, & Soto-Pérez, M. (2025). Typology of teaching profiles: A model for improving the quality of university education in the context of Sustainable Development Goal 4. *Sustainability*, 17(24), 11066. <https://doi.org/10.3390/su172411066>. Article.

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MANAGEMENT CAPACITY AND ITS EFFECT ON SPECIALIZED SERVICES SMES DURING THE COVID-19 CRISIS

ABSTRACT: This paper examines the significance of enhancing managerial capacity in the support activities for small and medium-sized enterprises (SMEs) in the veterinary services sector. This is relevant in the early stages of SME formation. Additionally, the competitive environment of veterinary services SMEs in Guadalajara, Mexico, is contextualized. To illustrate the scope of management theory in improving competitiveness, the case of a veterinary services SME that commenced operations during the COVID-19 sanitary crisis, a period that has historically posed challenges for SMEs, is presented. Alaak Veterinary Clinic is analyzed through the resource-based view theory, examining how it managed to operate during the crisis, consolidate its position, and remain open. The primary conclusion is that the manager can be a key factor in the survival of newly established SMEs, by strengthening support processes through management capacity through knowledge absorption capacity. Further relevant conclusions are that the management capacity of veterinary services SMEs is directly affected by their managers' knowledge absorption capacity and that improving support processes in veterinary services SMEs starting operations can help cushion the negative effects of market crises, such as COVID-19.

Ceja Sáinz, J., Fong Reynoso, C., Luquín-García, D. (2025). Management capacity and its effect on specialized services SMEs during the COVID-19 crisis. In M. Valeri, J. Y. Sánchez-García, & C. López-Hernández (Eds.), *Effective Strategy Implementation. Contributions to Management Science* (Vol. Part F930, pp. 111-128). Springer. https://doi.org/10.1007/978-3-031-94336-2_7. Book Chapter.

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Francisco Ortiz Arango
SNII Level II

THE IMPORTANCE OF IMPLEMENTING ENERGY JUSTICE AND ENERGY DEMOCRACY PRINCIPLES IN ENERGY PROJECTS IN MEXICO

ABSTRACT: This paper aims at examining the importance of adopting energy democracy and energy justice principles in carrying out energy projects in Mexico. These concepts have gained international relevance in recent years due to the climate change and the energy transition; however, they have not been adopted to evaluate the feasibility of Mexico's energy projects. In this context, this research analyzes the Eurus wind farm in the state of Oaxaca, which was recognized for complying with Mexican regulations and paying particular attention to environmental and social impacts, as well as governance issues; even it has gained international recognition. Nonetheless, from its construction to its current operation it has had conflicts with the communities. The main findings are that when analyzing this project under the crucible of energy democracy and energy justice, we found several negative impacts and deficiencies in its development, the reason being the absence of these principles when evaluating this energy project.

Medina-Cabrera, A., Ortiz-Arango, F., & Venegas-Martínez, F. (2023). The importance of implementing energy justice and energy democracy principles in energy projects in Mexico. *Revista Mexicana de Economía y Finanzas*, 18(1), e821. <https://doi.org/10.21919/remef.v18i1.821>. Article.

Javier Moreno Espinosa
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THE EFFECT OF LEGAL ENTROPY ON VALUE-ADDED TAX IN MEXICO, 1978–2023

ABSTRACT: This study investigates the relationship between legal entropy (LE) and value-added tax (VAT) in Mexico. Legal entropy is considered a measure of uncertainty or instability within the legal framework, which may influence tax collection and government revenues. To explore this relationship, the study employs a causality approach combined with an autoregressive distributed lag (ARDL) model to assess both short-term and long-term dynamics. The results indicate a unidirectional causal link running from LE to VAT, suggesting that changes in legal uncertainty directly affect tax performance. However, no long-run cointegration is found between the two variables, implying the absence of a stable equilibrium relationship over time. In the short term, a one percent increase in the entropy index is estimated to reduce VAT revenue by approximately

2.06 percent. These findings highlight the potential risks posed by legal uncertainty for fiscal stability and effective tax policy

Moreno, J., Mata, L., & Beltrán, J. H. (2025). The effect of legal entropy on value-added tax in Mexico, 1978-2023. *International Journal of Advanced and Applied Sciences*, 12(10), 81-87. <https://doi.org/10.21833/ijaas.2025.10.010>. Article.

Paolo Riccardo Morganti
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TOWARD FAIR FUTURES? DIGITAL TRANSFORMATION AND INCOME DISPARITIES IN THE ERA OF INDUSTRY 5.0

ABSTRACT: Digital transformation is revolutionizing industrial production systems, offering unprecedented opportunities for economic growth and innovation. Within this context, Industry 5.0 builds on these advancements by emphasizing sustainability and social stability, promising to integrate human-centric principles into industrial development. Using a theoretical Knowledge Economy equilibrium model, this article examines the interplay between technology and human skills, demonstrating how technological complementarity can lead to wage inequality and market failures. The non-monotonic relationship between technology and wage distribution highlights the complexity of achieving socio-economic sustainability. These objectives are particularly difficult to achieve in Latin America where the digital and geographical divide is structurally wide. While Industry 5.0 aspires to foster social stability, our findings suggest that targeted government interventions will likely be necessary to address these challenges and promote a more equitable income distribution.

Morganti, P., & Valdes, R. C. (2025). Toward fair futures? Digital transformation and income disparities in the era of Industry 5.0. In A. Teran-Bustamante, & M. Velázquez Salazar (Eds.), *Digital transformation and innovation in organizations: A Latin American perspective* (pp. 45-76). Palgrave Macmillan. Springer. https://doi.org/10.1007/978-3-031-90794-4_3. Book Chapter.

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Jacqueline Yvette Sánchez García
Senior Researcher B, SNII Level I

Guillermo Sosa Gómez
Senior Researcher C, SNII Level I

Omar Guillermo Rojas Altamirano
Senior Researcher D, SNII Level I

STRUCTURAL EQUATION MODELING FOR ANALYZING PRO-ENVIRONMENTAL BEHAVIOR IN SWITZERLAND

ABSTRACT: Using data from Round 11 of the European Social Survey, covering Switzerland, this article employs Structural Equation Modeling to investigate the associations between psychosocial factors and pro-environmental behavior. Based on the Theory of Planned Behavior, which integrates subjective norms, perceived behavioral control, and attitudes to predict behavioral intentions and actual pro-environmental behaviors. The findings reveal that perceived social norms are strong predictors of pro-environmental behavioral intentions, illustrating the power of expectations from other people on the propensity to act sustainably. However, the effects of attitudes toward the environment and perceived behavioral control on behavioral intention were minimal or unobserved. It indicates that respondents may support environmental and sustainability issues, but this is often not matched by strong intentions to act. Additionally, the perceived control over pro-environmental behavior does not directly affect actual behavior. This suggests that external barriers may prevent individuals from performing sustainable behavior, even if they are motivated. The measurement invariance across gender groups was also examined in the study, which is essential to confirm the equivalence of measurements, and observed differences in latent variables could not be an artifact due to potential measurement bias. The findings suggest that subjective norms and pro-environmental behaviors are more likely to be higher among women, while men scored higher on perceived control. This indicates that women internalize social expectations stronger than men do to act, but for men, they feel able to act, but this confidence does not imply action. This research focuses on the significance of social influences in ecologically friendly action and on the discrepancies between intention and behavior. This study adds to our understanding of the determinants of pro-environmental behavior, providing relevant insights for policymakers to inform more effective interventions that close the gap between awareness and action.

Cedrún-Vázquez, E., Núñez-Ríos, J. E., Sánchez-García, J. Y., Sosa-Gómez, G., & Rojas, O. (2025). Structural equation modeling for analyzing pro-environmental behavior in Switzerland. *Sustainability*, 17(8), 3624. <https://doi.org/10.3390/su17083624>. Article.

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VSM AS A FRAMEWORK FOR IMPLEMENTING IMPROVEMENT STRATEGIES IN WHOLESALE-FOCUSED COMPANIES IN THE POST-COVID-19 ERA

ABSTRACT: The current situation is characterized by turbulence and uncertainty, which introduces significant challenges that affect the ability of small and medium-sized enterprises (SMEs) in the Mexican industrial sector to adapt and compete. This chapter analyzes how a centralized organizational structure in SMEs can result in decision-making concentration, lack of long-term vision, and a hostile work environment. These factors make it difficult for companies to respond promptly to sudden changes and align crucial resources and processes. This chapter discusses the importance of organizational models in mediating the relationship between Small and Medium-sized Enterprises (SMEs) and the broader economy. It uses the example of a medium-sized firm in the industrial equipment sales sector and emphasizes its contribution to the Gross Domestic Product (GDP) and job creation. The chapter presents Beer's Viable System Model as an alternative to improve organizational decision-making capacity and strategic implementation. By adopting this model, decision-makers can improve planning and control and foster organizational resilience by enabling a more agile and coordinated response to internal and external challenges. The proposed framework supports decision-makers in adopting an alternative perspective to enhance their organization's performance.

Vásquez-Ruiz, L. A., & Núñez-Ríos, J. E. (2025). VSM as a framework for implementing improvement strategies in wholesale-focused companies in the post-COVID-19 era. In M. Valeri, J. Y. Sánchez-García, & C. López-Hernández (Eds.), *Effective Strategy Implementation. Contributions to Management Science* (pp. 19-34). Springer. https://doi.org/10.1007/978-3-031-94336-2_2. Book Chapter.

Francisco Ortiz Arango
SNII Level II

TRANSMISSION OF FUTURE PRICES OF CORN OF THE CHICAGO BOARD OF TRADE TO THE MEXICAN SPOT MARKET

ABSTRACT: In Mexico, the use of the coverage program of the Bureau of Market Services and Agricultural Market Development (ASERCA for its acronym in Spanish) is a tool that has been used by corn producers (mainly for white corn) for the acquisition of derived products in the CBOT (Chicago Board of Trade), the underlying element of which is US#2 grade yellow corn. In a high volatility

environment regarding the prices of corn, the prices of CBOT should be adjusted with the spot domestic prices to incentivize Mexican producers to participate in the program. However, through a multivariate stochastic volatility analysis during the period of 2007-2012, it was shown that the future price of corn is not strongly related to the prices registered in some states of the country, therefore, it can be inferred that the coverage through the ASERCA program does not properly comply with its objective of protecting the national farmers that grow white corn, despite the fact that its use has increased.

Ortiz Arango, F., & Montiel Guzmán, A. N. (2016). Transmission of future prices of corn of the Chicago Board of Trade to the Mexican spot market. *Contaduría y Administración*, 62(3), 941-957. <https://doi.org/10.1016/j.cya.2017.05.003>. Article.

Héctor Xavier Ramírez Pérez
SNII Candidate Level

María Lorena de la Torre Díaz
Research Professor

Salvador Rivas Aceves
Senior Researcher B, SNII Level I

HOW FINANCIAL LITERACY FACTORS INFLUENCE HOUSEHOLDS' INCOME AND EXPENSES

ABSTRACT: Financial literacy equips individuals with the knowledge and skills necessary to manage money effectively, thereby fostering financial well-being and supporting societal development through the promotion of financial responsibility. This study investigates the key determinants of financial literacy that influence household income and expenditure. The research employs an empirical analysis, utilising data from a biannual National Income and Expenses Survey. Two models were compared using multivariate estimations to examine the cause-and-effect relationships between income, expenditure, and financial literacy variables. The first model applied the least-squares method, while the second utilised a robust least-squares method, which accommodates outliers and mitigates the impact of assumption violations. Findings reveal that certain factors, including savings, education, medical expense insurance, life insurance, and credit card usage, significantly and positively influence household income and expenses over time. Notably, the acquisition of medical expense insurance, life insurance, and credit card usage emerged as the most impactful factors. Although savings and education were statistically significant, their overall influence on household financial outcomes was comparatively limited. This study contributes by identifying and highlighting the most influential factors affecting household income and expenditure, with implications for policy and practice. It is recommended to enhance financial literacy by improving public understanding and

practical engagement with medical expense insurance, life insurance, and credit card usage, thereby promoting more sustainable and prosperous financial outcomes for households.

Ramírez-Pérez, H. X., De la Torre-Díaz, L., & Rivas-Aceves, S. (2024). How financial literacy factors influence households' income and expenses. *International Journal of Economics and Finance Studies*, 16(2), 302-326. <https://doi.org/10.34109/ijefs.202416215>. Article.

Héctor Xavier Ramírez Pérez
SNII Candidate Level

María Lorena de la Torre Díaz
Research Professor

David Escobar Castillejos
Senior Researcher C, SNII Level I

THE EFFECTIVENESS OF CURRICULUM STANDARDIZATION IN DATA ANALYSIS AND TOOLS PROFICIENCY FOR UNDERGRADUATE EDUCATION: A CASE STUDY

ABSTRACT: Introduction: The rapid evolution of technology necessitates the development of advanced computing and data analysis skills in undergraduate education. Standardizing curricula is a strategy to ensure consistent learning outcomes and align educational objectives with industry requirements. This study investigates the impact of a standardized curriculum on students' academic performance and professional certification outcomes. Methods: A quasi-experimental design was used to analyze 1,597 students enrolled in a data analysis course before and after implementing a standardized curriculum at a private university in Mexico City. The study assessed course grades and certification exam scores to evaluate the effectiveness of standardization. Parametric and non-parametric tests were applied to ensure robust analysis. Results: Implementing the standardized curriculum resulted in a slight decrease in average course grades but significantly improved certification exam scores, exceeding the threshold for certification. The findings highlight enhanced proficiency in data analysis tools and consistency in achieving educational objectives across groups. Discussion: The results suggest that curriculum standardization effectively addresses teaching methodologies and assessment criteria discrepancies. While increased curriculum difficulty temporarily impacted grades, the improved certification outcomes demonstrate the value of standardization in preparing students for industry demands. These insights provide a foundation for future curriculum development to align academic instruction with the evolving requirements of a technology-driven workforce.

DelaTorre-Diaz, L., Ramírez-Pérez, H. X., & Escobar-Castillejos, D. (2025). The effectiveness of curriculum standardization in data analysis and tools proficiency for undergraduate education: a case study. *Frontiers in Education*, 10, 1537174. <https://doi.org/10.3389/feduc.2025.1537174>. Article.

Rajesh Ranjan

Research Professor

BEYOND THE TRACKS: UNDERSTANDING THE WORK-LIFE DYNAMICS OF INDIAN RAILWAY DRIVERS

ABSTRACT: This study explores the relationship between work-life balance and quality of life among Indian Railways' drivers (loco pilots). It specifically examines the concept of time balance, referring to the equal distribution of time between work and family life. The findings suggest that drivers who allocate more time to family than to work report a higher quality of life compared to those who prioritize work over family. This article proposes a conceptual framework identifying the key factors influencing work-life balance among Indian Railways' drivers, including organizational policies and their impact on personal well-being. Finally, this study discusses the broader implications of these findings and suggests directions for future research.

Ranjan, R., Prasad, T., Singh, R., & Tripathi, S. (2025). Beyond the tracks: Understanding the work-life dynamics of Indian railway drivers. *Edelweiss Applied Science and Technology*, 9(6), 815-820. <https://doi.org/10.55214/25768484.v9i6.7952>. Article.

Rajesh Ranjan

Research Professor

DRIVING THROUGH DEMANDS: HOW SELF-EFFICACY SHAPES THE IMPACT OF JOB STRESS ON PRIVATE BUS DRIVERS IN INDIA

ABSTRACT: This study investigates the relationship between various job demands namely, quantitative demands, work pace, emotional demands, and the demand to suppress emotions and their psychological and job-related effects, including stress, depressive symptoms, and job satisfaction, among private bus drivers in North India. A sample of 300 drivers was surveyed using a Hindi-translated version of the Copenhagen Psychosocial Questionnaire. Data analysis was conducted using SPSS to test the proposed research hypotheses. The findings highlight the significant moderating role of self-efficacy in this context. Specifically, self-efficacy was found to positively influence job satisfaction while mitigating levels of stress

and depressive symptoms. Furthermore, job demands exhibited a substantial impact on the respondents, which was notably moderated by their self-efficacy levels. The study offers both practical and theoretical contributions by providing insights that can help bus operators develop targeted interventions to enhance driver well-being and job performance. Limitations of the study and directions for future research are also discussed.

Ranjan, R., Singh, R., & Tripathi, S. (2025). Driving through demands: How self-efficacy shapes the impact of job stress on private bus drivers in India. *International Journal of Innovative Research and Scientific Studies*, 8(3), 2344-2349. <https://doi.org/10.53894/ijirss.v8i3.6990>. Article.

Rajesh Rajesh Ranjan

Research Professor

DRIVING TRAINS, JUGGLING LIVES: A REVIEW ON WORK-LIFE BALANCE OF INDIAN LOCO-PILOTS

ABSTRACT: Loco-pilots (railway drivers) in India operate in a highly demanding and challenging work environment. Their job involves working in isolation, limited social interaction, and the immense responsibility of ensuring both safety and punctuality while running the train. The role demands constant alertness, mental resilience, and the ability to adapt to unpredictable conditions. Loco-pilots have little control over how their work is carried out, as it is largely dictated by strict timetables and technical constraints like train type and track routes. One of the major challenges they face is maintaining a balance between work and personal life. Long working hours, irregular and inflexible schedules, and a heavy workload often lead to work-family conflict and increased stress levels. While much of the existing research on work-life balance focuses on corporate employees, this study aims to shift that focus to the unique experiences of Indian railway drivers. This review provides a comprehensive look at the lives of loco-pilots, highlighting the key factors that contribute to their work-life imbalance—factors that can even impact safety and increase the likelihood of accidents. It also explores the broader implications of these working conditions on their overall well-being, productivity, and the growth of Indian Railways. The paper briefly reviews essential concepts related to work-life balance, emphasizing the urgent need to address this issue among railway drivers.

Ranjan, R., Prasad, T., Singh, R., & Tripathi, S. (2025). Driving trains, juggling lives: A review on work-life balance of Indian loco-pilots. *Edelweiss Applied Science and Technology*, 9(6), 805-814. <https://doi.org/10.55214/25768484.v9i6.7950>. Article.

Rajesh Ranjan
Research Professor

EMPOWERING EQUALITY: HOW THE RIGHT TO INFORMATION FUELS INCLUSIVE DEVELOPMENT

ABSTRACT: The Right to Information (RTI), grounded in Article 19 of the Indian Constitution, is widely regarded as a fundamental human right—one that upholds the dignity of every individual. Often referred to simply as the RTI Act, it empowers citizens to demand transparency and accountability from public authorities. However, to truly harness the potential of this right, there needs to be a significant shift in mindset—not just among the public, but also within the government, bureaucracy, and political leadership. It's essential to promote the understanding that the RTI is not a hurdle to governance, but rather a powerful tool for progress and growth. When embraced fully, the disclosure of information can foster trust, improve public service delivery, and strengthen democracy. This transformation in attitude can be achieved through widespread education, awareness campaigns, and training programs focused on the value of transparency. Historically, the media has played a vital role in spreading information, particularly during India's struggle for independence against British rule. In today's context, where India stands as the world's largest democracy, the media's responsibility has only grown. By raising awareness and keeping both the public and officials informed, the media can play a pivotal role in promoting RTI, leveling the playing field, and encouraging open, inclusive governance.

Ranjan, R., Singh, R., & Tripathi, S. (2025). Empowering equality: How the right to information fuels inclusive development. *Edelweiss Applied Science and Technology*, 9(5), 1029-1039. <https://doi.org/10.55214/25768484.v9i5.7050>. Article.

Rajesh Ranjan
Research Professor

HARNESSING INFORMATION SYSTEMS FOR SUSTAINABLE ENTERPRISE DEVELOPMENT: A SYSTEMATIC LITERATURE NETWORK ANALYSIS

ABSTRACT: Information Systems (IS) are pivotal enablers of sustainable development, enhancing operational efficiency and resilience in enterprises and supply chains. This study applies a Systematic Literature Network Analysis (SLNA) of 132 peer-reviewed articles to map research trends linking IS and sustainability. Citation Network Analysis identifies three principal research domains: sustainable competitive advantage, environmental sustainability, and sustainable online social communities, alongside emerging domains such as IS in developing countries and sustainable information infrastructures. Main Path Analysis (MPA) traces the intel-

lectual evolution of these areas, revealing how IS integration with firm resources supports competitive differentiation and environmental performance, consistent with the Resource-Based View (RBV). Green IS initiatives mitigate environmental risks and are linked to improved financial outcomes. The study also highlights digital engagement dynamics in sustainable online communities, emphasizing member participation, social interaction, and thematic coherence. Overall, the findings align with the Triple Bottom Line (TBL) framework, demonstrating IS contributions across economic, environmental, and social dimensions of sustainability. These insights inform both academia and practice on aligning digital transformation with sustainability goals.

Ranjan, R., Singh, R., & Tripathi, S. (2025). Harnessing information systems for sustainable enterprise development: A systematic literature network analysis. In A. Mirzazadeh, Z. Molamohamadi, B. Erdebili, E. Babae Tirkolae, & G.-W. Weber (Eds.), *Science, engineering management and information technology. SEMIT 2025. Communications in computer and information science, (CCIS)* (Vol. 2652, pp. 94-104). Springer. https://doi.org/10.1007/978-3-032-04228-6_7. Conference Paper.

Rajesh Ranjan
Research Professor

IMPACT OF BENEFITS, WORK CULTURE AND CAREER DEVELOPMENT ON EMPLOYEE ENGAGEMENT AND ORGANIZATIONAL COMMITMENT

ABSTRACT: Many of the Business leaders and professionals are unaware or have a very limited information about the factors affecting job satisfaction and how it is related to employee engagement and work or organizational commitment. Today Employee engagement has become one of the biggest challenges for the companies as the engagement between the employees is on decline and it becomes a critical issue for the organizations or firms recovering from recession trauma. Today the role of employee engagement has become very important for the company as if the employee is not engaged, satisfied, and committed then there may be case of talent mobility. The purpose of the study is to investigate the impact of benefits, work culture and career development on employee engagement and work or organizational commitment. The main aim is to create awareness in employees about Career Satisfaction and Employee Engagement by analyzing that how it is positively related to Organization Commitment. Hypothesis was developed and tested on a sample size. A valid and reliable Questionnaire was used as data collection tool.

Ranjan, R., Arora, S., & Srivastava, D. K. (2025). Impact of benefits, work culture and career development on employee engage-

ment and organizational commitment. *International Journal of Innovative Research and Scientific Studies*, 8(2). <https://doi.org/10.53894/ijirss.v8i2.5677>. Article.

Rajesh Ranjan

Research Professor

TRANSFORMATION OF INDIAN RAILWAYS—A STORY OF CHANGE, CHALLENGES AND VISIONARY LEADERSHIP

ABSTRACT: The success or failure of an organization hinges on the leadership qualities of its leaders. Effective leaders assist their subordinates in finding solutions to their challenges. Leadership in Indian Railways involves bringing together resources, formulating strategies, organizing, and controlling activities to achieve set objectives. Additionally, the leaders within Indian Railways are responsible for selecting goals, deciding on actions, and motivating people to carry them out. In essence, leadership in Indian Railways is a management function focused on setting goals and inspiring people to work towards achieving them. Leaders in Indian Railways guide their teams by setting clear objectives and helping subordinates navigate the best path to achieve these goals. Indian Railways leadership can be seen as the art or process of influencing people to work willingly and enthusiastically towards the accomplishment of group goals. The key elements of leadership within Indian Railways include power, a deep understanding of people, the ability to inspire followers, and the leadership style and work environment created within the organization.

Ranjan, R., Prasad, T., Singh, R., & Tripathi, S. (2025). Transformation of Indian railways—a story of change, challenges and visionary leadership. *Edelweiss Applied Science and Technology*, 9(5), 2122-2132. <https://doi.org/10.55214/25768484.v9i5.7384>. Article.

Rajesh Ranjan

Research Professor

THE INFLUENCE OF IT SOPHISTICATION ON STRENGTHENING ORGANIZATIONAL STRUCTURE, PERFORMANCE, AND ADAPTABILITY

ABSTRACT: In organizational theory research, the connection between the use of IT within organizations and its influence on organizational structure has been a long-standing area of interest. However, with technology evolving at a rapid pace, it is crucial to revisit and reassess these established relationships, particularly in terms of their impact on organizational performance. Moreover,

this topic has been rarely explored in the Indian context. To address this gap, an empirical study was conducted among employees from various Indian organizations, using a comprehensive tool to measure IT sophistication, organizational performance, adaptability, and structural characteristics. The findings revealed that IT sophistication is positively correlated with both performance and adaptability. Among structural characteristics, centralization showed a negative correlation with IT sophistication, while participation showed a positive correlation. Additionally, the relationship between IT sophistication and organizational structure was stronger in high-performing businesses compared to low-performing ones. Differences also emerged between sectors: service sector firms became more informal as IT sophistication increased, and the correlation with performance was higher in service firms than in manufacturing firms.

Ranjan, R., Sai Chand, S., & Srivastava, D. K. (2025). The influence of IT sophistication on strengthening organizational structure, performance, and adaptability. *International Journal of Innovative Research and Scientific Studies*, 8(3), 3813-3819. <https://doi.org/10.53894/ijirss.v8i3.7393>. Article.

Rajesh Ranjan

Research Professor

THE ROLE OF GREEN INFORMATION SYSTEMS IN INDIA'S ENVIRONMENTAL SUSTAINABILITY: A REVIEW-BASED PERSPECTIVE

ABSTRACT: As India pursues its sustainability and digital transformation goals under initiatives such as Digital India and Mission LiFE (Lifestyle for Environment), the relevance of Green Information Systems (Green IS) has grown significantly. Despite increasing adoption of green practices in Indian enterprises, academic research on Green IS within the Indian context remains fragmented and underexplored. This study presents a systematic and comprehensive review of global and Indian academic literature on Green IS and juxtaposes it with insights from industry practices. The review identifies key thematic categories such as environmental sustainability, energy-efficient computing, green business processes, and IT-enabled eco-innovation. Furthermore, it highlights the limited contextual studies from India and suggests research directions to bridge the gap between global theory and Indian practice. Key limitations in existing literature, such as the absence of longitudinal studies and the lack of sector-specific research in emerging economies like India, are addressed. Future research should explore sectoral applications of Green IS in Indian SMEs, public services, and rural digital initiatives to align with India's climate commitments and sustainable development goals. Recent studies emphasize the role of Green IS in reducing carbon footprints and enabling sustainable operations in Indian enterprises. The integration of Green IS in India's smart city and digital governance initiatives is seen as

critical to achieving long-term environmental goals. However, there remains a gap in localized, empirical research that captures how Green IS practices are adopted in diverse Indian contexts such as public administration, agriculture, and SMEs.

Ranjan, R., Singh, R., & Tripathi, S. (2025). The role of green information systems in India's environmental sustainability: A review-based perspective. In A. Mirzazadeh, Z. Molamohamadi, B. Erdebili, E. Babaee Tirkolaee, & G.-W. Weber (Eds.), *Science, engineering management and information technology. SEMIT 2025. Communications in computer and information science, (CCIS)* (Vol. 2651, pp. 418-434). Springer. https://doi.org/10.1007/978-3-032-04225-5_26. Conference Paper.

Rajesh Ranjan
Research Professor

TIME MANAGEMENT FOR LEADERS AND IMPACT ON PRODUCTIVITY: A REVIEW STUDY

ABSTRACT: Increased productivity, action, and results are oriented towards the objectives of the organization and rely heavily on effective time management, which is among the critical attributes of a leader. This article argues that time management should be treated as a key skill among leaders, with a focus on the need for reserving time for what matters, effective delegation, and resolution of overstrain. This article addresses multiple streams that present the phenomenon of time management as a problem of leadership, productivity, and emotional intelligence in a remote and hybrid era. How time management is perceived in different cultures and time management in a globalized world are examined as well. Additionally, this study illustrates a positive relationship between efficient time organization and the performance of the organization, including creativity and motivation among employees. With the criticism of the literature already available, the possibilities for the practical application of such strategies as planning a management process and consideration of the trends are presented in a more general way. This study emphasizes the changing landscape of leadership output while shedding light on how time management skills can be aligned with today's organizations.

Ranjan, R., Singh, R., Kumar, J., & Tripathi, S. (2025). Time management for leaders and impact on productivity: A review study. *International Journal of Innovative Research and Scientific Studies*, 8(2), 653-660. <https://doi.org/10.53894/ijriss.v8i2.5286>. Article.

Salvador Rivas Aceves
Senior Researcher B, SNII Level I

CULTIVATING CRISIS: COMPARATIVE CASES OF POLICY COMPLICITY, SLOW VIOLENCE, AND CULTURAL GENOCIDE

ABSTRACT: Connections between food systems, state and market failures, and mass atrocity risk are shown through comparative analyses of three case studies. The corporatization of agriculture, influenced by policies that prioritize massified food production rather than small-scale farming has eroded food sovereignty and marginalized Indigenous and other minoritized communities. The study situates food systems within the framework of cultural genocide, illustrating how the displacement of traditional agricultural practices, loss of land sovereignty, and structural disenfranchisement contribute to broader patterns of erasure. The paper underscores the need for policy interventions that protect food sovereignty and prevent the conditions that facilitate cultural erasure, economic exclusion, and social instability.

Schmidt, S., & Rivas-Aceves, S. (2025). Cultivating crisis: Comparative cases of policy complicity, slow violence, and cultural genocide. *Journal of Comparative Policy Analysis: Research and Practice*, 27(3), 1-23. <https://doi.org/10.1080/13876988.2025.2594030>. Article.

Salvador Rivas Aceves
Senior Researcher B, SNII Level I

UNDERSTANDING INEQUALITY THROUGHOUT PRODUCTION AND FINANCIAL ACTIVITIES

ABSTRACT: The relationships between inequality and economic activities with a financial system as a financing source is analyzed. An endogenous growth model with human, physical, and financial capitals, diminishing returns, constant scale effects, and heterogeneous agents is outlined. Heterogeneity comes from capital endowments in agents, allowing to introduce a financial system into the economy. Macroeconomic equilibrium, distributional dynamics, and long-run shocks due to the interaction between economic growth, inequality, and financial system are characterized. An empirical study is conducted to test the theoretical findings using LS Panel Data techniques with fixed and random effects estimations. The econometric model is fed with information drawn from the Penn World Table for 81 countries during 1970 – 2019. Main results are: a) in the absence of a financial system, poor households will allocate less time to leisure if they want to consume more, increase human capital or both; b) physical and human capital ratio of the economy relies only in one sector when there is none financial system. Consequently, economic growth rate is lower since only one

sector performs production activities; c) increases in output lead to increases in inequality; d) inequality decreases when human capital goes up; e) physical capital generates small and positive changes in inequality; f) financial capital causes positive impacts on inequality; g) inequality decreases if total factor productivity increases; h) empirical evidence verifies theoretical findings.

Rivas-Aceves, S. (2025). Understanding inequality throughout production and financial activities. *Montenegrin Journal of Economics*, 21(3), 129-144. <https://doi.org/10.14254/1800-5845/2025.21-3.10>. Article.

Román Rodríguez Aguilar
Senior Researcher C, SNII Level II

ARTIFICIAL INTELLIGENCE FOR RENEWABLE ENERGY AND CLIMATE CHANGE

ABSTRACT: Renewable energy and climate change are two of the most important and difficult issues facing the world today. The state of the art in these areas are changing rapidly, with new techniques and theories coming online seemingly every day. It is important for scientists, engineers, and other professionals working in these areas to stay abreast of developments, advances, and practical applications, and this volume is an outstanding reference and tool for this purpose. The paradigm in renewable energy and climate change shifts constantly. In today's international and competitive environment, lean and green practices are important determinants to increase performance. Corresponding production philosophies and techniques help companies diminish lead times and costs of manufacturing, to improve delivery on time and quality, and at the same time become more ecological by reducing material use and waste, and by recycling and reusing. Those lean and green activities enhance productivity, lower carbon footprint and improve consumer satisfaction, which in reverse makes firms competitive and sustainable. These topics are all covered here, in this comprehensive, practical, new groundbreaking volume, written and edited by a team of experts in the field.

Vasant, P., Weber, G.-W., Thomas, J., Marmolejo-Saucedo, J. A., & Rodríguez-Aguilar, R. (Eds.). (2022). *Artificial intelligence for renewable energy and climate change*. Wiley. <https://doi.org/10.1002/9781119771524>. Book.

Román Rodríguez Aguilar
Senior Researcher C, SNII Level II

DIGITAL TRANSFORMATION AND XAI IN HEALTHCARE

ABSTRACT: This book explores the pivotal role of explainable artificial intelligence (XAI) in driving digital transformation within the healthcare sector, providing comprehensive insights into its applications, ethical and legal considerations, technological requirements, and future trends.

Digital Transformation and XAI in Healthcare delves into the fundamental role of XAI in transforming healthcare, addressing critical issues such as data security, ethical considerations, and the integration of XAI into existing healthcare infrastructures. By offering a comprehensive overview of technological tools, infrastructure requirements, and legal frameworks, this book equips healthcare professionals with the knowledge to navigate the complexities of XAI applications. The book explores the future of healthcare education and the pivotal role of XAI in training the next generation of healthcare professionals. It discusses how XAI can enhance learning experiences and provide more personalized education, ensuring that future clinicians are well equipped to utilize advanced AI technologies. It also delves into the technological tools and infrastructure required for implementing XAI, as well as data management and privacy concerns. The exploration of global collaborations and innovative projects highlights the book's unique perspective on the international impact of XAI in healthcare.

Intended for healthcare professionals, researchers, and students, this book will provide valuable insights into the future of healthcare technology. Readers will be equipped with the knowledge to harness the power of XAI, ensuring that AI systems are not only accurate but also transparent, trustworthy, and ethically sound.

Uysal, I., Rodríguez-Aguilar, R., Abed Alzubi, J. A., & Bilen, M. (Eds.). (2025). *Digital transformation and XAI in healthcare*. CRC Press. <https://doi.org/10.1201/9781003605416>. Book.

Román Rodríguez Aguilar
Senior Researcher C, SNII Level II

FEDERATED LEARNING BASED ON AN INTERNET OF MEDICAL THINGS FRAMEWORK FOR A SECURE BRAIN TUMOR DIAGNOSTIC SYSTEM: A CAPSULE NETWORKS APPLICATION

ABSTRACT: Artificial intelligence (AI) has already played a significant role in the healthcare sector, particularly in image-based medical diagnosis. Deep learning models have produced satisfactory and useful results for accurate decision-making. Among the various types of medical images, magnetic resonance imaging (MRI) is frequently utilized in deep learning applications to analyze detailed structures and organs in the body, using advanced intelligent software. However, challenges related to performance and data privacy often arise when using medical data from patients and healthcare institutions. To address these issues, new approaches

have emerged, such as federated learning. This technique ensures the secure exchange of sensitive patient and institutional data. It enables machine learning or deep learning algorithms to establish a client-server relationship, whereby specific parameters are securely shared between models while maintaining the integrity of the learning tasks being executed. Federated learning has been successfully applied in medical settings, including diagnostic applications involving medical images such as MRI data. This research introduces an analytical intelligence system based on an Internet of Medical Things (IoMT) framework that employs federated learning to provide a safe and effective diagnostic solution for brain tumor identification. By utilizing specific brain MRI datasets, the model enables multiple local capsule networks (CapsNet) to achieve improved classification results. The average accuracy rate of the CapsNet model exceeds 97%. The precision rate indicates that the CapsNet model performs well in accurately predicting true classes. Additionally, the recall findings suggest that this model is effective in detecting the target classes of meningiomas, pituitary tumors, and gliomas. The integration of these components into an analytical intelligence system that supports the work of healthcare personnel is the main contribution of this work. Evaluations have shown that this approach is effective for diagnosing brain tumors while ensuring data privacy and security. Moreover, it represents a valuable tool for enhancing the efficiency of the medical diagnostic process.

Rodríguez-Aguilar, R., Marmolejo-Saucedo, J.-A., & Köse, U. (2025). Federated learning based on an Internet of Medical Things framework for a secure brain tumor diagnostic system: A capsule networks application. *Mathematics*, 13(15), 2393. <https://doi.org/10.3390/math13152395>. Article.

Román Rodríguez Aguilar
Senior Researcher C, SNII Level II

IMPROVING A BIOLOGICAL EXTRACTS COMPANY'S CASH CYCLE BY SIMULATING DISCRETE EVENTS: FIRST STEPS TOWARDS DESIGNING A DIGITAL TWIN

ABSTRACT: Companies with consistently positive cash cycles tend to outperform those with negative cycles, which struggle to cover operational and capital expenses. This study focuses on a Mexican company facing financial liquidity challenges due to a high investment in finished product inventory and an 80-day cash conversion cycle, with 73 days tied to inventory. Using discrete event simulation and digital modeling, the production process of fluid extract was analyzed to identify inefficiencies and propose improvements. The simulation, conducted with Anylogic software, revealed significant delays in the percolation operation, contributing to a 20-day production process and substantial work-in-process inventory. This work lays the foundation for implementing a digital twin to evaluate real-

time financial impacts of operational changes, ultimately improving the company's financial performance.

Jarquín-Segovia, R., Marmolejo-Saucedo, J. A., & Rodríguez-Aguilar, R. (2025). Improving a biological extracts company's cash cycle by simulating discrete events: First steps towards designing a digital twin. *IFAC-PapersOnLine*, 59(10), 2310-2314. <https://doi.org/10.1016/j.ifacol.2025.09.388>. Conference Paper.

Román Rodríguez Aguilar
Senior Researcher C, SNII Level II

MODELING RESPONSIBLE TECHNOLOGIES USING MULTIAGENT SYSTEM FOR CLIMATE CRISIS AND SUSTAINABILITY

ABSTRACT: This chapter delves into the dynamic landscape of responsible technologies and their crucial role in addressing the climate crisis and advancing sustainability. It highlights the need to understand the intricate connections between technology adoption, environmental impact, and societal behavior across various dimensions of sustainability, including environmental, social, economic, cultural, technological, political, ethical, health, educational, and adaptive aspects. The chapter introduces the concept of responsible technologies and their key principles, emphasizing real-world experimentation limitations and simulation advantages, particularly through a multiagent system (MAS). It explores different modeling approaches, focusing on the suitability of MAS for studying responsible technologies, along with considerations in its implementation. A step-by-step guide is provided for constructing a tailored MAS model for responsible technologies, incorporating real-world data and environmental factors. Findings and insights from MAS simulations are analyzed, shedding light on the implications of responsible technology adoption across these sustainability dimensions. The chapter also underscores the pivotal role of a MAS in comprehensively modeling responsible technologies and invites further research exploration in this expansive domain, serving as a comprehensive guide for researchers, policymakers, and stakeholders committed to leveraging responsible technologies for climate change mitigation and sustainability advancement.

Nanda, P., Sahoo, S., Rodríguez Aguilar, R., Marmolejo-Saucedo, J. A., & Behera, I. (2025). Modeling responsible technologies using multiagent system for climate crisis and sustainability. In U. Kose, D. Gupta, & J. A. Marmolejo-Saucedo (Eds.), *Computational modeling applications for climate crisis* (pp. 203-225). Morgan Kaufmann. <https://doi.org/10.1016/B978-0-443-21905-4.00011-0>. Book Chapter.

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MODELING THE RELATION BETWEEN NON-COMMUNICABLE DISEASES AND THE HEALTH HABITS OF THE MEXICAN WORKING POPULATION: A HYBRID MODELING APPROACH

ABSTRACT: The impact that Non-Communicable Diseases (NCDs) have on the health status of the population has generated the need for an in-depth analysis of health habits and NCDs. In addition to its significant impact on population health, this phenomenon also translates into substantial economic consequences for countries. This study delves into the analysis of the relationship between health habits and NCDs among the economically active population of Mexico. Through a hybrid approach that integrates the use of machine learning (ML) models and a structural equation model (SEM), we seek to quantify the direct and indirect causal effects between health habits and NCDs. For this study, information from the 2022 National Health and Nutrition Survey carried out in Mexico for the working-age population is used. According to the results obtained in the first stage of analysis using ML, the most relevant variables (health habits) that impact the probability of individuals presenting with NCDs were identified (random forest precision of 78.66% and Lasso with 71.27%). The second stage of analysis through SEM using the most relevant variables, which were selected through ML, allowed us to measure the direct and indirect causal effect of health habits on NCDs. The SEM model was statistically significant (Chi-square: 449.186; p-value = 0.0000) and revealed that negative health habits, such as a poor diet, physical inactivity, smoking and alcohol consumption, significantly increase the risk of NCDs in the working-age population in Mexico (0.23), while vigorous physical activity and salary has a negative impact (-0.17 and -0.23, respectively) on the presence of NCDs. This study highlights the ability of machine learning and SEM approaches to model the impact of health habits on NCDs for the economically active population in Mexico.

Domínguez-Miranda, S. A., Rodríguez-Aguilar, R., & Velázquez-Salazar, M. (2025). Modeling the relation between non-communicable diseases and the health habits of the Mexican working population: A hybrid modeling approach. *Mathematics*, 13(6), 959. <https://doi.org/10.3390/math13060959>. Article.

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SALES PREDICTIVE ANALYSIS FOR IMPROVING SUPPLY CHAIN DRUG SAMPLE

ABSTRACT: The delivery of drug samples allows increasing sales of pharmaceutical products. However, we discovered some problems that can be improved in the supply chain that delivers drug samples (used for the treatment of excess glucose). Databases were integrated; then we apply data extraction and transformation; and finally we apply multiple regression analysis to explain drug sales. The first analysis evaluates the integration of regional data and the second analysis refers to data dis-aggregated by region. We identify the region with the greatest impact on sales and the impact of the delivery of drug samples in the Mexican market.

Téllez-Ballesteros, S. C., Torres-Mendoza, R., Marmolejo-Saucedo, J. A., & Rodríguez-Aguilar, R. (2025). Sales predictive analysis for improving supply chain drug sample. *Procedia Computer Science*, 253, 1712-1719. <https://doi.org/10.1016/j.procs.2025.01.233>. Conference Paper.

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LEVERAGING MHEALTH AND ARTIFICIAL INTELLIGENCE FOR ENHANCED HEALTH INDICATORS, A TWIMV FRAMEWORK PROPOSAL

ABSTRACT: Technological advances and artificial intelligence (AI) are transforming healthcare by improving prevention, diagnosis, and remote health monitoring. This paper explores the current landscape of the potential application of digital technologies to the healthcare sector. The design of the TwiMV system is proposed to integrate diverse health data for patient diagnosis and monitoring, in a comprehensive framework, encompassing biochemical studies, genetic analysis, medical images, biometric data, dietary and lifestyle information, and wearable data. The proposal involves real-time processing through cloud-based platforms, as well as the integration of artificial intelligence algorithms and digital technologies. The proposed system aims to improve health management through personalized interventions, with specialized modules addressing priority conditions such as stroke, cardiovascular disease, oncology, diabetes, and neurological disorders.

Domínguez-Miranda, S. A., & Rodríguez-Aguilar, R. (2025). Leveraging mHealth and artificial intelligence for enhanced health indicators, a TwiMV framework proposal. In U. Kose & J. Alzubi (Eds.), *IoT technologies and wearables for healthcare*. ICWH 2024. Lecture notes of the Institute for Computer Sci-

ences, *Social Informatics and Telecommunications Engineering*, (LNICST) (Vol. 639, pp. 87-107). Springer. https://doi.org/10.1007/978-3-031-95571-6_6. Conference Paper.

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THE CULTURE PROCESS APPLIED TO THE HÑAHÑU ARTISANAL TEXTILE EMBROIDERY IN MEXICO

ABSTRACT: raftworking represents a cultural expression of the region where it is made; as intangible cultural heritage, its preservation is compromised by the dynamics the modern societies have developed in. In Mexico, the artisanal sector plays an important role for its cultural, social, and economic development, as well as for the consolidation of its identity in the world. However, worldwide social dynamics also affects this country, besides its statistical inaccuracy and lack of research in the field. This work aims at providing evidence of Mexican craft through exploring the production and trading of the traditional textile embroidery in the Valle de Mezquital in the State of Hidalgo. The Culture Process Model was used from a social dimension, as well as the Social Network Analysis. In-depth semistructured interviews from three sources were undertaken: (1) 21 craftswomen, (2) 14 small businesses, and (3) 7 stakeholders. The findings systematically show the type of embroidery being produced, and how it is traded, disseminated, and preserved. This allows us to detect some areas for improvement at the time some specific qualitative data are generated for its proper measurement, which would help strengthen its resilience capacity when in uncertain scenarios.

Rómulo-Pérez, Y., & Romero-García, L. E. (2025). The culture process applied to the Hñahñu artisanal textile embroidery in Mexico. *Textile: The Journal of Cloth and Culture*, 23(3-4), 463-488. <https://doi.org/10.1080/14759756.2025.2502209>. Article.

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AN ORGANIZATIONAL FRAMEWORK FOR MICROENTERPRISES TO FACE EXOGENOUS SHOCKS: A VIABLE SYSTEM APPROACH

ABSTRACT: This study examines how integrating the critical components of entrepreneurial orientation (EO) can improve the adaptability of microenterprises by applying the Viable System Model

(VSM). Given the crucial role of microenterprises in job creation, entrepreneurship promotion, and social cohesion, the need for approaches that ensure their success in turbulent environments is highlighted. We applied Social Network Analysis (SNA) to analyze a co-occurrence network to identify critical EO factors relevant to microenterprises and to understand how authors relate them to the structure of the VSM using a Californian microenterprise as a conceptual model. These factors include innovation, autonomy, control implementation, market orientation, and change management, organized into the five functions of the VSM. The results suggest that this conceptual framework strengthens organizational responsiveness in disruptive environments, promoting internal cohesion and more informed decision-making. Although the specific characteristics of each microenterprise require adjusting the VSM to their particular needs, this study provides a solid basis for applying the key elements of EO in the VSM, underscoring the need for further research to adapt this approach to different contexts to improve organizational agility in the face of exogenous shocks.

Suarez Ambriz, D., Sánchez-García, J. Y., & Núñez-Ríos, J. E. (2024). An organizational framework for microenterprises to face exogenous shocks: A viable system approach. *Administrative Sciences*, 14(12), 315. <https://doi.org/10.3390/admsci14120315>. Article.

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ASSERTIVENESS AS A CRITICAL FACTOR FOR ORGANISATIONAL ADAPTABILITY IN SERVICE SMES

ABSTRACT: To continue operating and seeking competitiveness in a complex and highly changing context, small- and medium-sized service companies (SMEs) depend heavily on their employees. Organisations must identify capabilities that allow them to respond quickly to environmental changes. This chapter empirically explores the impact of assertiveness on organisational adaptability (OA) and proposes a model with relationships oriented to foster adaptability, considering assertiveness as a relevant factor. Partial least squares structural equation modelling (PLS-SEM) was used to express and test the model hypotheses. Data were collected from 200 SMEs. The results show a strong and significant association between assertiveness, people development and organisational adaptation, suggesting that decision-makers can promote OA. This work may enable academics and managers to improve communication and inter-organisational relationships, allowing them to focus their strategies and resources to increase managerial and adaptive capacity and enhance performance and innovation.

Sánchez-García, J. Y., & Núñez-Ríos, J. E. (2025). Assertiveness as a critical factor for organisational adaptability in service SMEs. In C. Atristain-Suárez & S. Castaños-Cervantes, *Assertiveness in the workplace: Personal and business competitiveness in emerging and developing countries* (pp. 95-127). Emerald Publishing. <https://doi.org/10.1108/978-1-83662-214-720251031>. Book Chapter.

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CIRCULAR SUBSIDIARITY: HUMANIZING WORK THROUGH RELATIONAL GOODS

ABSTRACT: The Fourth Industrial Revolution based on digitalization, the development of AI, robotics, big data, and increasing automation is dredging up older debates on the end of human work. This article contributes to this debate arguing that these changing circumstances represent an opportunity to advance a renewed consideration of human work. By emphasizing its most distinctively human dimensions, including gratuitousness, relationality, and meaningfulness, we propose the articulation of a social model that recognizes relational goods as a specific contribution of human work in an attempt to overcome the state and the market's monopoly of public life built around the dichotomy between the private and the public. Such a social model is based on the concept of circular subsidiarity, which represents a departure from traditional notions of subsidiarity by promoting a dynamic and reciprocal interplay between three essential societal spheres: the state, the market, and organized civil society, all of which have their role to fulfill by providing security, efficiency, and relational goods. Ultimately, this article suggests that circular subsidiarity can lead to a more inclusive and equitable social model by acknowledging how relational goods not only humanize civil society but also sustain the functioning of both the market and the state.

González, A. M., & Scalzo, G. (2024). Circular subsidiarity: Humanizing work through relational goods. *Business and Society Review*, 129(S1), 705-720. <https://doi.org/10.1111/basr.12333>. Article.

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ETHICAL LEADERSHIP AS A DRIVER OF SUPERVISOR TECHNICAL AND SOCIAL EFFECTIVENESS: A TRIPLE HELIX FOR CULTIVATING EMPLOYEES' SENSE OF PURPOSE

ABSTRACT: A sense of purpose is generated when individuals perceive an authentic connection between their work and a broader transcendent life purpose beyond the self. Academics have shown significant positive effects of this driving force in life for employees and organizations, and thus the literature demands studies that analyze its antecedents, i.e., the potential factors that shape an individual's sense of purpose in life. Following an Aristotelian approach to virtue ethics in business, we analyze (1) whether ethical leadership enhances the technical and social effectiveness of supervisors, and (2) whether this moral asset of leaders enhances employee sense of purpose, either directly or by interacting with their technical and social effectiveness-related dimensions. Using data from 395 employees in the Iraqi insurance and health care industry, structural equation modeling analysis revealed that, as expected, the ethical dimension of supervisors can influence employees' sense of purpose, both directly and by improving their technical and social effectiveness as leaders. Our findings thus encourage managers to practice ethical leadership to become more effective in leadership and in encouraging employees to have a sense of purpose in what they do.

Al Halbusi, H., Ruiz-Palomino, P., Linuesa-Langreo, J., & Scalzo, G. (2025). Ethical leadership as a driver of supervisor technical and social effectiveness: A triple helix for cultivating employees' sense of purpose. *Business Ethics, the Environment and Responsibility*, 34(4), 2013-2033. <https://doi.org/10.1111/beer.12750>. Article.

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MAKING WISER DECISIONS IN ORGANIZATIONS: INSIGHTS FROM INTER-PROCESSUAL SELF THEORY AND TRANSCENDENTAL ANTHROPOLOGY

ABSTRACT: Current approaches in decision making, influenced by rationalist and pragmatist paradigms, offer notable strengths but fail to adequately address human growth, moral depth, and relational dynamics. Rationalist models emphasize universal principles and cognitive processing, offering structured approaches at the expense of human relationality and cultural diversity. Pragmatist approaches focus on adaptability and social context and provide flexibility, but their morally relativistic stance leads to ethical inconsistency. To address these gaps, we integrate Leonardo Polo's transcendental personalist philosophy and the Inter-processual Self (IPS) Theory to redefine decision making as an opportunity for personal and relational growth. Grounded in anthropological insights, this framework prioritizes the human person as the center of moral action and decision making, fostering personal and relational growth through the transcendentals of personal love, knowledge,

and freedom. We argue that this enriched perspective addresses critical limitations of existing models, enabling decision making to serve as a source of systemic wisdom and sustainable growth. By applying this framework to organizational contexts, we show how it enhances personal growth, and the persons' transcendent motivation for virtues involving inter-relational growth and wisdom. Our approach offers a holistic and transformative lens to rethink decision making as a catalyst for individual and collective flourishing, providing actionable insights to meet contemporary challenges in business and society.

Akrivou, K., Martínez, M., Luis, E. O., & Scalzo, G. (2025). Making wiser decisions in organizations: Insights from inter-processual self theory and transcendental anthropology. *Humanistic Management Journal*, 10(3), 431-460. <https://doi.org/10.1007/s41463-025-00208-z>. Article.

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NECESSITY, EQUILIBRIUM AND GIFT: AN ANTHROPOLOGICAL FOUNDATION FOR ECONOMICS

ABSTRACT: Modernity was characterized by a zero-sum game anthropology that exaggerates the human desire for freedom and led to an anthropological crisis materialized in a sole focus on results. To overcome this reductionism, this article takes up the narrative of the gift—first social, then moral—and enrich it with a transcendental proposal. It aims to show that, although man is a needy being, his most radical feature is his self-giving capacity, since he is also a transcendently open person who is backed by his status as gift. This anthropological backdrop could lead to a renewal of economics with a capacity to create new alternatives.

Vargas, A. I., & Scalzo, G. (2024). Necessity, equilibrium and gift: An anthropological foundation for economics. *Pensamiento*, 80(311), 1165-1190. <https://doi.org/10.14422/pen.v80.i311.y2024.003>. Article.

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A BLACK-BOX ANALYSIS OF THE CAPACITY OF CHATGPT TO GENERATE DATASETS OF HUMAN-LIKE COMMENTS

ABSTRACT: This paper examines the ability of ChatGPT to generate synthetic comment datasets that mimic those produced by humans. To this end, a collection of datasets containing human comments, freely available in the Kaggle repository, was compared to comments generated via ChatGPT. The latter were based on prompts designed to provide the necessary context for approximating human results. It was hypothesized that the responses obtained from ChatGPT would demonstrate a high degree of similarity with the human-generated datasets with regard to vocabulary usage. Two categories of prompts were analyzed, depending on whether they specified the desired length of the generated comments. The evaluation of the results primarily focused on the vocabulary used in each comment dataset, employing several analytical measures. This analysis yielded noteworthy observations, which reflect the current capabilities of ChatGPT in this particular task domain. It was observed that ChatGPT typically employs a reduced number of words compared to human respondents and tends to provide repetitive answers. Furthermore, the responses of ChatGPT have been observed to vary considerably when the length is specified. It is noteworthy that ChatGPT employs a smaller vocabulary, which does not always align with human language. Furthermore, the proportion of non-stop words in ChatGPT's output is higher than that found in human communication. Finally, the vocabulary of ChatGPT is more closely aligned with human language than the similarity between the two configurations of ChatGPT. This alignment is particularly evident in the use of stop words. While it does not fully achieve the intended purpose, the generated vocabulary serves as a reasonable approximation, enabling specific applications such as the creation of word clouds.

Rosete, A., Sosa-Gómez, G., & Rojas, O. (2025). A black-box analysis of the capacity of ChatGPT to generate datasets of human-like comments. *Computers*, 14(5), 162. <https://doi.org/10.3390/computers14050162>. Article.

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COMBINED AND GENERAL METHODOLOGIES OF KEY SPACE PARTITION FOR THE CRYPTANALYSIS OF BLOCK CIPHERS

ABSTRACT: This paper proposes two new methods of key space partitioning for the cryptanalysis of block ciphers. The first one is called combined methodology of key space partition (CoMeKSPar), which allows us to simultaneously set some of the first and last consecutive bits of the key. In this way, the search is performed using the remaining middle bits. CoMeKSPar is a combination

of two methods already proposed in the scientific literature, the Borges, Borges, Monier (BBM) and the Tito, Borges, Borges (TBB). The second method is called the general algorithm of key space reduction (GAKSRed), which makes it possible to perform a genetic algorithm search in the space formed by the unknown bits of the key, regardless of their distribution in the binary block. Furthermore, a method of attacking block ciphers is presented for the case where some key bits are known; the basic idea is to deduce some of the remaining bits of the block. An advantage of these methods is that they allow parallel computing, which allows simultaneous searches in different sub-blocks of key bits, thereby increasing the probability of success. The experiments are performed with the KLEIN (Small) lightweight block cipher using the genetic algorithm.

Borges-Quintana, M., Borges-Trenard, M. A., Tito-Corrioso, O., Rojas, O., & Sosa-Gómez, G. (2024). Combined and general methodologies of key space partition for the cryptanalysis of block ciphers. *Cryptography*, 8(4), 45. <https://doi.org/10.3390/cryptography8040045>. Article.

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CORRECTION: ASSESSMENT OF THE ENVIRONMENTAL EFFECT OF CARBON TAXATION IN CHILE USING A BAYESIAN DIFFERENCE-IN-DIFFERENCES APPROACH

ABSTRACT: Carbon pricing instruments play a crucial role in mitigating CO2 emissions and are widely recognized as effective strategies for addressing climate change. In this context, Chile implemented a carbon tax on large fixed sources in 2017, marking a significant advance in Latin American environmental policy. However, there is a knowledge gap regarding the actual effectiveness of this policy using Bayesian approaches. Therefore, this research aims to evaluate the effect of this tax on CO2 emissions using a novel methodological approach: the Bayesian difference-in-differences method. This method provides an accurate estimate of the carbon tax's effects, taking into account the inherent variability and uncertainty in the data. To carry out this assessment, an annual database at the thermoelectric unit level is used, covering the period from 2014 to 2022. The results of this study reveal that the application of a tax of 5 USD/tCO2 significantly reduces CO2 emissions, with an annual decrease of between 17.7% and 18.1% in the taxed units. However, the magnitude of the observed impact is limited in relation to Chile's decarbonization targets, suggesting that the current design of this climate policy could benefit from improvements to enhance its emission reduction potential.

Fernández-López, R., Mardones, C., Sosa-Gómez, G., & Navarrete, J. P. (2026). Correction: Assessment of the environmental effect of carbon taxation in Chile using a Bayesian difference-in-differences approach. *Annals of Operations Research*, 356(2-3), 1355. <https://doi.org/10.1007/s10479-025-06946-5>. Article (erratum).

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GENERATION OF AFFINE-SHIFTED S-BOXES WITH CONSTANT CONFUSION COEFFICIENT VARIANCE AND APPLICATION IN THE PARTITIONING OF THE S-BOX SPACE

ABSTRACT: Among the multiple important properties that characterize strong S-boxes for symmetric cryptography and are used in their designs, this study focuses on two: the non-linearity property, a classical security metric, and the confusion coefficient variance property, a statistical proxy for side channel resistance under the Hamming weight leakage model. Given an S-box, two sets can be created: the set of affine-shifted S-boxes, where S-boxes have the same non-linearity value, and the set of Hamming weight classes, where S-boxes have the same confusion coefficient variance value. The inherent values of these two properties ensure resistance to cryptographic attacks; however, if the value of one property increases, it will imply a decrease in the value of the other property. In view of the aforementioned fact, attaining a trade-off becomes a complex undertaking. The impetus for this research stems from the following hypothesis: if an initial S-box already exhibits a trade-off, it would be advantageous to employ a method that generates new S-boxes while preserving the balance. A thorough review of the extant literature reveals the absence of any methodology that encompasses the aforementioned elements. The present paper proposes a novel methodology for generating an affine-shifted subset of S-boxes, ensuring that the resulting subset possesses the same confusion coefficient variance value. We provide insights on the optimal search strategy to optimize non-linearity and confusion coefficient variance. The proposed methodology guarantees the preservation of constant values on the designated. It is possible to incorporate these properties into a comprehensive design scheme, in which case the remaining S-box properties are to be examined. We also demonstrate that, despite the fact that this subset contains S-boxes with the theoretical resistance to side channel attacks under the Hamming weight model, the S-boxes are in different Hamming weight classes.

Martínez-Díaz, I., Legón-Pérez, C. M., & Sosa-Gómez, G. (2025). Generation of affine-shifted S-boxes with constant confusion coefficient variance and application in the partitioning of the S-box space. *Cryptography*, 9(2), 45. <https://doi.org/10.3390/cryptography9020045>. Article.

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NEW WEAK KEYS WITH PARITY PATTERNS IN THE RC4 STREAM CIPHER

ABSTRACT: The RC4 cryptographic algorithm is the most extensively studied stream cipher of the past two decades. This extensive research has resulted in numerous publications, many of which identify various vulnerabilities. Although these vulnerabilities do not preclude the correct use of the algorithm, they complicate its practical implementation. In this paper, we present a novel weakness in the RC4 cipher. Our findings indicate that, for input keys exhibiting certain patterns, the parity of the values in the output permutation of the KSA can be determined with high probability from the parity of its position in the output permutation. Furthermore, the use of keys with these specific patterns leads to noticeable distortions in several bytes of the RC4 output.

Madarro-Capó, E. J., Legón-Pérez, C. M., Sosa-Gómez, G., & Rojas, O. (2024). New weak keys with parity patterns in the RC4 stream cipher. *Cryptography*, 8(4), 54. <https://doi.org/10.3390/cryptography8040054>. Article.

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STATISTICAL OPTIMIZATION IN THE FERMENTATION STAGE FOR ORGANIC ETHANOL: A SUSTAINABLE APPROACH

ABSTRACT: The growing demand for organic products is having a transformative effect on the alcoholic beverage industry. This work investigates the possibility of producing organic ethanol only from sugarcane final molasses as a nutrient vector and *Saccharomyces cerevisiae* in the absence of inorganic nitrogen or phosphorus compounds. The Plackett-Bürman design included the pseudo-factors (X4–X6) due to the experimental design requirements. These factors represent the possible influence of uncontrolled variables, such as pH or nutrient interactions. Subsequently, a predictive quadratic model using Box-Behnken design with the real variables (sugar concentration, yeast dose, and incubation time) was developed and validated ($R^2 = 0.977$) with internal validation; given the lack of replications and the sample size, this value should be interpreted with caution and not as generalizable predictive evidence. Further experiments with replications and cross-validation will be required to confirm its predictive capacity. Through statistical optimization, the maximum cell proliferation of 432×10^6 cells/mL was achieved under optimal conditions of 8°Brix sugar concentration, 20 g/L dry yeast,

and 3 h incubation time. The optimized fermentation process produced 7.8% v/v ethanol with a theoretical fermentation efficiency of 78.52%, an alcohol-to-substrate yield of 62.15%, and a productivity of 1.86 g/L-h, representing significant improvements of 21.9%, 24.6%, 31.0%, and 10.1%, respectively, compared with non-optimized conditions. The fermentation time was reduced from 48 to 42 h while maintaining superior performance. These results demonstrate the technical feasibility of producing organic ethanol using certified organic molasses and no chemical additives. Overall, these findings should be regarded as proof of concept. All experiments were single-run without biological or technical replicates; consequently, the optimization and models are preliminary and require confirmation with replicated experiments and external validation.

Sosa-Gómez, E., Aguilar, I. G., de Armas Martínez, A. C., & Sosa-Gómez, G. (2025). Statistical optimization in the fermentation stage for organic ethanol: A sustainable approach. *Processes*, 13(9), 2675. <https://doi.org/10.3390/pr13092675>. Article.

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THE RELEVANCE OF LEAD PRIORITIZATION: A B2B LEAD SCORING MODEL BASED ON MACHINE LEARNING

ABSTRACT: In business-to-business (B2B) companies, marketing and sales teams face significant challenges in identifying, qualifying, and prioritizing a large number of leads. Lead prioritization is a critical task for B2B organizations because it allows them to allocate resources more effectively, focus their sales force on the most viable and valuable opportunities, optimize their time spent qualifying leads, and maximize their B2B digital marketing strategies. This article addresses the topic by presenting a case study of a B2B software company's development of a lead scoring model based on data analytics and machine learning under the consumer theory approach. The model was developed using real lead data generated between January 2020 and April 2024, extracted from the company's CRM, which were analyzed and evaluated by fifteen classification algorithms, where the results in terms of accuracy and ROC AUC showed a superior performance of the Gradient Boosting Classifier over the other classifiers. At the same time, the feature importance analysis allowed the identification of features such as "source" and "lead status," which increased the accuracy of the conversion prediction. The developed model significantly improved the company's ability to identify high quality leads compared to the traditional methods used. This research confirms and complements existing theories related to understanding the application of consumer behavior theory and the application of machine learning in the development of B2B lead scoring models. This study also contributes to bridging the gap between marketers and data scientists

in jointly understanding lead scoring as a critical activity because of its impact on overall marketing strategy performance and sales revenue performance in B2B organizations.

González-Flores, L., Rubiano-Moreno, J., & Sosa-Gómez, G. (2025). The relevance of lead prioritization: A B2B lead scoring model based on machine learning. *Frontiers in Artificial Intelligence*, 8, 1554325. <https://doi.org/10.3389/frai.2025.1554325>. Article.

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CONTEXTUAL DIFFERENCES IN THE STUDENT EVALUATION OF TEACHING (SET) IN MEXICO: COMPARING EDUCATION FACE TO FACE AND ONLINE CLASSES BETWEEN DIFFERENT FACULTIES

ABSTRACT: The factors that influence SET have been extensively addressed, but not the differences that these factors may have either by different modalities (online and face-to-face) or by the faculty in which the class is taught (business, engineering or law). The present study develops logit models sectioned by year (2018 to 2022) and by faculty to analyse the students' teaching evaluations at a private university in western Mexico with a sample of 7967 observations. The results show significant differences in the face-to-face and online modalities, with some similarities and different results among the faculties in the study. The findings provide guidelines to establish institutional policies that support the management of higher education institutions in the framework of the new normality under the online and face-to-face education scheme.

Martínez-Orozco, E., López-Hernández, C., Briseño, H., & Soto-Pérez, M. (2025). Contextual differences in the student evaluation of teaching (SET) in Mexico: Comparing education face to face and online classes between different faculties. *International Journal of Management in Education*, 19(5), 552-572. <https://doi.org/10.1504/IJMIE.2025.148275>. Article.

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DEVELOPING SOFT SKILLS FOR MANAGEMENT THROUGH VIRTUAL INTERNSHIPS

ABSTRACT: Purpose: The objective of this research is to statistically contrast the initial level of students' soft skills against the subsequent level after having completed a virtual internship. These online internships took place during the period of social distancing by COVID-19 pandemic. Design/methodology: The methodology consisted of a pre-experimental pretest/post-test design with a single treatment group. Findings: achievement orientation, planning and organization, stress management, decision-making, problem-solving and emotional intelligence skills increased significantly after completing the online internship. Practical Implications: the findings lend themselves useful to guide higher education institutions in updating their curricula to meet the demands of the labour market in terms of soft skills in the so-called new post-pandemic reality. Originality/value: We provide evidence that virtual internships can have positive returns in terms of soft skills training. Previous studies were limited to recommending that internships be implemented on face-to-face mode.

Sánchez-Pérez, X., Soto-Pérez, M., & López-Hernández, C. (2023). Developing soft skills for management through virtual internships. *Revista Academia & Negocios*, 9(2), 155-168. <https://doi.org/10.29393/RAN9-11DHXC3001>. Article.

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MARKETING STRATEGIES AS TOOLS TO IMPROVE EFFICIENCY IN THE REAL ESTATE SECTOR: A BIBLIOMETRIC ANALYSIS

ABSTRACT: This research aims to analyse the structures of the scientific literature on marketing strategies and the real estate industry through a bibliometric analysis. This analysis identifies topics that are out of print and urgently need to be emphasised in future research. Furthermore, this research aims to identify marketing strategies that can influence the sustainability of small and medium-sized enterprises in the real estate sector in emerging countries. The methodology consists of the first step of a search strategy in the Scopus database, where 300 articles related to marketing strat-

egies in the real estate industry were identified. A second step was conducting a bibliometric analysis of these articles. Through this methodology, it was possible to identify relevant topics such as digital marketing, virtual tours, and even driving research topics in this field, such as green marketing for houses and ecological projects. The marketing strategies implemented have most often been in developed countries and large companies, so transferring this knowledge to developing countries and small and medium-sized enterprises should be a priority.

Beltrán, L., & Soto-Pérez, M. (2025). Marketing strategies as tools to improve efficiency in the real estate sector: A bibliometric analysis. In M. Valeri, J. Y. Sánchez-García, & C. López-Hernández (Eds.), *Effective strategy implementation*. Contributions to Management Science (pp. 129-140). Springer. https://doi.org/10.1007/978-3-031-94336-2_8. Book Chapter.

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THEMATIC MAPPING OF ARTIFICIAL INTELLIGENCE IN MANAGEMENT: A BIBLIOMETRIC APPROACH USING CO-WORD ANALYSIS (2015-2024)

ABSTRACT: Objective. The objective of this study was twofold: first, to map the main themes in the literature on artificial intelligence in management, and second, to explore the relationships between these themes. Design/Methodology/Approach. A co-word analysis was performed on 15,835 articles indexed in Scopus (2015–2024), with the author's keywords in the field of administration constituting the unit of analysis. The semantic network under consideration was constructed using the 50 most frequent terms, applying normalization by association and the Walktrap algorithm for cluster detection. Results/Discussion. The results of the analysis indicated that the extant literature was organized around three thematic groups. The first of these focused on conversational interfaces, the second on digital transformation, and the third adopted a computational approach. The thematic structure identified reflected a field in the process of consolidation, with a predominance of technical approaches and limited functional specialization. Conclusion. Contemporary research endeavors prioritized methodological development over strategic implementation in particular organizational contexts. These findings underscored the necessity for more comprehensive approaches that articulated technology, management, and governance. Moreover, they called for a future agenda that was oriented toward its adoption from sociotechnical perspectives.

Salgado-García, J. A., Terán-Bustamante, A., & Velázquez-Salazar, M. (2025). Thematic mapping of artificial intelligence in management: A bibliometric approach using co-word analysis (2015–2024). *Iberoamerican Journal of Science Measurement and Communication*, 5(3), 205. <https://doi.org/10.47909/ijsmc.205>. Article.

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DIGITAL TRANSFORMATION AND INNOVATION IN ORGANIZATIONS: A LATIN AMERICAN PERSPECTIVE

ABSTRACT: This volume discusses the intersection of digital transformation and innovation in firms, sectors, and regions in Latin America. It addresses the region's labor market challenges in the advent of the digital era and the influences of AI. The chapters cover topics ranging from education, organizational culture, sustainability, ethics, and human resources. Exploring how digital and STEM literacies can serve as a tool for developing skills in organizations and emphasizing the need for human adaptability in the context of Industry 5.0, this book provides scholars with case studies to better understand the ongoing debates on labor market challenges.

Terán-Bustamante, A., & Velázquez Salazar, M. (Eds.). (2025). *Digital transformation and innovation in organizations: A Latin American perspective*. Palgrave Macmillan. <https://doi.org/10.1007/978-3-031-90794-4>. Book.

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DIGITAL FINANCIAL INCLUSION AS A CATALYST FOR INNOVATION, ECONOMIC GROWTH, AND SUSTAINABILITY: A BIBLIOMETRIC ANALYSIS (2014-2024)

ABSTRACT: Objective. This study aimed to conduct a bibliometric analysis of keywords to identify strategic topics in digital financial inclusion (DFI) and their relationship with sustainability and economic growth between 2014 and 2024. Design/Methodology/Approach. A bibliometric analysis was conducted on a sample of 1,234 academic articles indexed in Scopus using the Bibliometrix tool in R. Keyword co-occurrence was examined using multiple correspondence analysis and K-means clustering to reveal thematic

structures. Results/Discussion. A total of six thematic clusters were identified: (1) threshold effect, (2) digital transformation, (3) central bank digital currencies (CBDCs), (4) sustainable development, (5) financial and digital literacy, and (6) fintech. These clusters demonstrated the evolution of DFI from its initial role as a technological enabler, such as fintech and blockchain, to its current impact on economic development, growth, and sustainability. This analysis proposed a conceptual model of DFI. In this model, digital literacy and fintech functioned as enablers. Meanwhile, CBDCs and blockchain technology served as structural tools. Digital financial inclusion was defined as a mechanism for inclusive economic development. Conclusion. The findings contributed to an understanding of how financial digitization is linked to sustainability strategies and long-term economic growth. Originality/Value. This research provided insights based on a comprehensive bibliometric mapping of DFI, incorporating literature on economic sustainability and digital innovation. This empirical approach, which differed from narrative reviews and isolated case studies, enabled.

Salazar-Uribe, M. Y., Terán-Bustamante, A., Salgado-García, J. A., & Hernández-Lara, A. B. (2025). Digital financial inclusion as a catalyst for innovation, economic growth, and sustainability: A bibliometric analysis (2014-2024). *Iberoamerican Journal of Science Measurement and Communication*, 5(4), 218. <https://doi.org/10.47909/ijsmc.218>. Article.

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INTERSECTION OF BANKING, SOCIAL WELFARE, AND DIGITAL TRANSFORMATION: THE MEXICAN CASE, A LATIN AMERICAN PERSPECTIVE

ABSTRACT: The banking system has been instrumental in developing economies throughout history, as it has effectively directed the funds collected from their clients' savings and investments into productive activities of individuals and enterprises, financed consumer goods and current expenditures, housing and infrastructure projects, and provided market liquidity. However, in Latin America and amid digital transformation, banks face the dual challenge of modernizing operations while addressing socio-economic disparities. This study shows that fluctuations in operational measurements of top Mexican banks significantly affect changes in the widely used global measure of social welfare, the Human Development Index. We evaluated findings by using a machine learning prediction model and a panel data estimation, and underline how digital transformation in banking using emerging technologies to increase public access to financial services, especially credit loans for marginalized populations, can improve customer experience and

financial inclusion to exploit this correlation. This approach provides a framework for understanding the potential of digital technologies to drive competitive advantages and social benefits across Latin America.

Terán-Bustamante, A., Gonzalez-Rossano, C. & Rivas-Aceves, S. (2025). Intersection of banking, social welfare, and digital transformation: The Mexican case, a Latin American perspective. In A. Teran-Bustamante, & M. Velázquez Salazar (Eds.), *Digital transformation and innovation in organizations: A Latin American perspective* (pp. 251-283). Palgrave Macmillan. Springer. https://doi.org/10.1007/978-3-031-90794-4_10. Book Chapter.

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KNOWLEDGE AND INNOVATION MANAGEMENT MODEL IN THE MEZCAL INDUSTRY IN MEXICO

ABSTRACT: This research aims to study and analyze knowledge management in the mezcal sector in Mexico and its impact on the development of rural communities through Bayesian-networks with machine learning techniques. A model is made in which the critical factors that impact is identified and quantified to optimally manage the knowledge that generates value and translates into innovation and competitive advantages. The results show that the most relevant factors to adequate knowledge and innovation management are commercialization and marketing capacity, value system model, ancient knowledge, strategic business model, process management, competencies, Business structure model, Facilitators governments, universities, mezcaleros, and indigenous communities.

Terán-Bustamante, A., Leyva-Hernández, S. N., & Martínez-Velasco, A. (2025). Knowledge and innovation management model in the mezcal industry in Mexico. *Heliyon*, 11(3), e42032. <https://doi.org/10.1016/j.heliyon.2025.e42032>. Article.

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MANAGEMENT OF SCIENTIFIC AND ANCESTRAL KNOWLEDGE: A DECISION-MAKING MODEL IN MEZCAL INDUSTRY IN MEXICO

ABSTRACT: Introduction: Knowledge management is essential to ensure the sustainability of rural communities and small producers since it generates value for innovation, productivity, and competitiveness. The aim of this study is to identify relevant factors for adequate decision-making in managing knowledge in the Mexican mezcal industry and its impact on developing rural communities and small producers - mezcaleros. For this purpose, a decision-making model for managing scientific and ancestral knowledge is created to support links with universities, research centers, and rural communities to accelerate innovation and competitiveness in this sector. Methods: The analysis methods were carried out through decision-making, machine-learning techniques, and fuzzy logic. Results: The Bayesian Network model suggests that the preceding variables to optimize the Mezcaleros Knowledge Management are the Mezcaleros Indigenous community, the Denomination of Origin, Scientific and Ancestral Knowledge, Waste Management and Use, and Jima. Discussion: This knowledge management model aims to guide small producers to be more productive and competitive through the support of a facilitator.

Terán-Bustamante, A., Martínez-Velasco, A., & Leyva-Hernández, S. N. (2025). Management of scientific and ancestral knowledge: A decision-making model in mezcal industry in Mexico. *Frontiers in Artificial Intelligence*, 8, 1570617. <https://doi.org/10.3389/frai.2025.1570617>. Article.

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THE VALUE OF ASSERTIVENESS IN PATIENT CARE IN HEALTH INSTITUTIONS UNDER THE EXPERT SYSTEMS APPROACH

ABSTRACT: Assertive communication between health professionals and patients plays a crucial role in the disease–health relationship, creating trust and loyalty while promoting health. A medical expert computer system that emulates human reasoning by acting as a human expert would do so to provide clinical decision support to physicians, patients, and others involved in health care. This research aims to analyse and develop a model of assertiveness in patient care in health institutions through Bayesian networks with machine learning techniques. For this, a model is created in which the critical factors that impact optimally managing assertive communication are identified and quantified, which allows health institutions to generate value for the patient through a service experience with humane treatment. The results show that the most relevant factors in managing assertive communication in health institutions are disease information, communication, human

capital, medical team, health institution, continuity of care, patient safety, and patient rights. Furthermore, the evidence shows that the optimal or non-optimal management of assertive communication and its various processes, through the causality of the variables, allow the interrelation to be more adequately captured to manage it.

Terán-Bustamante, A., & Martínez-Velasco, A. (2025). The value of assertiveness in patient care in health institutions under the expert systems approach. In S. Castaños-Cervantes & C. Atristain-Suárez (Eds.), *Assertiveness in the health domain: The path to self-fulfilment, wellness, and professional success in emerging and developing countries* (pp. 117-147). Emerald Publishing. <https://doi.org/10.1108/978-1-83662-280-220251021>. Book Chapter.

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REGULATIONS AND LAWS AFFECTING WOMEN'S ECONOMIC OPPORTUNITIES: A WORLDWIDE APPROACH

ABSTRACT: This research aims to analyze the regulations and laws that promote economic opportunities for women at an international level, predict their impact on income levels, and estimate when legal gender equality will be achieved across different regions. The countries are compared over time, based on their income levels and regional locations, considering regulatory indicators on mobility, workplace, pay, marriage, parenthood, entrepreneurship, assets, and pensions. The methodological strategy was based on machine learning methods. The results indicate a positive trend in the average scores of all regulatory indicators, revealing significant differences across groups of countries and suggesting more egalitarian regulatory frameworks for developed countries, as well as more imbalanced and less progressive frameworks for underdeveloped and developing countries. The regulatory axes that better predict a country's income level were parenthood, analyzing laws affecting women's work after having children; assets, which consider gender differences in ownership and inheritance; and marriage, related to the legal constraints on women affected by marriage and divorce. However, the paternity axis is the last to be achieved.

Hernández-Lara, A. B., Terán-Bustamante, A., Martínez-Velasco, A., & Leyva-Hernández, S. N. (2025). Regulations and laws affecting women's economic opportunities: A worldwide approach. *Sage Open*, 15(3), 51377929. <https://doi.org/10.1177/21582440251377929>. Article.

Héctor Xavier Ramírez Pérez
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María Lorena de la Torre Díaz
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SOCIAL MOBILITY THROUGH TECHNOLOGICAL ASSETS: A REGIONAL MICROSIMULATION MODEL

ABSTRACT: Access to technology is a significant factor in facilitating upward social mobility by reducing disparities in access to information and fostering educational and employment opportunities. This study develops a microsimulation model for a region in Mexico to estimate the probabilities of households achieving social mobility through a two-year renewable microcredit scheme for acquiring a computer with internet access over a 14-year period. The data utilised include the National Income and Expenses Survey and a regional social mobility survey. The methodology incorporates principal component analysis to construct an Asset Index, ordered logistic regression for asset selection, a Markov Chain for transition probability estimation, and Monte Carlo simulation. The findings reveal that 13.75% of households could progress to a higher wealth quintile while sustaining their ability to repay the microcredit. The study advocates for targeting public programmes aimed at social mobility towards specific sectors rather than implementing universal initiatives. Additionally, it recommends enhancing credit conditions through public-private partnerships to mitigate inequality.

DelaTorre-Díaz, L., & Ramírez Pérez, H. X. (2024). Social mobility through technological assets: A regional microsimulation model. *International Journal of Economics and Finance Studies*, 16(3), 139-165. <https://doi.org/10.34109/ijefs.202416307>. Article.

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INTERNATIONALIZATION AND TRUST FROM THE PERSPECTIVE OF MEXICAN ENTREPRENEURS: POLICY IMPLICATIONS FOR SMALL- AND MEDIUM-SIZED ENTERPRISES IN DEVELOPING COUNTRIES

ABSTRACT: This article examines the associations between trust—institutional and personal—and entrepreneurial internationalization by surveying to collect data from entrepreneurs (owners or chief executive officers). The survey involved a representative sample of 103 respondents who are members of the Employers Confederation of the Mexican Republic (Coparmex), Jalisco delegation. The survey process facilitated a comprehensive diagnosis, identifying trust levels among domestic and internationalized entre-

preneurs. Based on *t*-tests for mean comparisons, correlation, and regression analyses, the trust levels reported by entrepreneurs do not differentiate between those with exported sales and those with only local businesses. It suggests, all else being equal, that the trust of foreign partners should explain the possibilities for the internationalization of Mexican entrepreneurs. These findings have policy implications to support international networking and transparency by providing training in global business practices based on building trust with foreign partners and strengthening diplomatic relations and access to market information.

Tovar-García, E. D., & De Anda, F. (2025). Internationalization and trust from the perspective of Mexican entrepreneurs: Policy implications for small- and medium-sized enterprises in developing countries. *Latin American Policy*, 16(2), e70013. <https://doi.org/10.1111/lamp.70013>. Article.

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FACTORS CONTRIBUTING TO THE RELATIVELY LOW GENDER GAP IN ENTREPRENEURSHIP IN RUSSIA

ABSTRACT: Entrepreneurship is notably characterized by gender disparities, adversely impacting aggregate income and productivity. Accordingly, this study investigates the determinants of gender gaps in entrepreneurship in Russia, where the entrepreneurship gender gap, which is defined as the difference in entrepreneurial participation rates between men and women, is approximately 2%. Since the 2000s, this gap has remained relatively stable and is notably smaller than in many developed and developing countries. As such, the article highlights Russia's relatively strong performance in fostering inclusive entrepreneurship using data from the Russian Longitudinal Monitoring Survey, encompassing 197,699 observations from 33,889 individuals (55% women) between 2000 and 2019. Based on panel data regression models and incorporating a comprehensive set of independent variables, including age, education, health status, marital status, number of children, religious participation, physical exercise, trust, migration background, ethnicity, and residence in Moscow and Saint Petersburg. The findings reveal that participation in physical exercise and religious events significantly predicts entrepreneurial activity by gender, offering insights for reducing gender disparities in entrepreneurship. In contrast, traditional variables such as education, marital status, and number of children exhibit negligible effects. These results remain robust across different measures of entrepreneurship and hold when differentiating between necessity-driven and opportunity-driven entrepreneurship. Therefore, the findings suggest that Russia's experience in narrowing gender gaps in entrepreneurship may serve as a model for other countries.

Tovar-García, E. (2025). Factors contributing to the relatively low gender gap in entrepreneurship in Russia. *Changing Societies & Personalities*, 9(1), 218-241. <https://doi.org/10.15826/csp.2025.9.1.325>. Article.

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MARKET DISCIPLINE IN THE CENTRAL AMERICAN BANKING SYSTEM; DISCIPLINA DE MERCADO EN EL SISTEMA BANCARIO CENTROAMERICANO

ABSTRACT: The hypothesis of market discipline is empirically verified in the Central American banking system. A contrast is carried out on whether the riskier banks (the ones with the worst banking fundamentals) pay higher interest rates and receive smaller amounts in deposits. The generalized method of moments is used for dynamic panel data models (the SYS GMM estimator), as well as a sample of 30 banks from six Central American countries during the 2008–2012 period. Unlike the majority of the previous empirical literature, specifically for developed countries, no evidence of market discipline was found in Central America. The results are robust for several indicators of the banking fundamentals for purposes of internal demand of bank capital, and for other econometric models. These findings indicate weaknesses in the bank policy regarding the disclosure of information.

Tovar-García, E. D. (2017). Market discipline in the Central American banking system. *Contaduría y Administración*, 62(5), 1610-1626. <https://doi.org/10.1016/j.cya.2017.07.002>. Article.

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A LATIN AMERICAN PERSPECTIVE OF DIGITAL TRANSFORMATION AND INNOVATION IN ORGANIZATIONS: AN INTRODUCTION

ABSTRACT: Digital transformation is a key component of an organization's transformation strategy. The right technologies, people, processes, and operations allow organizations to respond faster to a changing market, adapt, take advantage of opportunities, innovate, and generate value and competitive advantages. This paper discusses the Digital Transformation (DT) in Latin America, highlighting its accelerated growth due to the COVID-19 pandemic. It explores the digital divide and inequalities between sectors, with some industries advancing faster than others. The document

emphasizes the need for human-centric approaches to DT and the importance of public policies to ensure equitable access and protection. It also examines different authors' definitions and perspectives on DT, emphasizing the importance of data-driven processes and the role of digital capabilities in organizational success.

Teran-Bustamante, A., & Velázquez Salazar, M. (2025). A Latin American perspective of digital transformation and innovation in organizations: An introduction. In A. Teran-Bustamante, & M. Velázquez Salazar, (Eds.), *Digital transformation and innovation in organizations: A Latin American perspective* (pp. 1-17). Palgrave Macmillan. https://doi.org/10.1007/978-3-031-90794-4_1. Book Chapter.

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ASSERTIVENESS IN COFFEE AGRI-FOOD CHAIN BUSINESS

ABSTRACT: This document is a chapter that discusses the negotiation problem in product commercialisation by small-scale producers in the Mexican agri-food sector, specifically in the coffee industry. The chapter emphasises the importance of developing soft skills, particularly assertiveness, in the different actors of the productive chain for price negotiation and product commercialisation. The article discusses the concepts of agroecology and assertiveness in agri-food value chains and the methodology used to measure the relationship between assertiveness and overpricing of agri-food goods using a logistic model. The study found that assertiveness in management and other skills and knowledge can lead to higher coffee prices and improve producers' quality of life. The article also discusses the coffee industry's evolution in terms of economic units, added value, governance, institutional framework and policy initiatives to support the sector. The study's results could have implications for other agri-food products in Mexico, such as Creole corn, mezcal, tequila and cocoa.

Velázquez-Salazar, M., Atristain-Suárez, C., Vega Vera, N. V., & Castañeda Martínez, A. E. (2025). Assertiveness in coffee agri-food chain business. In C. Atristain-Suárez & S. Castaños-Cervantes, *Assertiveness in the workplace: Personal and business competitiveness in emerging and developing countries* (pp. 165-187). Emerald Publishing. <https://doi.org/10.1108/978-1-83662-214-720251024>. Book Chapter.

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CULTURAL PRESERVATION AND ECONOMIC INCLUSION IN SMALL-SCALE FOOD PRODUCTION: THE CASE OF LATINO FARMS IN OHIO

ABSTRACT: Small-scale food production is declining worldwide, primarily due to the corporatization of food systems. The lack of economic inclusion, the difficulty in preserving culture, and low social integration are some of the primary barriers this economic activity faces. Based on grounded theory and through in-depth interviews with small-scale farmers and other community stakeholders, these components are analyzed in case studies of immigrant Latin American-owned farms and markets in Ohio, USA. This study analyzes SFSC in Ohio Farms as alternatives to preserve food culture as heritage and combat social inequities. The primary findings show that family traditions and cropping methods are closely related and both are important factors for farmers to preserve their cultural heritage. The common typology of SFSC in the analyzed cases is the farmers' market type. By prioritizing cultural preservation, farmers sacrifice the use of technology, crop fashionable or market-demand food, and therefore forego potential economic benefits. This prioritization creates restrictions to economic inclusion that escalate when coupled with the lack of institutional support.

Rivas-Aceves, S., Schmidt, S., & Velázquez-Salazar, M. (2025). Cultural preservation and economic inclusion in small-scale food production: The case of Latino Farms in Ohio. *Agricultural and Food Economics*, 13(1), 80. <https://doi.org/10.1186/s40100-025-00428-9>. Article.

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DYNAMIC BALANCING OF A SLIDER-CRANK MECHANISM USING EQUIMOMENTAL SYSTEM OF POINT MASSES

ABSTRACT: In this paper, a new procedure for the dynamic balancing of a slider-crank mechanism is presented. First, the inertial properties are represented by equimomental systems of point masses. Then, the acceleration analysis is performed using natural coordinates, which allows us to obtain directly the acceleration of the point masses. The dynamic is solved using the screw theory through Davies' method. Finally, the shaking screw is proposed, with which the objective function is formulated. The proposed procedure is implemented in Matlab®, and the results show a satisfactory dynamic balancing.

Romero N., N. N., Moreno Contreras, G., Acevedo Alvarado, M., & Martins, D. (2026). Dynamic balancing of a slider-crank mechanism using equimomental system of point masses. In M. Acevedo, L. Valdivia, & H. Ponce (Eds.), *Multibody mechatronic systems. MuSMe 2025. Mechanisms and machine science, (Mechan. Machine Science)* (Vol. 195, pp. 93-100). Springer. https://doi.org/10.1007/978-3-032-10862-3_9. Conference Paper.

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KINEMATIC ANALYSIS AND EXPERIMENTAL VALIDATION OF A TRIPOD PARALLEL CONTINUUM MANIPULATOR

ABSTRACT: A tripod is a classical lower mobility parallel manipulator with three degrees of freedom. The usual geometrical constraints enforce a type of motion with two rotations on a horizontal plane and a translational motion in a vertical direction. These devices are applicable where a task requires a precise orientational motion. Nevertheless, some parasitic motions occur on the constrained degrees of freedom. Parallel Continuum Manipulators are devices where some elements have been replaced by slender rods whose deformation is source of mobility, allowing the elimination of some of the kinematic joints. This type of closed-loop compliant mechanisms have some features that can be useful in certain applications, e.g., the deformed state introduces a certain preload that avoids backlash, they have an inherent compliance that can be useful in

some delicate tasks, and a certain control on wrench applied can be obtained. In this article, the comprehensive kinetostatic analysis of a tripod-type parallel continuum manipulator, *3PFS*, is explained and compared with that of its rigid counterpart *3PRS*. Workspace and singularity locus is obtained, positioning accuracy and wrench generation are evaluated experimentally.

Altuzarra, O., Petuya, V., Acevedo, M., Vizcaino, M., & Rodríguez, S. (2025). Kinematic analysis and experimental validation of a tripod parallel continuum manipulator. *Mechanics Based Design of Structures and Machines*, 53(3), 2215-2238. <https://doi.org/10.1080/15397734.2024.2404609>. Article.

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EFFECT OF 3D PRINTING BY FUSED DEPOSITION MODELLING ON THE MICROSTRUCTURAL AND MACROSTRUCTURAL PROPERTIES OF ACRYLONITRILE BUTADIENE STYRENE, POLYLACTIC ACID AND POLYAMIDE 12

ABSTRACT: The objective of this research was to find a relationship between the microstructural and macrostructural properties of polylactic acid, acrylonitrile butadiene styrene and polyamide 12 (PA12) when processed using fused deposition modelling. The crystallinity, enthalpy of crystallization (ΔH_c), glass transition temperature (T_g) and Young's modulus (E) were evaluated. The results showed that crystallinity increased for all materials after the 3D printing process, leading to an increase in ΔH_c and a decrease in T_g , particularly in PA12. This variation in microstructural properties resulted in a significant decrease in Young's modulus, indicating a reduction in the stiffness of the printed materials. The research suggests that an increase in crystalline material volume, resulting from polymer chain rearrangement during 3D printing, reduces the energy required for thermal softening and decreases the material's rigidity.

Acevedo-Parra, H. R., Tapia, F., Guerrero de León, J. A., Díaz A., J. H., & Rodríguez-Reyna, S. L. (2025). Effect of 3D printing by fused deposition modelling on the microstructural and macrostructural properties of acrylonitrile butadiene styrene, polylactic acid and polyamide 12. *Plastics, Rubber and Composites*, 54(8-10), 335-343. <https://doi.org/10.1177/14658011251377196>. Article.

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REAL-TIME EMOTION RECOGNITION IN INTELLIGENT TUTORING SYSTEMS

ABSTRACT: This study investigates the integration of facial emotion recognition (FER) into Intelligent Tutoring Systems (ITS), with the aim of identifying the emotions that emerge throughout the learning process. Building on prior research, we argue that understanding students' emotional states enables the delivery of more adaptive and effective feedback, thereby improving learning outcomes. A Deep Convolutional Neural Network (DCNN) was trained on the FER2013+ dataset, achieving a top-3 accuracy of 95.24% in classifying facial expressions across eight emotion categories. The model was integrated with MediaPipe to enable real-time emotion detection from video streams using a standard laptop camera, facilitating practical deployment in educational settings. Thirteen high school and early university students interacted with OATutor—an open-source ITS—while their facial expressions and on-screen activities were recorded. Emotional data from each frame was synchronized with an academic event log documenting actions such as starting a lesson, requesting help, or submitting answers. Results show that “surprise” was the most frequently observed emotion (over 85% of instances), whereas “anger,” “sadness,” and “contempt” appeared only in specific learning scenarios, particularly when students faced cognitive challenges or achieved multiple correct responses. Despite the absence of affective feedback from the system, students' emotions fluctuated dynamically, suggesting active self-regulation processes. These findings demonstrate the feasibility of FER-enhanced ITS in real-world educational environments and underscore the need for future work integrating multimodal data and personalization strategies to optimize affective responsiveness in intelligent learning contexts.

Alcauter, I., & Martínez-Villaseñor, L. (2026). Real-time emotion recognition in intelligent tutoring systems. In L. Martínez-Villaseñor, R. A. Vázquez, & G. Ochoa-Ruiz (Eds.), *Advances in soft computing. MICAI 2025. Lecture Notes in Computer Science (LNCS)* (Vol. 16222, pp. 363-378). Springer. https://doi.org/10.1007/978-3-032-09044-7_26. Conference Paper.

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Senior Researcher D, SNII Level III

DATA-DRIVEN MODELING OF PROTON- EXCHANGE MEMBRANE FUEL CELL STACKS

ABSTRACT: This article introduces a data-driven modeling approach for Proton-Exchange Membrane Fuel Cell (PEMFC) stacks. The proposed data-driven methodology leverages real-time operational data to refine a dynamic model of the fuel cell, capturing its performance under varying operating conditions. By using actual signal values obtained from the fuel cell, the proposed model can accurately replicate the dynamic behavior of the PEMFC stack, offering improved predictive capabilities over traditional modeling techniques. This refined model is validated against experimental data, demonstrating its efficacy in predicting the fuel cell's response to changes in operation. The proposed data-driven approach provides a robust framework for enhancing the design, control, and optimization of fuel cell systems, contributing to the advancement of sustainable energy technologies.

Silva-Vera, E., Valdez-Resendiz, J. E., Alejo-Reyes, A., Rumbo-Morales, J. Y., Rosas-Caro, J. C., & Sanchez, V. M. (2025). Data-driven modeling of proton-exchange membrane fuel cell stacks. *International Journal of Hydrogen Energy*, 141, 1050-1060. <https://doi.org/10.1016/j.ijhydene.2025.01.157>. Article.

Claudia Yohana Arias Portela

Research Professor

David Ernesto Salinas Navarro

Research Professor

SITUATIONAL AWARENESS ERRORS IN FORKLIFT LOGISTICS OPERATIONS: A MULTIPHASE EYE- TRACKING AND THINK-ALOUD APPROACH

ABSTRACT: Background: This study explores forklift operators' situational awareness (SA) and human errors in logistic operations using a multiphase approach as an innovative methodology. Methods: Ethnography, eye tracking, error taxonomy, and retrospective think-aloud (RTA) were used to study the diverse cognitive, behavioral, and operational aspects affecting SA. After analyzing 566 events across 18 tasks, this research highlighted eye tracking's potential by offering real-time insights into operator behavior and RTA's potential as a method for cross-checking the causal factors underlying errors. Results: Critical tasks, like positioning forklifts and lowering pallets, significantly impact incident occurrence, while high-cognitive demand tasks, such as hoisting and identifying

pedestrians/obstacles, reduce SA and increase errors. Driving tasks are particularly vulnerable to errors and are the most affected by operator risk generators (ORGs), representing 42% of incident risk events. This study identifies driving, hoisting, and lowering loads as the tasks most influenced by system factors. Limitations include the task difficulty levels, managing physical risk, and training. Future research is suggested in autonomous industrial vehicles and advanced driver assistance systems (ADASs). Conclusions: This study provides valuable insights into how we may improve safety in logistics operations by proposing a multiphase methodology to uncover the patterns of attention, perception, and cognitive errors and their impact on decision-making.

Arias-Portela, C. Y., Mora-Vargas, J., Caro, M., & Salinas-Navarro, D. E. (2024). Situational awareness errors in forklift logistics operations: A multiphase eye-tracking and think-aloud approach. *Logistics*, 8(4), 124. <https://doi.org/10.3390/logistics8040124>. Article.

Gerardo Bárcena Ruiz
Research Professor

TEXTUAL EMOTION DETECTION WITH COMPLEMENTARY BERT TRANSFORMERS IN A CONDORCET'S JURY THEOREM ASSEMBLY

ABSTRACT: This paper explores a novel approach to textual emotion detection (TED) in Spanish and English, leveraging an ensemble of partially trained BERT transformers within a Condorcet's Jury Theorem (CJT) framework. Recognizing the challenges of limited training data and the complexities of emotion classification, this research investigates whether a combination of BERT models in the CJT ensemble can enhance performance even when individual models have incomplete training. The study evaluates different BERT modalities (BERT, RoBERTa, DistilBERT) and datasets, including SemEval-2018, XED, and Dair-ai/emotion. The main contribution is the development of a CJT ensemble, specifically the Jury Dynamic (JD), a key contribution of this research. This algorithm is designed for deployment in unsupervised production environments, eliminating the need for labeled data or continuous human supervision, leveraging Reinforcement Learning (RL). The Jury Dynamic (JD) adapts to incoming data, making it suitable for real-time applications. Experiments involve retraining BERT models with varying levels of emotional data reduction to simulate incomplete training. Results demonstrate that the CJT ensemble, particularly the JD, can effectively mitigate the negative impacts of limited training data, achieving comparable performance to fully trained models and outperforming individual models. The study highlights the importance of high-quality datasets for TED, particularly in Spanish, and proposes future research directions, including the evaluation of various classifiers and ensemble configurations.

Bárcena Ruiz, G., & Gil Herrera, R. J. (2025). Textual emotion detection with complementary BERT transformers in a Condorcet's Jury theorem assembly. *Knowledge-Based Systems*, 326, 114070. <https://doi.org/10.1016/j.knsys.2025.114070>. Article.

Ari Yair Barrera Animas
SNII Level I

BENCHMARK OF WRIST-WEARABLE DEVICES FOR STUDENT STRESS MONITORING

ABSTRACT: This study presents a comparative analysis of various activity wristbands to evaluate their suitability as a tool for collecting human activity among university students. The research examines key factors such as battery life, data extraction methods, file formats, integrated sensors, and developer support. The results reveal significant differences in device capabilities, with the Garmin Venu 3 offering the most comprehensive sensor suite but at a high cost, while the Fitbit Inspire 3 provides a cost-effective alternative with essential monitoring features. The study highlights the importance of compatibility with data processing tools and the ability to extract information efficiently for research applications. These insights contribute to the selection of suitable wearable devices for academic studies.

Mena-Martinez, A., Alvarado-Urbe, J., Garcia-Ceja, E., Barrera-Animas, A. Y., & Escamilla-Ambrosio, P. J. (2025). Benchmark of wrist-wearable devices for student stress monitoring. In L. Martínez-Villaseñor, B. Martínez-Seis, & O. Pichardo (Eds.), *Artificial intelligence. COMIA 2025. Communications in Computer and Information Science (CCIS)* (Vol. 2252, pp. 255-268). Springer. https://doi.org/10.1007/978-3-031-97913-2_21. Conference Paper.

Pia Berger
SNII Candidate Level

Isaí Gerardo Reyes Cedeño
Senior Researcher A

Hugo Luna Villavicencio
Research Professor

IDENTIFICATION OF POTENTIAL AREAS FOR REFORESTATION APPLYING THE ANALYTIC HIERARCHY PROCESS (AHP), CASE STUDY FROM THE VALLEY OF AGUASCALIENTES, MEXICO

ABSTRACT: To promote urban sustainability and resilience amid environmental degradation, it is crucial to preserve and expand

urban and peri-urban forests. These green infrastructures play a key role in mitigating climate impacts, enhancing biodiversity, and improving environmental quality. This study aims to identify and prioritize suitable areas for reforestation in the Aguascalientes Valley, Mexico, using a multicriteria decision-making approach that integrates environmental and spatial variables within a GIS-based framework. The objective is to support strategic ecological restoration through a replicable, data-driven methodology. Focusing on the semi-arid metropolitan region of the Aguascalientes Valley—characterized by urban expansion and increasing pressure on natural resources—the study applies the Analytic Hierarchy Process (AHP) within a spatially explicit framework. Five geospatial variables were selected for their relevance to reforestation: land use, precipitation, natural drainage network, topography, and geological faults. Each variable was hierarchically weighted using AHP based on its relative influence on reforestation success. GIS tools were employed to integrate these variables into a composite suitability map through raster-based analysis. Results show that areas with the highest potential for reforestation are primarily in the north-eastern, southeastern, and northwestern parts of the valley, where vegetation is sparse, urban development is limited, and favorable hydrological and topographical conditions exist. These zones also align with regional conservation and development plans. By combining geospatial analysis with structured decision-making, this study provides a valuable model for informed land use planning. The resulting maps and methodology offer strategic tools for policymakers to guide ecological restoration and promote sustainable resource management.

Reyes-Cedeño, I. G., Berger, P., Sánchez, C. N., Coronado, A., Mahichi, F., & Luna-Villavicencio, H. (2025). Identification of potential areas for reforestation applying the analytic hierarchy process (AHP), case study from the valley of Aguascalientes, Mexico. *Journal of Maps*, 21(1), 2529551. <https://doi.org/10.1080/17445647.2025.2529551>. Article.

Pia Berger

SNII Candidate Level

INCLUDING BIOCHAR'S SOIL EFFECTS IN LIFECYCLE ASSESSMENT: APPLICATION TO A PRACTICE-ORIENTED CASE STUDY IN AGUASCALIENTES, MEXICO

ABSTRACT: Purpose: Life cycle assessment (LCA) studies have overlooked the potential range of biochar's effects on agricultural soils. Only several of the numerous soil effects reported in empirical studies have been included in LCA models. This study aims to establish a consistent lifecycle inventory (LCI) approach to include biochar's soil effects in LCA and assess the conceptual applicability of LCA to model soil effects. Methods: To exemplify this approach,

a case study was conducted, which also provides insight into the environmental implications of biochar's soil effects and whether LCA results can help guide biochar optimization for greater environmental benefits. For soil effects that met all inclusion criteria, empirical data was selected based on controlling factors and translated into inventory data. The LCI approach was applied to a case study in Aguascalientes, a semi-arid state in central Mexico that suffers from droughts. Results: The combined soil effects have a substantial overall impact across all impact categories, mostly dwarfing upstream biochar production and treatment impacts. This is driven by the persistent soil effects; the transient soil effects contribute far less. Biochar primarily leads to a net environmental benefit in an impact category, strongly depending on the soil effect literature data that is selected. While some soil effects have been researched sufficiently to produce sensible meta-analyses (e.g. crop yield increase), others have only been quantified a handful of times or solely qualitatively assessed (e.g. fire hazard increase). Most soil effects have a non-intermediate impact and can be modelled as intervention or economic flow in some form, with some missing appropriate characterization models. Biochar's soil effects have a substantial environmental effect and cannot be ignored. A highly accurate inclusion of soil effects in LCA is hindered by several conceptual (non-linearity of soil effect expression, missing characterization models, focus on environmental impact) but mostly data-related (availability of long-term empirical field data) constraints. Conclusion: Although the results varied across scenarios due to differences in model assumptions and uncertainties, they provided in order of magnitude trends that still allowed for informed conclusions on how to tailor biochar in Aguascalientes to maximize environmental benefits while minimizing associated risks (e.g. increasing pyrolysis temperature to reduce PAH content).

Van de Lande, S., Berger, P., & Korevaar, G. (2025). Including biochar's soil effects in lifecycle assessment: Application to a practice-oriented case study in Aguascalientes, Mexico. *The International Journal of Life Cycle Assessment*, 30(9), 1965-1986. <https://doi.org/10.1007/s11367-025-02517-9>. Article.

Pia Berger

SNII Candidate Level

Linda Carolina Hernández Lozano

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Crisdolith Cachutt Alvarado

Senior Researcher A

Julieta Domínguez Soberanes

Senior Researcher A, SNII Level I

SUSTAINABLE SOLUTIONS: BIODEGRADABLE POLYMERS DERIVED FROM MANGO RESIDUES

ABSTRACT: The increasing reliance on plastic materials in modern life has led to significant environmental challenges due to plastic waste accumulation in various ecosystems. This study explores the potential of utilizing mango waste, specifically mango peel and seed, as sustainable sources for bioplastic production within the framework of circular economy principles. Two formulations were developed: one using mango peel powder (<100µm) and the other using mango seed powder (<250µm). A systematic methodology was employed, encompassing empirical and experimental phases, to evaluate the thermal, mechanical and biochemical properties of the resulting bioplastics. Quantitative analyses revealed significant differences in water solubility between the formulations, with the mango peel-based bioplastic exhibiting higher solubility (50%) compared to the mango seed-based formulation (30.22%). No significant differences were observed in thickness or color, indicating consistent physical characteristics across samples. Biodegradability assessments demonstrated that both formulations began to degrade within 15 days, ultimately transforming into powder by day 45, highlighting their potential for environmental integration. This research underscores the viability of mango waste as a resource for developing biodegradable polymers, contributing to circular economy strategies and addressing plastic pollution.

Hernández-Lozano, L. C., Berger, P., Cachutt-Alvarado, C., & Domínguez-Soberanes, J. (2025). Sustainable solutions: Biodegradable polymers derived from mango residues. *Polymer*, 319, 127980. <https://doi.org/10.1016/j.polymer.2024.127980>. Article.

Jorge Eduardo Brieva Rico
Senior Researcher D, SNII Level I

NEURAL ARCHITECTURE SEARCH USING TRAJECTORY METAHEURISTICS TO CLASSIFY CORONARY STENOSIS

ABSTRACT: Coronary stenosis is a disease that claims millions of lives each year. Early detection of this condition is crucial for patient survival. Currently, physicians perform detection by x-ray angiograms, however, the variability of diagnoses and the difficulty of access to expertise has led to the need for automated, computer-assisted diagnosis. In this work explores the use of deep learning to classify stenosis or non-stenosis in angiogram images using convolutional neural networks from scratch. A methodology to fine-tuning network architectures automatically using metaheuristic optimization techniques is proposed, demonstrating superior performance to fine-tuning empirically and proposing a new architecture in the literature to classify coronary stenosis. The proposed architectures achieved 86.02% and 95.67% F1-score with simulated annealing and iterated local search techniques, respectively.

Franco-Gaona, E., Avila-Garcia, M.-S., Cruz-Aceves, I., Orocio-Garcia, H.-E., Escobedo-Gordillo, A., & Brieva, J. (2024). Neural architecture search using trajectory metaheuristics to classify coronary stenosis. In *Proceedings of the 20th International Symposium on Medical Information Processing and Analysis, SIPAIM 2024* (pp. 1-4). IEEE. <https://doi.org/10.1109/SIPAIM62974.2024.10783513>. Conference Paper.

Jorge Eduardo Brieva Rico
Senior Researcher D, SNII Level I

Ernesto Moya Albor
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NON-CONTACT OXYGEN SATURATION ESTIMATION USING DEEP LEARNING ENSEMBLE MODELS AND BAYESIAN OPTIMIZATION

ABSTRACT: Monitoring Peripheral Oxygen Saturation (SpO₂) is an important vital sign both in Intensive Care Units (ICUs), during surgery and convalescence, and as part of remote medical consultations after of the COVID-19 pandemic. This has made the development of new SpO₂-measurement tools an area of active research and opportunity. In this paper, we present a new Deep Learning (DL) combined strategy to estimate SpO₂ without contact, using pre-magnified facial videos to reveal subtle color changes related to blood flow and with no calibration per subject required. We applied the Eulerian Video Magnification technique using the Hermite Transform (EVM-HT) as a feature detector to feed a Three-Dimensional Convolutional Neural Network (3D-CNN). Additionally, parameters and hyperparameter Bayesian optimization and an ensemble technique over the dataset magnified were applied. We tested the method on 18 healthy subjects, where facial videos of the subjects, including the automatic detection of the reference from a contact pulse oximeter device, were acquired. As performance metrics for the SpO₂-estimation proposal, we calculated the Mean Absolute Error (MAE), Root Mean Squared Error (RMSE), and other parameters from the Bland-Altman (BA) analysis with respect to the reference. Therefore, a significant improvement was observed by adding the ensemble technique with respect to the only optimization, obtaining 14.32% in RMSE (reduction from 0.6204 to 0.5315) and 13.23% in MAE (reduction from 0.4323 to 0.3751). On the other hand, regarding Bland-Altman analysis, the upper and lower limits of agreement for the Mean of Differences (MOD) between the estimation and the ground truth were 1.04 and -1.05, with an MOD (bias) of -0.00175; therefore, MOD ± 1.96σ = -0.00175 ± 1.04. Thus, by leveraging Bayesian optimization for hyperparameter tuning and integrating a Bagging Ensemble, we achieved a significant reduction in the training error (bias), achieving a better generalization over the test set, and reducing the variance in comparison with the baseline model for SpO₂ estimation.

Escobedo-Gordillo, A., Brieva, J., & Moya-Albor, E. (2025). Non-contact oxygen saturation estimation using deep learning ensemble models and Bayesian optimization. *Technologies*, 13(7), 309. <https://doi.org/10.3390/technologies13070309>. Article.

Jorge Eduardo Brieva Rico
Senior Researcher D, SNII Level I

Ernesto Moya Albor
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NON-CONTACT RESPIRATORY RATE ESTIMATION IN NEWBORNS DURING QUIET SLEEP USING VIDEO MAGNIFICATION TECHNIQUES AND A 3D CONVOLUTIONAL NEURAL NETWORK

ABSTRACT: In this paper, we present a new non-contact strategy to estimate the respiratory rate (RR) in a neonatal intensive care unit (NICU) based on the Eulerian motion video magnification technique and a 3D Convolutional Neural Network (3D CNN). The magnification procedure was carried out using the Hermite decomposition. The RR is estimated using a 3D CNN and a region of interest (ROI) detected manually. We have tested the method on 8 infants in NICU during quiet sleep. A contact respiratory signal is acquired synchronously to the videos to compute the RR as reference for training the CNN. To compare the performance of the method, we compute the Mean Absolute Error, the Root Mean Squared Error and metrics from the Bland and Altman analysis to investigate the agreement of the method with respect to the respiratory signal reference. The proposed solution shows an agreement with respect to the reference of 95% and root mean squared error of 2.88.

Escobedo-Gordillo, A., Rivas-Scott, O. Y., Brieva, J., Moya-Albor, E., Carbon, S., & Pladys, P. (2024). Non-contact respiratory rate estimation in newborns during quiet sleep using video magnification techniques and a 3D convolutional neural network. In *Proceedings of the 20th International Symposium on Medical Information Processing and Analysis, SIPAIM 2024* (pp. 1-5). IEEE. <https://doi.org/10.1109/SIPAIM62974.2024.10783554>. Conference Paper.

Jorge Eduardo Brieva Rico
Senior Researcher D, SNII Level I

Ernesto Moya Albor
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Hiram Eredín Ponce Espinosa
Senior Researcher D, SNII Level I

OPTIMAL DATASET SIZE FOR FINE-TUNING SEMG-BASED HAND GESTURE RECOGNITION IN REHABILITATION PROSTHESIS

ABSTRACT: Surface electromyography (sEMG) has become a vital tool for controlling prostheses and rehabilitation using hand gesture recognition. However, the process of fine-tuning machine learning models to individual users often requires considerable amounts of data, which can be challenging to obtain due to user fatigue and discomfort. This work investigates the optimal dataset size needed for fine-tuning a pretrained Convolutional Neural Network (CNN) model for hand gesture recognition, using the NinaPro DB2 dataset. Our results show that training on just a third of the dataset achieves over 90% accuracy, highlighting a significant reduction in the data requirements compared to traditional methods. This approach can minimize the burden of data collection on users, making sEMG-based rehabilitation devices more practical and accessible.

Escobedo-Gordillo, A., Brieva, J., Moya-Albor, E., Ponce, H., Franco-Gaona, E., & Cruz-Aceves, I. (2024). Optimal dataset size for fine-tuning sEMG-based hand gesture recognition in rehabilitation prosthesis. In *Proceedings of the 20th International Symposium on Medical Information Processing and Analysis, SIPAIM 2024* (pp. 1-5). IEEE. <https://doi.org/10.1109/SIPAIM62974.2024.10783516>. Conference Paper.

Jorge Eduardo Brieva Rico
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Ernesto Moya Albor
Senior Researcher D, SNII Level I

Hiram Eredín Ponce Espinosa
Senior Researcher D, SNII Level I

ORTHOSIS CONTROL BASED ON ELECTROMYOGRAPHIC SIGNALS AND MACHINE LEARNING

ABSTRACT: The human hand is indispensable for daily activities, and those who suffer from dysfunction due to strokes or accidents often require therapy to improve their condition. This study has developed a hand orthosis that uses surface Electromyographic

(sEMG) signals and machine learning to address therapeutic needs and improve the quality of life for individuals with reduced motor skills in their hands and/or wrists. While current orthoses meet therapy requirements, they do not incorporate machine learning (ML) or sEMG sensors to optimize performance and accessibility. This chapter describes a remote-controlled, electro-mechanical orthosis that can replicate six basic movements of the human hand using three sEMG channels and ML. Our dataset of 14,400 samples, each labeled with a hand gesture, was generated by eight participants. The orthosis is comfortable and customizable for different users, as shown in prototype testing. The convolutional neural network (CNN) used achieves an accuracy of 90.38% with an inference time of 1.515 ms. Therefore, this orthosis system has significant potential for further development and practical application in patients who require such intervention.

Escobedo-Gordillo, A., Díaz, F., Villa, J., Sepúlveda, M., García-Casas, S., Villanueva, X., Brieva, J., Moya-Albor, E., & Ponce, H. (2026). Orthosis control based on electromyographic signals and machine learning. In E. Moya-Albor, H. Ponce, J. Brieva, S. L. Gomez-Coronel, & D. R. Torres (Eds.), *Machine learning methods in biomedical field. Studies in Computational Intelligence (SCI)* (Vol. 1218, pp. 241-255). Springer. https://doi.org/10.1007/978-3-031-96328-5_10. Book Chapter.

Daniel Adrián Contreras Olivas
Research Professor

REINFORCEMENT LEARNING IN URBANISM: BUILDING THE CITIES OF THE FUTURE WITH AI

ABSTRACT: Reinforcement Learning (RL) is a type of machine learning technique in which an intelligent autonomous agent makes observations in an environment. The agent receives rewards or punishments, in order to maximize cumulative rewards through trial and error. RL has made significant achievements in the fields of robotics, economics, finance, and autonomous cars. In the context of urbanism, growing populations have complicated the task of urban planning, increasing the need to optimize cities for livability. An approach to achieving this is through the n-minute city model, which ensures that all essential services and facilities are located within a short distance of every residence. The purpose of this investigation was to build an agent capable of designing a city that maximized livability by optimizing the interactions between buildings and urban infrastructure. The RL framework was used because it provides tools for programming an agent to design the city without explicitly defining its layout. Using this approach raises questions about whether RL is the best method, which hyperparameters are optimal, the trade-off between exploration and exploitation, and the comparison between Q-learning and Deep Q-learning. This paper outlines how this methodology can be applied and the advantages of this approach in urban planning.

Murillo, A. C., Anaya, A. V., Hambleton, B. G., Contreras, D. A., Durán, H. Á. P., Rivas, O. C. F., & Hernández, R. N. (2025). Reinforcement learning in urbanism: Building the cities of the future with AI. In L. Martínez-Villaseñor, B. Martínez-Seis, & O. Pichardo (Eds.), *Artificial intelligence. COMIA 2025. Communications in Computer and Information Science (CCIS)* (Vol. 2253, pp. 280-293). Springer. https://doi.org/10.1007/978-3-031-97910-1_22. Conference Paper.

Daniel Adrián Contreras Olivas
Research Professor

OPTIMIZING URBAN LAYOUTS USING REINFORCEMENT LEARNING (Q-LEARNING AGENT AND DEEP Q NETWORK AGENTS)

ABSTRACT: This paper explores the use of reinforcement learning (RL) to optimize urban layouts under the n-minute city model, a planning paradigm that aims to ensure that all essential services are accessible within a short walk distance. The paper presents two RL agents: Qtopia, a Q-learning agent that builds cities from scratch through episodic reward maximization, and city_planner, a Deep Q-Network (DQN) agent capable of classifying and redesigning pre-existing city grids. Both agents aim to generate livable, modular and accessible urban environments by balancing proximity, diversity, and spatial compatibility. Both agents were tested and validated on artificial grids and a real-world layout of Rome, integrating natural constraints such as the Tiber River. A new metric for urban efficiency—residential service *reachability rate*—was introduced to measure how many residences are within the target service radius. The results demonstrate the potential of RL as a scalable tool for intelligent urbanism.

Crespo, A., Villafañá, A., Galli, B., Contreras, D. A., Plata, H. Á., Farley, O. C., & Naranjo, R. (2025). Optimizing urban layouts using reinforcement learning (Q-learning agent and deep Q network agents). In L. Martínez-Villaseñor, R. A. Vázquez, & G. Ochoa-Ruiz (Eds.), *Advances in soft computing. MICAI 2025 Posters Track. Communications in Computer and Information Science (CCIS)* (Vol. 2712, pp. 141-155). Springer. https://doi.org/10.1007/978-3-032-08704-1_11. Conference Paper.

Daniel Adrián Contreras Olivas
Research Professor

María de Lourdes Martínez Villaseñor
Senior Researcher D, SNII Level I

HUMAN-FRIENDLY EXPLANATIONS CHECKLIST FOR REINFORCEMENT LEARNING: XRL H-F-E CHECKLIST

ABSTRACT: Explainable Reinforcement Learning (XRL) has emerged as a critical subfield at the intersection of reinforcement learning (RL) and Explainable Artificial Intelligence (XAI), aiming to render the decision-making processes of learning agents interpretable, transparent, and accessible to human users. This paper introduces a comprehensive evaluation framework, the XRL H-F-E Metrics, to assess the human-friendliness of explanations generated by XRL systems. Drawing from interdisciplinary literature in computer science, cognitive psychology, philosophy of science, and human-computer interaction, the framework is structured across four dimensions: foundational principles (e.g., correctness, robustness, bias mitigation), cognitively aligned explanation types (e.g., “why”, “why not”, counterfactuals), characteristics of “good” explanations (e.g., contrastiveness, selectivity, causality), and human-friendly presentation attributes (e.g., comprehensibility, interactivity, personalization). This checklist provides both a theoretical model and a practical tool for fostering transparency and trust in RL applications, while also identifying key directions for future research, including quantitative metrics, adaptive explanations, and emotionally responsive interfaces.

Contreras, D. A., & Martínez-Villaseñor, L. (2025). Human-friendly explanations checklist for reinforcement learning: XRL H-F-E checklist. In L. Martínez-Villaseñor, B. Martínez-Seis, & O. Pichardo (Eds.), *Artificial intelligence. COMIA 2025. Communications in Computer and Information Science (CCIS)* (Vol. 2253, pp. 268-279). Springer. https://doi.org/10.1007/978-3-031-97910-1_21. Conference Paper.

María Luisa Cruz López
SNII Level I

WIDE-ANGLE COLOR HOLOGRAPHIC NEAR EYE DISPLAY WITH FULL BANDWIDTH FREQUENCY MULTIPLEXING

ABSTRACT: Wide-angle holographic near-eye displays (HNEDs) face challenges in achieving high frame rates, full-color, high-resolution images, and shallow depth of field. Existing full-color methods either rely on time multiplexing or suffer from reduced image resolution due to the applied filtering of the available spatial bandwidth

of the light modulator. To address these limitations, we propose a non-pupil HNED system that reconstructs large 3D full-color scenes from a single hologram using RGB LED illumination. The non-pupil architecture allows employing an incoherent LED source, which offers reduced speckle noise and high imaging resolution. This is, to our knowledge, the first wide-angle 3D color holographic display to use a single spatial light modulator (SLM) at full frame rate. Our system is supported by a developed computer generation hologram (CGH) method, which maximizes the SLM's bandwidth for color coding and improves the speed of RGB CGH calculations. Additionally, we introduce a frequency filter design to simplify color coding and illumination alignment. Through optical reconstructions, we demonstrate that our method preserves 3D depth and color distribution, achieving high-resolution color holographic video without compromising refresh rate or hologram bandwidth.

Chlipala, M., Cruz, M. L., Martínez-Carranza, J., Idicula, M., Kukolowicz, R., & Kozacki, T. (2025). Wide-angle color holographic near eye display with full bandwidth frequency multiplexing. *Scientific Reports*, 15(1), 15221. <https://doi.org/10.1038/s41598-025-98411-3>. Article.

Héctor Gabriel Dávalos Alejo
Senior Researcher B, SNII Level I

DIRECTIONALITY OF AVERAGE SPECTRAL ACCELERATION, SAAVG, IN THE 2023 KAHRAMANMARAS, TÜRKİYE EARTHQUAKE SEQUENCE

ABSTRACT: This study investigates the directionality of spectral accelerations averaged over a period range in 453 ground motions that were recorded in the Turkish strong-motion accelerograph network during the 2023 Kahramanmaraş earthquake sequence. This measure of ground motion intensity, referred to as SaAvg, is computed by using 5%-damped pseudo-acceleration spectral ordinates averaged over a period range from one-fifth to three times the period of interest. Several studies have shown that, compared to the typically used single spectral ordinate, this intensity measure is significantly better correlated with structural damage and, in particular, with structural collapse. Additionally, it is also more sufficient with respect to earthquake magnitude and distance to the source, less sensitive to record scaling, and more predictable. The variation of SaAvg with changes in orientation is carefully studied using two normalised parameters. It is found that, similarly to the directionality of individual spectral ordinates, the directionality of SaAvg also increases with increasing period of the oscillator; however, the level of directionality is smaller. Nonetheless, the dispersion on normalised parameters characterising directionality is in the order of half of that in the directionality of individual spectral ordinates, thus making the directionality of SaAvg significantly more predictable

than that of *S_a*. Models for estimating the directionality in *S_a*_{Avg} are proposed. This study also evaluated for the first time the orientation of maximum *S_a*_{Avg}. Similarly to the orientation of maximum oscillator response in strike-slip earthquakes, it is found that the orientation of maximum *S_a*_{Avg} tends to occur close to the transverse direction from the source. In particular, this study shows that computing the transverse orientation with respect to the point of maximum slip in a finite rupture model leads to better results than doing it using the epicentre.

Liapopoulou, M., Dávalos, H., Bravo-Haro, M., & Miranda, E. (2025). Directionality of average spectral acceleration, *S_a*_{Avg}, in the 2023 Kahramanmaraş, Türkiye earthquake sequence. *Bulletin of Earthquake Engineering*, 23(3), 1083-1105. <https://doi.org/10.1007/s10518-024-02047-z>. Article.

Héctor Gabriel Dávalos Alejo
Senior Researcher B, SNII Level I

EVALUATION OF THE EFFECTS OF GROUND MOTION DURATION ON STRUCTURAL COLLAPSE

ABSTRACT: This study investigates the effect of strong motion duration on the earthquake-induced structural collapse in seven moment-resisting frame buildings when subjected to a set of 269 recorded ground motions. Intensities necessary to produce collapse by each record as a function of their corresponding significant duration show a clear descending trend of collapse capacity with increasing duration for all buildings with a fairly strong negative correlation ranging from -0.32 to -0.61. However, it is shown that the observed descending trend, which prior studies have attributed to being the result of strong motion duration, is primarily produced by characteristics of the ground motions other than duration. Results indicate that once these other characteristics of the ground motion are accounted for, the improvements in the estimates of collapse obtained by adding the explicit consideration of strong motion duration are not significant, particularly when using the next generation of intensity measures that are much better correlated with structural collapse. It is concluded that while there are some effects of strong motion duration, they are very small and in most cases negligible, such that practically the same probabilities of collapse are obtained by using scalar intensity measures that are well correlated with collapse without the explicit consideration of the strong motion duration.

Montemayor, D., Miranda, E., & Dávalos, H. (2025). Evaluation of the effects of ground motion duration on structural collapse. *Earthquake Engineering & Structural Dynamics*, 54(11), 2727-2747. <https://doi.org/10.1002/eqe.4385>. Article.

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DEVELOPMENT OF A PROOF-OF-CONCEPT CONCENTRATING PHOTOVOLTAIC MODULE WITH INTEGRATED TRACKING AND AZIMUTHAL CELL ROTATION

ABSTRACT: Photovoltaics can be more efficient by concentrating the sunlight onto multi-junction solar cells. However, conventional concentrator systems require expensive solar trackers. Recently, the micro-tracking concept, developed inside the photovoltaic module, has emerged as a way to improve competitiveness by eliminating the need for an external tracker. This study presents the design and laboratory validation of a proof-of-concept wide-acceptance-angle tracking integrated micro-concentrator photovoltaic (WiT-CPV) system, featuring a pioneering azimuthal cell rotation mechanism. This innovation ensures perpendicular alignment with incident solar rays in the azimuthal axis, enhancing optical efficiency while reducing mechanical complexity compared to conventional dual-axis tracking systems. The WiT-CPV employs a biconvex aspheric lens and three linear actuators to achieve precise micro-tracking within $\pm 30^\circ$ zenithal and $\pm 40^\circ$ azimuthal ranges. Laboratory tests confirm that single-axis azimuthal rotation captures 72–74% of two-axis rotation energy gains, with annual energy improvements of 3.15% (Aguascalientes, Mexico) and 2.87% (Jaen, Spain) over micro-tracking non-rotating systems. The prototype exhibits stable optical efficiency at low incidence angles (0° – 25°). Transparent materials enable the transmission of diffuse radiation, supporting agrivoltaic applications. The system's modular design, using cost-effective PMMA lenses and PET brackets, enhances scalability and economic viability. This proof-of-concept study, focused on optical and mechanical performance, did not assess material degradation or outdoor performance. Future work will involve integrating durable materials and conducting field trials to validate long-term performance and the leveled cost of electricity. The WiT-CPV provides a scalable and efficient solution for sustainable solar energy generation, particularly in resource-constrained environments.

Díaz-Ponce, A., Trejo-Zúñiga, I., Dávalos, F., Rodrigo, P. M., Ceballos, M. A., Valera-Albacete, Á., Almonacid, F., & Fernández, E. F. (2025). Development of a proof-of-concept concentrating photovoltaic module with integrated tracking and azimuthal cell rotation. *Results in Engineering*, 27, 106735. <https://doi.org/10.1016/j.rineng.2025.106735>. Article.

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A SYSTEMATIC REVIEW OF PROSPECTIVE EVIDENCE LINKING NON-ALCOHOLIC FERMENTED FOOD CONSUMPTION WITH LOWER MORTALITY RISK

ABSTRACT: Fermented foods are consumed worldwide and are increasingly being studied for their potential health benefits. Although their consumption is widespread, their association with long-term health outcomes such as mortality risk remains unclear. The aim of this systematic review was to assess the association between the consumption of fermented foods and risk of all-cause, cardiovascular, and cancer-related mortality in generally healthy adult populations in accordance with the European Food Safety Authority (EFSA) framework for the substantiation of health claims. A comprehensive literature search identified prospective cohort studies from 1970 to 2025 that investigated the association between fermented food consumption and mortality outcomes. Risk of bias was assessed using the Newcastle-Ottawa Scale, and strength of evidence was evaluated based on study quality, sample size, and precision within a structured narrative framework that also classified the direction of association across categories. A complementary non-systematic review examined the compositional characteristics, mechanisms of action, and potential health risks associated with fermented foods. Fifty-two cohort studies were included. Fermented milk products (including yogurt), chocolate, and fermented soy products (particularly natto) suggested a modest inverse association with all-cause and cardiovascular mortality. Cheese was associated with reduced all-cause mortality in some studies, but it showed inconsistent effect on cardiovascular mortality. The evidence for cancer-related mortality was weaker, although yogurt and fermented milk displayed some protective trends. Evidence from a single cohort suggested a potential reduction in all-cause mortality with fermented vegetable consumption, whereas fermented meat suggested no clear association with mortality. Biological plausibility was supported by fermentation-derived compounds such as bioactive peptides, polyphenols, isoflavones, natto-kinase, and vitamin K2. Habitual consumption of certain fermented foods may be associated with modest reductions in mortality risk, but the current evidence remains insufficient to support EFSA-approved health claims. Randomized controlled trials are essential to demonstrate causality. While long-term trials with mortality endpoints are not feasible, studies targeting intermediate outcomes linked to mortality offer a practical alternative. These should be complemented by observational studies to capture long-term, real-world associations. Together, such efforts support the objectives of the COST Action PIMENTO (CA20128) in building a more robust evidence base on fermented foods and health.

Paveljšek, D., Pertziger, E., Fardet, A., Panagiotakos, D. B., Savary-Auzeloux, I., Adamberg, S., Peñas, E., Frias, J., Ntantou, A., Diamantoglou, I., Domínguez-Soberanes, J., Louis, S., Chassard, C., Pračar, S., Vergères, G., & Matalas, A. (2025). A systematic review of prospective evidence linking non-alcoholic fermented food consumption with lower mortality risk. *Frontiers in Nutrition*, 12, 1657100. <https://doi.org/10.3389/fnut.2025.1657100>. Review.

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EFFICACY OF FERMENTED FOODS FOR THE PREVENTION AND TREATMENT OF BACTERIAL VAGINOSIS AND VULVOVAGINAL CANDIDIASIS

ABSTRACT: Vaginal function in healthy women is closely associated with a lactobacilli-dominated microbiome. Among the most common conditions arising from dysbiosis are bacterial vaginosis (BV) and vulvovaginal candidiasis (VVC). While the efficacy of oral probiotics for the treatment of BV and VVC is well documented, the role of consuming fermented foods remains underexplored. This systematic review aims to present a systematic evaluation of the potential role of fermented foods in the prevention and treatment of BV and VVC and establish the extant research gap between the realm of the clinical sciences and the field of food science and technology. For this purpose, under the guidance of COST Action CA20128—Promoting Innovation of Fermented Foods (PIMENTO), a systematic literature review was conducted in two phases. PubMed, Scopus, and Cochrane databases were used for Phase I to analyze articles on human trials and observational studies where the intervention/exposure involved oral consumption of fermented food. In Phase II, a two-step search strategy was employed: (i) identifying microorganisms with demonstrated clinical efficacy in managing BV and VVC, and (ii) reviewing food science literature where these strains are utilized for fermentation. It was observed that 87% of the food starter applications exploited only two of the 54 efficacious strains identified through clinical studies, namely *Lactobacillus rhamnosus* GG and *Lactobacillus acidophilus* LA-5. Findings underscore the potential of fermented foods as carriers for beneficial microorganisms and their relevance in supporting vaginal health. This review contributes to a deeper understanding of the interplay between nutritional consumption of viable probiotic strains and their importance in immunomodulation, highlighting the need for more integrated research efforts across disciplines. Future research aimed at filling this gap will enable informed clinical decisions and dietary recommendations.

Akpınar, A., Markiewicz, L. H., Harsa, H. Ş., Paveljšek, D., Domínguez-Soberanes, J., Agirbasli, Z., Naziri, E., El Jalil, M. H.,

Bouchaud, G., Salminen, S., Savary-Auzeloux, I., Humblot, C., Chassard, C., Pracer, S., Vergères, G., & Karakaş-Budak, B. (2025). Efficacy of fermented foods for the prevention and treatment of bacterial vaginosis and vulvovaginal candidiasis. *Frontiers in Nutrition*, 12, 1658988. <https://doi.org/10.3389/fnut.2025.1658988>. Review.

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SENSORY PROFILES OF CHEESES MANUFACTURED IN MEXICO AND THE US AND THE INFLUENCE OF JUDGES' CULTURAL CONTEXT: A PILOT STUDY

ABSTRACT: A remarkable variety of cheeses are made in the US and Mexico, each with distinct sensory characteristics. Therefore, the objective of this study was to identify the sensory perception of eighteen varieties of cheeses, comprising eight manufactured in the US and ten manufactured in Mexico. Additionally, we evaluated the influence of the cultural context of the judges on the sensory profiles of different cheeses. Twelve semi-trained judges, divided equally between the US and Mexico, participated in intensive training during an exchange program held in both countries. The judges utilized sensory evaluation questionnaires in English, which encompassed three components: (1) the Rate-All-That-Apply (RATA) method, which assessed eighteen specific attributes of each cheese on a numerical scale from 1 to 10; (2) preliminary acceptability tests conducted using a 9-point hedonic scale; and (3) preliminary tests of willingness to buy the products, evaluated by a yes/no question. This study reveals the perception of the most popular cheeses made in Mexico and the US, where the main differences were in three attributes—elasticity, saltiness, and acidity—explained by different cheese-making practices. In general, a few significant differences were observed in the sensory perception of cheese based on the judges' origins. The most notable differences were found in the cheeses manufactured in the US, particularly in terms of texture and taste attributes. This preliminary study identifies possible significant sensory trends in California, USA, and Aguascalientes, Mexico.

Freire, P., Domínguez-Soberanes, J., Licon, C. C., & Estevez-Rioja, A. (2024). Sensory profiles of cheeses manufactured in Mexico and the US and the influence of judges' cultural context: A pilot study. *Applied Sciences*, 14(24), 11980. <https://doi.org/10.3390/app142411980>. Article.

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WEFE NEXUS UNVEILED: A COMPREHENSIVE REVIEW OF MONITORING AND MODELLING METHODS IN THE WATER-ENERGY-FOOD- ECOSYSTEMS NEXUS

ABSTRACT: Sustainable resource management in the face of climate change is a pressing challenge for our society. This paper delves into the water-energy-food-ecosystems (WEFE) nexus, a scientific framework that supports the integrated assessment and management of the interconnected resources. Shifting from sectoral to cross-sectoral and transdisciplinary perspectives, the WEFE nexus addresses interdependencies and interactions among water, energy, food, ecosystems, and climate. This paper focuses on the extended nexus, incorporating ecosystems as a fourth pillar, underscoring the importance of considering ecosystems on an equal footing with water, energy, and food sectors. In addition, the paper emphasizes the significance of monitoring and modelling techniques, laying the foundations for understanding the nexus complexities and assessing uncertainty. The paper offers an overview of integrated nexus modelling, system analysis and socio-economic modelling, bridging the gap between nexus science and practice. It highlights the role of multifaceted stakeholder engagement methods, policy assessment, and institutional analysis in nexus models. Quantifying the nexus through indicators, and its alignment with the Sustainable Development Goals, EU Green Deal, and EU Blue Deal are also key focal points. Finally, the last part of the paper addresses challenges in existing nexus modelling attempts, advocates for the integration of transdisciplinary information, and presents lessons learned. The paper concludes with recommendations for the future of the WEFE nexus, emphasizing its potential in fostering transformative change toward sustainable resource management and inclusive policymaking.

Vrachioli, M., Mellios, N., Alp, E., Borchard, N., Calheiros, C., Castelli, G., Coletta, V., Carvalho, P., Domínguez-Soberanes, J., Fader, M., Giordano, R., Madrid-López, C., Oral, H., Papadopoulou, C.-A., Papadopoulou, M., Pereira, S., Pineda-Martos, R., Stepisnik Perdih, T., Vamvakieridou-Lyroudia, L., & Laspidou, C. (2025). WEFE nexus unveiled: A comprehensive review of monitoring and modelling methods in the water-energy-food-ecosystems nexus. *Environmental Research Letters*, 20(11), 113005. <https://doi.org/10.1088/1748-9326/ae0da3>. Article.

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SPHONIC: DEVELOPMENT OF A MOBILE APPLICATION USING AI AND AR FOR LEARNING BIOMEDICAL CONCEPTS

ABSTRACT: This chapter covers the development of Sphonic, an iOS mobile application that combines artificial intelligence (AI) and augmented reality (AR) to improve biomedical education. Sphonic was designed to employ SwiftUI for its front end, while its back end is based on Django and hosted on Amazon Web Services. Sphonic intends to assist in explaining complex topics in chemistry and biology. Using Apple's ARKit framework, Sphonic allows students to explore dynamic representations of DNA architecture, chemical bonding interactions, and biological processes to promote engagement and retention. On the other hand, the application features an OCR-based chemical equation solver, using Amazon Bedrock's generative AI capabilities, that balances equations and offers comprehensive, step-by-step guidance, addressing conceptual deficiencies for learners. Additionally, Sphonic implements secure authentication protocols to protect user data and features a user-friendly interface that simplifies navigation. This chapter concludes by emphasizing the importance of AI and AR in modern education, demonstrating how these technologies could democratize access and understanding of scientific information and foster creativity in academic environments.

Escobar-Castillejos, D., Báez, E. U., Chavarría-Reyes, F. M., Sigüenza-Noriega, I., Cruz-Ledesma, I., Elizondo-Estrada, H. M., & Escobar-Castillejos, D. (2026). Sphonic: Development of a mobile application using AI and AR for learning biomedical concepts. In E. Moya-Albor, H. Ponce, J. Brieva, S. L. Gomez-Coronel, & D. R. Torres (Eds.), *Machine learning methods in biomedical field. Studies in Computational Intelligence (SCI)* (Vol. 1218, (pp. 365-388). Springer. https://doi.org/10.1007/978-3-031-96328-5_15. Book Chapter.

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TRANSFORMING SURGICAL TRAINING WITH AI TECHNIQUES FOR TRAINING, ASSESSMENT, AND EVALUATION: SCOPING REVIEW

ABSTRACT: Background: Artificial intelligence (AI) has introduced novel opportunities for assessment and evaluation in surgical training, offering potential improvements that could surpass traditional educational methods. Objective: This scoping review examines the integration of AI in surgical training, assessment, and evaluation, aiming to determine how AI technologies can enhance trainees' learning paths and performance by incorporating data-driven insights and predictive analytics. In addition, this review examines the current state and applications of AI algorithms in this field, identifying potential areas for future research. Methods: Following the PRISMA-ScR (Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for Scoping Reviews) guidelines, the PubMed, Scopus, and Web of Science were searched for studies published between January 2020 and March 18, 2024. Eligibility criteria included English-language full-text articles that investigated the application of AI in surgical training, assessment, or evaluation; non-English texts, reviews, preprints, and studies not addressing AI in surgical education were excluded. After duplicate removal and screening, 56 studies were included in the analysis. Data were structured by categorizing studies according to surgical procedure, AI technique, and training setup. Results were synthesized narratively and summarized in frequency tables. Results: From 1400 initial records, 56 studies met the inclusion criteria. Most were journal articles (84%, 47/56), with the remainder being conference papers (16%, 9/56). AI was most frequently applied in minimally invasive surgery (27%, 15/56), neurosurgery (20%, 11/56), and laparoscopy (16%, 9/56). Common techniques included machine learning (20%, 11/56), clustering (14%, 8/56), deep learning (11%, 6/56), convolutional neural networks (11%, 6/56), and support vector machines (11%, 6/56). Training setups were dominated by simulation platforms (33%, 19/56) and box trainers (24%, 13/56), followed by surgical video analysis (16%, 9/56), and robotic systems such as the da Vinci platform (13%, 7/56). Across studies, AI-enhanced training environments provided automated skill assessment, personalized feedback, and adaptive learning trajectories, with several reporting improvements in trainees' learning curves and technical proficiency. However, heterogeneity in study design and outcome measures limited comparability, and algorithmic transparency was often lacking. Conclusions: The application of AI in surgical training demonstrates the potential to enhance skill acquisition and support more efficient, personalized, and adaptive learning pathways. Despite encouraging findings, several limitations exist, including small sample sizes, the lack of standardized evaluation metrics, and insufficient external validation of AI models. Future studies should aim to clarify AI methodologies, improve reproducibility, and develop scalable, simulation-based solutions aligned with global education goals.

Escobar-Castillejos, D., Barrera-Animas, A. Y., Noguez, J., Magana, A. J., & Benes, B. (2025). Transforming surgical training with AI techniques for training, assessment, and evaluation: Scoping review. *Journal of Medical Internet Research*, 27, e58966. <https://doi.org/10.2196/58966>. Review.

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PROMPT ASSISTED ENHANCEMENT FOR CORRECTING ILLUMINATION ARTIFACTS IN ENDOSCOPIC IMAGES

ABSTRACT: Accurate diagnosis in medical imaging depends heavily on image quality, often degraded by illumination artifacts such as overexposure, underexposure, and specular reflections. This paper presents a novel prompt-assisted enhancement system for attenuating such artifacts in endoscopic imagery. Leveraging a BERT-based model's semantic capabilities, our system interprets user prompts to dynamically select and apply targeted enhancement techniques. Unlike general-purpose prompt-based editors like InstructIR or InstructPix2Pix, our method is tailored to the spatially varying, clinically critical distortions specific to endoscopy.

By enabling localized correction of under- and over-exposed regions, our system improves downstream tasks such as 3D colon surface reconstruction. We show that this reprocessing enhances deep learning-based SLAM performance, yielding clearer visualizations and improved diagnostic accuracy. Furthermore, by integrating natural language prompts into the imaging pipeline, our system enables interactive, clinician-driven enhancements—potentially via voice commands—during live procedures. This introduces a new paradigm in human-AI collaboration for surgery and establishes a foundation for real-time, user-centered AI in clinical endoscopy.

Espinosa, R., Hernández, E., Cerriteño Magaña, J., Ochoa, G., & Daul, C. (2026). Prompt assisted enhancement for correcting illumination artifacts in endoscopic images. In L. Martínez-Villaseñor, R. A. Vázquez, & G. Ochoa-Ruiz (Eds.), *Advances in soft computing. MICAI 2025. Lecture Notes in Computer Science (LNAI)* (Vol. 16221, pp. 40-54). Springer. https://doi.org/10.1007/978-3-032-09037-9_4. Conference Paper.

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A COMPARATIVE STUDY OF BROWNIAN DYNAMICS BASED ON THE JERK EQUATION AGAINST A STOCHASTIC PROCESS UNDER AN EXTERNAL FORCE FIELD

ABSTRACT: Brownian motion has been studied since 1827, leading to numerous important advances in many branches of science and to it being studied primarily as a stochastic dynamical system. In this paper, we present a deterministic model for the Brownian

motion for a particle in a constant force field based on the Ornstein–Uhlenbeck model. By adding one degree of freedom, the system evolves into three differential equations. This change in the model is based on the Jerk equation with commutation surfaces and is analyzed in three cases: overdamped, critically damped, and underdamped. The dynamics of the proposed model are compared with classical results using a random process with normal distribution, where despite the absence of a stochastic component, the model preserves key Brownian motion characteristics, which are lost in stochastic models, giving a new perspective to the study of particle dynamics under different force fields. This is validated by a linear average square displacement and a Gaussian distribution of particle displacement in all cases. Furthermore, the correlation properties are examined using detrended fluctuation analysis (DFA) for compared cases, which confirms that the model effectively replicates the essential behaviors of Brownian motion that the classic models lose.

Ruiz-Silva, A., Cassal-Quiroga, B. B., Escalante-Gonzalez, R. d. J., Del-Puerto-Flores, J. A., Gilardi-Velazquez, H. E., & Campos, E. (2025). A comparative study of Brownian dynamics based on the jerk equation against a stochastic process under an external force field. *Mathematics*, 13(5), 804. <https://doi.org/10.3390/math13050804>. Article.

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A COMPARISON STUDY OF DIFFUSION PROPERTIES IN BROWNIAN MOTION MODELS: FROM THE STOCHASTIC TO DISCRETE AND CONTINUOUS CHAOTIC-BASED MODELS

ABSTRACT: The Brownian motion has been studied from different perspectives. Einstein proposed the first mathematical description of the Brownian motion of a free particle in one dimension; later, Langevin proposed another model using stochastic differential equations based on Newton's second law, and recently, deterministic models based on Langevin equations have been proposed, where the fluctuating acceleration is replaced, by the jerk equation and by a discrete system "booster" capable of generating chaos. In this work, we compare the statistical properties of the Brownian motion generated by a chaotic map, the Jerk equation, and the classical Langevin Model under parameter variations. We analyze their properties, such as the mean square displacement, the probability distribution for average displacement, and the type of diffusion generated by these models through the detrended fluctuation analysis and the diffusion coefficient calculation. Our results reveal that deterministic models can serve as viable alternatives to classical stochastic models, offering comparable statistical properties for particle diffusion.

De Nova Ríos, P. K., Velázquez-Pérez, S. E., Campos-Cantón, E., & Gilardi-Velázquez, H. E. (2025). A comparison study of diffusion properties in Brownian motion models: From the stochastic to discrete and continuous chaotic-based models. *Physics of Fluids*, 37(4), 043316. <https://doi.org/10.1063/5.0255684>. Article.

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ANALYSIS AND SIMULATION OF DYNAMIC HEAT TRANSFER AND THERMAL DISTRIBUTION IN BURNS WITH MULTILAYER MODELS USING FINITE VOLUMES

ABSTRACT: Burns represent a significant medical challenge, and the development of theoretical models has the potential to contribute to the advancement of new diagnostic tools. This study aimed to perform numerical simulations of the Pennes bioheat transfer equation, incorporating heat generation terms due to the body's immunological response to thermal injury, as well as changes in skin thermal parameters and blood perfusion for each burn type. We propose the incorporation of specific parameters and boundary conditions related to multilayer perfusion into the Pennes bioheat model. Using the proposed layered skin model, we evaluate temperature differences to establish correlations for determining burn depth. In this investigation, 1D and 3D algorithms based on the finite volume method were applied to capture transient and spatial thermal variations, with the resulting temperature distributions demonstrating the ability of the proposed models to describe the expected thermal variations in healthy and burned tissue. This work demonstrates the potential of the finite volume method to approximate the solution of the Pennes biothermal equation. Overall, this study provides a computational framework for analyzing heat transfer in burn injuries and highlights the relevance of mathematical simulations as a tool for future research on infrared thermography in medicine.

Rodríguez-Pérez, A. S., Gilardi-Velázquez, H. E., & Velázquez-Pérez, S. E. (2025). Analysis and simulation of dynamic heat transfer and thermal distribution in burns with multilayer models using finite volumes. *Dynamics*, 5(4), 41. <https://doi.org/10.3390/dynamics5040041>. Article.

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ANALYSIS OF CHAOTIC SYSTEMS IN THE GENERATION OF RANDOM PHASES FOR AMPLITUDE HOLOGRAMS

ABSTRACT: In recent decades, there has been great interest in the development of applications of chaotic systems in cryptographic systems and communication systems due to their non-periodic and long-term unpredictable nature. In this work, the properties of different chaotic systems, both continuous and discrete in time, are analyzed for the generation of pseudo-random phases practical for holography. The different types of dynamics generated by different systems are analyzed using bifurcation diagrams, transition from chaos to periodic orbits and equilibrium points, as well as two methodologies to construct the phase (Cartesian and polar). Our results shows a better performance in discrete-time systems by generating smooth transitions in the formed patterns and avoiding the generation of artifacts in the holograms, given the wider range of parameters in which the system is stable.

Gilardi Velázquez, H. E., & Cruz, M.-L. (2025). Analysis of chaotic systems in the generation of random phases for amplitude holograms. *Chaos Theory and Applications*, 7(2), 177-185. <https://doi.org/10.51537/chaos.1621022>. Article.

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ANALYSIS OF PARTICLE SETTLEMENT CHARACTERISTICS IN A ONE-DIMENSIONAL DETERMINISTIC MODEL

ABSTRACT: In this paper, we investigate how particles settle in a one-dimensional deterministic model. We leverage a model for deterministic Brownian motion and introduce boundary conditions to simulate particle settling. By adjusting parameters in the Jerk equation, we explore how different diffusion, and the size of the settling space affect the particles' behavior. We analyze how these parameters influence the settling time and its relationship to the dispersion medium. Additionally, we examine statistical properties as follows: the average settling time, the probability distributions for mean displacement, and how the probability distribution of settling times changes with the size of the space.

Velázquez-Pérez, S. E., Gilardi-Velázquez, H. E., & Campos-Cantón, E. (2025). Analysis of particle settlement characteristics in a

one-dimensional deterministic model. *International Journal of Modern Physics C*, 36(11), 2550024. <https://doi.org/10.1142/S012918312550024X>. Article.

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BEYOND CHAOS IN FRACTIONAL-ORDER SYSTEMS: KEEN INSIGHT IN THE DYNAMIC EFFECTS

ABSTRACT: Fractional calculus (or arbitrary order calculus) refers to the integration and derivative operators of an order different than one and was developed in 1695. They have been widely used to study dynamical systems, especially chaotic systems, as the use of arbitrary-order operators broke the milestone of restricting autonomous continuous systems of order three to obtain chaotic behavior and triggered the study of fractional chaotic systems. In this paper, we study the chaotic behavior in fractional systems in more detail and characterize the geometric variations that the dynamics of the system undergo when using arbitrary-order operators by asking the following question: is the Lyapunov exponent sufficient to describe the dynamical variations in a chaotic system of fractional order? By quantifying the convex envelope generated by the 2D projection of the system into all its phase portraits, the changes in the area of the system, as well as the volume of the attractor, are characterized. The results are compared with standard metrics for the study of chaotic systems, such as the Kaplan–Yorke dimension and the fractal dimension, and we also evaluate the frequency fluctuations in the dynamical response. It is found that our methodology can better describe the changes occurring in the systems, while the traditional dimensions are limited to confirming chaotic behaviors; meanwhile, the frequency spectrum hardly changes. The results deepen the study of fractional-order chaotic systems, contribute to understanding the implications and effects observed in the dynamics of the systems, and provide a reference framework for decision-making when using arbitrary-order operators to model dynamical systems.

Echenausía-Monroy, J. L., Quezada-Tellez, L. A., Gilardi-Velázquez, H. E., Ruíz-Martínez, O. F., Heras-Sánchez, M. d. C., Lozano-Rizk, J. E., Cuesta-García, J. R., Márquez-Martínez, L. A., Rivera-Rodríguez, R., Pena Ramirez, J., & Álvarez, J. (2025). Beyond chaos in fractional-order systems: Keen insight in the dynamic effects. *Fractal and Fractional*, 9(1), 22. <https://doi.org/10.3390/fractalfract9010022>. Article.

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CODIFICATION OF IMAGES BASED ON DETERMINISTIC BROWNIAN MOTION

ABSTRACT: Advances and developments in electronic transactions and computing have led to the need to develop new techniques to ensure information security. In this sense, cryptographic algorithms protect information from any attacks. One of the most important requirements for encryption systems is the generation of time series with strong random properties. An example of this type of behavior is Brownian motion, a dynamic behavior with random changes over time that occurs in many vital functions related to fluid environments, stock behavior, or even renewable energy generation. In this paper, we present a method for image encryption based on deterministic Brownian-like motion. By analyzing the dynamics of a fully deterministic set of differential equations reproducing Brownian-like motion, an algorithm for generating binary sequences for image encryption is proposed and the probability distribution of this system is determined. The performance of the proposed algorithm is evaluated using the security tests for cypher schemes such as entropy, pixel correlation and quality of the cypher device.

Gilardi-Velázquez, H. E., Echenausía-Monroy, J. L., Escalante-González, R. J., & Campos, E. (2024). Codification of images based on deterministic Brownian motion. In C. H. Skiadas & Y. Dimotikalis (Eds.), *16th Chaotic Modeling and Simulation International Conference. CHAOS 2023. Springer Proceedings in Complexity* (pp. 143-156). Springer. https://doi.org/10.1007/978-3-031-60907-7_12. Conference Paper.

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OPTICAL ENERGY INCREASING IN A SYNCHRONIZED MOTIF-RING ARRAY OF AUTONOMOUS ERBIUM-DOPED FIBER LASERS

ABSTRACT: This work investigates the enhancement of optical energy in the synchronized dynamics of three erbium-doped fiber lasers (EDFLs) that are diffusively coupled in a unidirectional ring configuration without the need for external pump modulation. Before the system shows stable high-energy pulses, different dynamic behaviors can be observed in the dynamics of the coupled lasers. The evolution of the studied system was analyzed using different techniques for different values of coupling strength. The system shows the well-known dynamic behavior towards chaos at weak coupling, starting with a fixed point at low coupling and passing through Hopf and torus bifurcations as the coupling strength increases. An interesting finding emerged at high coupling

strengths, where phase locking occurs between the frequencies of the three lasers of the system. This phase-locking leads to a significant increase in the peak energy of the EDFL pulses, effectively converting the emission into short, high amplitude pulses. With this method, it is possible to significantly increase the peak energy of the laser compared to a continuous EDFL single pulse.

Esqueda de la Torre, J. O., García-López, J. H., Jaimes-Reátegui, R., Echenausía-Monroy, J. L., López-Muñoz, E. E., Gilardi-Velázquez, H. E., & Huerta-Cuellar, G. (2024). Optical energy increasing in a synchronized motif-ring array of autonomous erbium-doped fiber lasers. *Quantum Beam Science*, 8(4), 27. <https://doi.org/10.3390/qubs8040027>. Article.

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DEPLOYING REAL-TIME SPEECH RECOGNITION ON ESP32 USING TINYML AND EDGE IMPULSE

ABSTRACT: The emergence of Tiny Machine Learning (TinyML) has enabled real-time on-device inference on ultra-low-power microcontrollers, eliminating reliance on cloud computing while significantly reducing latency, power consumption, and bandwidth requirements. This study explores the deployment of a TinyML-based speech recognition system on an ESP32 microcontroller, leveraging Edge Impulse for model development, Mel-Frequency Cepstral Coefficients (MFCCs) for feature extraction, and TensorFlow Lite for Microcontrollers (TFLM) for efficient inference.

The model was trained on a curated subset of the Google Speech Commands Dataset, incorporating background noise augmentation to enhance robustness in real-world environments. Using Edge Impulse's EON Compiler, the model was fully quantized and optimized, achieving a 37% reduction in RAM usage and 27% in ROM. The final model attained 87.14% accuracy on testing data and 97.1% average classification confidence during real-time inference, with excellent noise rejection (99.6%) and latency of 266 ms.

Compared to state-of-the-art systems deployed on more powerful platforms, the proposed approach achieves competitive accuracy while maintaining real-time inference and minimal resource consumption on ultra-low-power hardware. This makes it particularly suitable for battery-powered IoT, robotics, and embedded automation applications where connectivity and energy efficiency are critical.

By balancing performance and efficiency, this research highlights the viability of deploying speech recognition systems on

constrained microcontrollers. Future work will explore advanced architectures and enhanced feature extraction strategies to further improve recognition accuracy, especially for short or phonetically similar commands.

González, M., Gutiérrez, S., Espinosa, R., & Ponce, H. (2025). Deploying real-time speech recognition on ESP32 using TinyML and Edge Impulse. In L. Martínez-Villaseñor, B. Martínez-Seis, & O. Pichardo (Eds.), *Artificial intelligence. COMIA 2025. Communications in Computer and Information Science (CCIS)* (Vol. 2252, pp. 211-230). Springer. https://doi.org/10.1007/978-3-031-97907-1_17. Conference Paper.

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A PARAMETRIC STUDY OF LASER-DIRECTED ENERGY DEPOSITED DSS 2205: MICROSTRUCTURE AND MECHANICAL PROPERTIES PERSPECTIVES

ABSTRACT: Duplex stainless steels (DSS) are corrosion-resistant materials with excellent mechanical properties. This family of steels is only a recent addition to the additive manufacturing (AM) realm due to the limited availability of DSS powder in the past. This study has investigated the effect of varying energy flux (laser power and scanning speed) in a laser-based directed energy deposition AM process on the as-deposited materials state of DSS 2205, a material widely used in marine applications. The primary focus was to understand how changes in laser power (200 W and 300 W) and scanning speed (10 mm/s and 15 mm/s) influence key microstructural features such as phase distribution (δ -ferrite and γ -austenite), grain size, morphology, defects, and microhardness of the as-deposited material. Microstructural analysis revealed a significant correlation between the processing parameters and the resulting microstructure. Increasing the scanning speed reduces the defect content in the samples, while increasing laser power results in larger δ -ferrite grains. The hardness was influenced by both the γ -austenite content and the δ -ferrite grain size. This study provides a pathway for tailoring directed energy deposition (DED) conditions to achieve high-quality and dimensionally accurate components, particularly suited for demanding marine applications.

Mahey, V., Johnson, G. A., Burad, P., Gonzalez-Ojeda, R., Quintana, M. J., Collins, P. C., & Roy, S. (2025). A parametric study of laser-directed energy deposited DSS 2205: Microstructure and mechanical properties perspectives. *JOM*, 77(12), 9295-9307. <https://doi.org/10.1007/s11837-025-07282-6>. Article.

EFFECT OF SIGNAL FILTERING ON METAHEURISTIC-BASED STRUCTURAL PARAMETER IDENTIFICATION IN SHEAR BUILDING MODELS

ABSTRACT: This study evaluates the effectiveness of three metaheuristic algorithms—Genetic Algorithm (GA), Differential Evolution (DE), and Particle Swarm Optimization (PSO)—for identifying lateral interstory stiffness and the modal damping ratio in two-dimensional shear building models. The main objective is to estimate these parameters using time-domain displacement, velocity, and acceleration data, assuming known floor masses and unknown input excitation that primarily excites translational vibration modes. Three structural configurations with 2, 3, and 5 stories are analyzed to assess the scalability and robustness of each algorithm. To assess the effect of signal filtering on the performance of the algorithms, white noise is added to the synthetic response data at six levels ranging from 0% to 5% of the root mean square (RMS) amplitude. A sixth-order Butterworth filter is applied to evaluate the effect of signal preprocessing, and results obtained with and without filtering are compared. The results show that all three algorithms achieve acceptable levels of accuracy, even under noisy conditions. Filtering consistently improves identification accuracy, especially in high-noise conditions. In the most challenging case (5% noise, 5-story model), the average identification errors were 5.042% for GA, 5.106% for DE, and 5.035% for PSO. The findings underscore the practical value of integrating signal filtering with metaheuristic optimization for robust structural system identification in noise-contaminated environments. To account for the random nature of the algorithms, all results reported correspond to the average of 10 independent runs per identification scenario to ensure reliable performance evaluation.

González-Pérez, C. A., De-la-Colina, J., & Valdés-González, J. (2025). Effect of signal filtering on metaheuristic-based structural parameter identification in shear building models. *Civil Engineering Journal*, 11(6), 2231-2254. <https://doi.org/10.28991/CEJ-2025-011-06-04>. Article.

Juan Carlos López Pimentel
Senior Researcher B, SNII Level I

A DIGITAL IDENTITY BLOCKCHAIN ECOSYSTEM: LINKING GOVERNMENT-CERTIFIED AND UNCERTIFIED TOKENIZED OBJECTS

ABSTRACT: This paper presents a novel digital identity ecosystem built upon a hierarchical structure of Blockchain tokens, where both

government-certified and uncertified tokens can coexist to represent various attributes of an individual's identity. At the core of this system is the government, which functions as a trusted authority capable of creating entities and issuing a unique, non-replicable digital identity token for each one. Entities are the exclusive owners of their identity tokens and can attach additional tokens—such as those issued by the government, educational institutions, or financial entities—to form a verifiable, token-based digital identity tree. This model accommodates a flexible identity framework that enables decentralized yet accountable identity construction. Our contributions include the design of a digital identity system (supported by smart contracts) that enforces uniqueness through state-issued identity tokens while supporting user-driven identity formation. The model differentiates between user types and certifies tokens according to their source, enabling a scalable and extensible structure. We also analyze the economic, technical, and social feasibility of deploying this system, including a breakdown of transaction costs for key stakeholders such as governments, end-users, and institutions like universities. Considering the benefits of blockchain, implementing a digital identity ecosystem in this technology is economically viable for all involved stakeholders.

López-Pimentel, J.-C., Gonzalez-Sanchez, J., & Morales-Rosales, L. A. (2025). A digital identity blockchain ecosystem: Linking government-certified and uncertified tokenized objects. *Applied Sciences*, 15(15), 8577. <https://doi.org/10.3390/app15158577>. Article.

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AN INTEGRAL FUZZY MODEL TO EVALUATE SLAB AND BEAM BRIDGES WITH A PREVENTIVE APPROACH

ABSTRACT: Bridges, owing to their intricacy, represent pivotal yet relatively underexplored assets within the domain of maintenance services in civil engineering. While international evaluation methodologies exist to gauge the overall condition of bridges, they often fall short in establishing interrelationships among individual elements, thereby neglecting insights into the influence exerted by each element's condition on the bridge's overall performance. This research introduces an integral fuzzy model evaluation with a preventive approach, designed to assess both the integral condition of a bridge and its constituent elements. Furthermore, the study generates maintenance recommendations, subsequently evaluated by professionals to determine the most suitable course of action based on available resources. To validate the efficacy of the proposed model, a case study involving Bridge 15-016-00.0-0-04.0 PIV, known as "La Cuesta" in Mexico, is presented. The findings indicate that the bridge is in a satisfactory condition and warrants high-priority attention. Bridge analysis is compared with evaluations conducted using the methods of the Secretariat of Infrastructure, Communica-

tions, and Transportation (SICT), the American Association of State Highway and Transportation Officials (AASHTO), and the Ministry of Transport and Communications of Peru. The comparative evaluation reveals that our proposed model provides a more detailed representation of deterioration, facilitating more efficient maintenance planning by considering the hierarchical relationships between the bridge's modules and elements.

Arriaga-Orejuel, P., Morales-Rosales, L. A., Arreygue-Rocha, J. E., Vargas-Santiago, M., López-Pimentel, J. C., & Jara-Díaz, M. (2025). An integral fuzzy model to evaluate slab and beam bridges with a preventive approach. *Applied Sciences*, 15(15), 8333. <https://doi.org/10.3390/app15158333>. Article.

Juan Carlos López Pimentel
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Carolina del Valle Soto
Senior Researcher D, SNII Level I

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Senior Researcher C, SNII Level I

EMPHASIZING THE EARLY PHASES OF THE SOFTWARE DEVELOPMENT PROCESS BEFORE DEPLOYING SMART CONTRACTS

ABSTRACT: Immutability is one of the main characteristics of Blockchain. However, most software development is not static. This dilemma, among others, has caused a new branch of blockchain-oriented software engineering. This paper emphasizes the importance of the early phases of software development before deploying blockchain-based software. It follows case-based research to illustrate the implications of smart contracts designed in the early phases without including all requirements. The paper presents a digital identity case designed within a microservice architecture. We show two stages: an initial design and an upgrading requirement, which causes considerable changes in the architecture. The case is analyzed from three different perspectives: 1) Economic, finding that re-deploying smart contracts does not implicate considerable cost; 2) Computational perspective, finding that it generates various implications: smart contract purpose duplication, storage wastage, failure to recognize the original smart contract, cascade dependency repercussion, and migration problems; and 3) Interconnected effect, a simple change, required for upgrading smart contracts, generates broad collateral repercussions in both on-chain (within the blockchain) and off-chain.

López-Pimentel, J. C., Del Valle-Soto, C., Valdivia, L. J., & Monroy, R. (2025). Emphasizing the early phases of the software development process before deploying smart contracts.

IEEE Access, 13, 13628-13643. <https://doi.org/10.1109/ACCESS.2025.3530269>. Article.

Juan Carlos López Pimentel
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TASK-ORIENTED ADVERSARIAL ATTACKS FOR ASPECT-BASED SENTIMENT ANALYSIS MODELS

ABSTRACT: Adversarial attacks deliberately modify deep learning inputs, mislead models, and cause incorrect results. Previous adversarial attacks on sentiment analysis models have demonstrated success in misleading these models. However, most existing attacks in sentiment analysis have applied a generalized approach to input modifications, without considering the characteristics and objectives of the different analysis levels. Specifically, for aspect-based sentiment analysis, there is a lack of attack methods that modify inputs in accordance with the evaluated aspects. Consequently, unnecessary modifications are made, compromising the input semantics, making the changes more detectable, and avoiding the identification of new vulnerabilities. In previous work, we proposed a model to generate adversarial examples in particular for aspect-based sentiment analysis. In this paper, we assess the effectiveness of our adversarial example model in negatively impacting aspect-based model results while maintaining high levels of semantic inputs. To conduct this evaluation, we propose diverse adversarial attacks across different dataset domains, target architectures, and consider distinct levels of victim model knowledge, thus obtaining a comprehensive evaluation. The obtained results demonstrate that our approach outperforms existing attack methods in terms of accuracy reduction and semantic similarity, achieving a 65.30% reduction in model accuracy with a low perturbation ratio of 7.79%. These findings highlight the importance of considering task-specific characteristics when designing adversarial examples, as even simple modifications to elements that support task classification can successfully mislead models.

Vázquez-Hernández, M., Algreto-Badillo, I., Villaseñor-Pineda, L., Lobato-Báez, M., Lopez-Pimentel, J. C., & Morales-Rosales, L. A. (2025). Task-oriented adversarial attacks for aspect-based sentiment analysis models. *Applied Sciences*, 15(2), 855. <https://doi.org/10.3390/app15020855>. Article.

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SNII Level I

EFFICIENT RECOGNITION OF VOLATILE ORGANIC COMPOUNDS USING LOW-COST E-NOSE DEVICE AND RANDOM FOREST CLASSIFICATION

ABSTRACT: This paper introduces a novel method for the efficient recognition of volatile organic compounds (VOCs) using an electronic nose (e-nose) device coupled with advanced signal processing and classification techniques. The proposed e-nose is a cost-effective sensor array designed to detect a broad spectrum of VOCs with applications in several domains including industrial safety. Data collected from the sensors are processed using the Filter Diagonalization Method (FDM), a novel non-Fourier spectral estimation algorithm that provides reliable footprints from the VOCs. The classification stage employs a Random Forest (RF) model to analyze the FDM footprints and predict the VOC present in the e-nose's surroundings. Experimental results show that the FDM-RF approach achieves a 96.4% classification accuracy.

Macías-Quijas, R., Velázquez, R., Ghavifekr, A. A., de Fazio, R., & Visconti, P. (2024). Efficient recognition of volatile organic compounds using low-cost e-nose device and random forest classification. In *2024 10th International Conference on Control, Instrumentation and Automation, ICCIA 2024* (pp. 1-5). IEEE. <https://doi.org/10.1109/ICCIA65044.2024.10768140>. Conference Paper.

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FUNCTIONAL ELECTRONIC NOSE TECHNOLOGY FOR MONITORING AIR GASES

ABSTRACT: In recent years, electronic noses (e-noses) have emerged as innovative tools for environmental monitoring, particularly in detecting air pollutants. This study presents the design and development of a functional, portable, and low-cost e-nose technology capable of identifying gases such as carbon monoxide, methane, and several volatile compounds. Such technology integrates a multi-sensor array and a data acquisition module, along with advanced signal processing algorithms. The Filter Diagonal-

ization Method (FDM) is proposed for spectral feature extraction, combined with Random Forest (RF) for gas classification. Experimental results demonstrate a 96.4 % accuracy in gas identification, validating the effectiveness of the FDM-RF combination. This study contributes to the advancement of accessible air quality monitoring technologies and new gas detection and classification approaches.

Macías-Quijas, R., Garzón-Castro, C. L., Filomena-Ambrosio, A., Del-Valle-Soto, C., de Fazio, R., Visconti, P., & Velázquez, R. (2025). Functional electronic nose technology for monitoring air gases. *Revista Politécnica*, 56(2), 57-66. <https://doi.org/10.33333/rp.vol56n2.06>. Article.

Yovani Marrero Ponce

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BIOLOGICAL IMPLICATIONS OF THE INTRINSIC DEFORMABILITY OF HUMAN ACETYLCHOLINESTERASE INDUCED BY DIVERSE COMPOUNDS: A COMPUTATIONAL STUDY

ABSTRACT: The enzyme acetylcholinesterase (AChE) plays a crucial role in the termination of nerve impulses by hydrolyzing the neurotransmitter acetylcholine (ACh). The inhibition of AChE has emerged as a promising therapeutic approach for the management of neurological disorders such as Lewy body dementia and Alzheimer's disease. The potential of various compounds as AChE inhibitors was investigated. In this study, we evaluated the impact of natural compounds of interest on the intrinsic deformability of human AChE using computational biophysical analysis. Our approach incorporates classical dynamics, elastic networks (ENM and NMA), statistical potentials (CUPSAT and SWOTein), energy frustration (Frustratometer), and volumetric cavity analyses (MOLE and PockDrug). The results revealed that cyanidin induced significant changes in the flexibility and rigidity of AChE, especially in the distribution and volume of internal cavities, compared to model inhibitors such as TZ2PA6, and through a distinct biophysical-molecular mechanism from the other inhibitors considered. These findings suggest that cyanidin could offer potential mechanistic pathways for future research and applications in the development of new treatments for neurodegenerative diseases.

Alvarado, Y. J., González-Paz, L., Paz, J. L., Loroño-González, M. A., Santiago Contreras, J., Lossada, C., Vivas, A., Marrero-Ponce, Y., Martínez-Ríos, F., Rodríguez-Lugo, P., Balladores, Y., & Vera-Villalobos, J. (2024). Biological implications of the intrinsic deformability of human acetylcholinesterase induced by

diverse compounds: A computational study. *Biology*, 13(12), 1065. <https://doi.org/10.3390/biology13121065>. Article.

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Senior Researcher C, SNII Level I

HALF-SPACE PROXIMAL NETWORKS (HSPNS): A PROXY FOR MULTI-QUERY SIMILARITY SEARCHING MODELS PREDICTING TUMOR- HOMING PEPTIDES

ABSTRACT: Tumor-homing peptides (THPs) have emerged as promising agents in cancer treatments. These short sequences can specifically target tumor cells and vasculature. Here, a non-trained machine learning (ML) method based on network science and multiquery similarity searching to predict THPs is presented. We leverage the network-based representation of THPs' chemical space to extract valuable information by employing a novel similarity-based, yet sparse, network known as the half-space proximal network (HSPN). The HSPN of the THPs' giant component is composed of 12 communities that represent distinct modes of action and/or targets, as well as sequence templates (scaffolds). In the HSPN analysis, various centrality measures were employed to identify the most significant and nonredundant THPs. These central THPs were then used as queries (Qs) in group fusion similarity-based searches against an established collection of known THPs. The performance of the resulting multiquery similarity-based search models (MQSSMs) was assessed using three benchmarking datasets of THPs/non-THPs. The MQSSMs derived from the HSPNs (THP2) demonstrated superior discrimination performance compared to the classical chemical space networks (CSNs, namely THP1) when applied to the THPs/non-THPs datasets. Remarkably, exceptional MCC values (>0.887) were achieved when utilizing Qs from both CSN and HSPN networks to construct MQSSMs (THP3), employing a similarity threshold of 0.6, in external datasets. Next, we conducted a statistical comparison between the performance of our top-performing MQSSM, THP3, and several THP prediction servers, including TumorHPD, THPep, SCMTHP, and NEPTUNE. Our proposed model demonstrated its superiority by surpassing the state-of-the-art supervised and trained ML methods for THP prediction with statistically significant differences. These results provide strong evidence that network-based similarity searches are highly effective and reliable for identifying THPs.

Romero, M., Marrero-Ponce, Y., Martínez-Ríos, F., Agüero-Chapin, G., Aguilera-Mendoza, L., Chavez, E., Márquez, E. A., Pérez-Pérez, N., Mora, J. R., Contreras-Torres, E., & Barigye, S. J. (2025). Half-space proximal networks (HSPNs): A proxy

for multi-query similarity searching models predicting tumor-homing peptides. *ACS Omega*, 10(45), 54389-54404. <https://doi.org/10.1021/acsomega.5c07055>. Article.

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IN SILICO IDENTIFICATION OF POTENTIAL CLOVIBACTIN-LIKE ANTIBIOTICS BINDING TO UNIQUE CELL WALL PRECURSORS IN DIVERSE GRAM-POSITIVE BACTERIAL STRAINS

ABSTRACT: The rise in multidrug-resistant bacteria highlights the critical need for novel antibiotics. This study explores clovibactin-like compounds as potential therapeutic agents targeting lipid II, a crucial component in bacterial cell wall synthesis, using *in silico* techniques. A total of 2624 clovibactin analogs were sourced from the PubChem database and screened using ProTox 3.0 software based on their ADME-Tox properties, prioritizing candidates with favorable pharmacokinetic profiles and minimal toxicity. Molecular docking protocols were then employed to assess the binding interactions of the selected compounds with lipid II. Our analysis identified Compound 22 as a particularly promising candidate, exhibiting strong binding affinity, stable complex formation, and high selectivity for the target. Binding energy analysis, conducted via molecular dynamics simulations, revealed a highly negative value of -25.50 kcal/mol for Compound 22, surpassing that of clovibactin and underscoring its potential efficacy. In addition, Compound 22 was prioritized due to its exceptional binding affinity to lipid II and its favorable ADME-Tox properties, suggesting a lower likelihood of adverse effects. These characteristics position Compound 22 as a promising candidate for further pharmacological development. While our computational results are encouraging, experimental validation is essential to confirm the efficacy and safety of these compounds. This study not only advances our understanding of clovibactin analogs but also contributes to the ongoing efforts to combat antimicrobial resistance through innovative antibiotic development.

Sierra-Hernandez, O., Saurith-Coronell, O., Rodríguez-Macías, J., Márquez, E., Mora, J. R., Paz, J. L., Flores-Sumaza, M., Mendoza-Mendoza, A., Flores-Morales, V., Marrero-Ponce, Y., Barigye, S. J., & Martínez-Ríos, F. (2025). *In silico* identification of potential clovibactin-like antibiotics binding to unique cell wall precursors in diverse Gram-positive bacterial strains. *International Journal of Molecular Sciences*, 26(4), 1724. <https://doi.org/10.3390/ijms26041724>. Article.

Yovani Marrero Ponce

SNII Level III

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Senior Researcher C, SNII Level I

LIGAND-BASED VIRTUAL SCREENING WORKFLOW FOR ANTIMALARIAL REPOSITIONING FROM KNOWN DRUGS AND CHEMICAL LIBRARIES

ABSTRACT: The present report outlines a workflow integrating various virtual screening methods to identify potential antimalarial compounds. To develop QSAR models, a dataset of 2,314 compounds was analyzed using linear discriminant analysis and the QuBiLS-MAS software. 37 individual models were generated and subsequently combined into a fusion-based multiclassifier system (MCS), which achieved predictive performances of 91.35% for the training set and 92.06% for the test set. The MCS was further evaluated through a virtual screening simulation involving 13,410 compounds from GlaxoSmithKline, yielding an extrapolation rate of 91.43%. Following this, several drug-likeness filters, the finalized MCS, and chemical diversity analyses were applied to select candidate compounds from three datasets for parasitological assays. Using the proposed in silico pipeline, a total of 6,811 drugs, 15,000 chemical compounds, and 1,120 biologically active molecules from the DrugBank, PrintScreen15, and Tocriscreen collections, respectively, were virtually screened. From these, 80 compounds were shortlisted as potential antimalarial candidates. Ultimately, 15 compounds were purchased and tested in vitro against two *Plasmodium falciparum* strains (3D7 and Dd2). Of these, five drugs (ziprasidone, isradipine, amcinonide, triflupromazine, and anisotropine) and four chemical compounds (NGB 2904, A23187, Otava-7019050991, and Otava-1677649) demonstrated antimalarial activity, with values μ . This approach represents a promising computational tool for the early stages of antimalarial drug discovery.

Machado-Tugores, Y., Meneses-Marcel, A., Marrero-Ponce, Y., Martínez-Ríos, F., Aguilar, A. C., Teran, E., Arán, V. J., Escario García-Trevijano, J. A., & Gómez-Barrio, A. (2026). Ligand-based virtual screening workflow for antimalarial repositioning from known drugs and chemical libraries. In E. Moya-Albor, H. Ponce, J. Brieva, S. L. Gomez-Coronel, & D. R. Torres (Eds.), *Machine learning methods in biomedical field. Studies in Computational Intelligence (SCI)* (Vol. 1218, pp. 415-435). Springer. https://doi.org/10.1007/978-3-031-96328-5_17. Book Chapter.

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SNII Level III

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MACROMOLECULAR INTERACTION MECHANISM OF THE BACTERIOCIN ENTDD14 WITH THE RECEPTOR BINDING DOMAIN (RBD) FOR THE INHIBITION OF SARS-COV-2 AND THE JN.1 VARIANT: BIOMEDICAL STUDY BASED ON ELASTIC NETWORKS, STOCHASTIC MARKOV MODELS, AND MACROMOLECULAR VOLUMETRIC ANALYSIS

ABSTRACT: Bacteriocins, a class of molecules produced by bacteria, exhibit potent antimicrobial properties, including antiviral activities. The urgent need for treatments against SARS-CoV-2 has proposed bacteriocins such as enterocin DD14 (EntDD14) as potential therapeutic agents. However, the mechanism of macromolecular interaction of EntDD14 for the inhibition of SARS-CoV-2 is not yet fully understood, and its efficacy against variants like JN.1 has not been completely established. To address these knowledge gaps, biocomputational analyses were employed using a diverse set of tools, including Markov state models and volumetric analyses. This analysis revealed a favorable interaction between EntDD14 and the receptor-binding domain (RBD) of SARS-CoV-2. Furthermore, it was found that EntDD14 induces changes in the flexibility of the RBD and alters the distribution and size of its internal cavities, particularly in the JN.1 variant. These findings align with experimental observations and support the inhibitory mechanism of EntDD14 against SARS-CoV-2. Additionally, they suggest that EntDD14 may possess a broader spectrum of action, encompassing the JN.1 variant. This study paves the way for future investigations and therapeutic applications, encouraging further exploration of the antiviral activity of bacteriocins like EntDD14 against variants of concern like JN.1. However, additional experimental demonstrations are warranted to substantiate these findings.

Moncayo, L., Aguaiza, M. E., Yamasqui, J. I., Pinos, M. E., Yamasqui, K. M., Cardozo, A., Lossada, C., Marrero-Ponce, Y., Martínez-Ríos, F., Alvarado, Y. J., Pérez, A., & González-Paz, L. (2025). Macromolecular interaction mechanism of the bacteriocin EntDD14 with the receptor binding domain (RBD) for the inhibition of SARS-CoV-2 and the JN.1 variant: Biomedical study based on elastic networks, stochastic Markov models, and macromolecular volumetric analysis. *Biophysical Chemistry*, 318, 107388. <https://doi.org/10.1016/j.bpc.2024.107388>. Article.

Yovani Marrero Ponce

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Senior Researcher C, SNII Level I

MAPPING THE CHEMICAL SPACE OF ANTIVIRAL PEPTIDES WITH HALF-SPACE PROXIMAL AND METADATA NETWORKS THROUGH INTERACTIVE DATA MINING

ABSTRACT: Antiviral peptides (AVPs) are promising therapeutic candidates, yet the rapid growth of sequence data and the field's emphasis on predictors have left a gap: the lack of an integrated view linking peptide chemistry with biological context. Here, we map the AVP landscape through interactive data mining using Half-Space Proximal Networks (HSPNs) and Metadata Networks (MNs) in the StarPep toolbox. HSPNs minimize edges and avoid fixed thresholds, reducing computational cost while enabling high-resolution analysis. A threshold-free HSPN resolved eight chemically and biologically distinct communities, while MNs contextualized AVPs by source, function, and target, revealing structural-functional relationships. To capture diversity compactly, we applied centrality-guided scaffold extraction with redundancy removal (90–50% identity), producing four representative subsets suitable for modeling and similarity searches. Alignment-free motif discovery yielded 33 validated motifs, including 10 overlapping with reported AVP signatures and 23 apparently novel. Motifs displayed category-specific enrichment across antimicrobial classes, and sequences carrying multiple motifs (≥ 4) consistently showed higher predicted antiviral probabilities. Beyond computational insights, scaffolds provide representative “entry points” into AVP chemical space, while motifs serve as modular building blocks for rational design. Together, these resources provide an integrated framework that may inform AVP discovery and support scaffold- and motif-guided therapeutic design.

De Llano García, D., Marrero-Ponce, Y., Agüero-Chapin, G., Rodríguez, H., Ferri, F. J., Márquez, E. A., Mora, J. R., Martínez-Ríos, F., & Pérez-Castillo, Y. (2025). Mapping the chemical space of antiviral peptides with half-space proximal and metadata networks through interactive data mining. *Computers*, 14(10), 423. <https://doi.org/10.3390/computers14100423>. Article.

Yovani Marrero Ponce

SNII Level III

MOLECULAR AND DESCRIPTOR SPACES FOR PREDICTING INITIAL RATE OF CATALYTIC HOMOGENEOUS QUINOLINE HYDROGENATION WITH RU, RH, OS, AND IR CATALYSTS

ABSTRACT: Developing highly active catalysts for quinoline hydrogenation is crucial for efficient hydrogen carrier technologies and clean fossil fuel hydrodenitrogenation. In this work, we employed Tensor Algebra-based 3D-Geometrical Molecular Descriptors (QuBiLS-MIDAS) to develop Quantitative Structure–Property Relationship (QSPR) models predicting the initial rate of homogeneous quinoline hydrogenation catalyzed by transition metal complexes of Ru, Rh, Os, and Ir. A data set of 32 catalytic precursors was used: 25 for model training (training set) and 7 for external validation (testing set). Multiple linear regression analysis yielded a model with good predictive ability for the training set ($R^2 = 0.90$) and satisfactory external validation for the testing set ($Q_{\text{EXT}}^2 = 0.86$). The model's descriptors highlighted the importance of hardness, softness, electrophilicity, and mass in predicting catalytic activity. The virtual screening revealed that Rh and Ir complexes with η^5 -acidic ligands (e.g., olefins, diolefins, and η^5 -Cp) and nitrile ligands exhibited the highest predicted catalytic activity, suggesting potential for further improvement through ligand structural modification. Notably, iridium complexes, particularly those with tri(cyclopropyl) phosphine ligands, demonstrated significant potential for hydrogen storage, transport, and production, underscoring their relevance in sustainable energy systems. These findings demonstrate the potential of the QuBiLS-MIDAS approach for in silico design of efficient catalysts for quinoline hydrogenation processes.

Izquierdo, R., Zadorosny, R., Rosales, M., Marrero-Ponce, Y., & Cubillan, N. (2025). Molecular and descriptor spaces for predicting initial rate of catalytic homogeneous quinoline hydrogenation with Ru, Rh, Os, and Ir catalysts. *ACS Omega*, 10(18), 18312–18331. <https://doi.org/10.1021/acsomega.4c09503>. Article.

Yovani Marrero Ponce

SNII Level III

MOLECULAR MODELING OF VASODILATORY ACTIVITY: UNVEILING NOVEL CANDIDATES THROUGH DENSITY FUNCTIONAL THEORY, QSAR, AND MOLECULAR DYNAMICS

ABSTRACT: Cardiovascular diseases (CVD) pose a significant global health challenge, requiring innovative therapeutic strategies. Vasodilators, which are central to vasodilation and blood pressure

reduction, play a crucial role in cardiovascular treatment. This study integrates quantitative structure– (QSAR) modeling and molecular dynamics (MD) simulations to predict the biological activity and interactions of vasodilatory compounds with the aim to repurpose drugs already known and estimate their potential use as vasodilators. By exploring molecular descriptors, such as electronegativity, softness, and highest occupied molecular orbital (HOMO) energy, this study identifies key structural features influencing vasodilatory effects, as it seems molecules with the same mechanism of actions present similar frontier orbitals pattern. The QSAR model was built using fifty-four Food Drugs Administration-approved (FDA-approved) compounds used in cardiovascular treatment and their activities in rat thoracic aortic rings; several molecular descriptors, such as electronic, thermodynamics, and topographic were used. The best QSAR model was validated through robust training and test dataset split, demonstrating high predictive accuracy in drug design. The validated model was applied on the FDA dataset and molecules in the application domain with high predicted activity were retrieved and filtered. Thirty molecules with the best-predicted pK_{i50} were further analyzed employing molecular orbital frontiers and classified as angiotensin-I or β 1-adrenergic inhibitors; then, the best scoring values obtained from molecular docking were used to perform a molecular dynamics simulation, providing insight into the dynamic interactions between vasodilatory compounds and their targets, elucidating the strength and stability of these interactions over time. According to the binding energies results, this study identifies novel vasodilatory candidates where Dasabuvir and Sertindole seem to have potent and selective activity, offering promising avenues for the development of next-generation cardiovascular therapies. Finally, this research bridges computational modelling with experimental validation, providing valuable insight for the design of optimized vasodilatory agents to address critical unmet needs in cardiovascular medicine.

Bernal, A., Márquez, E. A., Flores-Sumaza, M., Cuesta, S. A., Mora, J. R., Paz, J. L., Mendoza-Mendoza, A., Rodríguez-Macías, J., Salazar, F., Insuasty, D., Marrero-Ponce, Y., Agüero-Chapin, G., Flores-Morales, V., & Carrascal-Hernández, D. C. (2024). Molecular modeling of vasodilatory activity: Unveiling novel candidates through density functional theory, QSAR, and molecular dynamics. *International Journal of Molecular Sciences*, 25(23), 12649. <https://doi.org/10.3390/ijms252312649>. Article.

Yovani Marrero Ponce
SNII Level III

MULTITARGET DESIGN OF STEROIDAL INHIBITORS AGAINST HORMONE-DEPENDENT BREAST CANCER: AN INTEGRATED IN SILICO APPROACH

ABSTRACT: Hormone-dependent breast cancer, particularly in its treatment-resistant forms, remains a significant therapeutic challenge. In this study, we applied a fully computational strategy to design steroid-based compounds capable of simultaneously targeting three key receptors involved in disease progression: progesterone receptor (PR), estrogen receptor alpha (ER- α), and HER2. Using a robust 3D-QSAR model ($R^2 = 0.86$; $Q^2_{\text{LOO}} = 0.86$) built from 52 steroidal structures, we identified molecular features associated with high anticancer potential, specifically increased polarizability and reduced electronegativity. From a virtual library of 271 DFT-optimized analogs, 31 compounds were selected based on predicted potency ($\text{pIC}_{50} > 7.0$) and screened via molecular docking against PR (PDB 2W8Y), HER2 (PDB 7JXH), and ER- α (PDB 6VJD). Seven candidates showed strong binding affinities ($\Delta G \leq -9$ kcal/mol for at least two targets), with Estero-255 emerging as the most promising. This compound demonstrated excellent conformational stability, a robust hydrogen-bonding network, and consistent multitarget engagement. Molecular dynamics simulations over 100 nanoseconds confirmed the structural integrity of the top ligands, with low RMSD values, compact radii of gyration, and stable binding energy profiles. Key interactions included hydrophobic contacts, π - π stacking, halogen- π interactions, and classical hydrogen bonds with conserved residues across all three targets. These findings highlight Estero-255, alongside Estero-261 and Estero-264, as strong multitarget candidates for further development. By potentially disrupting the PI3K/AKT/mTOR signaling pathway, these compounds offer a promising strategy for overcoming resistance in hormone-driven breast cancer. Experimental validation, including cytotoxicity assays and ADME/Tox profiling, is recommended to confirm their therapeutic potential.

Rodríguez-Macías, J., Saurith-Coronell, O., Vargas-Echeverria, C., Delgado, D. I., Márquez Brazón, E. A., De Aguas, R. G., Mora, J. R., Paz, J. L., & Marrero-Ponce, Y. (2025). Multitarget design of steroidal inhibitors against hormone-dependent breast cancer: An integrated in silico approach. *International Journal of Molecular Sciences*, 26(15), 7477. <https://doi.org/10.3390/ijms26157477>. Article.

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SNII Level III

OPTIMAL DESCRIPTOR SUBSET SEARCH VIA CHEMICAL INFORMATION AND TARGET ACTIVITY-GUIDED ALGORITHM FOR ANTIMICROBIAL PEPTIDE PREDICTION

ABSTRACT: Antimicrobial peptides (AMPs) have emerged as a promising alternative to conventional drugs due to their potential applications in combating multidrug-resistant pathogens. Various computational approaches have been developed for AMP predic-

tion, ranging from shallow learning methods to advanced deep learning techniques. Additionally, the performance of shallow learning models based on self-learning features derived from protein language models has recently been studied. However, the performance of AMP models based on shallow learning strongly depends on the quality of descriptors derived via manual feature engineering, which may miss crucial information by assuming that the initial descriptor set fully captures relevant information. The AExOp-DCS algorithm was introduced as an automatic feature domain optimization method that identifies the “optimal” descriptor set driven by the chemical structure and biological activity of the compounds under study. QSAR models built on AExOp-DCS optimized descriptors outperform those using nonoptimized sets. In this study, we explore the use of AExOp-DCS to identify optimal descriptor subsets for AMP modeling. Experimental results show that the descriptors returned by AExOp-DCS contain information comparable to those used in top-performing models while exhibiting higher discriminative capacity. The generated models based on the descriptors returned by AExOp-DCS achieved performance metric values comparable to state-of-the-art approaches while utilizing fewer descriptors, suggesting a more efficient modeling process. By reducing dimensionality without sacrificing accuracy, this approach contributes to the development of more efficient computational pipelines for AMP discovery. Finally, a Java software called AExOp-DCS-SEQ is freely available, enabling researchers to leverage its capabilities for peptide descriptor search and AMP classification tasks.

García-González, L. A., Marrero-Ponce, Y., García-Jacas, C. R., & Aguila Puentes, S. A. (2025). Optimal descriptor subset search via chemical information and target activity-guided algorithm for antimicrobial peptide prediction. *Journal of Chemical Information and Modeling*, 65(13), 6621-6631. <https://doi.org/10.1021/acs.jcim.5c00600>. Article.

Yovani Marrero Ponce

SNII Level III

QUANTUM CHEMICAL CHARACTERIZATION OF UREA METHANOLYSIS: MECHANISTIC PATHWAYS AND ORGANOTIN-CATALYZED DMC FORMATION

ABSTRACT: The methanolysis of urea represents a promising green route for the synthesis of dimethyl carbonate (DMC), a versatile compound with applications in sustainable chemistry and energy storage. In this work, a comprehensive quantum chemical investigation of the reaction mechanism is presented using density functional theory (DFT), focusing on both uncatalyzed and organotin-catalyzed systems, considering both stepwise and concerted pathways. For MC production, both the stepwise and the concerted mechanisms mediated by a methanol dimer exhibit the

lowest activation enthalpies. Consequently, an effective activation enthalpy of 24.0 kcal/mol was determined, in excellent agreement with the experimental value of 23.45 kcal/mol. In contrast, the bimolecular stepwise and concerted models exhibited higher barriers ($\Delta H^\ddagger \approx 42\text{--}52$ kcal/mol). Entropy values indicated that mechanisms with two methanol molecules involve higher preorganization ($\Delta S^\ddagger \approx -60$ cal/mol K), compared to -30 cal/mol K in single-molecule pathways. For DMC production from the methyl carbamate intermediate, the rate-limiting step, it was analyzed with and without an organotin catalyst. Catalysis lowers the activation enthalpy by approximately 10 kcal/mol, yielding a value of 24.9 kcal/mol for the methanol monomer catalyzed system, in good agreement with the experimental $\Delta H^\ddagger$ of 24.3 kcal/mol. To deepen mechanistic understanding, we employed advanced quantum descriptors including reaction force analysis, reaction electronic flux (REF), and natural bond orbital (NBO) charge evolution. These tools revealed synchronous bond rearrangements and electronic polarization effects that govern transition state stability, mainly by the electronic charges of the carbon atom in the carbonyl group and the amine group in the sense $C^{6+}\text{---}N^{6-}$. This study provides novel mechanistic insights into the dual role of hydrogen bonding and Lewis acid catalysis in DMC synthesis and demonstrates the utility of quantum chemical tools in elucidating complex reaction pathways, offering a foundation for rational catalyst design.

Martínez-Arias, D., Mora, J. R., Rodríguez, V., Márquez, E. A., Espinoza-Montero, P. J., Paz, J. L., & Marrero-Ponce, Y. (2026). Quantum chemical characterization of urea methanolysis: Mechanistic pathways and organotin-catalyzed DMC formation. *Journal of Computational Chemistry*, 47(1), e70299. <https://doi.org/10.1002/jcc.70299>. Article.

Yovani Marrero Ponce

SNII Level III

UNLOCKING ANTIMICROBIAL PEPTIDES: IN SILICO PROTEOLYSIS AND ARTIFICIAL INTELLIGENCE-DRIVEN DISCOVERY FROM CNIDARIAN OMICS

ABSTRACT: Overcoming the growing challenge of antimicrobial resistance (AMR), which affects millions of people worldwide, has driven attention for the exploration of marine-derived antimicrobial peptides (AMPs) for innovative solutions. Cnidarians, such as corals, sea anemones, and jellyfish, are a promising valuable resource of these bioactive peptides due to their robust innate immune systems yet are still poorly explored. Hence, we employed an in silico proteolysis strategy to search for novel AMPs from omics data of 111 Cnidaria species. Millions of peptides were retrieved and screened using shallow- and deep-learning models, prioritizing AMPs with a reduced toxicity and with a structural distinctiveness from char-

acterized AMPs. After complex network analysis, a final dataset of 3130 Cnidaria singular non-haemolytic and non-toxic AMPs were identified. Such unique AMPs were mined for their putative antibacterial activity, revealing 20 favourable candidates for in vitro testing against important ESKAPEE pathogens, offering potential new avenues for antibiotic development.

Barroso, R. A., Agüero-Chapin, G., Sousa, R., Marrero-Ponce, Y., & Antunes, A. (2025). Unlocking antimicrobial peptides: In silico proteolysis and artificial intelligence-driven discovery from cnidarian omics. *Molecules*, 30(3), 550. <https://doi.org/10.3390/molecules30030550>. Article.

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STARPEPWEB: AN INTEGRATIVE, GRAPH-BASED RESOURCE FOR BIOACTIVE PEPTIDES

ABSTRACT: Motivation: The rapid growth of bioactive peptide sequences presents challenges for organization and analysis. Existing repositories often specialize in functions, taxonomic origins, or structural classes, but most remain isolated, use heterogeneous metadata, and lack uniform descriptors or structural models. Few integrative web services exist, offering only partial coverage or depth. As a result, reproducible and comprehensive exploration of the bioactive peptide landscape remains limited, underscoring the need for a unified, source-tracked, extensible platform. Results: We present StarPepWeb, a freely accessible web application that democratizes access to StarPepDB, one of the largest curated repositories of bioactive peptides. The platform integrates 45 120 non-redundant sequences from 40 public databases into a source-tracked graph enriched with metadata, physicochemical features, and predicted 3D structures from ESMFold. Each peptide is represented with ESM-2 embeddings and iFeature descriptors, while the interface supports metadata-aware filtering, alignment-based similarity searches with single and multiple queries, and interactive visualization. A microservice-oriented architecture ensures scalability, maintainability, and reproducible versioned downloads, including Neo4j exports. StarPepWeb thus overcomes deployment and expertise barriers of the standalone database, providing an extensible, cloud-hosted framework for integrative bioactive peptide analysis.

López, C., Cárdenas, R., Aguilera-Mendoza, L., Agüero-Chapin, G., Martínez-Ríos, F., García-Jacas, C. R., Pérez-Pérez, N., & Marrero-Ponce, Y. (2025). StarPepWeb: An integrative, graph-based resource for bioactive peptides. *Bioinformatics Advances*, 5(1), vbaf261. <https://doi.org/10.1093/bioadv/vbaf261>. Article.

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THEORETICAL STUDY OF THE HYDROLYSIS MECHANISM OF B-LACTAM ANTIBIOTICS CATALYSED BY A ZN(II) DINUCLEAR BIOMIMETIC ORGANOMETALLIC COMPLEX

ABSTRACT: The degradation and metabolism of antibiotics have attracted the scientific community's attention due to the environmental problems caused by the inappropriate use and disposal of these drugs. Therefore, it is crucial to understand the reaction mechanism involved in the degradation of these compounds. We studied the hydrolysis of nitrocefin and benzylpenicillin, two β -lactam ring antibiotics, mediated by an enzymatic mimetic Zn organometallic compound, using DFT methods. The electronic effects of functional groups adjacent to the β -lactam ring were analysed and good agreement between experimental and theoretical results was found. The reaction involves the nucleophilic attack of the bridging hydroxide group on the Zn atoms towards the β -lactam ring. A stepwise mechanism was found to agree with the experimental results. Chemical hardness profiles were affected by the solvent and reaction synchronicity. Geometric rearrangements dominated the activation barrier, and both antibiotics exhibited late transition states.

Zurita, J. E., Mora, J. R., Martínez-Ríos, F., Barigye, S. J., & Espinoza-Montero, P. J. (2025). Theoretical study of the hydrolysis mechanism of β -lactam antibiotics catalysed by a Zn(II) dinuclear biomimetic organometallic complex. *Molecular Physics*, 123(2), e2356752. <https://doi.org/10.1080/00268976.2024.2356752>. Article.

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DETERMINING THE INFLUENCE OF SOCIOECONOMIC AND CLINICAL FACTORS IN DIABETES IN THE MEXICAN POPULATION USING MACHINE LEARNING TECHNIQUES

ABSTRACT: Diabetes has a significant cost for health systems and the economy in general of countries, in addition to affecting the quality of life of people who suffer from it. Studying and analyzing the economic and clinical factors that trigger it allows us to identify the financial burden it represents and how policies and programs can be generated to support the prevention of this disease. This research aims to analyze the influence of socioeconomic and clinical factors on the Mexican population suffering from Diabetes. The

analysis methods that are applied are the machine learning technique. The results in the Mexican population show that deaths from Diabetes occur more frequently in the population between 20 and 59 years of age. The factors related to housing-urbanization, specifically homes without piped water and houses with dirt floors, as well as people without the right to social security, are the critical factors that correlate with deaths caused by Diabetes: Hypertension, pneumonia, chronic respiratory diseases, coronary diseases, and influenza.

Martínez-Velasco, A., & Terán-Bustamante, A. (2026). Determining the influence of socioeconomic and clinical factors in diabetes in the Mexican population using machine learning techniques. In E. Moya-Albor, H. Ponce, J. Brieva, S. L. Gomez-Coronel, & D. R. Torres (Eds.), *Machine learning methods in biomedical field. Studies in Computational Intelligence (SCI)* (Vol. 1218, pp. 335-362). Springer. https://doi.org/10.1007/978-3-031-96328-5_14. Book Chapter.

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MAKING BETTER MEDICAL DECISIONS USING MACHINE LEARNING: A BAYESIAN MODEL

ABSTRACT: Currently, most countries seek universal health coverage for all people; however, in the face of the crisis in health systems caused by the COVID-19 pandemic and the high demand for these services, it is more relevant to have tools that allow faster data taking. However, making medical decisions is one of the most complex processes. Artificial intelligence (AI) is a rapidly evolving field that can transform various aspects of healthcare, such as diagnosis, treatment, prevention, and management. However, to have confidence in the systems, the actors must ensure they are adequately trained to make correct decisions. This research analyzes medical decision-making through Bayesian networks with machine learning techniques. This research creates a methodology and model for making medical decisions based on artificial intelligence. The model shows critical factors that optimally influence decision-making to generate value that translates into patient health. The results show that optimal or non-optimal medical decision-making and its various aspects through the causality of the variables allow the interrelation to be more adequately captured to manage it. The most relevant factors for adequate decision-making are Ethical Issues, Risk/Benefit, Scientific Integrity, Transparent Decisions, Data Pre-processing and Curation, Performance Evaluation, and ML Model.

Terán-Bustamante, A., & Martínez-Velasco, A. (2026). Making better medical decisions using machine learning: A Bayesian model. In E. Moya-Albor, H. Ponce, J. Brieva, S. L. Gomez-Coronel, & D. R. Torres (Eds.), *Machine learning methods in biomedical field. Studies in Computational Intelligence (SCI)* (Vol. 1218, pp. 309-334). Springer. https://doi.org/10.1007/978-3-031-96328-5_13. Book Chapter.

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THE MOST RELEVANT FACTORS IN THE GENDER GAP IN EUROPEAN COUNTRIES

ABSTRACT: Gender equality is essential for the sustainable development of all countries. It brings economic growth, improved education and health for the entire population, poverty reduction, and social and political stability as democracy is strengthened and more peaceful communities are generated. However, its study is complex and includes various dimensions. This research aims to analyze the most relevant factors of the gender gap in European countries. The methodological strategy is based on machine learning techniques applied to the Gender Equality Index, which includes the EU27 countries and was developed by EIGE. These machine-learning techniques are methods computers use to learn from data and make predictions without being explicitly programmed. This index has 31 relevant indicators that are grouped into 14 subdimensions, which are, in turn, divided into six dimensions. The relevant dimensions in the study of gender equality are I. work (5 indicators), II. Money (4 indicators), III. Knowledge (3 indicators), IV. Time (4 indicators), V. power (8 indicators), and VI. Health (7 indicators). The results show a women's gap. Three of the most relevant dimensions from this research inhibit gender equity: I. Power in its three economic, political, and social dimensions; II. Knowledge in its two dimensions of attainment, participation, and segregation, and III. Time in its dimension of social activities. Women's most significant factors for the gender gap are power, knowledge, and time.

Martínez-Velasco, A., Terán-Bustamante, A., & DelaTorre-Díaz, L. (2025). The most relevant factors in the gender gap in European countries. In *Proceedings of the International Conference on Gender Research* (pp. 266-276). Academic Conferences International. <https://doi.org/10.34190/icgr.8.1.3263>. Conference Paper.

María de Lourdes Martínez Villaseñor
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A NOVEL ETHICAL DESIGN FRAMEWORK APPLIED TO IMAGE CLASSIFICATION CHALLENGES IN THE FASHION INDUSTRY

ABSTRACT: As artificial intelligence (AI) continues to play a pivotal role in image classification applications, the ethical implications of these technologies become increasingly significant. This paper explores the intersection of AI and ethics in the context of image classification, specifically focusing on the application of ethical design principles through a framework for a use of case in the fashion industry involving bags images and social media. This work delves into the integration of a comprehensive ethical framework around all the design process. The case study involves the development and implementation of a neural network tailored for bag image classification, leveraging transfer learning techniques. Through a meticulous examination of the ethical dimensions inherent in image classification, the study aims to establish a foundation for responsible and transparent AI practices.

Guillen-Alvarez, L., Martínez-Villaseñor, L., & Ponce, H. (2025). A novel ethical design framework applied to image classification challenges in the fashion industry. In L. Martínez-Villaseñor, B. Martínez-Seis, & O. Pichardo (Eds.), *Artificial intelligence. COMIA 2025. Communications in Computer and Information Science (CCIS)* (Vol. 2252, pp. 323-343). Springer. https://doi.org/10.1007/978-3-031-97907-1_26. Conference Paper.

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ETHICAL CONSIDERATIONS IN THE DEVELOPMENT OF RECOMMENDATION SYSTEMS: BOUTIQUE TRAVEL AGENCY

ABSTRACT: This paper explores the ethical implications of implementing a recommendation system within a boutique travel agency specialized in personalized group travel experiences. It covers legal frameworks, internal policies, risk-benefit analyses, and ethical design principles to ensure fair, transparent, and privacy-respecting use of AI.

Alcázar-Pérez, R., & Martínez-Villaseñor, L. (2025). Ethical considerations in the development of recommendation systems: Boutique travel agency. In L. Martínez-Villaseñor, B. Martínez-Seis, & O. Pichardo (Eds.), *Artificial intelligence.*

COMIA 2025. *Communications in Computer and Information Science (CCIS)* (Vol. 2252, pp. 344-354). Springer. https://doi.org/10.1007/978-3-031-97907-1_27. Conference Paper.

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ETHICAL CHALLENGES IN DEMAND PREDICTION: A CASE STUDY IN THE WHOLESALE GROCERY SECTOR

ABSTRACT: Artificial Intelligence (AI) has emerged as a transformative tool in inventory management and demand prediction within the wholesale grocery sector. By leveraging machine learning algorithms, businesses can analyze historical sales data, market trends, and seasonal variations to optimize inventory levels, reducing overstock and stockouts. AI-driven demand prediction models provide accurate forecasts, enabling wholesalers to anticipate customer needs and streamline supply chain operations. This article examines the ethical challenges associated with developing and implementing AI-driven demand prediction models in the wholesale grocery sector. As businesses seek to optimize their operations through artificial intelligence, significant ethical concerns arise that must be addressed to ensure responsible and fair implementation. This case study highlights the main ethical challenges identified in a grocery wholesaler, focusing on issues such as transparency, accountability, fairness, and human control. Through the analysis of a specific demand prediction model, we discuss how these ethical concerns not only influence user acceptance of the model but also impact operational efficiency and customer satisfaction. The article aims to contribute to the ongoing dialogue on ethics in data science, providing insights and recommendations for companies looking to adopt predictive technologies ethically.

Duarte, J., & Martínez-Villaseñor, L. (2025). Ethical challenges in demand prediction: A case study in the wholesale grocery sector. *Computación y Sistemas*, 29(1), 111-121. <https://doi.org/10.13053/CyS-29-1-5534>. Article.

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Daniel Adrián Contreras Olivas
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HUMAN-FRIENDLY EXPLANATION MODEL BASED ON THE ARISTOTELIAN PRACTICAL SYLLOGISM FOR REINFORCEMENT LEARNING AGENTS IN URBAN INTELLIGENT DESIGN

ABSTRACT: This paper introduces a novel explanation model for reinforcement learning agents, grounded in Aristotle's practical syllogism, with the goal of enhancing human-friendly explanations (HFEs) in urban intelligent design. By aligning the internal processes of a Q-learning agent with Aristotelian categories such as *telos*, *phronēsis*, and *bouleusis*, the model enables the interpretation of agent behavior as a form of ethically structured practical reasoning. The selected case study focuses on an urban planning agent designed to optimize service accessibility and spatial coherence in real city environments. Through this alignment, the agent's policy learning, state-action evaluation, and reward optimization are made intelligible to human users in terms of goals, normative principles, perception, deliberation, and action. Evaluated using the Human-Friendly Explanations (HFE) checklist, the model exhibits strengths in interpretability, comprehensibility, and ethical relevance, while identifying areas for improvement such as contrastive reasoning, personalization, and regulatory compliance. This work offers a conceptual and methodological foundation for integrating philosophical models into Explainable Reinforcement Learning (XRL), facilitating transparent, ethical, and user-aligned AI systems. Future directions include empirical validation, interactive implementation, and domain-specific adaptation across sociotechnical contexts.

Contreras, D. A., Martínez-Villaseñor, L., & Murillo, A. C. (2025). Human-friendly explanation model based on the Aristotelian practical syllogism for reinforcement learning agents in urban intelligent design. In L. Martínez-Villaseñor, R. A. Vázquez, & G. Ochoa-Ruiz (Eds.), *Advances in soft computing: MICAI 2025 Posters Track. Communications in Computer and Information Science (CCIS)* (Vol. 2712, pp. 37-54). Springer. https://doi.org/10.1007/978-3-032-08704-1_4. Conference Paper.

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MICAI AND THE MAKING OF AI IN MEXICO THROUGH 25 YEARS OF DATA-DRIVEN INSIGHT

ABSTRACT: This paper presents a comprehensive computational analysis of 25 years of research published in the proceedings of the Mexican International Conference on Artificial Intelligence (MICAI), the most influential AI conference in Mexico with a growing international reach. Using a combination of bibliometric techniques and unsupervised natural language processing methods such as topic modeling, the study traces the evolution of research priorities, collaborative networks, and the tone of scientific discourse over time.

The analysis identifies key topics and shifting patterns in the focus of AI research, from early work in logic and symbolic reasoning to more recent trends in machine learning, applied AI, and generative AI supported by large language models (LLMs).

In addition to its retrospective contribution, the study underscores the importance of systematic, meta-level analyses in

understanding and shaping national scientific agendas. By offering a data-driven portrait of MICAI's intellectual trajectory, the work serves as both a historical record and a strategic resource for the Mexican AI community. It provides insight for researchers, policy-makers, and institutions seeking to strengthen Mexico's position in the global AI landscape. The framework presented may also support the study of scientific evolution in other national and regional AI communities.

Avalos-Gauna, E., Palafox, L., & Martínez-Villaseñor, L. (2026). MICAI and the making of AI in Mexico through 25 years of data-driven insight. In L. Martínez-Villaseñor, R. A. Vázquez, & G. Ochoa-Ruiz (Eds.), *Advances in soft computing. MICAI 2025. Lecture Notes in Computer Science (LNAI)* (Vol. 16222, pp. 57-72). Springer. https://doi.org/10.1007/978-3-032-09044-7_5. Conference Paper.

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RISK FACTORS FOR HYPERTENSION AND HEALTH POLICY

ABSTRACT: Hypertension (HTN) remains a leading cause of global morbidity and mortality, with its prevalence rapidly increasing in middle-income countries like Mexico. This study leverages data from the National Health and Nutrition Survey (ENSANUT) 2022–2023 to identify significant risk factors for HTN using machine learning models and explainable artificial intelligence techniques. Methods: We analyzed 8,650 Mexican adults aged 20 years using logistic regression, random forest, and extreme gradient boosting (XGBoost) classifiers, optimized through Optuna framework. Hypertension was defined using ACC/AHA 2017 criteria (130/80 mmHg or previous diagnosis). SHAP, LIME, and ELI5 were employed for model interpretation. Performance was evaluated using stratified 5-fold cross-validation and external validation on ENSANUT 2023 data. Results: XGBoost demonstrated superior predictive performance (ROC-AUC: 0.758, F1-score: 0.703) compared to logistic regression and random forest. Key risk factors identified were age, body mass index (BMI), gender, family history of hypertension (maternal and paternal), and physical activity—particularly sedentary behavior. SHAP-based subgroup analysis revealed that age and BMI consistently emerged as the most influential factors across both genders, with family history of hypertension (maternal and paternal) also showing significant importance. Gender-specific differences were subtle, with similar risk factor patterns observed in men and women. Conclusions: Machine learning models, particularly XGBoost with explainable AI techniques, effectively predict hypertension risk using nationally representative Mexican data. These findings support implementation of ML-driven risk stratification in primary care and inform targeted public health interventions. The integration of

XAI methods provides transparent, interpretable predictions suitable for clinical decision-making and policy development in Mexico's healthcare system.

Navarro-Mentado, M., Martínez-Villaseñor, L., & Salazar-Altamirano, V. (2026). Risk factors for hypertension and health policy. In L. Martínez-Villaseñor, R. A. Vázquez, & G. Ochoa-Ruiz (Eds.), *Advances in soft computing. MICAI 2025. Lecture Notes in Computer Science (LNAI)* (Vol. 16222, pp. 457-471). Springer. https://doi.org/10.1007/978-3-032-09044-7_33. Conference Paper.

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Research Professor

PPSA: POLYNOMIAL PRIVATE STREAM AGGREGATION FOR TIME-SERIES DATA ANALYSIS

ABSTRACT: Modern data analytics requires computing functions on streams of data points from many users that are challenging to calculate, due to both the high scale and nontrivial nature of the computation at hand. The need for data privacy complicates this matter further, as general-purpose privacy-enhancing technologies face limitations in at least scalability or utility. Existing work has attempted to improve this by designing purpose-built protocols for the use case of Private Stream Aggregation; however, prior work lacks the ability to compute more general aggregative functions without the assumption of trusted parties or hardware.

In this work, we present PPSA, a protocol that performs Private Polynomial Stream Aggregation, allowing the private computation of any polynomial function on user data streams even in the presence of an untrusted aggregator. Unlike previous state-of-the-art approaches, PPSA enables secure aggregation beyond simple summations without relying on trusted hardware; it utilizes only tools from cryptography and differential privacy. Our experiments show that PPSA has low latency during the encryption and aggregation processes with an encryption latency of 10.5 ms and aggregation latency of 21.6 ms for 1000 users, which are up to 138 faster than the state-of-the-art prior work.

Januszewicz, A., Medrano Gutiérrez, D., Koirala, N., Zhao, J., Takeshita, J., Lee, J., & Jung, T. (2026). PPSA: Polynomial private stream aggregation for time-series data analysis. In S. Alrabaee, K.-K. R. Choo, E. Damiani, & R. H. Deng (Eds.), *Security and privacy in communication networks. SecureComm 2024. Lecture Notes of the Institute for Computer Sciences, Social-Informatics and Telecommunications Engineering, (LNICST)* (Vol. 627, pp. 14-33). Springer. https://doi.org/10.1007/978-3-031-94445-1_2. Conference Paper.

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Francisco Alejandro Orozco Argote

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FIXED START METHOD FOR REPETITIVE PROJECT SCHEDULING WITH SIMULATED ANNEALING

ABSTRACT: This research deals with the high project completion variability by presenting a new method to decrease such variability in repetitive construction projects. To achieve this, a Fixed Start Method (FSM) —where the starts of each activity with a high level of probabilistic confidence for the planned project duration are fixed— was applied, where the high level of probabilistic confidence obtained was optimized with the use of the metaheuristic algorithm called Simulated Annealing (SA). This procedure evaluated the project completion in a case study based on the coefficient of variance (COV) of the resulting standard deviation, mean, and temperature selected for the SA. Thus, the combined FSM and SA (FSSA) is a new method that decreases the variability of scheduling duration while achieving project completion times. Finally, the proposed FSSA method for construction scheduling was validated in a case study using Discrete Event Simulation.

Moreno, F., Forcael, E., Orozco, F., Baesler, F., & Agdas, D. (2025). Fixed start method for repetitive project scheduling with simulated annealing. *Heliyon*, 11(2), e41741. <https://doi.org/10.1016/j.heliyon.2025.e41741>. Article.

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AUTOMATIC ROBOTICS MEDICATION DELIVERY SYSTEM: THE ANDIS CASE STUDY

ABSTRACT: Hospitals face challenges such as nurse burnout and unproductive time utilization. Interviews with nurses and physicians revealed that 75% of their workday is dedicated to patient care and the remaining 25% could be considered unproductive due to other tasks such as manual record-keeping, canceled surgeries and postponed procedures. Streamlining tasks can free up nurses' time for better patient care. One of these tasks is medication delivery, which can be automated using autonomous delivery robots. In this regard, we propose the design of a small autonomous robot that delivers drugs inside hospitals to reduce the medical staff's workload. The proposed robotics system uses ultrasonic sensors and

fuzzy logic control for the avoidance of obstacle tasks. In addition, an AI camera and color indicators are used to identify the room and follow the designed trajectory to deliver the medication. Results showed that the robot navigates without colliding, and the final distance between the robot and the indicators was considered appropriate for medication delivery tasks. Furthermore, its maintenance is straightforward due to its uncomplicated mechanical design. Finally, the non-invasive nature of the colored indicators minimizes the visual impact on hospital environments.

Carbajal, P., Cobb, E., Hernández, C., Mejía, A., Menchaca, L., Murillo, A., Moya-Albor, E., Ponce, H., & Brieva, J. (2026). Automatic robotics medication delivery system: The ANDIS case study. In E. Moya-Albor, H. Ponce, J. Brieva, S. L. Gomez-Coronel, & D. R. Torres (Eds.), *Machine learning methods in biomedical field. Studies in Computational Intelligence (SCI)* (Vol. 1218, pp. 287-307). Springer. https://doi.org/10.1007/978-3-031-96328-5_12. Book Chapter.

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CHALLENGES AND ADVANCES IN DIGITAL PROCESSING OF FETAL PHONOCARDIOGRAPHY SIGNAL: A REVIEW

ABSTRACT: This chapter presents a state-of-the-art review of different investigations focused on Fetal Phonocardiography (fPCG). fPCG signals allow the identification of the fetus's cardiac alterations during pregnancy through a noninvasive and secure approach. However, fPCG signals present some challenges, for example: very weak signal sources, high levels of noise, source mixing, and significant signal attenuation. This work provides a review of available fPCG datasets and the methods proposed for source separation, extraction, and filtering of fPCG signals, as well as the methods for estimating fetal heart rate (fHR) and detecting fetal Heart Sounds (fHS). Additionally, since it is sometimes necessary to transmit or store fPCG signals, the chapter also discusses signal compression approaches and applications involving fPCG signals.

Moya-Albor, E., Brieva, J., Gomez-Coronel, S. L., & Renza, D. (2026). Challenges and advances in digital processing of fetal phonocardiography signal: A review. In E. Moya-Albor, H. Ponce, J. Brieva, S. L. Gomez-Coronel, & D. R. Torres (Eds.), *Machine learning methods in biomedical field. Studies in Computational Intelligence (SCI)* (Vol. 1218, pp. 161-187). Springer. https://doi.org/10.1007/978-3-031-96328-5_7. Book Chapter.

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EDGE-ENHANCED KNOWLEDGE DISTILLATION SYSTEM FOR DIABETIC RETINOPATHY LESIONS COMPUTER-AIDED DIAGNOSIS

ABSTRACT: This work addresses the challenge of deploying computationally intensive Deep Learning (DL) models for Diabetic Retinopathy (DR) lesion detection in clinical settings, particularly on resource-constrained edge devices. DR is a significant global health issue and a leading cause of preventable blindness, making early and accessible detection crucial. We propose a proof-of-concept system utilizing Knowledge Distillation (KD) to create a tiny, efficient DL model for DR lesion detection, specifically designed for embedding into retinal scanners via the NVIDIA Jetson Nano platform. Our novel approach employs a KD framework where a pre-trained Inception-v3 model acts as the 'teacher,' fine-tuned on fundus image data. This teacher model distills its knowledge into a compact 'student' model based on the MobileNet-v2 architecture, which is trained on a small, synthetically generated dataset optimized through an iterative distillation process using a custom loss function combining Kullback-Leibler divergence and Categorical Cross-Entropy. This method significantly reduces model size and computational requirements while maintaining high diagnostic accuracy, comparable to larger, state-of-the-art models. By enabling real-time, on-device analysis, this embedded AI solution enhances data privacy, ensures consistent performance, and improves the accessibility of advanced DR screening, particularly in remote or underserved healthcare environments. This makes AI-assisted DR detection feasible for widespread clinical adoption directly within scanning devices.

Lopez-Figueroa, A., Jacome-Herrera, S., Moya-Albor, E., Renza, D., & Brieva, J. (2026). Edge-enhanced knowledge distillation system for diabetic retinopathy lesions computer-aided diagnosis. In E. Moya-Albor, H. Ponce, J. Brieva, S. L. Gomez-Coronel, & D. R. Torres (Eds.), *Machine learning methods in biomedical field. Studies in Computational Intelligence (SCI)* (Vol. 1218, pp. 3-24). Springer. https://doi.org/10.1007/978-3-031-96328-5_1. Book Chapter.

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EVALUATION OF DATASET DISTRIBUTION IN BIOMEDICAL IMAGE CLASSIFICATION AGAINST IMAGE ACQUISITION DISTORTIONS

ABSTRACT: One of the conditions expected when training a machine learning model is that the inference data should be independently and identically distributed (i.i.d.) with respect to the training data. However, as the real world evolves, this condition can be lost, which is known as shift distribution. This situation can affect the performance of a machine learning model, so the question is how to evaluate (without training a model) the presence of shift distribution. Consequently, this paper presents a proposal to determine the degree of distribution shift in medical image datasets in the face of possible distortions due to the capture system. The methodology is based on Cumulative Spectral Gradient (CSG) metric and it is applied to three biomedical imaging datasets extracted from MedMNIST, an initiative that has compiled several standardized biomedical datasets: PneumoniaMNIST, BreastMNIST and RetinaMNIST. Thanks to this methodology, it is possible to evaluate which types of modifications have a greater impact on the generalization of the models, as well as to determine if there are classes more affected by corruptions.

Aguilera-González, S., Renza, D., & Moya-Albor, E. (2024). Evaluation of dataset distribution in biomedical image classification against image acquisition distortions. In *Proceedings of the 20th International Symposium on Medical Information Processing and Analysis, SIPAIM 2024* (pp. 1-6). IEEE. <https://doi.org/10.1109/SIPAIM62974.2024.10783583>. Conference Paper.

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IDENTIFYING AND MITIGATING LABEL NOISE IN DEEP LEARNING FOR IMAGE CLASSIFICATION

ABSTRACT: Labeling errors in datasets are a persistent challenge in machine learning because they introduce noise and bias and reduce the model's generalization. This study proposes a novel methodology for detecting and correcting mislabeled samples in image datasets by using the Cumulative Spectral Gradient (CSG) metric to assess the intrinsic complexity of the data. This methodology is applied to the noisy CIFAR-10/100 and CIFAR-10n/100n datasets, where mislabeled samples in CIFAR-10n/100n are identified and relabeled using CIFAR-10/100 as a reference. The DenseNet and Xception models pre-trained on ImageNet are fine-tuned to evaluate the impact of label correction on the model performance. Evaluation metrics based on the confusion matrix are used to compare the model performance on the original and noisy datasets and on the label-corrected datasets. The results show that correcting the mislabeled samples significantly improves the accuracy and robustness of the model, highlighting the importance of dataset quality in machine learning.

González-Santoyo, C., Renza, D., & Moya-Albor, E. (2025). Identifying and mitigating label noise in deep learning for image classification. *Technologies*, 13(4), 132. <https://doi.org/10.3390/technologies13040132>. Article.

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METAHEURISTIC STRATEGY IN AUTOMATIC ROBOTICS NAVIGATION FOR PATIENT CARE IN HOSPITALS

ABSTRACT: This chapter presents a novel approach for developing a global automatic navigation strategy for a mobile robot for patient care into health centers and hospitals. The proposal uses a metaheuristic strategy through the Grey Wolf Optimizer algorithm to find the shortest route between the robot's starting and patient destination points, while also integrating knowledge of the environment acquired through vision. The global navigation tracking is achieved through the use of Fuzzy Logic Rules to control the robot's wheel velocity according to its current position and orientation. The proposed strategy was implemented in a virtual robotics environment demonstrating that the approach successfully generated optimal paths for various environments with a minimal number of control points and in a relatively short amount of time. In addition, a simulated hospital room with common furniture and tasks was used to evaluate the performance of the global navigation strategy, demonstrating that the robot could successfully generate a global route and navigate within this environment.

Monroy-Rueda, I. J., Moya-Albor, E., Brieva, J., & Ponce, H. (2026). Metaheuristic strategy in automatic robotics navigation for patient care in hospitals. In E. Moya-Albor, H. Ponce, J. Brieva, S. L. Gomez-Coronel, & D. R. Torres (Eds.), *Machine learning methods in biomedical field. Studies in Computational Intelligence (SCI)* (Vol. 1218, pp. 221-239). Springer. https://doi.org/10.1007/978-3-031-96328-5_9. Book Chapter.

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CUTTING-EDGE TECHNOLOGIES: DRIVING SUSTAINABILITY IN HOSPITAL OPERATIONS

ABSTRACT: Hospitals play a vital role in health but also contribute significantly to environmental harm due to outdated practices and unstandardized sustainability strategies. This chapter identifies the urgent need for standardized, scalable, and tech-driven solutions to address hospital-generated emissions and waste. Through a review of recent literature, it explores how Industry 4.0 technologies—AI, ML, IoT, blockchain, and cloud computing—can enable real-time monitoring, predictive analytics, and secure environmental assessments. These innovations present a global opportunity to harmonize reporting, optimize resource use, and improve operational resilience. The roadmap outlined is designed for administrators, engineers, and policymakers to lead healthcare toward net-zero goals and digital sustainability leadership.

Magaña Ocaña, O. F., & Niembro-García, I. J. (2026). Cutting-edge technologies: Driving sustainability in hospital operations. In E. Moya-Albor, H. Ponce, J. Brieva, S. L. Gomez-Coronel, & D. R. Torres (Eds.), *Machine learning methods in biomedical field. Studies in Computational Intelligence (SCI)* (Vol. 1218, pp. 461-492). Springer. https://doi.org/10.1007/978-3-031-96328-5_19. Book Chapter.

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REDEFINING CARE: HOSPITALS' PIVOTAL ROLE IN SUSTAINABLE DEVELOPMENT

ABSTRACT: This chapter explores the evolution of hospitals from ancient institutions of healing into modern pillars of healthcare—now facing growing ethical and environmental contradictions. While designed to preserve life, hospitals also contribute to rising emissions, resource waste, and deepening health inequities, directly harming people's health and well-being. This chapter critically examines that paradox, tracing the historical role of hospitals and the industrial forces that have transformed them into complex—and often unsustainable—institutions. It presents a bold vision for their reinvention: one driven by Artificial Intelligence (AI), Machine Learning (ML), IoT, blockchain, and sustainable cloud computing. These technologies equip hospitals with the tools to monitor their environmental footprint, optimize operations, and collaborate globally through standardized, transparent data systems. Ultimately, this chapter calls for a technological transformation in sustainability reporting, positioning hospitals not only as providers of high-quality care, but as pioneers of environmental responsibility and ethical governance in the healthcare sector.

Niembro-García, I. J., & Magaña Ocaña, O. F. (2026). Redefining care: Hospitals' pivotal role in sustainable development. In E. Moya-Albor, H. Ponce, J. Brieva, S. L. Gomez-Coronel, & D. R. Torres (Eds.), *Machine learning methods in biomedical field.*

Studies in Computational Intelligence (SCI) (Vol. 1218, pp. 437-459). Springer. https://doi.org/10.1007/978-3-031-96328-5_18. Book Chapter.

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A MIXED INTEGER FORMULATION AND AN NSGA-II FOR THE CUMULATIVE CAPACITATED VEHICLE ROUTING PROBLEM WITH PRIORITY INDEXES

ABSTRACT: The aim of the paper presented herein is to propose a new mixed integer formulation and an efficient metaheuristic for the Biobjective Cumulative Capacitated Vehicle Routing Problem that incorporates Priority Indexes, an extension of the classical capacitated vehicle routing problem (CCVRP) in which customers are served according to a certain level of preferences by a fixed fleet of heterogeneous vehicles. In this problem, the objectives to minimize consist of (i) the total latency and (ii) the total tardiness of the system. The proposed formulation is based on the multilevel network model for the single objective CCVRP and is implemented via AUGMECON -II. The exact approach proved effective by solving instances of up to 15 nodes in reasonable computational times. In addition, an NSGA-II scheme was designed to deal with larger instances at competitive computational times. This algorithm displayed efficient performance by providing high-quality solutions for instances of up to 100 nodes. Likewise, a comparative analysis was conducted between the proposed approaches and a Particle Swarm Optimization algorithm already presented in the literature. The results indicate the superiority of both of our proposed approaches in providing high-quality Pareto fronts in competitive computational times.

Corona-Gutiérrez, K., Nucamendi-Guillén, S., Martínez-Salazar, I., & Marcos Moreno-Vega, J. (2025). A mixed integer formulation and an NSGA-II for the cumulative capacitated vehicle routing problem with priority indexes. *IEEE Access*, 13, 74499-74520. <https://doi.org/10.1109/ACCESS.2025.3560896>. Article.

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Senior Researcher D, SNII Level I

María Alejandra López Ceballos
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PREDICTING POSTPARTUM DEPRESSION IN MATERNAL HEALTH USING MACHINE LEARNING

ABSTRACT: Postpartum depression (PPD) is a severe mental health condition affecting mothers after childbirth, characterized by prolonged sadness, anxiety, and fatigue. Unlike the transient “baby blues,” PPD’s symptoms can last months, impacting a mother’s ability to care for herself and her baby. In the U.S., PPD affects about 1 in 7 women, with a significant rise in prevalence from 13.8% to 19.8% in recent years. This condition leads to adverse effects on maternal and infant health. Early diagnosis and treatment of PPD can help prevent longterm depression and minimize the emotional and financial burden associated with the condition. This research aims to evaluate machine learning models to predict PPD risk. Critical factors were identified, and an accuracy of 96.57% and a precision of 99.88% were obtained. This predictive model enables early, personalized interventions, aiming to improve maternal health outcomes and reduce the societal burden of PPD.

Terreros-Lozano, M. A., Lopez-Soto, D., Nucamendi-Guillén, S., & López-Ceballos, M. A. (2025). Predicting postpartum depression in maternal health using machine learning. In *Proceedings of the 14th International Conference on Operations Research and Enterprise Systems (ICORES 2025)* (Vol. 1, pp. 255-263). SciTePress. <https://doi.org/10.5220/0013155700003893>. Conference Paper.

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THE LATENCY LOCATION ROUTING PROBLEM WITH SPLIT DELIVERIES: MATHEMATICAL FORMULATION AND METAHEURISTIC ALGORITHM

ABSTRACT: Integrating location and routing into a unified decision-making framework offers a more comprehensive reflection of real-world scenarios where different facility layouts directly influence routing plans. Consequently, addressing the issue holistically becomes imperative, especially when considering service level metrics like customer waiting times. In this paper, we address the latency location routing problem with opening costs and split deliveries (LLRP-OCSD). This complex problem involves optimizing the design of a supply chain network by determining depot locations, assigning vehicles and demand nodes to these depots, and designing routes. This must be done while accommodating split deliveries and prioritizing minimizing waiting times for demand nodes. We formulate a mathematical model and propose an iterated local search (ILS) algorithm to solve the problem. To validate the performance of our approach, we adapted a set of benchmark instances previously used for LLRP-OC without considering split deliveries. Computational results demonstrate that the proposed model is able to optimally solve only 2 out of the 38 tested instances within a 2-hour timeframe. On the other hand, the proposed ILS

algorithm is able to find good-quality solutions in significantly less computational time for the LLRP-OCSD. Extensive experimentation on larger instances (up to 200 nodes) yields consistent results within reasonable computational limits. In summary, our findings highlight how split deliveries enhance vehicle utilization, enabling the use of smaller vehicles and creating balanced routes with minimal increases in latency costs.

Nucamendi-Guillén, S., Gómez-Rocha, J. E., Camacho-Vallejo, J.-F., Moraga Pardo, J. A., & González-Ramírez, R. G. (2026). The latency location routing problem with split deliveries: Mathematical formulation and metaheuristic algorithm. *International Transactions in Operational Research*, 33(3), 1609-1635. Article.

Samuel Moisés Nucamendi Guillén
Senior Researcher D, SNII Level I

THE UNRELATED PARALLEL MACHINE SCHEDULING PROBLEM WITH SEQUENCE AND MACHINE DEPENDENT SETUP TIMES AND A SHARED RESOURCE WITHOUT OVERLAP

ABSTRACT: This paper addresses with minimizing the makespan in unrelated parallel machines with sequence and machine-dependent setup times involving a non-overlapping shared resource. The shared resource corresponds to an operator who can service one machine at a time to perform setup operations when it is necessary to change the type of job to be processed. We develop two Mixed Integer Linear Programming (MILP) formulations and a metaheuristic algorithm that combines an Iterated Greedy scheme with Variable Neighborhood Descent (IG + VND). Both approaches were compared with existing models and algorithms from the literature. The results indicate that the proposed formulation outperforms previous models present in the literature in instances of up to 14 jobs and 4 machines. The algorithm reported average deviations within 5 % of the solutions obtained by the model, but performed up to 3 orders of magnitude faster. Similarly, the proposed IG+VND outperformed the other algorithms in the literature, particularly for instances of up to 40 jobs and 6 machines, and obtained solutions for instances of up to 60 jobs and up to 6 machines.

G.-de-Alba, H., Nucamendi-Guillén, S., Avalos-Rosales, O., & Ángel-Bello, F. (2025). The unrelated parallel machine scheduling problem with sequence and machine dependent setup times and a shared resource without overlap. *EURO Journal on Computational Optimization*, 13, 100117. <https://doi.org/10.1016/j.ejco.2025.100117>. Article.

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Alfredo Segismundo Ramos Jiménez
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A CAPACITATED VEHICLE ROUTING MODEL FOR DISTRIBUTION AND REPAIR WITH A SERVICE CENTER

ABSTRACT: Background: Distribution systems often face the dual challenge of delivering products to customers and retrieving damaged items for repair, especially when the service center is separate from the depot. An optimized solution to this logistics problem produces benefits in terms of costs, greenhouse gas emissions, and disposal reduction. Methods: This research proposes a Capacitated Vehicle Routing Problem with Service Center (CVRPwSC) model to determine optimal routes involving customers, the depot, and the service center. AMPL-Gurobi was used to solve the model on adapted instances and new instances developed for the CVRPwSC. Additionally, a Variable Neighborhood Search (VNS) algorithm was implemented and compared with AMPL-Gurobi. Results: The model was applied to a real-world case study, achieving a 40% reduction in fuel costs, a reduction from 5 to 3 routes, and a sustainable logistics operations model with potential reductions of greenhouse gas emissions and item disposals. Conclusions: The main contribution of the proposal is a minimum-cost routing model integrating item returns for repair with customer deliveries, while the limitation is the exclusion of scenarios where return items exceed vehicle capacity. Finally, future research will enhance the CVRPwSC model by incorporating additional constraints and decision variables to address such scenarios.

Rojas-Cuevas, I.-D., Olivares-Benitez, E., Ramos, A. S., & Nucamendi-Guillén, S. (2025). A capacitated vehicle routing model for distribution and repair with a service center. *Logistics*, 9(1), 28. <https://doi.org/10.3390/logistics9010028>. Article.

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A MULTI-OBJECTIVE SUSTAINABLE CLOSED-LOOP SUPPLY CHAIN NETWORK PROBLEM WITH HYBRID FACILITIES

ABSTRACT: A sustainable closed-loop supply chain network requires conjunctive implementation of reverse logistics in the supply chain, with decisions that consider economic, environmental, and social factors. In real life, the problem needs to be addressed by prioritizing targets or interacting between them to give a range of solutions to the decision maker. In this context, this work proposes a novel multi-objective sustainable closed-loop supply chain network problem based on the revised network design model with hybrid recovery centers minimizing (1) the total economic cost, (2) the CO₂ emission of vehicles used, and (3) the total obnoxious distance. The latter objective is a novel implementation of the social dimension of a sustainable model. A sensitivity analysis of the multi-objective model is developed through ANOVA. A dataset of instances was generated to test the model and the solution methods, which are configured with AUGMECON2, a linear programming relaxation implemented to improve the CPU time, and AUGMECON2-EXTENDED to obtain more solutions to avoid exploring all space of the solution. The results show that an AUGMECON2-EXTENDED implementation outperforms all the selected performance metrics. These performance metrics include NPS, CPU time, RPOS, QM, and HV. The results show an improvement on average of at least 50%, 60%, 90%, 60%, and 5.7%, respectively, in those metrics, in comparison to other implementations.

Rodríguez-Escoto, J.-N., Olivares-Benitez, E., Nucamendi-Guillén, S., & Drzymalski, J. (2025). A multi-objective sustainable closed-loop supply chain network problem with hybrid facilities. *International Transactions in Operational Research*, 32(6), 3497-3527. <https://doi.org/10.1111/itor.13523>. Article.

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Juan Martín Orejel Orejel
Research Professor

AN AIRLINE PROFIT MANAGEMENT MODEL WITH OVERBOOKING AND NO-SHOWS

ABSTRACT: This research presents a model for airline profit optimization considering information such as demand forecasts, seat inventory, operational costs, overbooking penalties, expected no-shows, and time-dependent fare classes. The main decisions in the model are the selection of the aircraft, the number of seats sold per fare, including overbooking, and the number of denied seats. The model incorporates probabilistic information, like the expected demand and the expected proportion of no-shows. The model is constructed as a deterministic mixed-integer program. Some data was estimated using information acquired from different industry sources, and some data was set with reasonable estimations. A factorial experiment was designed to understand the importance of different parameters. The input variables were the overbooking compensation penalty, the no-show probabilities per fare and time block, and the seat demand. Using a statistical analysis, it was determined that the no-show estimation has the most significant impact on the total revenue, and the demand forecast after that. These results highlight the importance of precise estimations to increase the airline's profit.

Olivares-Benitez, E., Orozco, A. P., Orejel, J., & Zuniga, C. (2025). An airline profit management model with overbooking and no-shows. In *Proceedings of the 14th International Conference on Operations Research and Enterprise Systems (ICORES 2025)* (Vol. 1, (pp. 264-270). SciTePress. <https://doi.org/10.5220/0013159900003893>. Conference Paper.

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EXPLORING FAIRNESS AND CENTRALISATION IN INSULAR WASTE COLLECTION SYSTEMS

ABSTRACT: This paper studies a household waste collection problem to serve a set of rural islands. The problem is modelled as an Insular Travelling Salesman Problem (InTSP), which simultaneously optimises port selection decisions for a set of islands or isolated regions to be served, along with the optimal maritime visit sequence for the selected ports. The problem considers two types of costs, the Maritime Transportation Cost incurred by a vehicle for visiting all the selected ports, and the Ground Transportation Cost incurred by island inhabitants to move the freight from (to) the selected ports. Based on an existing Extended Stakeholder Network Structure, this research aims to simultaneously balance fairness and efficiency among the islands, in addition to control the centralisation level in decision making process by contrasting the central level (i.e., maritime operations), and the regional or island level (i.e., ground operations). This research enhances the literature by proposing a baseline formulation of an Extended Goal Programming Model along with three distinct variants of normalisation. Results of a real-world application of insular routing in Southern Chile are

presented, discussing the advantages and shortcomings of each formulation. The results show the advantages of employing the proposed modelling approach when addressing the studied problem from managerial and political perspectives. Choosing the appropriate normalization significantly affects the number and diversity of obtained solutions, which may finally enhance the decision-making process. The results denote how increasing efficiency may lead to "unfair" solutions in terms of perceived ground transportation cost by inhabitants of different islands.

Miranda-Gonzalez, P. A., Jones, D., Olivares-Benitez, E., & Olivares-Alvarez, L. (2025). Exploring fairness and centralisation in insular waste collection systems. *Results in Engineering*, 28, 107449. <https://doi.org/10.1016/j.rineng.2025.107449>. Article.

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MULTIOBJECTIVE MODEL TO OPTIMIZE CHARGING STATION LOCATION FOR THE DECARBONIZATION PROCESS IN MEXICO

ABSTRACT: Electric vehicles (EVs) offer significant potential for advancing sustainable environmental goals. However, their widespread adoption has been concentrated in urban areas, raising challenges for interurban travel. In many countries, charging station networks are primarily located within cities, highlighting a key opportunity for expansion to support longer distance journeys. This article addresses the facility location problem for EV charging stations to enable interurban travel. We propose a multiobjective optimization model based on the flow refueling location model with three objectives: maximizing CO2 emissions reduction, minimizing total costs, and reducing user charging time. The model is solved using an epsilon constraint approach, and Mexico's charging station network is used as a case study. Through computational experiments, various scenarios are evaluated, and a comparative analysis is performed between electric and internal combustion vehicles. Results show that deploying 20 strategically located charging stations could mitigate 3.1 million tons of CO2, requiring an investment of nearly USD 3.9 million.

Ruiz-Barajas, F., Olivares-Benitez, E., Ramirez-Nafarrate, A., & González-Ramírez, R. G. (2025). Multiobjective model to optimize charging station location for the decarbonization process in Mexico. *International Transactions in Operational Research*, 32(6), 3211-3231. <https://doi.org/10.1111/itor.13611>. Article.

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TRADE-OFF OPTIMIZATION OF A LOCATION-ROUTING PROBLEM INVOLVING OPEN ROUTES AND FLEXIBLE FLEET: A CASE STUDY IN GUADALAJARA, MEXICO

ABSTRACT: This study investigates a location-routing problem with self-supply, open routes, and a fixed fleet, focusing on the trade-off between total traveling costs and vehicle contracting costs. A bi-objective approach is developed, comparing the impact of minimizing traveling costs versus vehicle contracting costs, which is the cost associated with vehicle selection. The model is solved using three multi-objective methods: improved augmented epsilon constraint, weighted revised multi-choice goal programming, and chebyshev-based method, to determine the most suitable for the proposed approach. The methods are tested on three instances, two with homogeneous fixed fleets and one with a heterogeneous fixed fleet. Four performance metrics are used to compare the methods, and a real-world case study in Guadalajara, Mexico, is also solved. The results show that the augmented epsilon constraint method outperforms the other methods, improving on average up to 40% in NPS, 50% in CPU time, and 30% in performance metrics. The study also finds that homogeneous instances have, on average, up to 87% unused utilization capacity, while heterogeneous instances have 26% unused capacity. The economic analysis shows that reducing transport costs, on average, by 40% requires a 200% increase in hiring costs for homogeneous instances and a 60% increase for heterogeneous instances to obtain a reducing transport cost of 30%. A bi-objective approach achieves substantial cost savings of over 18% for the company.

Rodríguez-Escoto, J. N., Nucamendi-Guillén, S., & Olivares-Benitez, E. (2025). Trade-off optimization of a location-routing problem involving open routes and flexible fleet: A case study in Guadalajara, Mexico. *TOP*, 33(3), 511-547. <https://doi.org/10.1007/s11750-024-00690-y>. Article.

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Francisco Moreno Abril
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BARRIERS TO BIM IMPLEMENTATION IN BRIDGE CONSTRUCTION: A CASE STUDY

ABSTRACT: The purpose of this research was to find the barriers that hinder the implementation of BIM in bridge projects (BrIM). This was done by a bibliographic analysis and the application of an evaluation tool to a case study, corresponding to a Chilean road project with an important number of bridges. Based on the literature, twenty-three barriers were found, which were then validated through the application of the survey to the case study, resulting in the main barriers: "Interoperability problems between different BIM software", and "Differences between BIM for buildings and BIM for bridges". Then, a risk analysis was run, concluding that the barriers in bridge projects cause high levels of impact when implementing BIM. Thus, this research may help project and engineering managers to have a first approximation to the most recurring barriers in BrIM and how to rank them according to their impact. Finally, for future research, the findings of this study can be extended to other complex projects—such as bridges—but with different levels of uncertainty, that allow finding new barriers or confirm those found here.

Forcael, E., Castro, A., Bedwell, F., Casanova, E., Orozco, F., & Moreno, F. (2023). Barriers to BIM implementation in bridge construction: A case study. In *Annual Conference of the International Group for Lean Construction, IGLC31* (pp. 128-139). IGLC. <https://doi.org/10.24928/2023/0211>. Conference Paper.

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Julieta Domínguez Soberanes
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A HISTORICAL REVIEW OF THE TECHNOLOGY USED FOR THE STUDY OF FRESHNESS IN RED MEATS

ABSTRACT: Meat is a high-quality source of protein, vitamins, and minerals, making it a fundamental component of the human diet. Ensuring the availability of fresh meat is, therefore, essential for both consumers and the food industry. Traditional methods for assessing meat freshness, such as sensory evaluation and chemical analysis, are often manual, time-consuming, costly, and may lead to human interpretation errors. In contrast, advanced non-destructive technologies—supported by data-driven analysis—offer efficient,

accurate, and objective alternatives. This review provides a comprehensive historical overview of the methods used to assess red meat freshness, including their advantages, limitations, and applications. Furthermore, it discusses state of the art data analysis techniques to enhance detection accuracy, highlighting the potential for industrial implementation and the challenges that must be addressed.

Nava-Granados, J., Orvañanos-Guerrero, M. T., Sánchez, C. N., & Domínguez-Soberanes, J. (2025). A historical review of the technology used for the study of freshness in red meats. *IEEE Access*, 13, 117119-117134. <https://doi.org/10.1109/ACCESS.2025.3585491>. Review.

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FUZZY RULE-BASED COMBINATION MODEL FOR THE FIRE PIXEL SEGMENTATION

ABSTRACT: Color-feature-based wildfire pixel segmentation has become a challenging task extensively addressed in various research studies. Rule-based models aim to identify fire pixels in a binary manner by determining whether the pixel intensity exceeds a specified threshold value. The authors determine the thresholds by analyzing diverse collections of images that contain wildfires. This has resulted in a lack of consensus on the thresholds determined by various researchers, even when the same color space is used during the examination process. Additionally, determining fire pixels in a binary manner complicates the handling of uncertainty and vagueness in color information. This research aims to enhance fire-pixel segmentation by integrating color-based rule models with a fuzzy set approach, which effectively addresses uncertainty and vagueness. The proposed approach automatically learns the optimal set of fuzzy operators and rules for fire detection to construct a combined model. To address the limitations of combining binary class labels, this approach modifies the rule form proposed by various authors to obtain a fuzzy set of data, such as a grayscale fire map, instead of a crisp set of data, such as a binary fire map. In addition, our proposal uses a genetic algorithm approach to construct the best combination model. The final binary form of the fire map is calculated using the widely used Otsu method. The presented method is evaluated qualitatively and quantitatively in a well-accepted dataset designed for wildfire pixel segmentation tasks. The model obtained outperforms state-of-the-art rules and traditional strategies for combining binary labels in the F-measure and IoU metrics.

Lopez-Alanis, A., de-la-Torre-Gutierrez, H., Hernández-Aguirre, A., & Orvañanos-Guerrero, M. T. (2025). Fuzzy rule-based combination model for the fire pixel segmentation. *IEEE Access*, 13, 52478-52496. <https://doi.org/10.1109/ACCESS.2025.3554140>. Article.

María Teresa Orvañanos Guerrero
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PERFORMANCE COMPARISON OF MULTI-OBJECTIVE OPTIMIZERS FOR DYNAMIC BALANCING OF SIX-BAR WATT LINKAGES USING A FULLY CARTESIAN MODEL

ABSTRACT: Balancing mechanisms require the minimization of both the Shaking Moment (*ShM*) and Shaking Force (*ShF*), a complex multi-criteria challenge often tackled using single-objective algorithms. However, these methods face difficulties in navigating competing objectives. In contrast, multi-objective algorithms provide a more efficient and adaptable framework, while Fully Cartesian Coordinates (*FCC*) simplify the balancing equations compared to conventional Cartesian formulations. This study focuses on optimizing the dynamic balance of a six-bar Watt linkage using *FCC*. A wide set of optimization methods is analyzed and compared, and among them, the S-Metric Selection Evolutionary Multi-objective Optimization Algorithm (SMS-EMOA) demonstrates superior performance. This algorithm achieves the most significant hypervolume value in only 10.44 min of execution. The results indicate that multi-objective algorithms outperform single-objective approaches, offering faster and more diverse optimization solutions. Additionally, this study introduces an analytical method that enables the straightforward identification of removable counterweights, achieving an equally effective balance while minimizing the number of counterweights required.

Orvañanos-Guerrero, M. T., Sánchez, C. N., Robles-Jiménez, L. E., & Gómez-Delgado, S. C. (2025). Performance comparison of multi-objective optimizers for dynamic balancing of six-bar Watt linkages using a fully Cartesian model. *Applied Sciences*, 15(13), 7543. <https://doi.org/10.3390/app15137543>. Article.

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María de Lourdes Martínez Villaseñor
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CONTRASTIVE STEERING VECTORS FOR AUTOENCODER EXPLAINABILITY

ABSTRACT: Generative models, particularly autoencoders, often function as black boxes, making it challenging for non-expert users to effectively control the generation process and understand how inputs affect outputs. Existing methods for improving interpretability and control frequently require specific model training regimes or labeled data, limiting their applicability. This work introduces a novel approach to enhance the controllability and explain-

ability of generative models, specifically tested on autoencoders with entangled latent spaces. We propose using a semi-supervised contrastive learning setup to learn steering vectors. These vectors, when added to an input's latent representation, effectively manipulate specific attributes in the generated output without conditional training of the model or attribute classifiers, thus being applicable to pretrained models and avoiding compound classification errors. Furthermore, we leverage these learned steering vectors to interpret and explain the decoding process of a target attribute, allowing for efficient exploration of feature dimension interactions and the construction of an interpretable plot of the generative process, while lowering scalability limitations of perturbation-based Explainable AI (XAI) methods by reducing the search space. Our method provides an efficient pathway to controllable generation, offers an interpretable result of the model's internal mechanisms, and relates the interpretations to human-understandable explanation questions.

González Mora, J. G., Ponce, H., & Martínez-Villaseñor, L. (2025). Contrastive steering vectors for autoencoder explainability. *Electronics*, 14(18), 3586. <https://doi.org/10.3390/electronics14183586>. Article.

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DESIGN AND PROTOTYPING OF A BIO-INSPIRED ROBOTIC TAIL

ABSTRACT: Bio-inspired robotics, which involves observing and replicating the behavior of natural systems, has driven significant innovation in the technical development of robotic components. A primary objective within this field is to emulate the sophisticated internal functions of animals to solve complex engineering challenges, such as control and stability. While the integration of bio-mimetic tails in robotic systems is not new, with applications ranging from running to walking robots, existing designs are often limited in their functionality. Currently, most robotic tails primarily offer stability within static or limited dynamic contexts. The objective of this work is to design a preliminary robotic tail inspired by the cheetah's tail, using hard and soft materials. Design and prototyping are discussed in the paper. We anticipate that this robotic tail can be used in the context of dynamic stability of quadruped robots.

Ponce, H., & Ramírez, A. (2026). Design and prototyping of a bio-inspired robotic tail. In M. Acevedo, L. Valdivia, & H. Ponce (Eds.), *Multibody mechatronic systems. MuSMe 2025. Mechanisms and machine science, (Mechan. Machine Science)* (Vol. 195, pp. 272-281). Springer. https://doi.org/10.1007/978-3-032-10862-3_25. Conference Paper.

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DESIGN OF AN UNDERWATER MECHATRONICS SYSTEM FOR DETECTING DISSOLVED SOLIDS IN WATER

ABSTRACT: Marine pollution has been one of the most important problems we need to address in modern days, as it can cause an imbalance in the marine life of a body of water. This work presents a proof-of-concept of an underwater unmanned autonomous vehicle for detecting dissolved solids. The system was designed based on the mechatronics engineering model, so that it can move around a body water while measures the solid particles in water. The preliminary results are promising, and we anticipate the use of this low-cost system to help measuring water pollution in near city body waters.

Estudillo, E., Bautista, L., Cardenas, G., Mendoza, A., Perez, F., Hernandez, F., Ponce, H., Moya-Albor, E., & Brieva, J. (2024). Design of an underwater mechatronics system for detecting dissolved solids in water. In *Proceedings - 2024 IEEE International Conference on Machine Learning and Applied Network Technologies, ICMLANT 2024* (pp. 132-137). IEEE. <https://doi.org/10.1109/ICMLANT63295.2024.00028>. Conference Paper.

Hiram Eredín Ponce Espinosa
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MODULAR IOT HYDROPONICS SYSTEM

ABSTRACT: Hydroponics offers a promising alternative to soil-based agriculture, enabling higher yields, resource efficiency, and improved crop quality. This study compares traditional hydroponic setups with systems enhanced through the Internet of Things (IoT) framework using the Nutrient Film Technique and a proportional-integral controller, focusing on growth performance and environmental control. Systems incorporating Internet of Things technology achieved a growth rate of 0.94 cm/day versus 0.16 cm/day for conventional setups, due to precise water temperature control, optimized lighting, data acquisition, targeted nutrients, and reduced pest incidence. The integration of Industry 4.0 principles further enhances sustainable production and resource management. Statistical validation under diverse conditions is recommended. Future work will add environmental sensors, refine mechanical design, and explore machine learning for adaptive control, highlighting the

potential of Internet of Things-based hydroponics to transform agriculture through intelligent, efficient, and eco-friendly cultivation.

Aranda Barrera, M. F., & Ponce, H. (2025). Modular IoT hydroponics system. *Horticulturae*, 11(11), 1306. <https://doi.org/10.3390/horticulturae11111306>. Article.

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PREDICTING SUBSTANCE ADDICTION IN UNIVERSITY STUDENTS: A DSM-5-GUIDED MACHINE LEARNING MODEL

ABSTRACT: Substance use among university students is a growing health concern that is often overlooked until it escalates into a full-grown disorder. This study presents a multiclass machine learning model for predicting substance use risk levels based on DSM-5 diagnostic criteria and psychosocial factors such as trauma, academic stress and social networks. Data were collected through a survey answered by university students, the resulting dataset was used to train and compare multiple models. After performing feature selection, class balancing and hyperparameter tuning, the best performing and most accurate model, was a logistic-regression model that achieved a macro F1-score of 0.946. More notably however, the model showed improved sensitivity for mild-risk cases, which tend to go undetected in binary classification schemes. These results support the integration of clinically based machine learning models, into educational institutions health protocols.

Bustamante, P. G., & Ponce, H. (2026). Predicting substance addiction in university students: A DSM-5-guided machine learning model. In L. Martínez-Villaseñor, R. A. Vázquez, & G. Ochoa-Ruiz (Eds.), *Advances in soft computing. MICAI 2025. Lecture Notes in Computer Science (LNAI)* (Vol. 16221, pp. 16-27). Springer. https://doi.org/10.1007/978-3-032-09037-9_2. Conference Paper.

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PRE-TRAINED MODELS FOR GRAMMATICAL ERROR CORRECTION IN HEALTHCARE-SPECIFIC TEXT

ABSTRACT: Grammatical Error Correction (GEC) is a common Natural Language Processing task and has been studied extensively in the field. There is an added complexity when trying to correct domain-specific text that is uncommon in general-purpose

corpora. In this paper, we present a comparative study of three different approaches using pre-trained language models for Grammatical Error Correction in healthcare-specific text. We evaluated the performance of all proposals using the GLEU score metric, which allows a quantitative comparison of all methods. We utilized two different problem settings: first, a sequence-to-sequence pre-trained T5 model, followed by a fine-tuning process over a small set of examples. The second model is a pre-trained large language model, for which we test both zero-shot and few-shot in-context learning. The study shows how the fine-tuned T5 model is capable of exceeding the performance shown by the LLM tested. With this result, we show how smaller encoder-decoder models can solve domain-specific tasks with fewer parameters than a purely generative pre-trained LLM.

González Mora, G., & Ponce, H. (2026). Pre-trained models for grammatical error correction in healthcare-specific text. In L. Martínez-Villaseñor, R. A. Vázquez, & G. Ochoa-Ruiz (Eds.), *Advances in soft computing. MICAI 2025. Lecture Notes in Computer Science (LNAI)* (Vol. 16221, pp. 347-356). Springer. https://doi.org/10.1007/978-3-032-09037-9_27. Conference Paper.

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SONG SENSE: DELVING INTO MUSIC MOODS THROUGH MACHINE LEARNING

ABSTRACT: This article describes a machine learning model to identify the feelings generated by songs in a family group. Two models were compared: Support Vector Machines and Random Forest, to determine the precision in musical recommendation. A data set with songs of various genres and associated emotions was used. Natural language processing and feature extraction techniques were applied. The models were evaluated with metrics such as accuracy, precision, and F1 score. Both models performed well in sentiment identification, but Random Forest showed a slight advantage (82% of accuracy in testing). It is concluded that Random Forest is more effective for generating musical recommendations based on feelings. This study demonstrates the potential of machine learning in understanding musical emotions and provides a solid foundation for personalized recommendation systems in music.

Prado, A., & Ponce, H. (2024). Song sense: Delving into music moods through machine learning. In *Proceedings - 2024 IEEE International Conference on Machine Learning and Applied Network Technologies, ICMLANT 2024* (pp. 138-142). IEEE. <https://doi.org/10.1109/ICMLANT63295.2024.00029>. Conference Paper.

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TOWARDS A DISTRIBUTED-BASED LEARNING ROBOT FROM SCRATCH VIA NEURO- EVOLUTIONARY COMPUTATION

ABSTRACT: In the context of Industry 4.0, multi-robot systems (MRS) have become essential for enhancing the adaptability and efficiency of flexible manufacturing systems, enabling rapid responses to market demands through personalized customization. Effective collaboration among multiple robots requires advanced communication, shared goal alignment, and the ability to gather and process environmental data to execute coordinated actions with precision. Despite their advantages, improving efficiency of robot learning still remains a crucial challenge, particularly in flexible manufacturing multi-robot systems, where generalization across diverse scenarios is essential for effective deployment. In this work, we propose the use of neuro-evolutionary computation to solve the particular learning-from-scratch problem in a multi-robot system. This approach consists of an architecture of a decentralized MRS in which a local controller per robot is based on Artificial Hydrocarbon Networks machine learning model. Also, it includes a learning strategy via Wound Treatment Optimization algorithm. We implement the architecture in a simulated environment to solve the mountain car domain. Experimental results and a comparison with reinforcement learning validate the ability of this approach to learn a task from scratch without prior explicit data. We anticipate the applicability of this approach in smart factories or autonomous vehicles.

Ponce, H., & Martínez-Villaseñor, L. (2026). Towards a distributed-based learning robot from scratch via neuro-evolutionary computation. In L. Martínez-Villaseñor, R. A. Vázquez, & G. Ochoa-Ruiz (Eds.), *Advances in soft computing. MICAI 2025. Lecture Notes in Computer Science (LNCS)* (Vol. 16222, pp. 100-114). Springer. https://doi.org/10.1007/978-3-032-09044-7_8. Conference Paper.

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A TRANSFORMER-BASED MULTI-TASK LEARNING MODEL FOR VEHICLE TRAFFIC SURVEILLANCE

ABSTRACT: Vehicle traffic surveillance (VTS) systems are based on the automatic analysis of video sequences to detect, classify, and track vehicles in urban environments. The design of new VTS systems requires computationally efficient architectures with high performance in accuracy. Conventional approaches based on multi-stage pipelines have been successfully used during the last decade. However, these systems need to be improved to face the challenges of complex, high-mobility traffic environments. This article proposes an efficient system based on transformer architectures for VTS channels. The proposed analysis system is evaluated in scenarios with high vehicle density and occlusions. The results demonstrate that the proposed scheme reduces the computational complexity required for multi-object detection and tracking and exhibits a Multiple Object Tracking Accuracy (MOTA) of 0.757 and an identity F1 score (IDF1) of 0.832 when compared to conventional multi-stage systems under the same conditions and parameters, along with achieving a high detection precision of 0.934. The results show the viability of implementing the proposed system in practical applications for high-density vehicle VTS channels.

Hermosillo-Reynoso, F., López-Pimentel, J.-C., Ruiz-Ibarra, E., García-Berumen, A., Del-Puerto-Flores, J. A., Gilardi-Velázquez, H. E., Kumaravelu, V. B., & Luna-Rodriguez, L. A. (2025). A transformer-based multi-task learning model for vehicle traffic surveillance. *Mathematics*, 13(23), 3832. <https://doi.org/10.3390/math13233832>. Article.

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AUDIO'S IMPACT ON DEEP LEARNING MODELS: A COMPARATIVE STUDY OF EEG-BASED CONCENTRATION DETECTION IN VR GAMES

ABSTRACT: This study investigates the impact of audio feedback on cognitive performance during VR puzzle games using EEG analysis. Thirty participants played three different VR puzzle games under two conditions (with and without audio) while their brain activity was recorded. To analyze concentration levels and neural engagement patterns, we employed spectral analysis combined with a preprocessing algorithm and an optimized Deep Neural Network (DNN) model. The proposed processing stage integrates feature normalization, automatic labeling based on Principal Component Analysis (PCA), and Gamma band feature extraction, transforming concentration detection into a supervised classification problem. Experimental validation was conducted under the two gaming conditions in order to evaluate the impact of multisensory stimulation on model performance. The results show that the proposed approach significantly outperforms traditional machine learning classifiers (SVM, LR) and baseline deep learning models (DNN, DGCNN), achieving a 97% accuracy in the audio scenario and 83% without audio. These findings confirm that auditory stimulation reinforces neural coherence and improves the discriminability of EEG patterns, while the proposed method maintains a robust performance under less stimulating conditions.

GomezRomero-Borquez, J., Del-Valle-Soto, C., Del-Puerto-Flores, J. A., López-Pimentel, J.-C., Castillo-Soria, F. R., Ibarra-Hernández, R. F., & Betancur Agudelo, L. (2025). Audio's impact on deep learning models: A comparative study of EEG-based concentration detection in VR games. *Inventions*, 10(6), 97. <https://doi.org/10.3390/inventions10060097>. Article.

José Alberto del Puerto Flores
SNII Level I

EFFICIENT DEEP LEARNING-BASED DETECTION SCHEME FOR MIMO COMMUNICATION SYSTEMS

ABSTRACT: Multiple input-multiple output (MIMO) is a key enabling technology for the next generation of wireless communi-

cation systems. However, one of the main challenges in the implementation of MIMO system is the complexity of the detectors when the number of antennas increases. This aspect will be crucial in the implementation of future massive MIMO systems. A flexible design can offer a convenient tradeoff between detection complexity and bit error rate (BER). Deep learning (DL) has emerged as an efficient method for solving optimization problems in different areas. In MIMO communication systems, neural networks can provide efficient and innovative solutions. This paper presents an efficient DL-based signal detection strategy for MIMO communication systems. More specifically, a preprocessing stage is added to label the input signals. The labeling scheme provides more information about the transmitted symbols for better training. Based on this strategy, two novel schemes are proposed and evaluated considering BER performance and detection complexity. The performance of the proposed schemes is compared with the conventional one-hot (OH) scheme and the optimal maximum likelihood (ML) criterion. The results show that the proposed OH per antenna (OHA) and direct symbol encoding (DSE) schemes reach a classification performance F1-score of 0.97. Both schemes present a lower complexity compared with the conventional OH and the ML schemes, used as references. On the other hand, the OHA and DSE schemes have losses of less than 1 dB and 2 dB in BER performance, respectively, compared to the OH scheme. The proposed strategy can be applied to adaptive systems where computational resources are limited.

Ibarra-Hernández, R. F., Castillo-Soria, F. R., Gutiérrez, C. A., Del-Puerto-Flores, J. A., Acosta-Elias, J., Rodríguez-Abdala, V. I., & Palacios-Luengas, L. (2025). Efficient deep learning-based detection scheme for MIMO communication systems. *Sensors*, 25(3), 669. <https://doi.org/10.3390/s25030669>. Article.

José Alberto del Puerto Flores
SNII Level I

NEURAL NETWORK AIDED M-PSK DETECTION IN 802.11P V2V OFDM SYSTEMS UNDER ICI CONDITIONS

ABSTRACT: This letter investigates the application of neural networks for Quadrature Phase Shift Keying (QPSK) signal detection in Orthogonal Frequency Division Multiplexing (OFDM) systems designed for wideband vehicle-to-vehicle (V2V) communication environments. In such scenarios, inter-carrier interference (ICI) induced by doubly dispersive channels leads to a loss of subcarrier orthogonality, significantly impairing detection performance. Traditional linear and nonlinear ICI mitigation techniques exhibit fundamental trade-offs between bit error rate (BER) performance and computational complexity, limiting their effectiveness in highly dynamic V2V conditions. A low-complexity neural network is proposed for M-PSK detection under ICI. The approach includes a pre-

processing step that converts interference mitigation into a classification task. Results show that this approach performs better than conventional non-linear algorithms while keeping complexity near to linear least squares detection.

Tonix-Gleason, L. E., Del-Puerto-Flores, J. A., Castillo-Soria, F. R., Para-Michel, R., & Campos, F. P. (2025). Neural network aided M-PSK detection in 802.11P V2V OFDM systems under ICI conditions. *IEEE Wireless Communications Letters*, 14(11), 3420-3424. <https://doi.org/10.1109/LWC.2025.3592856>. Article.

José Alberto del Puerto Flores
SNII Level I

PERFORMANCE OPTIMIZATION OF MULTIPLE RIS-ASSISTED MULTIUSER MIMO COMMUNICATION SYSTEMS

ABSTRACT: Integrating reconfigurable intelligent surfaces (RISs) into wireless communication systems represents a crucial challenge. This task can be even more challenging when dealing with multiple users connected to a system sharing spectrum, time, or power resources. This chapter explores the challenges of integrating the RIS into multiuser downlink transmission systems. The efficiency and applicability of RIS-assisted multiple input-single output (MISO) and multiple input-multiple output (MIMO) schemes are analyzed in terms of bit error rate (BER) performance and complexity of the algorithms and techniques utilized. Likewise, the effects of the different wireless propagation channel models are analyzed. Approaches of blind RISs and optimization algorithms are also reviewed. Our simulation results showed up to 37 dB gain in BER curves when using N-RIS surfaces when the system has SE = 12 bpcu/user, 32 Tx antennas, and 8 users with 4 Rx antennas. These outcomes validate an increase in performance by adopting N-RIS surfaces and optimization techniques for adequate phase searching. This chapter also reviews the reported frameworks that apply machine learning algorithms to improve the overall system performance. Topics such as estimation of channel state information, beamforming applications, federated learning, and demodulation applications are reviewed. Finally, we shed light on trends and open research areas in this emerging topic.

Castillo Soria, F. R., Ibarra-Hernández, R. F., Gutiérrez Díaz de León, C. A., García Barrientos, A., Macías-Velasquez, S., & Del-Puerto-Flores, J. A. (2025). Performance optimization of multiple RIS-assisted multiuser MIMO communication systems. In A. L. Imoize, V. B. Kumaravelu, & D.-T. Do (Eds.), *Reconfigurable intelligent surfaces for 6G and beyond wireless networks* (pp. 169-200). Wiley. <https://doi.org/10.1002/9781394250141.ch5>. Book Chapter.

José Alberto del Puerto Flores
SNII Level I

VERIFICATION OF A PROBABILISTIC MODEL AND OPTIMIZATION IN LONG-RANGE NETWORKS

ABSTRACT: This paper presents a comprehensive probabilistic analysis of packet loss in long-range (LoRa) networks, a vital aspect of low-power, wide-area communication systems increasingly employed in IoT applications. The proposed model integrates multiple critical factors, including packet arrival rates, transmission power levels, and the distance between transmitting nodes and the gateway. By incorporating these variables into a unified probabilistic framework, the model not only predicts packet loss and interference patterns but also provides insights into optimizing network parameters. Specifically, it focuses on determining the optimal transmission power required to balance energy efficiency and communication reliability. A distinctive feature of the analysis is its ability to adapt dynamically to varying network conditions, ensuring sustained performance even in environments with high node density or fluctuating traffic loads. The study also explores the interplay between transmission power and interference, demonstrating how careful calibration of power settings can significantly reduce packet collisions while conserving energy resources. The proposed framework not only advances theoretical understanding, but also offers actionable guidelines for network designers seeking to achieve high performance in resource-constrained environments.

Romero Vázquez, J. L., García-Barrientos, A., Del-Puerto-Flores, J. A., Castillo Soria, F. R., Ibarra-Hernández, R. F., Pineda Rico, U., & Zambrano-Serrano, E. (2025). Verification of a probabilistic model and optimization in long-range networks. *Applied Sciences*, 15(4), 1873. <https://doi.org/10.3390/app15041873>. Article.

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EXPLORATION OF A GENERALIZED BENDERS DECOMPOSITION METHOD FOR SOLVING PROJECT SCHEDULING PROBLEMS WITH RESOURCE CONSTRAINTS

ABSTRACT: This research introduces a new Generalized Benders Decomposition-based Algorithm (GBDA) to solve the Multi-Mode Resource-Constrained Project Scheduling Problem (MRCPSP). The MRCPSP is a scheduling problem that besides precedence constraints, includes renewable and non-renewable resource con-

straints, as well as the selection of execution modes for the project activities. This mode selection determines the resource usage and duration of each activity. The GBDA splits the problem into a Master Problem (MP) and a Sub- Problem (SP) with a relaxation. Both problems are solved alternately, each one incorporating information from the other at each iteration, until a stopping criterion is met. Additionally, at each iteration, a non-relaxed SP is solved to obtain a solution for the original problem, and the best solution from all iterations is reported. The GBDA was tested, with three different stopping criteria, on benchmark instances from a public library and compared against solving the traditional formulation of the problem with an exact Mixed Integer Linear Programming (MILP) method. The GBDA found solutions of good quality in less than half the computing time than the exact method, with one of the stopping criteria. The analysis of the results provides valuable insights for future research.

Ramos, A. S., Miranda-Gonzalez, P., & Olivares-Benitez, E. (2025). Exploration of a generalized Benders decomposition method for solving project scheduling problems with resource constraints. In *Proceedings of the 14th International Conference on Operations Research and Enterprise Systems (ICORES 2025)* (Vol. 1, pp. 57-66). SciTePress. <https://doi.org/10.5220/0013116300003893>. Conference Paper.

Isaí Gerardo Reyes Cedeño
Senior Researcher A

EXPERIMENTAL AND NUMERICAL INVESTIGATION ON CLOGGING BY TRAPPED SOLID PARTICLES IN PERMEABLE POROUS CONCRETE

ABSTRACT: Clogging due to entrapment of solid particles in pores is a recurring process that limits the performance of permeable porous concrete (PPC). In this work, an analysis based on the results of laboratory and numerical modelling is presented. The experimental work involved the preparation and testing of PPC cylindric samples (100 mm diameter and 160 mm in height) to obtain the porosity and permeability parameters, and based on these two, the seepage velocity. These three parameters were used as inputs in the further numerical models, which were accomplished with the commercial software COMSOL Multiphysics v.6.2, based on the finite element method. Two scenarios with six simulations (3 each) were performed using three types of materials as solid particles, as well as two dimensional samples with the dimensions of the experimental samples. From the experimental work we found that the porosity and permeability varied from 26 % to 28 % and 1.75–1.96 mm/s, respectively, and from these parameters the calculated seepage velocity varied from 8.28 to 9.61 mm/s. However, for a comparative analysis, a different value of seepage velocity was used

in each modelling scenario: the resulting from the experimental work, this is 8.98 mm/s for scenario 1, while for scenario 2, a value of 2.43 mm/s was used, which corresponds to the minimum recommended for the performance of PPC, according to American Concrete Institute ACI 522 R technical report. In the numerical work, we observed that the reduced seepage velocity of scenario 2 permitted the exit of particles from the model in all cases.

Vizcaino-López, C. I., Hernández-Marín, M., Ochoa-González, G. H., Guerrero-Martínez, L., Reyes-Cedeño, I. G., & Pacheco-Guerrero, A. I. (2025). Experimental and numerical investigation on clogging by trapped solid particles in permeable porous concrete. *Case Studies in Construction Materials*, 22, e04810. <https://doi.org/10.1016/j.cscm.2025.e04810>. Article.

Héctor Rogelio Robles Campos
SNII Level I

Julio César Rosas Caro
Senior Researcher D, SNII Level III

ripple-free input current quadratic converter based on Watkin–Johnson topology

ABSTRACT: This article proposes a power electronics converter capable of providing high voltage gain while keeping a high-quality input current ripple operating with low duty cycle. The technique for achieving the zero input current ripple at a selected duty cycle consists of extracting two inductor currents from the source in a counter-phase manner. The technique is similar to those employed in interleaved converters, maintaining the high voltage gain. The quadratic-type voltage gain makes the proposed converter suitable for low-voltage renewable energy sources, such as PV panel generation. Another important topology feature is the common reference to the output voltage; that is, the load and source share the negative terminals. The high voltage gain is achieved by cascading two particular power cells. On the input side, a modified buck-boost converter is connected, while the second stage consists of an H-bridge based on the Watkin–Johnson topology. The H-bridge configuration consists of two capacitors, one inductor, and a pair of transistors and diodes to control the voltage gain, which provides polarity selection flexibility. This paper includes the mathematical development in continuous conduction mode operation, providing design guidelines. Besides, two commutation techniques are proposed to obtain direct or inverse polarity. The modeling is validated via simulation, and an experimental lab-scale corroborates its performance. The validation includes open-loop performance, demonstrating low input current ripple, and a closed-loop configuration that confirms proper output voltage regulation.

Reyes-García, B. L., García-Vite, P. M., Robles-Campos, H. R., Coronel-García, M. A., Rosas-Caro, J. C., & Hernández Angel, F. (2025). Ripple-free input current quadratic converter based on Watkin-Johnson topology. *IET Power Electronics*, 18(1), e70122. <https://doi.org/10.1049/pel2.70122>. Article.

Pedro Manuel Rodrigo Cruz
Senior Researcher C, SNII Level I

DESIGN AND DEVELOPMENT OF A GRAPHICAL INTERFACE TO DETERMINE THE APPROPRIATE TRANSPARENCY LEVEL OF SOLAR GREENHOUSE COVERS IN MEXICO

ABSTRACT: Solar greenhouses incorporate photovoltaic modules on the cover to transform solar irradiance into electricity. Modules with separate cells or conventional modules installed with separation can be used, predominating crystalline, monofacial or bifacial silicon technology. It is important to minimize the shadow of the agrivoltaic modules on the crops so as not to reduce their yield. Therefore, it is necessary to know the global transparency factor of the solar greenhouse cover to design and/or select agrivoltaic modules, contributing to sustainable agricultural practices and maximizing energy and agricultural performance. This work presents the design and construction of a graphical interface to estimate the appropriate transparency level of a solar greenhouse covers according to the characteristics of the crop and the location, using a simplified agrivoltaic model. The verification results showed that the transparency values obtained with the interface present a deviation of plus/minus four percent with respect to the reference model, and that the interface is portable, autonomous, efficient, intuitive and low-cost. Additionally, the transparency factor is calculated in real-time, with a response time of eight seconds. This research allows maximizing solar energy production and limiting the loss of plant productivity to below ten percent, offering a valuable tool for farmers and solar greenhouse designers.

González, A. M., Rodrigo, P. M., Díaz-Ponce, A., Escalante, N. I., & Almonacid, B. (2024). Design and development of a graphical interface to determine the appropriate transparency level of solar greenhouse covers in Mexico. In *2024 IEEE PES Generation, Transmission and Distribution Latin America Conference and Industrial Exposition (GTDLA)* (pp. 1-7). IEEE. <https://doi.org/10.1109/GTDLA61236.2024.10913849>. Conference Paper.

Pedro Manuel Rodrigo Cruz
Senior Researcher C, SNII Level I

DESIGN, DEVELOPMENT, AND ELECTRICAL CHARACTERIZATION OF A PARABOLIC DISH PHOTOVOLTAIC THERMAL CONCENTRATION SYSTEM

ABSTRACT: Hybrid solar concentrating systems are recognized for their superior efficiency in generating both electricity and heat from solar radiation compared to standalone thermal or photovoltaic systems. However, these systems require greater technological maturity, are complex to produce, and are currently expensive, which restricts their commercial deployment. Few reported prototypes exist, and they offer significant opportunities for improvement. This article presents a prototype of a photovoltaic thermal concentrator that uses a parabolic dish, state-of-the-art multi-junction solar cells equipped with secondary optics, and an easy-to-build active cooling system with straight fins as channels to circulate water. It covers the design, optical simulation, construction, and electrical characterization of the prototype. One advantage of the prototype is its more straightforward structure compared to other reported prototypes, which facilitates manufacturing. The prototype was tested outdoors with and without active cooling. In the first case, it was observed that without the cooling system, the concentrating photovoltaic receiver temperature exceeded 108 °C, causing the electrical efficiency to drop to 8.31%. In the second case, the receiver temperature was maintained below 50 °C. Under clear-sky conditions, the system achieved an average real concentration of 414.8 suns and an average electrical efficiency of 29.75%, representing one of the highest efficiencies reported for these hybrid systems. This experimental study marks a fundamental step toward advancing photovoltaic thermal concentrator systems and bringing them closer to technological maturity. This study demonstrates a scalable solution for hybrid solar concentration, showcasing significant advancements in thermal management and system efficiency.

Fuentes-Morales, R. F., Díaz-Ponce, A., Acosta-Pérez, E. D., Martell-Chavez, F., Peña-Cruz, M. I., & Rodrigo, P. M. (2024). Design, development, and electrical characterization of a parabolic dish photovoltaic thermal concentration system. *Journal of Renewable and Sustainable Energy*, 16(6), 063706. <https://doi.org/10.1063/5.0234029>. Article.

Pedro Manuel Rodrigo Cruz
Senior Researcher C, SNII Level I

SPECTRAL FACTORS FOR PV TECHNOLOGIES

ABSTRACT: Photovoltaic devices convert sunlight into electricity; however, the solar spectrum varies due to atmospheric conditions

such as air mass, water vapor, aerosol optical depth, and precipitable water. These variations impact photovoltaic materials, each with a unique spectral absorption profile. This chapter investigates how real-world spectral changes affect photovoltaic technologies, emphasizing absorption limits and atmospheric variables in electricity generation. We introduce and examine spectral response functions and indices to quantify and predict these impacts, providing a framework for understanding the interaction between the solar spectrum and photovoltaic materials. Additionally, device-independent, device-dependent, and optical degradation indices are described for nonconcentrating (monofacial and bifacial) and concentrating photovoltaic technologies. By delving into these spectral indices, this chapter offers insights for optimizing photovoltaic system design and enhancing energy harvest under varying conditions, ultimately advancing solar energy efficiency and reliability.

Mouhib, E., Almonacid, F., Rodrigo, P. M., & Fernández, E. F. (2025). Spectral factors for PV technologies. In V. Badescu & M. Paulescu (Eds.), *Spectral characteristics of solar radiation: Applications in photovoltaic conversion* (pp. 279-307). Elsevier. <https://doi.org/10.1016/B978-0-443-23839-0.00010-9>. Book Chapter.

Alejandro Esteban Rodríguez Sánchez
SNII Level I

AN ORTHOTROPIC HYPERFOAM-BASED MODEL FOR THE COMPRESSIVE RESPONSE OF AGED POLYURETHANE FOAMS

ABSTRACT: This study presents a constitutive modeling framework to characterize the uniaxial compressive response of polyurethane foams subjected to nine distinct accelerated aging conditions. A new orthotropic, three-term Hyperfoam-based model was simultaneously calibrated for two principal material directions using previously published experimental data. The unified model was successfully fitted to the experimental stress-strain curves, achieving coefficients of determination greater than 0.78 in all cases. This demonstrates its capability to capture the material's characteristic response, even under severe degradation that significantly increases experimental variability. Analysis of energy absorption and efficiency revealed that while the model is accurate for mild to moderate degradation states, deviations are observed at high strains (above a compressive strain of 0.7) for severely degraded samples. Crucially, the analysis of the fitted orthotropic response quantitatively demonstrates that severe aging accentuates the foam's mechanical anisotropy. This work establishes a quantitative link between aging conditions, the evolution of mechanical properties, and the orthotropic constitutive parameters, providing a predictive tool for evaluating the material's directional performance.

Rodríguez-Sánchez, A. E. (2025). An orthotropic hyperfoam-based model for the compressive response of aged polyurethane foams. *Engineering Research Express*, 7(4), 045598. <https://doi.org/10.1088/2631-8695/ae2196>. Article.

Alejandro Esteban Rodríguez Sánchez
SNII Level I

CLASSIFICATION OF RUGOSITY IN PLASMONIC METALLIC THIN FILMS USING DEEP LEARNING FOR SPECKLE IMAGES

ABSTRACT: In this work, we report, for the first time, to the best of our knowledge, the classification of metallic samples with different roughness values. As a reference, the R_a and R_q values were obtained using a Mitutoyo roughness meter. About 2,000 Speckle images were obtained for each sample. They were processed and used as inputting neural networks such as ResNet50 and EfficientNet. We obtained 99.63 % accuracy in classifying the samples with the ResNet50 model and 99.48 % accuracy for the EfficientNet model. These accuracies can be compared with the 99.926 % and 99.932 % values obtained for aluminum and steel surfaces in a similar work that used an optics system, image processing, and a CNN.

Magaña-Barocio, C. N., Gonzalez, M., Peña-Gomar, M. C., Torres-Cisneros, M., & Rodriguez-Sanchez, A. E. (2024). Classification of rugosity in plasmonic metallic thin films using deep learning for speckle images. In *Proceedings Optica Latin America Optics and Photonics Conference, LAOP 2024. Latin America Optics and Photonics Conference (LAOP)*. Optica Publishing Group. <https://doi.org/10.1364/LAOP.2024.W4A.33>. Conference Paper.

Alejandro Esteban Rodríguez Sánchez
SNII Level I

DEEP LEARNING AUTOMATED MEASUREMENTS OF EXPANDED POLYSTYRENE BEADS SIZE USING LOW-RESOLUTION MICROGRAPHY

ABSTRACT: The analysis of microscopic characteristics of closed-cell polymeric foams, particularly bead size, is relevant for understanding properties such as thermal insulation, energy absorption, and compressive structural strength of these materials. This study presents an automated method based on Deep Learning models to measure the bead size of Expanded Polystyrene foams in low-resolution micrographs. The results of this approach were compared with manual measurements at two expanded polystyrene foam densities: 8.5 and 24 kg/m³. Hypothesis tests, including Student's t-test, Levene's test, and Mann-Whitney U test, were conducted and

showed no significant differences between manual and automatic measurements. Student's t-test and Levene's test indicated that both methods have comparable means and variances, while the Two One-Sided Test confirmed that they were equivalent for bead size measurement. Additionally, the Mann–Whitney U test revealed no differences in medians, and Bland–Altman plot analyses demonstrated no systematic bias between the methods. Taken together, these results suggest that the proposed Deep Learning-based method is a reliable and precise substitute for the manual method in measuring the bead size of expanded polystyrene, making it suitable for practical use in the bead microstructural analysis of expanded polystyrene material.

Rodríguez-Sánchez, A. E., & Plascencia-Mora, H. (2025). Deep learning automated measurements of expanded polystyrene beads size using low-resolution micrography. *Microscopy Research and Technique*, 88(11), 2999-3008. <https://doi.org/10.1002/jemt.70019>. Article.

Alejandro Esteban Rodríguez Sánchez
SNII Level I

EXPERIMENTAL CHARACTERIZATION AND TENSILE MECHANICAL MODELING OF AN OPUNTIA VELUTINA BIOPOLYMER

ABSTRACT: The characterization of novel biopolymers is critical for their integration into engineering applications. This work presents the comprehensive mechanical characterization and constitutive modeling of a ductile biopolymer derived from *Opuntia velutina* (nopal) plant. Uniaxial tensile tests at distinct loading rates (10, and 1000 mm/min) revealed a significant rate-dependency in the material's stiffness and ultimate tensile strength, and a statistically significant decrease in its ultimate strain at failure. To capture this complex behavior, a phenomenological, three-network constitutive model incorporating Yeoh hyperelasticity and a viscous flow rule was developed. Calibrated simultaneously against the experimental dataset, the model's empirical adequacy was confirmed through a dual-validation criterion: achieving coefficients of determination above 0.90 for tested conditions and validation data, while accurately predicting key mechanical properties from a single set of material parameters. The application of this framework to a novel biomaterial demonstrates the broader applicability of established polymer mechanical models. Ultimately, the validated constitutive model provides a predictive tool for further analysis and engineering design of new sustainable products.

Rodríguez-Sánchez, A. E., & Pascoe-Ortiz, S. (2026). Experimental characterization and tensile mechanical modeling of an *Opuntia velutina* biopolymer. *Polymer Bulletin*, 83(3), 112. <https://doi.org/10.1007/s00289-025-06144-0>. Article.

Alejandro Esteban Rodríguez Sánchez
SNII Level I

Mario Acevedo Alvarado
Senior Researcher D, SNII Level I

MODELING PLANAR FLEXIBLE LINKAGES WITH COSSERAT RODS AND NEURAL NETWORKS

ABSTRACT: Continuous parallel mechanisms, characterized by slender and flexible members, present significant challenges for kinematic analysis due to the use of large-deformation theory and the inherent multiplicity of solutions to the position problem. This paper introduces an alternative forward-kinematics strategy that employs a feed-forward neural network trained on data generated by a Cosserat-rod physics-based numerical solver. The methodology is applied to a representative planar parallel linkage, using input features such as applied load magnitude, the specific rod affected, and boundary conditions to predict the deformed nodal coordinates of the mechanism. The trained neural network achieved high fidelity in replicating the linkage's behavior, with a mean absolute error of approximately 3.04 mm and a coefficient of determination near unity on test cases not seen during training. These findings highlight the potential of the proposed data-driven approach for accurate deformation prediction and real-time position estimation in continuous parallel manipulators.

Rodríguez-Sánchez, A. E., Acevedo, M., Altuzarra, O., & Petuya, V. (2026). Modeling planar flexible linkages with Cosserat rods and neural networks. In M. Acevedo, L. Valdivia, & H. Ponce (Eds.), *Multibody mechatronic systems. MuSMe 2025. Mechanisms and machine science, (Mechan. Machine Science)* (Vol. 195, pp. 145-157). Springer. https://doi.org/10.1007/978-3-032-10862-3_14. Conference Paper.

Rodrigo Romero Silva
Research Professor

DOMINANCE OF LEADING BUSINESS SCHOOLS IN TOP JOURNALS: INSIGHTS FOR INCREASING INSTITUTIONAL REPRESENTATION

ABSTRACT: The competitive push for business schools to publish in prestigious journals has resulted in a disproportionate number of papers in prestigious Management and Operations Research/Management Science (OR/MS) journals coming from a select group of institutions. Our analysis shows the Matthew effect of prestigious journals favors established schools with 51.2 % of papers in 18 Management ABS 4* journals and 61.3 % of papers in 3 OR/MS ABS 4* journals involving authors from the 100 top business schools identified by the University of Texas at Dallas (UTD). Citation patterns are similarly concentrated among papers authored by scholars from

UTD-listed business schools, with nearly 80 % of citations from 4* Management journals directed to equally rated 4* Management journals (67.8 % for 4* OR/MS journals). An initial regression analysis suggested a positive correlation between the percentage of papers in a journal attributed to authors affiliated with those leading business schools and journal citation performance. However, further examination using multi-level regression adjusted for journal prestige, using the ABS and FT50 lists, showed a negative interaction effect on citation rates for papers from these schools in prestigious OR/MS journals. This insightful finding was confirmed by a post-hoc comparison revealing no significant citation advantage in prestigious journals for papers from leading business schools over those from a broader range of institutions. Thus, while leading business schools benefit from disproportionate space in prestigious journals, this does not translate to a citation advantage for the journals themselves, indicating no Matthew effect at the journal level driven by these schools. We argue that our findings show a unique opportunity for prestigious journals and business schools to expand collaborations with institutions in geographies historically underrepresented without a significant impact on the citation performance of those journals. This inclusion would only benefit research excellence, as our results demonstrate convergence in citation rates, citation patterns on external research areas, and topics across both subsets of papers—from leading institutions and those from a broader institutional spectrum—published in prestigious journals, indicating that diversifying contributions does not compromise the performance of these journals.

Romero-Silva, R., Marsillac, E., & de Leeuw, S. (2025). Dominance of leading business schools in top journals: Insights for increasing institutional representation. *Research Policy*, 54(3), 105193. <https://doi.org/10.1016/j.respol.2025.105193>. Article.

Rodrigo Romero Silva
Research Professor

SUPPLY CHAIN MANAGEMENT THEORY IN THE CONTEXT OF POPULISM

ABSTRACT: Businesses today rely on global supply chains that must coexist with global political ideologies. As populist ideologies become more prevalent in the twenty-first century, they therefore become a significant influence on modern supply chain management practices. This entry briefly examines and broadly describes how current populist perspectives, particularly for economic protectionism, integrate with today's supply chain management theories and strategic activities.

Marsillac, E., & Romero-Silva, R. (2024). Supply chain management theory in the context of populism. In J. C. Chennattuserry, M. Deshpande, & P. Hong (Eds.), *Encyclopedia of new populism*

and responses in the 21st century (pp. 979-983). Springer. https://doi.org/10.1007/978-981-99-7802-1_229. Book Chapter.

Rubén Romo Gamboa
Research Professor

Francisco Alejandro Orozco Argote
Senior Researcher D, SNII Level I

Francisco Moreno Abril
Research Professor

LEAN CONSTRUCTION BARRIERS FROM THE ORGANIZATIONAL CULTURE LENS

ABSTRACT: Organizational culture is vital for adopting Lean Construction (LC) methodologies in the construction industry. LC maximizes customer value by minimizing waste and optimizing processes. Implementing this philosophy necessitates a shift in values, attitudes, and behaviors. A culture promoting collaboration, innovation, and continuous improvement aids the acceptance of Lean principles, enhancing efficiency and sustainability. Effective leadership and employee engagement are essential to tackle barriers, like resistance to change and lack of strategic alignment. Organizational culture aligns individual and organizational goals, fostering open communication and continuous learning. This study shows how organizations amplify LC benefits by integrating its principles with a culture of adaptability, shared responsibility, and operational excellence, boosting productivity and positioning companies as leaders in a competitive and innovation-driven sector.

Romo, R., Orozco, F., Moreno, F., Francesconi, C., Valdebenito, R., & Forcael, E. (2025). Lean construction barriers from the organizational culture lens. In O. Seppänen, L. Koskela, & K. Murata (Eds.), *Proceedings of the 33rd Annual Conference of the International Group for Lean Construction (IGLC 33)* (pp. 1321-1332). <https://doi.org/10.24928/2025/0284>. Conference Paper.

Luis Alberto Rosa Sierra
SNII Level II

OPTIMIZING THE USER EXPERIENCE OF ADDITIVE MANUFACTURING PRODUCTS THROUGH MATERIAL DRIVEN DESIGN

ABSTRACT: Material selection in additive manufacturing (AM) is typically driven by the need to meet specific functional characteristics, often resulting in objects with limited user experiential interpretation. With the advent of new materials and recycling techniques in AM, it is crucial to understand the sensory and emotional responses

these materials can evoke. While the literature extensively covers the mechanical properties of 3D printed objects, a notable gap exists in studies focusing on user interaction and perception. This research addresses this gap by applying the material driven design (MDD) methodology to a case study that explores a new mixture of waste material from a polymer bed powder fusion process. To ensure a reliable and systematic approach, we integrated statistical tools such as Goodness of Fit, Pairwise comparison, ANOVA, and interval graphs into the MDD. We conducted a comprehensive study involving 42 participants, using a vocabulary of 65 descriptors from the Ma2E4 toolkit for experiential characterization. The study's findings resulted in a proposed process that made it possible to categorize and rank products into eight distinct families, identifying 36 potential objects. One of these objects was selected and, following a design process, fabricated using binder jetting technology. This research emphasizes the importance of incorporating user experience in AM and highlights the potential of sustainable waste utilization to advance the field. By focusing on functional and experiential aspects, we can develop 3D-printed items that enhance performance and engage users more effectively.

Balderrama-Armendariz, C. O., Arbelaez-Rios, S. E., Cortes-Saenz, D., Flores-Figuero, J. J., Maldonado-Macías, A. A., & Rosa-Sierra, A. (2025). Optimizing the user experience of additive manufacturing products through material driven design. *International Journal on Interactive Design and Manufacturing*, 19(7), 5331-5346. <https://doi.org/10.1007/s12008-024-02131-3>. Article.

Julio César Rosas Caro
Senior Researcher D, SNII Level III

COMPARATIVE ANALYSIS OF EFFICIENCY AND HARMONIC GENERATION IN MULTI-PORT CONVERTERS: STUDY OF TWO OPERATING CONDITIONS

ABSTRACT: This study presents a comparative analysis of efficiency and harmonic generation in Triple Active Bridge (TAB) converters under two operating configurations: Case I, with one input source and two loads, and Case II, with two input sources and one load. Two modulation strategies, Single-Phase Shift (SPS) and Dual-Phase Shift (DPS), are evaluated through frequency-domain modeling and simulations performed in MATLAB/Simulink. The analysis is complemented by experimental validation on a laboratory prototype. The results show that DPS reduces harmonic amplitudes, decreases conduction losses, and improves output waveform quality, leading to higher efficiency compared to SPS. Harmonic current spectra and total harmonic distortion (THD) are analyzed to quantify the impact of each modulation method. The findings highlight that DPS is more suitable for applications requiring stable power transfer and

improved efficiency, such as renewable energy systems, electric vehicles, and multi-source DC microgrids.

Arizaga, F. J., Ramírez, J. M., Alcalá, J. A., Rosas-Caro, J. C., & Rojas-Hernández, A. G. (2025). Comparative analysis of efficiency and harmonic generation in multiport converters: Study of two operating conditions. *World Electric Vehicle Journal*, 16(10), 566. <https://doi.org/10.3390/wevj16100566>. Article.

Julio César Rosas Caro
Senior Researcher D, SNII Level III

CONTROL ALGORITHM FOR AN INVERTER-BASED VIRTUAL SYNCHRONOUS GENERATOR WITH ADJUSTABLE INERTIA

ABSTRACT: This paper presents the design and implementation of a control algorithm for power converters in a microgrid, with the main objective of providing the flexibility to adjust the system inertia. The increasing integration of renewable energy sources in microgrids has driven the development of advanced control techniques to ensure stability and power quality. The proposed algorithm combines droop control, synchronverter dynamics, and virtual impedance to achieve a robust and efficient control strategy. Simulations were conducted to validate the algorithm's performance, demonstrating its capability to maintain voltage within acceptable limits and improve the inertial response of the microgrid. The results contribute to the advancement of intelligent and resilient microgrid development, which is essential for the transition towards a more sustainable energy system.

Villada-Leon, C. A., Posada Contreras, J., Rosas-Caro, J. C., Núñez-Rodríguez, R. A., Valencia, J. C., & Valdez-Resendiz, J. E. (2025). Control algorithm for an inverter-based virtual synchronous generator with adjustable inertia. *Eng.*, 6(9), 231. <https://doi.org/10.3390/eng6090231>. Article.

Julio César Rosas Caro
Senior Researcher D, SNII Level III

DATA-DRIVEN MODELING OF BATTERY-BASED ENERGY STORAGE SYSTEMS

ABSTRACT: This article presents a data-driven modeling methodology applied to a battery-based power system comprising a power converter and an electric machine. The proposed method captures the dynamics describing the complete system and allows the identification of its parameters without the need for any explicit theoretical model of the components. In particular, the proposed approach

considers the battery as the supplying element of a broader system comprising power electronics converters and direct-current motors, paying special attention to the battery open-circuit voltage curve estimation. This approach successfully yields a state-space representation that optimally describes the more essential variables, such as motor speed and output voltages of the converter and battery. Consequently, the proposed approach allows the generation of higher-order models representing transient and rapid dynamics and facilitates the identification of parameters that define reduced-order models describing slower dynamics. This streamlines the implementation of adaptive control strategies, providing an effective tool for their development and execution.

Silva-Vera, E. D., Valdez-Resendiz, J. E., Rosas-Caro, J. C., Escobar, G., Guillen, D., & Sosa Zuñiga, J. M. (2025). Data-driven modeling of battery-based energy storage systems. *IEEE Transactions on Industrial Electronics*, 72(8), 8184-8196. <https://doi.org/10.1109/TIE.2025.3532722>. Article.

Julio César Rosas Caro
Senior Researcher D, SNII Level III

EXPERIMENTAL STUDY OF A FUEL CELL STACK PERFORMANCE OPERATING WITH A POWER ELECTRONICS CONVERTER WITH HIGH-FREQUENCY CURRENT RIPPLE

ABSTRACT: This article presents an investigation into the effect of a high-frequency current ripple on the performance of fuel cell stacks. A current with high-frequency ripple can be drained from a fuel cell stack in applications in which a power electronics converter is the stack's electrical load, and this situation is very common in a wide variety of applications. The current ripple is a variation of its value around the average or dc component. It is caused by the switching action of the transistors in a power electronics converter, it can be calculated, and converters can be designed to have a particular current ripple amplitude and frequency. The existence of a ripple increases the Root Mean Square (RMS) value of the current (compared to their dc or average value). The study employs a boost converter to regulate the power output from the fuel cell stack, effectively generating a controlled AC ripple to observe its influence. A set of experiments are conducted to analyze the impacts of these conditions from the electrical point of view. Our results reveal that the main effect of the AC ripple is a reduction of the FC stack voltage output, like the one caused for an increase on the current, the voltage drop causes a shift on the operating condition which cause a reduced-efficiency operation. The presented findings provide information and must be considered for applications of power electronics converters feed by FC stacks. Experimental results are provided to demonstrate the discussed effects.

Valdez-Resendiz, J. E., Rosas-Caro, J. C., Sanchez, V. M., & Lopez-Núñez, A. R. (2025). Experimental study of a fuel cell stack performance operating with a power electronics converter with high-frequency current ripple. *International Journal of Hydrogen Energy*, 108, 66-75. <https://doi.org/10.1016/j.ijhydene.2024.01.248>. Article.

Julio César Rosas Caro
Senior Researcher D, SNII Level III

FAULT-TOLERANT CONTROL IMPLEMENTED FOR SUSTAINABLE ACTIVE AND REACTIVE REGULATION OF A WIND ENERGY GENERATION SYSTEM

ABSTRACT: This paper presents the design of a fault-tolerant control system based on fault estimation, aimed at enhancing the sustainability and efficiency of a wind energy conversion system using a doubly-fed induction generator. The control architecture comprises a rotor-side converter (RSC) and a grid-side converter (GSC). The RSC is responsible for regulating both active and reactive power, and its model incorporates two linear subsystem representations. A fault-tolerant control (FTC) scheme is developed using a state-feedback controller; this controller is applied to regulate stator and rotor currents. Additionally, for comparison purposes, Proportional-Integral (PI) and Sliding-Mode Controllers (SMCs) are designed to analyze the performance of each controller. Furthermore, a proportional integral observer is employed in the proposed fault-tolerant scheme for actuator fault estimation. Fault detection is achieved by comparing the fault estimation signal with a predefined threshold. The main contribution of this work is the design and validation of a comprehensive active FTC scheme that enhances system reliability and sustainability. It also includes a performance analysis comparing three controllers (PI, SMC, and state-feedback) applied to the RSC. These controllers are evaluated for their ability to regulate active and reactive power in a wind energy conversion system under conditions of non-constant actuator faults.

Lopez, A. R., Rumbo-Morales, J. Y., Ortiz-Torres, G., Valdez-Resendiz, J. E., Vazquez, G., & Rosas-Caro, J. C. (2024). Fault-tolerant control implemented for sustainable active and reactive regulation of a wind energy generation system. *Sustainability*, 16(24), 10875. <https://doi.org/10.3390/su162410875>. Article.

Julio César Rosas Caro
Senior Researcher D, SNII Level III

IMPROVED OPERATION OF THE MODIFIED NON-INVERTING STEP-DOWN/UP (MNI-SDU) DC-DC CONVERTER

ABSTRACT: This paper presents an enhanced operation strategy for a recently proposed converter called Modified Non-Inverting Step-Down/Up (MNI-SDU) DC-DC converter intended for battery voltage regulation. Unlike the conventional approach, where both switching stages share a single duty cycle, the proposed method controls asynchronously the two duty cycles through a fixed time offset to optimize performance. A methodology is developed to define suitable duty cycle ranges that ensure proper converter operation according to input/output voltage specifications, while simultaneously reducing the current and voltage ripples and electrical stress in the capacitor and semiconductors. Furthermore, a model-based control strategy is proposed, taking into account the enhanced operational characteristics. Consequently, a PI-PI current-mode controller is designed using loop shaping techniques to maintain the output voltage regulated at the desired level. The proposed approach is analyzed mathematically and validated through experimental results. The findings demonstrate that optimizing through asynchronous duty-cycle control with a fixed time offset improves ripple, stress values, and overall efficiency, while maintaining robust output voltage regulation, making this method well-suited for applications requiring compact and reliable power conversion.

Villanueva-Loredo, J. A., Rosas-Caro, J. C., Martinez-Rodriguez, P. R., Rodriguez-Cortes, C. J., Langerica-Cordoba, D., & Vazquez-Guzman, G. (2025). Improved operation of the modified non-inverting step-down/up (MNI-SDU) DC-DC converter. *Micromachines*, 16(9), 1063. <https://doi.org/10.3390/mi16091063>. Article.

Julio César Rosas Caro
Senior Researcher D, SNII Level III

INERTIA IN CONVERTER-DOMINATED MICROGRIDS: CONTROL STRATEGIES AND ESTIMATION TECHNIQUES

ABSTRACT: This scoping review analyzes the role of inertia in converter-dominated microgrids, with an emphasis on hybrid AC/DC architectures. Following the PRISMA-ScR methodology, 54 studies published between 2015 and 2025 were identified, screened, and synthesized. The review addresses two key aspects, inertia estimation methods and control strategies for emulating inertia via power converters, emphasizing the role of the interlinking converter (ILC)

as a bidirectional interface for inertia support between the AC and DC subsystems. This work addresses several limitations of prior reviews: their narrow scope, often overlooking advanced data-driven approaches such as machine learning; the lack of systematic classifications, hindering a comprehensive overview of existing methods; and the absence of practical guidance on selecting appropriate techniques for specific conditions. The findings show that conventional estimation methods are insufficient for low-inertia grids, necessitating adaptive and data-driven approaches. Virtual inertia emulation strategies—such as Virtual Synchronous Machines, Virtual Synchronous Generators, Synchronverters, and ILC-based controls—offer strong potential to enhance frequency stability but remain challenged by scalability, adaptability, and robustness. The review highlights critical research gaps and future directions to guide the development of resilient hybrid microgrid control strategies.

González, F. A., Posada, J., França, B. W., & Rosas-Caro, J. C. (2025). Inertia in converter-dominated microgrids: Control strategies and estimation techniques. *Electricity*, 6(4), 58. <https://doi.org/10.3390/electricity6040058>. Review.

Julio César Rosas Caro
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INTERLEAVED IMPROVED SUPER-BOOST CONVERTER FOR FUEL-CELL ELECTRIC VEHICLE POWER SYSTEM

ABSTRACT: The design of power electronics for electric vehicle applications must result in a high power density to improve their viability. It must also help preserve the lifespan of the energy systems involved, and provide a well-regulated voltage with a high efficiency. To improve the size characteristics and minimize input current and output voltage ripples, this paper proposes a conversion system for the powertrain DC bus in a fuel cell electric vehicle (FCEV). It uses an interleaved Improved SuperBoost (ISB) converter, which achieves the same ripple magnitudes as the traditional and fourth-order boost using smaller inductors and capacitors. Experimental results are provided to confirm the operation of the ISB, and simulations are performed for a 1 kW fuel cell system connected to the interleaved ISB to power a 200 V DC bus.

Garza-Arias, E., Valdez-Resendiz, J. E., Rosas-Caro, J. C., Silva-Vera, E. D., & Guillen-Aparicio, D. (2024). Interleaved improved super-boost converter for fuel-cell electric vehicle power system. In *2024 International Symposium on Electromobility (ISEM)* (pp. 1-5). IEEE. Conference Paper.

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NOVEL CURRENT-FED BIDIRECTIONAL DC-DC CONVERTER FOR BATTERY CHARGING IN ELECTRIC VEHICLE APPLICATIONS WITH REDUCED SPIKES

ABSTRACT: Electric vehicles (EVs) have emerged as the best alternative to conventional fossil fuel-based vehicles due to their lower emission rate and operating cost. The escalating growth of EVs has increased the necessity for distributed charging stations. On the other hand, the fast charging of EVs can be improved by the use of efficient converters. Hence, the fractional order proportional resonant (FOPR) controller-based current-fed bidirectional DC-DC converter is proposed in this work for EV charging applications. The output capacitance of the switches is utilized to achieve the resonance condition for zero voltage switching (ZVS) and zero current switching (ZCS). The proposed converter topology is implemented using the MATLAB Simulink tool. The result analysis verified that the proposed converter topology provides better switching characteristics for different operating modes, which is necessary for a high-voltage EV charger. Hence, it is proved that the proposed converter is more efficient for battery charging in EVs.

Sharma, P., Palwalia, D. K., Sharma, A. K., Gopal, Y., & Rosas-Caro, J. C. (2024). Novel current-fed bidirectional DC-DC converter for battery charging in electric vehicle applications with reduced spikes. *Electricity*, 5(4), 1022-1048. <https://doi.org/10.3390/electricity5040052>. Article.

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Avelina Alejo Reyes
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OPTIMIZED ENERGY CONVERSION IN FUEL CELLS USING THE 2P6O CONVERTER WITH SMALL INDUCTORS AND CAPACITORS

ABSTRACT: Renewable energy sources are critical to addressing global energy challenges, offering sustainable alternatives to fossil fuels. Among these, fuel cells are gaining attention with applications spanning transportation, stationary power, and portable devices. Power electronics play a vital role in enabling the integration of fuel cells into practical systems. Specifically, DC-DC converters are indispensable for transforming energy, regulating voltage levels, and optimizing the performance of the systems. This paper presents the design and evaluation of an energy conversion system for a Fuel Cell Stack based on a recently introduced DC-DC converter. The two-phase six-order (2P6O) has shown to be a feasible con-

verter with a good performance. In this article, the 2P6O converter was designed to convert the electrical energy from a fuel cell stack. The main objective of this study is to explore the performance of the 2P6O converter in the discussed application. Using a comparative analysis approach, the 2P6O converter was integrated into a standard fuel cell system, and its operation and storage demands were meticulously analyzed. The findings indicate that the system that incorporates the 2P6O converter requires less energy storage; specifically in the study, the 2P6O converter required 74% of the energy stored in inductors compared to the multiphase boost converter, a very competitive topology and 57% of the energy stored in capacitors. Reducing 26% of the stored energy in inductors and 43% of the energy stored in capacitors compared to the multiphase boost converter. Compared to the traditional boost and the multiphase boost, experimental results are provided.

Rosas-Caro, J. C., Valdez-Resendiz, J. E., Alejo-Reyes, A., Sanchez, V. M., Rodriguez, A., Silva-Vera, E. D., & Garza-Arias, E. (2025). Optimized energy conversion in fuel cells using the 2P6O converter with small inductors and capacitors. *International Journal of Hydrogen Energy*, 141, 1225-1237. <https://doi.org/10.1016/j.ijhydene.2025.02.248>. Article.

Julio César Rosas Caro
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Omar Fernando Ruíz Martínez
Senior Researcher C, SNII Level I

Avelina Alejo Reyes
SNII Level I

QUADRATIC BOOST CONVERTER WITH OPTIMIZED SWITCHING RIPPLE BASED ON THE SELECTION OF PASSIVE COMPONENTS

ABSTRACT: This work introduces a boost converter with quadratic gain. Its main advantage compared to well-known similar quadratic boost converters is that it requires capacitors with a relatively small capacitance and inductors with small inductance, leading to a reduction in the size or stored energy while performing a power conversion of similar power rating and the same switching ripples in both the input current and the output voltage. It is inspired by the recently introduced ISB converter and uses a specific PWM method. This results in achieving switching ripple constraints while using smaller energy storage elements (capacitors and inductors). The updated converter offers the same voltage gain compared to the conventional quadratic boost topology with the benefit of compact component sizes. While it has more passive elements, they are of reduced size. An analysis of energy storage revealed that this new converter uses only half the energy in inductors and 14% in capacitors when compared to specific design parameters.

Silva-Vera, E. D., Rosas-Caro, J. C., Valdez-Resendiz, J. E., Alejo-Reyes, A., Ruiz-Martinez, O. F., Posada Contreras, J., & García-Vite, P. M. (2024). Quadratic boost converter with optimized switching ripple based on the selection of passive components. *Electricity*, 5(4), 877-894. <https://doi.org/10.3390/electricity5040044>. Article.

Julio César Rosas Caro
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THREE-PHASE SPACE VECTOR PWM INVERTER FOR INDUCTION MOTOR DRIVE WITH LEAKAGE CURRENT REDUCTION

ABSTRACT: Several industrial applications rely on induction motors to carry out processes essential for product manufacturing. Speed control of an induction motor commonly requires a pulse width modulated inverter capable of driving a system with long cables, suppression of common mode voltage, reduction in common mode current, and suppression of electromagnetic interference. This paper proposes a three-phase motor drive aimed at maintaining a constant common-mode voltage. The proposed system consists of two three-phase conventional full bridge inverters connected in parallel and having as an input two separate direct current sources. The proposed system is controlled by using the space vector pulse width modulation technique. By properly designing the switching signal sequences for both converters, the common-mode voltage can be maintained constant, thereby reducing the associated common-mode current to an RMS value of 92.3 mA and enhancing the overall reliability of the system. The proposed system is validated through numerical simulations and by the implementation of an experimental prototype.

Vazquez-Guzman, G., Martinez-Rodriguez, P. R., Rosas-Caro, J. C., Rivera-Perez, E., Verdin-Cruz, J. A., Rodriguez-Cortes, C. J., & Langerica-Cordoba, D. (2025). Three-phase space vector PWM inverter for induction motor drive with leakage current reduction. *Sustainability*, 17(20), 9317. <https://doi.org/10.3390/su17209317>. Article.

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LYAPUNOV STABILITY ANALYSIS FOR A BOOST CONVERTER WITH COUPLED PV PANEL

ABSTRACT: Power converters have been widely used to provide regulated energy through an appropriate approach to a control law. Although it is known that these systems are controllable in a switched manner, stabilization criteria in interconnected systems (converters

with other dynamic elements) have not been sufficiently explored. In this work, the stability of a system made up of a power converter and a photovoltaic panel is analyzed. In order to carry out the conjunction of both systems, the transformation of the switched model of the converter to an averaged expression is considered. The mathematical expression of a photovoltaic cell is based on the Shockley equation. An equation that describes the complete operation of the panel is described through the addition of the dependent element of the Shockley equation (diode) in conjunction with resistive elements to define both output voltages and currents. Since this equation is not dynamic, it is not possible to couple it to the converter differential equations system. The panel dynamics are included through decoupling by charging an output capacitor. Once we have a system of three coupled differential equations, the system is analyzed by searching for a Lyapunov function. The conditions/constraints of the Lyapunov function are verified to define the stabilization of the system in some sense. The interaction of the equations system is simulated and the present dynamics are graphed.

Ruiz-Martinez, O. F., & Lopez-Cruz, J. M. (2024). Lyapunov stability analysis for a boost converter with coupled PV panel. In *2024 4th International Conference on Electrical, Computer, Communications and Mechatronics Engineering (ICECCME)* (pp. 1-6). IEEE. <https://doi.org/10.1109/ICECCME62383.2024.10796861>. Conference Paper.

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Fernando Dávalos Hernández
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POWER CONVERTER DESIGN FOR PULSED ELECTRIC FIELD-BASED MILK PROCESSING: A PROOF OF CONCEPT

ABSTRACT: The microbiological safety of milk can be ensured through heat processing; however, this method has a negative effect on the sensory profile of this food product. Emerging technologies could be used as an alternative process for guaranteeing innocuity and maintaining sensory changes. An alternative is to evaluate pulsed electric field (PEF) electroporation, which is a method of processing cells using short pulses of a strong electric field. PEF has the potential to be a type of alternative low-temperature pasteurization process that consists of high-frequency voltage pulsations. Specifically, the presented work is a proof of concept for the design of a converter capable of generating a PEF to feed a load that meets the impedance characteristics of milk. The proposed converter is simulated using PLECS software (4.9.6 version) under impedance change

scenarios that emulate variations in milk throughout the entire process. This research proposes the modification of a classic Vienna rectifier (adding an MBC—Multilevel Boost Converter structure) to supply a pulsating signal that could be used for low-temperature processes of milk to guarantee proper pasteurization. The characteristics of the generated high-voltage pulse make it feasible to quickly process the real sample. The control law design considers a regulation loop to achieve a voltage in the range of kV and a switching-type control law that activates switches in MMC arrays. These switches are activated randomly to avoid transients that cause significant stress on them.

Domínguez-Soberanes, J., Ruiz-Martínez, O. F., & Davalos Hernández, F. (2025). Power converter design for pulsed electric field-based milk processing: A proof of concept. *Foods*, 14(13), 2177. <https://doi.org/10.3390/foods14132177>. Article.

David Ernesto Salinas Navarro
Research Professor

BEYOND THE COUNTER: A SYSTEMIC MAPPING OF NANOSTORE IDENTITIES IN TRADITIONAL, INFORMAL RETAIL THROUGH MULTI-DIMENSIONAL ARCHETYPES

ABSTRACT: This study examines the identity of nanostores—micro, independent grocery retailers—through a systemic, stakeholder-informed lens to promote their survivability and competitiveness. Moving beyond traditional operational descriptions, it introduces a multidimensional framework that examines what nanostores do (X), how they do it (Y), and why they matter (Z), which is complemented by the use of the TASCOI tool to produce identity statements. Based on survey data collection and a thematic analysis of nanostore stakeholder responses in Mexico City, the research categorises identity statements into six 2 × 2 matrices across four dimensions: operational, functional, relational, and adaptive. This analysis yields twenty-four archetypes that capture the diversity, complexity, and adaptability of nanostores. The findings reveal that nanostores are not a homogeneous category. They simultaneously exhibit characteristics of multiple archetypes, blending retail function, social embeddedness, and entrepreneurial adaptation. This study contributes to the nanostore and micro-enterprise literature by operationalising identity description and offers practical insights for supporting diverse shop types through context-sensitive policy and business strategies. While this study ensures internal validity and reliability through systematic coding and stakeholder feedback, it acknowledges limitations in its generalisability. Future research may build on this work through comparative studies, longitudinal tracking, and direct engagement with nanostore owners and their communities to further understand the dynamics of their identity and their resilience in evolving retail landscapes.

Salinas-Navarro, D. E., Vilalta-Perdomo, E., & Mejía-Argueta, C. (2025). Beyond the counter: A systemic mapping of nanostore identities in traditional, informal retail through multi-dimensional archetypes. *Systems*, 13(7), 546. <https://doi.org/10.3390/systems13070546>. Article.

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CHALLENGE-BASED LEARNING FOR ACTIVE LEARNING IN INDUSTRIAL ENGINEERING EDUCATION

ABSTRACT: This chapter delves into the design of active learning activities for competence development in industrial engineering students through challenge-based learning (CBL). A learning challenge, as a purposeful experience, is proposed to expose students to real-world situations through experiential learning (EL). Around a challenge, tutors and students collaborate with an organization as an educational partner to develop alternative solutions in line with their intended learning outcomes. A case study is presented to exemplify the development of active learning activities within a CBL and EL framework that supports authentic assessment (AA) in a group of industrial engineering aggregated courses at Tecnológico de Monterrey in Mexico. The learning challenge provides promising results for the satisfactory development of student competences and the AA of their learning outcomes. However, limitations do exist concerning difficulties in the design and implementation process, which require further work.

Palma-Mendoza, J. A., Salinas-Navarro, D. E., Arana-Solares, I. A., & Franco-Herrera, F. (2025). Challenge-based learning for active learning in industrial engineering education. In E. Vilalta-Perdomo, A. Scroccaro, D. E. Salinas-Navarro, & R. Michel-Villarreal (Eds.), *The Emerald handbook of active learning for authentic assessment* (pp. 313-335). Emerald Publishing. <https://doi.org/10.1108/978-1-83797-857-120251016>. Book Chapter.

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DEFINING NANOSTORES: CYBERNETIC INSIGHTS ON INDEPENDENT GROCERY MICRO-RETAILERS' IDENTITY AND TRANSFORMATIONS

ABSTRACT: Nanostores—micro, independent grocery retailers—are often defined overlooking their socioeconomic roles and relational significance in favour of their primary functional aspects. To close this gap, this study adopts a systemic perspective to

examine how multiple stakeholders (owners, customers, and suppliers) shape nanostore identity. Accordingly, this study proposes a framework of X-Y-Z identity statements, along with the use of the TASCOI tool, to examine nanostore descriptions and map their roles, expectations, and transformation processes. This systemic framework, rooted in management cybernetics, enabled the collection and analysis of 168 survey responses from 34 stores in Mexico City. The results show that nanostore identities are varied and context-dependent, operating as grocery stores, family projects, community anchors, economic lifelines, and competitors. This diversity influences stakeholder engagement, resource utilisation, and operational decisions. Overall, this study provides a transferable framework for analysing micro-business identity and transformation, with implications for problem-solving, decision-making, and policy development. Future research should address the current limitations of this study, including its geographical cross-sectional design, limited sampling method, reliance on self-reported perceptions, and lack of generalisability to other populations. Future work will involve exploring other urban contexts, utilising longitudinal data, expanding the sample, and adopting a participatory research approach to gain a deeper understanding of identity dynamics and their implications for nanostore resilience and survivability.

Salinas-Navarro, D. E., Vilalta-Perdomo, E., Herron, R. M., & Mejía-Arqueta, C. (2025). Defining nanostores: Cybernetic insights on independent grocery micro-retailers' identity and transformations. *Systems*, 13(9), 771. <https://doi.org/10.3390/systems13090771>. Article.

David Ernesto Salinas Navarro
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EMPOWERING NANOSTORES FOR COMPETITIVENESS AND SUSTAINABLE COMMUNITIES IN EMERGING COUNTRIES: A GENERATIVE ARTIFICIAL INTELLIGENCE STRATEGY IDEATION PROCESS

ABSTRACT: This exploratory study investigates Generative Artificial Intelligence's (GenAI) use in strategy ideation for nanostores—i.e., small independent grocery retailers—to enhance their competitiveness while contributing to community sustainability. Nanostores, particularly in emerging countries, face intense competition and rapidly changing trends. These stores adopt various strategies by leveraging their proximity to consumers in neighbourhoods, resulting in different business configurations. While the existing literature highlights the broader nanostores' functions, there is limited research on how they may develop comprehensive strategies to face their challenges. By *employing a thing ethnography methodology*, this work proposes GenAI thing interviewing—i.e., with ChatGPT 3.5 and Microsoft Copilot—through incremental

prompting to explore potential strategy ideation and practices. Key findings suggest GenAI conversations can aid shopkeepers in strategy ideation through human-like written language, aligning with small business dynamics and structures. This proposition results in a GenAI ideation framework for strategy generation and definition. Moreover, this technology can enhance nanostore competitiveness and sustainability impact by enacting improved strategy practices in stakeholder engagements. Accordingly, this work's main contribution underscores a GenAI-enabled conversational approach to facilitate nanostores' strategy ideation and embedding in everyday business operations. Future work must address the limitations and further investigate GenAI's influence on human understanding and technological creation, strategy ideation, adoption, and usability in nanostores.

Salinas-Navarro, D. E., Vilalta-Perdomo, E., & Michel-Villarreal, R. (2024). Empowering nanostores for competitiveness and sustainable communities in emerging countries: A generative artificial intelligence strategy ideation process. *Sustainability*, 16(24), 11244. <https://doi.org/10.3390/su162411244>. Article.

David Ernesto Salinas Navarro
Research Professor

IMPLEMENTATION OF A CHALLENGE-BASED LEARNING MODEL FOR HIGHER EDUCATION UNDER A MODULAR EDUCATION SYSTEM: A CASE STUDY

ABSTRACT: As student profiles and industry expectations modify, universities must advance learning methodologies to deliver more suitable graduates to the labor market. The Universidad Privada Boliviana (UPB) has developed experiential learning practices by implementing challenge-based learning (CBL) to enrich undergraduate curricula. One example of the CBL experiences was developed by the Taquiña Brewery, one of the five breweries of the Cervecería Boliviana Nacional (CBN), for the Industrial and Systems Engineering Department of the UPB between 2018 and 2019. As a result, students widely accepted the methodology, and academics from all disciplines in the university were trained to replicate CBL experiences in their classrooms. Moreover, the CBN found the opportunity to hire new talent, receive a fresh perspective on recurrent operational issues, and find new ideas based on theoretical concepts. This work exemplifies innovative approaches to enhance teaching and learning in supply chain management and logistics education.

Da Silva-Ovando, A. C., Olivares Quintana, O. S., Salinas-Navarro, D. E., & Chong, M. (2024). Implementation of a challenge-based learning model for higher education under a modular education system: A case study. *IEEE Revista Iberoamericana*

de *Tecnologías del Aprendizaje*, 19, 389-396. <https://doi.org/10.1109/RITA.2024.3458851>. Article.

David Ernesto Salinas Navarro

Research Professor

INTRODUCTION TO ACTIVE LEARNING AND AUTHENTIC ASSESSMENT: CONCEPTS AND APPLICATIONS

ABSTRACT: This chapter describes the intentions and content of this handbook. This chapter also introduces the two main concepts addressed in this handbook: "Active learning" and "authentic assessment." Concerning the latter concept, this chapter suggests a spectrum of authentic assessment, linked to different active learning approaches, from approaches highly immersive with real-world tasks to approaches with more simulated or contrived environments. This spectrum may help module designers identify which kind of active learning approach for authentic assessment would work better, considering the constraints, under which the module will operate, and the resources available.

Vilalta-Perdomo, E., Scroccaro, A., Salinas-Navarro, D. E., & Michel-Villarreal, R. (2025). Introduction to active learning and authentic assessment: Concepts and applications. In E. Vilalta-Perdomo, A. Scroccaro, D. E. Salinas-Navarro, & R. Michel-Villarreal (Eds.), *The Emerald handbook of active learning for authentic assessment* (pp. 1-13). Emerald Publishing. <https://doi.org/10.1108/978-1-83797-857-120251001>. Book Chapter.

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THE EMERALD HANDBOOK OF ACTIVE LEARNING FOR AUTHENTIC ASSESSMENT

ABSTRACT: Written by teachers for educators and researchers, this is the first handbook to present a series of insights that teachers may use to conceive, design, execute, and develop active learning experiences for authentic assessment that will enrich students' learning experiences.

Active Learning considers a series of educational methods where students play an active role in the learner-centered process, engaging beyond passive listening and note taking, through hands-on learning experiences. Contributions from international experts introduce the notion of authentic assessment, where students evidence their knowledge through thoughtful understanding, by being able to do something effective, transformative, or novel with a problem or complex situation.

Showcasing a range of active learning approaches such as collaborative learning, experiential learning, gamification and learning by teaching, chapters also tackle one of the most urgent challenges in higher education – the emergence of artificial intelligence. All the chapters presented in this handbook are practical in scope and can be adjusted for use in both pedagogic and andragogic environments.

Vilalta-Perdomo, E., Scroccaro, A., Salinas-Navarro, D. E., & Michel-Villarreal, R. (Eds.). (2025). *The Emerald handbook of active learning for authentic assessment*. Emerald Publishing. <https://doi.org/10.1108/9781837978571>. Book.

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THE RESONANCE OF MIKE JACKSON'S WORK WITH THE USE OF SYSTEMS IDEAS IN COMMUNITY OPERATIONAL RESEARCH

ABSTRACT: The body of work of Mike Jackson covers several major themes in OR/Systems Thinking and articulates key aspects of Critical Systems Thinking, with an interest throughout in applications to complex social challenges. In this paper, as a direct response to this Festschrift, and acknowledging his contribution to Community OR, five active UK-based researchers have engaged in their own process of community-based learning in order to articulate the ways Jackson's work resonates with their contemporary research and practice. The researchers used a variation of the Delphi method to reflect first on the ways that the body of work of Jackson resonated with their practice and research agendas. This produced a framework of ideas. Examples from the UK and overseas are then provided to illustrate these points. Ultimately, the researchers used these experiences and reflections to produce a series of statements for developing Community OR practice (and theory)—reflecting and extending Jackson's work.

Herron, R. J. M., Mendiawelso-Bendek, Z., Salinas Navarro, D. E., Vilalta-Perdomo, E., & Weaver, M. W. (2025). The resonance of Mike Jackson's work with the use of systems ideas in community operational research. *Systems Research and Behavioral Science*, 42(1), 51-68. <https://doi.org/10.1002/sres.3100>. Article.

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WHAT ACTIVE LEARNING AND AUTHENTIC ASSESSMENT IN HIGHER EDUCATION CAN DO FOR THE WORLD

ABSTRACT: This chapter examines how active learning and authentic assessment can impact learners, society and the world. It advocates for extending traditional classroom pedagogies to real-world experiences, where students can become knowledge producers and problem solvers. In today's higher education, it is essential to equip students with skills to address contemporary challenges. Active learning fosters reflective and practical growth, while authentic assessment encourages engagement with realistic issues, self-directed learning and critical thinking. By placing students in real-world scenarios, these approaches enhance their learning outcome development and foster meaningful contributions to communities and society. This is a shift in learning from classroom spaces to real-world environments. Accordingly, this type of learning supports novel productive interactions for societal impact and community support beyond traditional academic mechanisms. This chapter discusses these concepts in light of the ideas presented in this book in previous sections. Overall, the different uses and applications of active learning for authentic assessment illustrate the link of active pedagogies with realistic learning scenarios and the production of a positive impact on learners and society. Future work could explore the long-term possibilities of these approaches on society and communities, investigating how these could be adapted across disciplines or scaled to larger educational contexts.

Salinas-Navarro, D. E., & Vilalta-Perdomo, E. (2025). What active learning and authentic assessment in higher education can do for the world. In E. Vilalta-Perdomo, A. Scroccaro, D. E. Salinas-Navarro, & R. Michel-Villarreal (Eds.), *The Emerald handbook of active learning for authentic assessment* (pp. 353-372). Emerald Publishing. <https://doi.org/10.1108/978-1-83797-857-120251018>. Book Chapter.

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DEVELOPMENT OF A MOBILE APPLICATION FOR DERMATOLOGICAL DIAGNOSIS USING IMAGE RECOGNITION: THE DERMARE CASE STUDY

ABSTRACT: This chapter discusses the development of DermAware, an iOS mobile application intended for assisting der-

matological diagnosis through image recognition and machine learning. DermAware aims to serve as a supplementary resource for specialized medical professionals and patients, aiding the early identification and supervision of dermatological illnesses. The application was developed with SwiftUI for the front end and Django for the back end, providing scalability and secure data management. The application incorporates multiple components designed to enhance its usability. A real-time messaging module was designed to facilitate direct communication among users for prompt consultation scheduling. Health tracking functionalities, supported by Apple's HealthKit, enable the collection and monitoring of patient data. The application integrates patient history management, allowing doctors to review previous assessments and track disease development conveniently. Ultimately, an authentication system guarantees data confidentiality and adherence to regulations. DermAware uses Apple's CoreML framework alongside the ResNet50 convolutional neural network model to classify skin diseases. The system was trained using publicly accessible dermatological datasets, achieving an accuracy of 85% for detecting various skin conditions, including melanoma. The chapter finishes by addressing the technical challenges faced during development, evaluating potential enhancements, and discussing future developments in the field. These factors highlight the significance of AI-driven applications for improving medical diagnostics and healthcare accessibility.

Cedillo-Maldonado, L., Sigüenza-Noriega, I., Miranda-Mateos, S. R., Reinoso-Fuentes, L., Pérez-Aguirre, M., & Escobar-Castillejos, D. (2026). Development of a mobile application for dermatological diagnosis using image recognition: The DermAware case study. In E. Moya-Albor, H. Ponce, J. Brieva, S. L. Gomez-Coronel, & D. R. Torres (Eds.), *Machine learning methods in biomedical field. Studies in Computational Intelligence (SCI)* (Vol. 1218, pp. 25-47). Springer. https://doi.org/10.1007/978-3-031-96328-5_2. Book Chapter.

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OPTIMIZATION OF THE MECHANICAL BEHAVIOR OF ABS AND PLA 3D PRINTED USING HEAT TREATMENTS

ABSTRACT: This research evaluated the ultimate tensile strength (UTS), hardness and crystallinity of 3D printed parts with and without heat treatments (HT). For acrylonitrile butadiene styrene (ABS), temperatures of 70, 80 and 90 °C were applied for 10, 20 and 30 min, and for PLA, 75, 90 and 105 °C were applied for 20, 40 and 60 min. The experimental design included two factors: percentage of infill (33%, 66% and 100%) and geometric pattern (linear, triangular

and hexagonal), with three levels of measurement for each factor. UTS increased with higher infill percentage, reaching 35.5 MPa for ABS and 46.5 MPa for PLA with hexagonal pattern. Optimal HTs raised UTS to 49 MPa for ABS (70 °C, 10 min) and 64 MPa for PLA (75 °C, 20 min), matching or exceeding the properties of the original filament. In addition, hardness and crystallinity improved, reducing internal voids and strengthening mechanical properties. Thus, the methodology presented in this work joining Design of Experiments and HT contributes to pieces with a better mechanical performance.

Rodríguez-Reyna, S. L., Díaz-Aguilera, J. H., Acevedo-Parra, H. R., Escobar-Barrios, V., & Tapia, F. (2025). Optimization of the mechanical behavior of ABS and PLA 3D printed using heat treatments. *MRS Advances*, 10(6), 780-788. <https://doi.org/10.1557/s43580-025-01236-5>. Article.

Fidencio Tapia Rodríguez

Senior Researcher C, Research Professor

Héctor Rubén Acevedo Parra

Research Professor

STUDY ON THE ULTIMATE TENSILE STRESS AND FATIGUE LIFE IN RECYCLED PLA PRINTED BY FDM WITH DIFFERENT PERCENTAGES OF RELATIVE HUMIDITY

ABSTRACT: Effect of relative humidity in Fused Deposition Modeling specimens on tensile and fatigue mechanical properties is evaluated. Virgin and recycled PLA specimens are generated using a factorial DoE study with three factors: Relative humidity (three levels 18%, 22%, and 26%); number of perimeters (two levels: 3 and 6 contours); and nozzle temperature (two levels: 190 °C and 220 °C). UTS is output factor of ANOVA. Virgin and recycled PLA specimens with the highest UTS values were fatigue tested under cyclic tensile loading, with stress increments from 50 to 90% UTS in 10% increments. The objective is to determine the number of cycles to failure. Results show that virgin PLA achieves higher UTS values than recycled PLA. The combination of recycled PLA with 18%HR, six contours, and a nozzle temperature of 190 °C achieves a UTS of 29 MPa, higher than its own filament of 18 MPa and more than 100 × 103 cycles to fatigue.

Rodríguez-Reyna, S. L., Ledezma-Mondragón, F., Díaz-Aguilera, J. H., Acevedo-Parra, H. R., & Tapia, F. (2025). Study on the ultimate tensile stress and fatigue life in recycled PLA printed by FDM with different percentages of relative humidity. *MRS Advances*, 10(6), 722-728. <https://doi.org/10.1557/s43580-025-01136-8>. Article.

Antonio Valderrábano González

SNII Level I

ENHANCED AI-DRIVEN HARMONIC OPTIMIZATION IN 36-PULSES CONVERTERS FOR SCADA INTEGRATION

ABSTRACT: This paper presents an integrated approach for optimizing the performance of a 36-pulses converter system by using artificial intelligence (AI) techniques to be included in a Supervisory Control and Data Acquisition (SCADA) environment. The focus of the proposal is on enhancing harmonic reduction through intelligent adjustment of switching angles and coordinated control of the reinjection transformer included in the power converter topology. A key component of the proposed methodology involves a simulation-based process to determine optimal firing angles (α_1 , α_2 , and α_3), based on Selective Harmonic Elimination (SHE) theory, that minimize Total Harmonic Distortion (THD). Using MATLAB with Simulink and PLECS models, a parametric sweep of the firing angles, generating a comprehensive dataset of THD outcomes. This dataset, consisting of THD evaluations across fine-grained angle variations, serves as the training foundation for supervised machine learning models—specifically, neural network regressors—that approximate the nonlinear mapping between firing angles and harmonic distortion. These predictive models are then employed as surrogates to estimate THD rapidly and guide the selection of optimal switching angles in real time without requiring iterative numerical solvers. Optimization heuristics and predictive models are then deployed to dynamically adapt system parameters in real time under varying load conditions. The proposed method demonstrates significant improvements in power quality and operational reliability, highlighting the potential of AI-assisted SCADA systems in advanced power electronics applications. Implementation results performed on a 36-pulses voltage source converter prototype are included to illustrate the appropriateness of the proposal.

Valderrabano-Gonzalez, A., & Castañeda, C. E. (2025). Enhanced AI-driven harmonic optimization in 36-pulses converters for SCADA integration. *Electronics*, 14(18), 3623. <https://doi.org/10.3390/electronics14183623>. Article.

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FAILURE MODE AND EFFECTS ANALYSIS AND SENSITIVITY ANALYSIS FOR A NEUTRAL POINT RE-INJECTION MULTI-PULSE VOLTAGE SOURCE CONVERTER

ABSTRACT: Sensitivity Analysis plays a crucial role in the design, control, and optimization of multi-pulse Voltage Source Converters. It helps engineers assess how variations in parameters influence system performance, enabling the development of more efficient and robust converters. This study presents some Failure Modes and Effects Analysis that intends to identify the most affected components when a gate disconnection failure occurs, making them critical points for stress management. Additionally, the most vulnerable components when gates remain connected to high value are distinguished. Verifying the voltage output shape, it can be noticed that RMS voltage measurements are not a reliable indicator for tracking failure, whereas THD offers a more effective solution. Understanding these failure modes is essential for refining the design and control strategies of electronic converters, particularly in applications such as motor control and StatCom. Sensitivity analysis also strengthens control algorithms, ensuring that they can effectively accommodate parameter fluctuations while aiding in fault diagnosis and failure prediction. The early detection of switch malfunctions in power converters is essential for maintaining system reliability, safety, performance, and cost efficiency. Timely identification allows for proactive maintenance, preventing extensive damage and ensuring continuous operation. As the converters become increasingly integral to various applications, implementing reliable fault detection mechanisms is essential for sustaining their optimal performance and long-term functionality.

Valderrabano-Gonzalez, A., Robles-Campos, H. R., Beltran-Carbal, F., Tapia-Olvera, R., Rosas-Caro, J. C., & Aguilar-Mejia, O. (2025). Failure mode and effects analysis and sensitivity analysis for a neutral point re-injection multi-pulse voltage source converter. *e-Prime - Advances in Electrical Engineering, Electronics and Energy*, 13, 101068. <https://doi.org/10.1016/j.prime.2025.101068>. Article.

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SNII Level I

HIGH-PRECISION SPEED CONTROL OF INDUCTION MOTORS USING A MULTI-PULSE VOLTAGE SOURCE CONVERTER AND ADVANCED OBSERVER-BASED STRATEGIES

ABSTRACT: This paper presents a speed motor control using a precise Electric Motor Drive System (EMDS) utilizing an 84-pulse Voltage Source Converter (VSC). The development of the VSC signal requires two critical parameters: V_{module} , representing the combined amplitude of the 3-phase signals, and a variable frequency adjusted via a Phase-Locked Loop (PLL) within each sample cycle. To estimate the non-measurable variables ($\lambda\alpha_r$, $\lambda\beta_r$ and TL), sliding mode, asymptotic, and Luenberger observers are employed and compared among themselves. The control algorithm is based on sliding mode with an equivalent control strategy, ensuring robust performance under various operating conditions. This control algorithm transforms the plant to be controlled to the non-linear block control form by using error-tracking dynamics. This is to obtain the sliding manifold and to apply the equivalent control strategy. The effectiveness of the proposed system is validated through a set of simulations conducted in Matlab/Simulink, demonstrating its capability to achieve high precision in motor drive applications.

Castañeda, C. E., Valderrabano-Gonzalez, A., Gabbar, H. A., & Sood, V. K. (2025). High-precision speed control of induction motors using a multi-pulse voltage source converter and advanced observer-based strategies. *e-Prime - Advances in Electrical Engineering, Electronics and Energy*, 11, 100884. <https://doi.org/10.1016/j.prime.2024.100884>. Article.

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DESIGN, CONSTRUCTION AND VALIDATION OF A VIBRATION TABLE WITH DISTRIBUTED LOAD CELLS FOR DYNAMIC MEASUREMENT

ABSTRACT: This work presents the design, construction, and validation of a low-cost vibration table equipped with four load cells arranged at the corners of a square structure constructed of aluminum profiles. The system was designed to enable distributed measurement of dynamic forces on components subjected to

vibration, with special emphasis on accessibility, modularity, and accuracy. A Raspberry Pi connected to HX711 amplifier modules was used for data acquisition, allowing load signals to be recorded in real time with a resolution suitable for experimental studies. System validation was carried out by operating a 3D printer placed on the platform for a 13-min print run, capturing over 30,000 samples per sensor. The results demonstrate the system's ability to detect complex vibration patterns and its potential as a tool for structural analysis, experimental diagnostics, and academic training. The proposed design represents a viable alternative to commercial tables, adapted to engineering research and teaching environments.

Valdivia, L. J., Rodríguez-Sánchez, A. E., & Acevedo, M. (2026). Design, construction and validation of a vibration table with distributed load cells for dynamic measurement. In M. Acevedo, L. Valdivia, & H. Ponce (Eds.), *Multibody mechatronic systems. MuSMe 2025. Mechanisms and machine science, (Mechan. Machine Science)* (Vol. 195, pp. 282-291). Springer. https://doi.org/10.1007/978-3-032-10862-3_26. Conference Paper.

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MASS FLOW CONTROL STRATEGY FOR MAXIMUM ENERGY EXTRACTION IN THERMAL ENERGY STORAGE TANKS

ABSTRACT: This paper introduces an experimental approach to enhance thermal energy storage (TES) tank performance by employing a novel control strategy and an automatic flow valve. The valve adjusts mass flow to minimize heat loss and maximize useful heat within a specified input–output temperature range. Experiments were conducted indoors, simulating input heat via an electric heating element, and adhering to ANSI/ASHRAE 93-2010 standards. In the proposed control strategy, the set point is self-regulated based on an input value which in this case is the heat introduced into the TES system. In this way, when there is more input heat available, the mass flow will increase to obtain more useful heat at the output and, on the contrary, when there is less heat available, the mass flow will be reduced to obtain greater exergy. A comparison between this strategy and conventional on–off control systems was conducted, evaluating their performance based on useful heat obtained over an 8-h period with varying input heat levels. Results demonstrate that the proposed flow control methodology consistently outperforms on–off control, achieving a maximum 13.56% increase in useful heat under optimal

conditions. This underscores the effectiveness of the novel control strategy in maximizing thermal energy storage tank efficiency.

Montoya-Marquez, O., Acevedo-Parra, H. R., & Valdivia, L. J. (2025). Mass flow control strategy for maximum energy extraction in thermal energy storage tanks. *Journal of Solar Energy Engineering*, 147(3), 031006. <https://doi.org/10.1115/1.4067196>. Article.

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A RESILIENT ENERGY-EFFICIENT FRAMEWORK FOR JAMMING MITIGATION IN CLUSTER-BASED WIRELESS SENSOR NETWORKS

ABSTRACT: This paper presents a resilient and energy-efficient framework for jamming mitigation in cluster-based wireless sensor networks (WSNs), addressing a critical vulnerability in hostile or interference-prone environments. The proposed approach integrates dynamic cluster reorganization, adaptive MAC-layer behavior, and multipath routing strategies to restore communication capabilities and sustain network functionality under jamming conditions. The framework is evaluated across heterogeneous topologies using Zigbee and Bluetooth Low Energy (BLE); both stacks were validated in a physical testbed with matched jammer and traffic conditions, while simulation was used solely to tune parameters and support sensitivity analyses. Results demonstrate significant improvements in Packet Delivery Ratio, end-to-end delay, energy consumption, and retransmission rate, with BLE showing particularly high resilience when combined with the mitigation mechanism. Furthermore, a comparative analysis of routing protocols including AODV, GAF, and LEACH reveals that hierarchical protocols achieve superior performance when integrated with the proposed method. This framework has broader applicability in mission-critical IoT domains, including environmental monitoring, industrial automation, and healthcare systems. The findings confirm that the framework offers a scalable and protocol-agnostic defense mechanism, with potential applicability in mission-critical and interference-sensitive IoT deployments.

Del-Valle-Soto, C., Del-Puerto-Flores, J. A., Valdivia, L. J., Lay-Ekuakille, A., & Visconti, P. (2025). A resilient energy-efficient framework for jamming mitigation in cluster-based wireless sensor networks. *Algorithms*, 18(10), 614. <https://doi.org/10.3390/a18100614>. Article.

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ADAPTIVE JAMMING MITIGATION FOR CLUSTERED ENERGY-EFFICIENT LORA-BLE HYBRID WIRELESS SENSOR NETWORKS

ABSTRACT: Wireless sensor networks (WSNs) are fundamental for modern IoT applications, yet they remain highly vulnerable to jamming attacks, which significantly degrade communication reliability and energy efficiency. This paper proposes a novel adaptive cluster-based jamming mitigation algorithm designed for heterogeneous WSNs that integrate LoRa and Bluetooth Low Energy (BLE) technologies. The proposed strategy dynamically switches between communication protocols, optimizes energy consumption, and reduces retransmissions under interference conditions by leveraging real-time network topology adjustments and adaptive transmission power control. Through extensive experimental validation, we demonstrate that our mitigation mechanism reduces energy consumption by up to 38% and lowers packet retransmission rates by 47% compared to single-protocol networks under jamming conditions. Additionally, our results indicate that the hybrid LoRa-BLE approach outperforms standalone LoRa and BLE configurations in terms of network resilience, adaptability, and sustained data transmission under attack scenarios. This work advances the state-of-the-art by introducing a multi-protocol interference-resilient communication strategy, paving the way for more robust, energy-efficient, and secure WSN deployments in smart cities, industrial IoT, and critical infrastructure monitoring.

Del-Valle-Soto, C., Valdivia, L. J., Velázquez, R., Del-Puerto-Flores, J. A., Varela-Aldás, J., & Visconti, P. (2025). Adaptive jamming mitigation for clustered energy-efficient LoRa-BLE hybrid wireless sensor networks. *Sensors*, 25(6), 1931. <https://doi.org/10.3390/s25061931>. Article.

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BRIDGING THE DIGITAL DIVIDE IN MEXICO: A CRITICAL ANALYSIS OF TELECOMMUNICATIONS INFRASTRUCTURE AND PREDICTIVE MODELS FOR POLICY INNOVATION

ABSTRACT: This work presents an in-depth evaluation of the telecommunications landscape in Mexico from 2015 to 2023. The study's primary focus is on the disparities in broadband access, telecommunications infrastructure, and digital inclusion across various regions, particularly between urban and rural areas. By employing predictive models and correlation analysis, the paper identifies key factors influencing technology adoption and service bundling in households. A significant contribution of this research lies in its identification of strong correlations between broadband access, GDP growth, and the penetration of multiple telecommunication services such as fixed telephony, broadband internet, and television. The predictive models developed offer crucial insights into the regional inequalities of digital access, revealing patterns that policymakers can use to prioritize infrastructure investments. The findings underscore the essential role of public policy innovation in promoting digital inclusion, particularly in underdeveloped regions, and provide a robust analytical framework for understanding how advanced telecommunications services contribute to socio-economic development. Through this analytical approach, the study demonstrates the critical relationship between telecommunications infrastructure and regional economic performance, offering data-driven recommendations to bridge the digital divide and enhance connectivity in underserved areas. The results offer significant value for future research and policy initiatives aimed at fostering equitable access to Information and communication technologies, promoting economic growth, and ensuring broader societal inclusion in the digital age.

Del-Valle-Soto, C., Briseño, R. A., López-Pimentel, J.-C., Velázquez, R., Valdivia, L. J., & Varela-Aldás, J. (2024). Bridging the digital divide in Mexico: A critical analysis of telecommunications infrastructure and predictive models for policy innovation. *Telecom*, 5(4), 1076-1101. <https://doi.org/10.3390/telecom5040055>. Article.

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DYNAMIC JAMMING MITIGATION IN WIRELESS SENSOR NETWORKS: A COMPREHENSIVE ALGORITHM FOR RESILIENCE AND EFFICIENCY

ABSTRACT: Jamming attacks threaten the reliability and energy efficiency of WSNs (Wireless Sensor Networks), affecting critical applications like healthcare, smart cities, and industrial systems. This paper proposes a novel mitigation algorithm that combines dynamic clustering, adaptive routing, and power control to ensure stability under jamming. Unlike prior work, it offers real-time scalability and robustness. Tested in simulations and real deployments with Zigbee sensors, the solution achieved up to 85% resilience, 30% lower delay, and a 33% increase in PDR (Packet Delivery Ratio).

Del-Valle-Soto, C., Valdivia, L. J., Aguilar-Molina, Y., & Velázquez, R. (2026). Dynamic jamming mitigation in wireless sensor networks: A comprehensive algorithm for resilience and efficiency. In M. Acevedo, L. Valdivia, & H. Ponce (Eds.), *Multibody mechatronic systems. MuSMe 2025. Mechanisms and machine science, (Mechan. Machine Science)* (Vol. 195, pp. 251-260). Springer. https://doi.org/10.1007/978-3-032-10862-3_23. Conference Paper.

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FOREHEAD AND IN-EAR EEG ACQUISITION AND PROCESSING: BIOMARKER ANALYSIS AND MEMORY-EFFICIENT DEEP LEARNING ALGORITHM FOR SLEEP STAGING WITH OPTIMIZED FEATURE DIMENSIONALITY

ABSTRACT: Advancements in electroencephalography (EEG) technology and feature extraction methods have paved the way for wearable, non-invasive systems that enable continuous sleep monitoring outside clinical environments. This study presents the development and evaluation of an EEG-based acquisition system for sleep staging, which can be adapted for wearable applications. The system utilizes a custom experimental setup with the ADS1299EEG-FE-PDK evaluation board to acquire EEG signals from the forehead and in-ear regions under various conditions, including visual and auditory stimuli. Afterward, the acquired signals were processed to

extract a wide range of features in time, frequency, and non-linear domains, selected based on their physiological relevance to sleep stages and disorders. The feature set was reduced using the Minimum Redundancy Maximum Relevance (mRMR) algorithm and Principal Component Analysis (PCA), resulting in a compact and informative subset of principal components. Experiments were conducted on the Bitbrain Open Access Sleep (BOAS) dataset to validate the selected features and assess their robustness across subjects. The feature set extracted from a single EEG frontal derivation (F4-F3) was then used to train and test a two-step deep learning model that combines Long Short-Term Memory (LSTM) and dense layers for 5-class sleep stage classification, utilizing attention and augmentation mechanisms to mitigate the natural imbalance of the feature set. The results—overall accuracies of 93.5% and 94.7% using the reduced feature sets (94% and 98% cumulative explained variance, respectively) and 97.9% using the complete feature set—demonstrate the feasibility of obtaining a reliable classification using a single EEG derivation, mainly for unobtrusive, home-based sleep monitoring systems.

De Fazio, R., Yalçinkaya, Ş. E., Cascella, I., Del-Valle-Soto, C., De Vittorio, M., & Visconti, P. (2025). Forehead and in-ear EEG acquisition and processing: Biomarker analysis and memory-efficient deep learning algorithm for sleep staging with optimized feature dimensionality. *Sensors*, 25(19), 6021. <https://doi.org/10.3390/s25196021>. Article.

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GENRE-SENSITIVE PREDICTION OF EMOTIONAL AROUSAL IN VIRTUAL REALITY: A NEURAL MODELING APPROACH USING SKIN CONDUCTANCE PEAKS

ABSTRACT: Understanding how different virtual reality (VR) game genres modulate physiological arousal is crucial for designing emotionally adaptive immersive systems. This study introduces a novel experimental framework combining high-resolution Skin Conductance Response (SCR) data and neural predictive modeling to compare emotional activation across horror, skill-based, and exercise VR games. Using Galvanic Skin Response (GSR) sensors, we recorded phasic peaks in SCR from 25 university-aged participants during gameplay sessions with controlled exposure times and standardized transitions. However, given the minimal difference relative to

the large variability, this observation should be considered preliminary and specific to the tested games and cohort. A feed-forward neural network was developed to forecast individual arousal levels based solely on genre-induced features, achieving strong predictive performance. This dual contribution—empirical genre comparison and lightweight predictive modeling—offers a scalable tool for integrating emotional responsiveness into VR systems without continuous biosignal monitoring. The findings not only advance the state of the art in affective computing but also open new avenues for therapeutic, educational, and entertainment applications grounded in physiological adaptation.

Del-Valle-Soto, C., Velasco, D., Arreola, S., Manjarrez, M. A., Vilaseñor, J. P., Corona, V., Varela-Aldás, J., & GomezRomeo-Borquez, J. (2025). Genre-sensitive prediction of emotional arousal in virtual reality: A neural modeling approach using skin conductance peaks. *IEEE Latin America Transactions*, 23(12), 1356-1364. <https://doi.org/10.1109/TLA.2025.11231219>. Article.

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INNOVATIVE DRIVER MONITORING SYSTEMS AND ON-BOARD-VEHICLE DEVICES IN A SMART-ROAD SCENARIO BASED ON THE INTERNET OF VEHICLE PARADIGM: A LITERATURE AND COMMERCIAL SOLUTIONS OVERVIEW

ABSTRACT: In recent years, the growing number of vehicles on the road have exacerbated issues related to safety and traffic congestion. However, the advent of the Internet of Vehicles (IoV) holds the potential to transform mobility, enhance traffic management and safety, and create smarter, more interconnected road networks. This paper addresses key road safety concerns, focusing on driver condition detection, vehicle monitoring, and traffic and road management. Specifically, various models proposed in the literature for monitoring the driver's health and detecting anomalies, drowsiness, and impairment due to alcohol consumption are illustrated. The paper describes vehicle condition monitoring architectures, including diagnostic solutions for identifying anomalies, malfunctions, and instability while driving on slippery or wet roads. It also covers systems for classifying driving style, as well as tire and emissions monitoring. Moreover, the paper provides a detailed overview of the proposed traffic monitoring and management solutions, along with systems for monitoring road and environmental conditions, including the sensors used and the Machine Learning (ML) algorithms implemented. Finally, this review also presents an

overview of innovative commercial solutions, illustrating advanced devices for driver monitoring, vehicle condition assessment, and traffic and road management.

Visconti, P., Rausa, G., Del-Valle-Soto, C., Velázquez, R., Cafagna, D., & De Fazio, R. (2025). Innovative driver monitoring systems and on-board-vehicle devices in a smart-road scenario based on the internet of vehicle paradigm: A literature and commercial solutions overview. *Sensors*, 25(2), 562. <https://doi.org/10.3390/s25020562>. Review.

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INTEGRATED DYNAMIC POWER MANAGEMENT STRATEGY WITH A FIELD PROGRAMMABLE GATE ARRAY-BASED CRYPTOPROCESSOR SYSTEM FOR SECURED INTERNET-OF-MEDICAL THINGS NETWORKS

ABSTRACT: Advancements in electronics and sensor technologies are driving the deployment of ubiquitous sensor networks across various applications, including asset monitoring, security, and networking. At the same time, ensuring the integrity and confidentiality of data collected by sensor nodes is crucial to prevent unauthorized access or modification. However, the limited resources of low-power sensor networks present significant challenges for securing innovative Internet-of-Medical Things (IoMT) applications in complex environments. These miniature sensing systems, essential for diverse healthcare applications, grapple with constrained computational power and energy budgets. To address this challenge, this study proposes a dynamic power management strategy within a resource-constrained FPGA-based cryptoprocessor core for secure IoMT networks. The sensor node design comprises two main modules: an 8-bit reduced instruction set computer (RISC) and a cryptographic engine. These modules collaboratively manage their power consumption during the operational stages of data acquisition, encryption, transmission, and sleep mode activation. The cryptographic engine employs a pseudorandom number generator to generate a keystream for data encryption, utilizing direct sequence spread spectrum (DSSS) encoding to ensure secure communication. The experimental results demonstrate the effectiveness of the proposed dynamic power management strategy within the resource-constrained cryptoprocessor core. The sensor node achieves an average power consumption of 0.1 mW while utilizing 2414 logic cells and 5292 registers. A comparative analysis with other state-of-the-art lightweight sensor nodes highlights the advantages of our dynamic power management approach within the cryptoprocessor sensing system.

Vázquez-Castillo, J., Visairo, D., Atoche-Enseñat, R., Castillo-Atoche, A., Quijano-Cetina, R., Del-Valle-Soto, C., Ortegón-Aguilar, J., & Estrada-López, J. J. (2025). Integrated dynamic power management strategy with a field programmable gate array-based cryptoprocessor system for secured internet-of-medical things networks. *Technologies*, 13(2), 68. <https://doi.org/10.3390/technologies13020068>. Article.

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PROJECTION OF PHOTOVOLTAIC SYSTEM ADOPTION AND ITS IMPACT ON A DISTRIBUTED POWER GRID USING FUZZY LOGIC

ABSTRACT: The increasing adoption of photovoltaic systems presents new challenges for energy planning and grid stability. This study proposes a fuzzy logic-based methodology to identify potential PV adopters by integrating variables such as energy consumption, electricity tariff, solar radiation, and socioeconomic level. The approach was applied to a real distribution grid and compared against a previously presented method that selects users based solely on high energy consumption. The fuzzy logic model demonstrated superior performance by identifying 77.03 [%] of real adopters, outperforming the previous selection strategy. Additionally, the study evaluates the technical impact of PV integration on the distribution grid through power flow simulations, analysing energy losses, voltage stability, and asset loadability. Findings highlight that while PV systems reduce energy losses, they can also introduce voltage regulation challenges under high penetration. The proposed methodology serves as a decision-support tool for utilities and regulators, enhancing the accuracy of adoption projections and informing infrastructure planning. Its flexibility and rule-based nature make it adaptable to different regulatory and technical environments, allowing it to be replicated globally for sustainable energy transition initiatives.

López-Eugenio, K., Torres-Bermeo, P., Del-Valle-Soto, C., & Varela-Aldás, J. (2025). Projection of photovoltaic system adoption and its impact on a distributed power grid using fuzzy logic. *Sustainability*, 17(12), 5235. <https://doi.org/10.3390/su17125235>. Article.

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SIZING AND CHARACTERIZATION OF LOAD CURVES OF DISTRIBUTION TRANSFORMERS USING CLUSTERING AND PREDICTIVE MACHINE LEARNING MODELS

ABSTRACT: The efficient sizing and characterization of the load curves of distribution transformers are crucial challenges for electric utilities, especially given the increasing variability of demand, driven by emerging loads such as electric vehicles. This study applies clustering techniques and predictive models to analyze and predict the behavior of transformer demand, optimize utilization factors, and improve infrastructure planning. Three clustering algorithms were evaluated, K-shape, DBSCAN, and DTW with K-means, to determine which one best characterizes the load curves of transformers. The results show that DTW with K-means provides the best segmentation, with a cross-correlation similarity of 0.9552 and a temporal consistency index of 0.9642. For predictive modeling, supervised algorithms were tested, where Random Forest achieved the highest accuracy in predicting the corresponding load curve type for each transformer (0.78), and the SVR model provided the best performance in predicting the maximum load, explaining 90% of the load variability ($R^2 = 0.90$). The models were applied to 16,696 transformers in the Ecuadorian electrical sector, validating the load prediction with an accuracy of 98.55%. Additionally, the optimized assignment of the transformers' nominal power reduced installed capacity by 39.27%, increasing the transformers' utilization factor from 31.79% to 52.35%. These findings highlight the value of data-driven approaches for optimizing electrical distribution systems.

Torres-Bermeo, P., López-Eugenio, K., Del-Valle-Soto, C., Palacios-Navarro, G., & Varela-Aldás, J. (2025). Sizing and characterization of load curves of distribution transformers using clustering and predictive machine learning models. *Energies*, 18(7), 1832. <https://doi.org/10.3390/en18071832>. Article.

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RF FINGERPRINTING OF IOT MULTI-MODULATION WIRELESS DEVICES

ABSTRACT: Deep learning-based RF fingerprinting is a recent research area in wireless transmitter authentication. This paper presents results demonstrating the use of convolutional neural networks (CNNs) to classify RF transmissions of an IoT multimod-

ulation wireless device. The model is trained on I/Q baseband samples captured by a software-defined radio. Results show that each unique combination of wireless device and physical layer corresponds to a distinct class, allowing differentiation based on device and physical layer parameters. Experimental results demonstrate classification accuracy of 88% at an SNR of 6 dB and 98% at 18dB, indicating the method's ability to differentiate the pair (wireless device, physical layer).

Herrera Loera, C., Del-Valle-Soto, C., Valdivia, L., Bazdresch, M., & Mex-Perera, C. (2024). RF fingerprinting of IoT multi-modulation wireless devices. In *2024 IEEE Western New York Image and Signal Processing Workshop (WNYISPW)* (pp. 1-5). IEEE. <https://doi.org/10.1109/WNYISPW63690.2024.10786608>. Conference Paper.

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AN INNOVATIVE SOLUTION WITH WEARABLE AND ABOARD-THE-VEHICLE SENSORS INTEGRATED WITH MACHINE LEARNING ALGORITHMS FOR MONITORING THE DRIVER'S PSYCHO-PHYSICAL CONDITION FOR SAFETY PURPOSES

ABSTRACT: Recent progress in automotive safety has led to the development of an intelligent multi-sensor system for monitoring driver stress and fatigue. Monitoring the driver's psycho-physical state helps reduce risks to drivers and pedestrians. A literature review has been conducted on existing systems for detecting bio-signals and their use in evaluating the driver's psycho-physical condition. This study proposes the architecture of a monitoring system to classify driver fatigue using wearable devices and in-vehicle sensors to detect physiological signals, vehicle dynamics data, and traffic and weather information accessed by the driver's smartphone. The system employs an ensemble learning strategy to enhance the accuracy of fatigue detection compared to classic video-based systems. This approach aims to improve road safety by enabling intervention before a loss of attention occurs.

De Fazio, R., Cascella, I., Visconti, P., Velazquez, R., & Del Valle Soto, C. (2024). An innovative solution with wearable and aboard-the-vehicle sensors integrated with machine learning algorithms for monitoring the driver's psycho-physical condition for safety purposes. In *2024 International Symposium on Electronics and Telecommunications (ISETC)* (pp. 1-4). IEEE. <https://doi.org/10.1109/ISETC63109.2024.10797403>. Conference Paper.

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ENVIRONMENTAL ODOR DETECTION AND CLASSIFICATION WITH ELECTRONIC NOSE SYSTEM

ABSTRACT: A prototype of an electronic nose (e-nose) system integrating a set of general-purpose gas sensors, an electronic module, and signal processing and classification methods has been designed and implemented to detect certain environmental odors that might pose a risk to human health. The proposed device explores the filter diagonalization method (FDM), an advanced signal processing technique for accurate spectral estimation, to detect the presence of odors together with random forest (RF), a popular machine learning algorithm, to classify the features of such spectra. Experimental results show that the proposed FDM-RF approach can recognize the targeted odors with an accuracy of 96.4%.

Macías-Quijas, R., Velázquez, R., Del-Valle-Soto, C., Lizut, R., Visconti, P., & Lay-Ekuakille, A. (2025). Environmental odor detection and classification with electronic nose system. *Bulletin of Electrical Engineering and Informatics*, 14(2), 1117-1125. <https://doi.org/10.11591/eei.v14i2.9046>. Article.

Ramiro Velázquez Guerrero
SNII Level I

Carolina del Valle Soto
Senior Researcher D, SNII Level I

MECHANICAL, THERMAL, AND ENVIRONMENTAL ENERGY HARVESTING SOLUTIONS IN FULLY ELECTRIC AND HYBRID VEHICLES: INNOVATIVE APPROACHES AND COMMERCIAL SYSTEMS

ABSTRACT: Energy harvesting in the automotive sector is a rapidly growing field aimed at improving vehicle efficiency and sustainability by recovering wasted energy. Various technologies have been developed to convert mechanical, thermal, and environmental energy into electrical power, reducing dependency on traditional energy sources. This manuscript provides a comprehensive review of energy harvesting applications/methodologies, aiming to trace the research lines and future developments. This work identifies the main categories of harvesting solutions, namely mechanical, thermal, and hybrid/environmental solar-wind systems; each sec-

tion includes a detailed review of the technical and scientific state of the art and a comparative analysis with detailed tables, allowing the state of the art to be mapped for identification of the strengths of each solution, as well as the challenges and future developments needed to enhance the technological level. These improvements focus on energy conversion efficiency, material innovation, vehicle integration, energy savings, and environmental sustainability. The mechanical harvesting section focuses on energy recovery from vehicle vibrations, with emphasis on regenerative suspensions and piezoelectric-based solutions. Specifically, solutions applied to suspensions with electric generators can achieve power outputs of around 1 kW, while piezoelectric-based suspension systems can generate up to tens of watts. The thermal harvesting section, instead, explores methods for converting waste heat from an internal combustion engine (ICE) into electrical power, including thermoelectric generators (TEGs) and organic Rankine cycle systems (ORC). Notably, ICEs with TEGs can recover above 1 kW of power, while ICE-based ORC systems can generate tens of watts. On the other hand, TEGs integrated into braking systems can harvest a few watts of power. Then, hybrid solutions are discussed, focusing on integrated mechanical and thermal energy recovery systems, as well as solar and wind energy harvesting. Hybrid solutions can achieve power outputs above 1 kW, with the main contribution from TEGs (≈ 1 kW), compared to piezoelectric systems (hundreds of W). Lastly, a section on commercial solutions highlights how current scientific research meets the automotive sector's needs, providing significant insights for future development. For these reasons, the research results aim to be guidelines for a better understanding of where future studies should focus to improve the technological level and efficiency of energy harvesting solutions in the automotive sector.

Rausa, G., Calabrese, M., Velazquez, R., Del-Valle-Soto, C., De Fazio, R., & Visconti, P. (2025). Mechanical, thermal, and environmental energy harvesting solutions in fully electric and hybrid vehicles: Innovative approaches and commercial systems. *Energies*, 18(8), 1970. <https://doi.org/10.3390/en18081970>. Review.

Ramiro Velázquez Guerrero
SNII Level I

Carolina del Valle Soto
Senior Researcher D, SNII Level I

NEURAL NETWORK-BASED WEARABLE DEVICES FOR LIMB REHABILITATION BY INERTIAL SIGNAL CLASSIFICATION

ABSTRACT: Recent progress has led to the widespread use of Machine Learning (ML) in various fields, including biomedical applications. ML can assist in the diagnosis by detecting disease-spe-

cific patterns and monitoring the patient's condition. Furthermore, ML algorithms can be implemented on resource-limited systems thanks to emerging technologies like the Internet of Things (IoT), Edge Computing, and wearable devices, enabling real-time disease detection and faster processing. This research explores wearable Neural Network (NN) applications using inertial signals. A multi-purpose wearable device has been developed for arm gesture recognition, fall detection, stair climbing and descending recognition, and gait and physical activity level monitoring. NN-based classifiers have been trained on the Edge Impulse platform and implemented on nRF52840 microcontroller. These classifiers achieved high accuracy (from 95.74% up to 100%), using a small memory portion (from 4.4kB to 9.4 kB of RAM and from 17.4kB to 99.8 kB of Flash memory)

De Fazio, R., Spongano, L., Visconti, P., Velazquez, R., & Del Valle Soto, C. (2024). Neural network-based wearable devices for limb rehabilitation by inertial signal classification. In *2024 International Symposium on Electronics and Telecommunications (ISETC)* (pp. 1-4). IEEE. <https://doi.org/10.1109/ISETC63109.2024.10797275>. Conference Paper.

Ramiro Velázquez Guerrero
SNII Level I

Carolina del Valle Soto
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REAL-TIME OBJECT FINDING FOR THE VISUALLY IMPAIRED USING AN IMAGE-TO-SPEECH WEARABLE DEVICE

ABSTRACT: This paper introduces a novel wearable assistive device designed to enhance the daily lives of visually impaired people (VIP) by providing continuous, real-time object finding. The proposed device integrates a miniature camera and a system on module (SoM) computing unit. Deep learning-based algorithms, specifically Faster R-CNNs, run on the SoM targeting to detect and recognize pertinent objects in the images provided by the camera. An integrated speaker conveys audio sentences letting the user know the presence of object(s) in the visual space. Experimental results conducted in real-world conditions show an 86% mean average precision for object recognition and a 215 ms mean computing time for real-time processing. The proposed image-to-speech device offers a practical and efficient solution to assist VIP in finding everyday objects.

Velázquez, R., Pissaloux, E., Del-Valle-Soto, C., Garzón-Castro, C. L., de Fazio, R., & Visconti, P. (2026). Real-time object finding for the visually impaired using an image-to-speech wearable device. In M. Acevedo, L. Valdivia, & H. Ponce (Eds.), *Multibody mechatronic systems. MuSMe 2025. Mechanisms and ma-*

chine science, (*Mechan. Machine Science*) (Vol. 195, pp. 214-223). Springer. https://doi.org/10.1007/978-3-032-10862-3_20. Conference Paper.

Ramiro Velázquez Guerrero

SNII Level I

SYNCHRONOUS ACQUISITION AND PROCESSING OF ELECTRO- AND PHONO-CARDIOGRAM SIGNALS FOR ACCURATE SYSTOLIC TIMES' MEASUREMENT IN HEART DISEASE DIAGNOSIS AND MONITORING

ABSTRACT: Cardiovascular diseases remain one of the leading causes of mortality worldwide, highlighting the importance of effective monitoring and early diagnosis. While electrocardiography (ECG) is the standard technique for evaluating the heart's electrical activity and detecting rhythm and conduction abnormalities, it alone is insufficient for identifying certain conditions, such as valvular disorders. Phonocardiography (PCG) allows the recording and analysis of heart sounds and improves the diagnostic accuracy when combined with ECG. In this study, ECG and PCG signals were simultaneously acquired from a resting adult subject using a compact system comprising an analog front-end (model AD8232, manufactured by Analog Devices, Wilmington, MA, USA) for ECG acquisition and a digital stethoscope built around a condenser electret microphone (model HM-9250, manufactured by HMYL, Anqing, China). Both the ECG electrodes and the microphone were positioned on the chest to ensure the spatial alignment of the signals. An adaptive segmentation algorithm was developed to segment PCG and ECG signals based on their morphological and temporal features. This algorithm identifies the onset and peaks of S1 and S2 heart sounds in the PCG and the Q, R, and S waves in the ECG, enabling the extraction of the systolic time intervals such as EMAT, PEP, LVET, and LVST parameters proven useful in the diagnosis and monitoring of cardiovascular diseases. Based on the segmented signals, the measured averages (EMAT = 74.35 ms, PEP = 89.00 ms, LVET = 244.39 ms, LVST = 258.60 ms) were consistent with the reference standards, demonstrating the reliability of the developed method. The proposed algorithm was validated on synchronized ECG and PCG signals from multiple subjects in an open-source dataset (BSSLAB Localized ECG Data). The systolic intervals extracted using the proposed method closely matched the literature values, confirming the robustness across different recording conditions; in detail, the mean Q-S1 interval was 40.45 ms ($\approx$ 45 ms reference value, mean difference: -4.85 ms, LoA: -3.42 ms and -6.09 ms) and the R-S1 interval was 14.09 ms ($\approx$ 15 ms reference value, mean difference: -1.2 ms, LoA: -0.55 ms and -1.85 ms). In conclusion, the results demonstrate the potential of the joint ECG and PCG analysis to improve the long-term monitoring of cardiovascular diseases.

De Fazio, R., Cascella, I., Yalçinkaya, Ş. E., De Vittorio, M., Patrono, L., Velazquez, R., & Visconti, P. (2025). Synchronous acquisition and processing of electro- and phono-cardiogram signals for accurate systolic times' measurement in heart disease diagnosis and monitoring. *Sensors*, 25(13), 4220. <https://doi.org/10.3390/s25134220>. Article.

Ramiro Velázquez Guerrero

SNII Level I

THE EFFECTS OF THERMAL DRIFT ON THE RELIABILITY OF WATER ANALYZERS

ABSTRACT: Given their ability to measure the concentration of various pollutants at remote locations, the analyzers used to detect and characterize pollutants in liquid, solid, and gaseous matrices are regarded as high-tech instruments. Since they frequently work in harsh environments, they are vulnerable to important factors like wind, temperature, and power limitations. This paper examines the use of water analyzers in identifying critical circumstances and the behavior that results from thermal drifts. The outcomes and measurement of the water sample are affected by the critical conditions. Two methods were used to evaluate the reliability of analyzers deployed on two water quality monitoring nodes. Principal component analysis (PCA) and Kriging (optimal estimator) are the methods. They have discovered that when there is an overtemperature, the findings do not match; therefore, they have to be dismissed due to a malfunction or failure.

Koyazo, J. T., Lay-Ekuakille, A., Maggi, S., Palmisano, M., Velasquez, R., & Passerella, G. (2024). The effects of thermal drift on the reliability of water analyzers. In *2024 IEEE International Workshop on Metrology for the Sea (MetroSea)* (pp. 191-196). IEEE. <https://doi.org/10.1109/MetroSea62823.2024.10765791>. Article.

Evandro Agazzi
SNII Emeritus

MENTAL HEALTH-RELATED, EXISTENTIAL, AND BIOLOGICAL FACTORS ARE ASSOCIATED WITH THE DESIRE TO HASTEN DEATH IN MEXICAN CANCER PATIENTS UNDERGOING PALLIATIVE CARE: A SINGLE-CENTER STUDY

ABSTRACT: Introduction: The wish to hasten death (WTHD) is a clinically significant phenomenon that arises from complex suffering. It has been predominantly studied in Caucasian populations, emphasizing the importance of gaining more diverse cultural perspectives. This study explores the factors associated with the WTHD in Mexican cancer patients receiving palliative care from one academic center, with a specific focus on its connection to dignity. Patients and methods: The study, a cross-sectional research conducted between October 12, 2023, and August 30, 2024, involved patients with confirmed cancer diagnoses who were attending a palliative care service. Patients had applied the Patient Dignity Inventory (PDI), Schedule of Attitudes Toward Hastened Death (SAHD), Brief Edinburgh Depression Scale (BEDS), EORTC QLQ-C15-PAL to assess health-related quality of life, Karnofsky Performance Status Scale (KPSS) to assess functional capacity, and the Edmonton Symptom Assessment System. A PDI score ≥ 55 indicated a fractured sense of dignity (DPD), while a SAHD score ≥ 1 indicated the WTHD. Factors associated with the WTHD were identified using multiple logistic regression analysis. The study was approved by the IRB. Results: The study included 302 primarily middle-aged (54.5 [45-64]) females (225 [74.5%]), with 9 years of education. They reported high severity of well-being (7 [1-7]) and tiredness (3 [0-6]). Their median KPSS score showed independence (80 [70-80]), despite impacts across all EORTC QLQ-C15-PAL dimensions. DPD was noted in 110 patients (36.5%). The most frequent diagnoses were breast cancer (114 [38%]), lung cancer (33 [11%]), and gastrointestinal cancer (28 [9%]). The WTHD was found in 94 patients (31.1%). Factors significantly associated included tiredness score (OR: 1.147, 95% CI: 1.044-1.261, $p = 0.004$), BEDS score (1.181, 1.085-1.284, $p \leq 0.001$) and a DPD (1.979, 1.038-3.772, $p = 0.04$). Conclusions: The WTHD was found in one out of every three Mexican cancer patients receiving palliative care and was linked to biological-, mental health-, and existential-related factors.

Rodríguez-Mayoral, O., Monreal-Carrillo, E., Contreras-Yáñez, I., Allende-Pérez, S., Agazzi, E., & Pascual-Ramos, V. (2025). Mental health-related, existential, and biological factors are associated with the desire to hasten death in Mexican cancer patients undergoing palliative care: A single-center study. *PLoS ONE*, 20(8), e0329736. <https://doi.org/10.1371/journal.pone.0329736>. Article.

Evandro Agazzi
SNII Emeritus

SCIENCE AND EXPERIENCE OF THE HOLY

ABSTRACT: The experience of the holy can be seen as part of the effort of human beings to construct a meaningful world. This perspective reveals that science and religion have both presented themselves in human history as *strong values*, characterized by different "types" of knowledge (with different degrees of certainty to which they aspire) and different goals. That they have often been able to integrate smoothly and at other times appear distant from each other is part of the historicity of human affairs. Today it is necessary for religious discourse to be able to express itself in a culture strongly permeated by the scientific mentality. As the paper tries to show, this capacity essentially depends on being able to clarify how scientific knowledge can be reconciled with the concept of a radical hope in a life beyond death, understood as an essential integration of meaning in human life.

Agazzi, E. (2025). Science and experience of the holy. *Global Philosophy*, 35(5), 24. <https://doi.org/10.1007/s10516-025-09757-2>. Article.

Evandro Agazzi
SNII Emeritus

THE SEMANTIC FUNCTION OF THE AXIOMATIC METHOD

ABSTRACT: Since ancient Greek mathematics the axiomatic method had essentially a *deductive function* in the sense of granting the truth of the propositions of a certain discipline by starting from primitive propositions that were "true in themselves" and submitting them to a truth-preserving formal manipulation. A new perspective emerged in the foundational research of Peano's school and Hilbert's view of mathematical theories. According to this view, the whole axiomatic system provides a sort of global meaning that offers the possibility of understanding the sense of a theory, and also to find possible models for it. We can call this the *semantic function* of the axiomatic method because it offers the two basic dimensions of semantics, i.e. *sense and reference* (according to the Fregean perspective). Intellectual intuition is no longer needed for providing the objects of mathematical theories and the requirement of truth is replaced by the requirement of consistency. This approach has immediate consequence of an ontological nature, i.e. regarding the *kind of existence* of mathematical entities (Is consistency a sufficient condition for existence in mathematics?).

Agazzi, E. (2022). The semantic function of the axiomatic method. In F. Ferreira, R. Kahle, & G. Sommaruga (Eds.), *Axiomatic thinking I* (pp. 43-61). Springer. https://doi.org/10.1007/978-3-030-77657-2_4. Book Chapter.

Vania Rocío Aldrete Cortez
SNII Level I

María Liz Cataño Cedillo
Research Professor

BEYOND CLINICAL SIGNS: THE INTERPLAY BETWEEN VAGAL TONE AND LETHARGIC BEHAVIOR IN PRETERM INFANTS

ABSTRACT: In this cross-sectional, observational study, the association between lethargy and vagal tone was analyzed in thirteen low-risk preterm infants. Infants underwent behavioral assessment and vagal tone measurement indexed by high-frequency heart-rate variability (HF-HRV). A lower vagal tone cluster was associated with greater lethargy ($p = .05$), reduced handling ($p = .003$), excitability ($p = .006$), higher skin stress indicators ($p = .13$), and central nervous system stress indicators ($p = .10$) than cluster with a higher vagal tone cluster. A lower vagal tone could indicate autonomic nervous system dysregulation or immaturity, leading to neurobehavioral challenges, such as lethargy and further neurodevelopmental difficulties.

Aldrete-Cortez, V., Catano-Cedillo, L., & Rendón-Macías, M. E. (2025). Beyond clinical signs: The interplay between vagal tone and lethargic behavior in preterm infants. *Developmental Neuropsychology*, 50(1), 24-35. <https://doi.org/10.1080/87565641.2025.2477531>. Article.

Susana Castaños Cervantes
Research Professor

ANALYSIS OF THE RIGHTS OF MEXICAN CHILDREN AND ADOLESCENTS PLACED IN RESIDENTIAL CARE ACCORDING TO CHILD WELL-BEING INDICATORS

ABSTRACT: The National System for the Integral Development of the Family of Mexico is the governmental institution that provides child protective services and coordinates and regulates the Mexican Social Welfare System. More information is needed on the effects of the system's interventions on children and adolescents in residential care. This study examines the degree to which this governmental organization has protected, promoted, fulfilled, guaranteed, and strengthened the rights of sheltered children and

adolescents, thus fostering their well-being. One hundred sixty-five case files from December 1, 2018, to August 1, 2022, were reviewed and analyzed thoroughly following the steps to content analysis of Bless et al. (2013) and Bardin (2015). The main findings revealed that the investment of the governmental institution in protecting children's rights is still insufficient and inefficient, that the rights of children and adolescents placed in residential care have been partially fulfilled or unfulfilled, and that this governmental organization has yet to comply with current Mexican legislation. This study is the first to examine the protection and restitution of the rights of Mexican children and adolescents placed in residential care in governmental organizations. This research will encourage the design and implementation of effective research-based programs and policies that protect and reconstitute sheltered children's rights and positively impact their well-being to promote healthier developmental trajectories, especially in the context of Latin American cities.

Castaños-Cervantes, S. (2025). Analysis of the rights of Mexican children and adolescents placed in residential care according to child well-being indicators. *Journal of Human Rights and Social Work*, 10(1), 98-123. <https://doi.org/10.1007/s41134-024-00344-w>. Article.

Susana Castaños Cervantes
Research Professor

ANXIETY AND ANXIETY DISORDERS AMONG MEXICAN CHILDREN AND ADOLESCENTS

ABSTRACT: Anxiety and anxiety disorders are more common in children than adults, with an estimated prevalence of 9-21%, indicating a critical mental health issue in childhood. Without early culturally competent and transdiagnostic treatment, anxiety and anxiety disorders can lead to severe negative consequences in all life domains and extend to adulthood, causing impairment and increasing the cost for the individual and society. In Mexico, the prevalence of anxiety disorders among children and adolescents is still ambiguous. Gender and age differences have yet to be addressed, and most childhood cases of anxiety remain undetected and are left untreated. This cross-sectional research examined gender and age differences in anxiety and specific phobia (SP), social anxiety (SA), obsessive-compulsive disorder (OCD), and separation anxiety disorder (SAD) in a sample of 889 Mexican children and adolescents selected randomly. Several statistical analyses were conducted: descriptive, correlation, and gender and age differences. The main results revealed an interaction effect (gender x age group) for SP, SAD, and OCD. The findings obtained will help design culturally competent and gender and age-specific intervention strategies for addressing anxiety and its various disorders in Mexican children and adolescents, thus contributing to them having healthier developmental trajectories.

Castañón Cervantes, S., & Ojeda García, A. (2025). Anxiety and anxiety disorders among Mexican children and adolescents. *Revista Colombiana de Psicología*, 34(1), 125-143. <https://doi.org/10.15446/rcpv.34n1.111641>. Article.

Susana Castañón Cervantes

Research Professor

María Concepción Atristain Suárez

Research Professor

ASSERTIVENESS IN THE CONTEXT OF HUMAN RIGHTS, ETHICS, AND CLASSICAL VIRTUES

ABSTRACT: Whether in everyday disagreements, bargaining episodes, or high-stakes disputes, people typically see a spectrum of possible responses to dealing with differences with others, ranging from avoidance and accommodation to competition and aggression. When coming across such circumstances, it is crucial to advocate for oneself—our positions, to achieve personal goals, overcome difficulties, and be determined—but control aggressive impulses without harming the rights and interests of others.

This book addresses assertiveness from a human rights perspective, using a mixed methods approach. It explores how assertiveness as a human right promotes human dignity and helps build more just, equitable, peaceful, and inclusive societies. With interdisciplinary contributors working in diverse fields, the collection brings together theoretical and applied research evidence on assertive rights. The collection examines assertive rights as critical factors for developing assertive behavior and as a virtue for personal development, empowerment, and thriving.

Castañón-Cervantes, S., & Atristain-Suárez, C. (Eds.). (2024). *Assertiveness in the context of human rights, ethics, and classical virtues*. Springer. <https://doi.org/10.1007/978-3-031-60962-6>. Book.

Susana Castañón Cervantes

Research Professor

ASSERTIVENESS IN THE CONTEXT OF HUMAN RIGHTS, ETHICS, AND CLASSICAL VIRTUES: FINAL REFLECTIONS

ABSTRACT: Emerging and developing countries face numerous challenges regarding human rights protection, promotion, and exercise, which lead to communities where assertiveness is not encouraged. Contemporary societies require new development models conducive to resilience, sustainability, and social well-being. One way to achieve such social well-being is by addressing the complex and intertwined

interactions among culturally diverse people whose backgrounds and origins are complex and multi-faceted. To effectively manage these interactions, we should begin by educating in assertiveness as a human right and as the ethical behaviour and communication style that paves the way for promoting a culture of respect, equity, justice, and peace, where inclusion and diversity are stimulated. Throughout its 12 chapters and using a mixed-methods approach, this interdisciplinary edited collection has provided a comprehensive understanding and analysis of assertiveness rights and how assertiveness can be cultivated as a human right in the context of emerging and developing countries so that these studies can help researchers, scholars, governments, and the people build societies based on ethics, virtues, and cultures grounded in human rights.

Castañón-Cervantes, S. (2024). Assertiveness in the context of human rights, ethics, and classical virtues: Final reflections. In S. Castañón-Cervantes & C. Atristain-Suárez (Eds.), *Assertiveness in the context of human rights, ethics, and classical virtues* (pp. 267-275). Palgrave Macmillan. https://doi.org/10.1007/978-3-031-60962-6_14. Book Chapter.

Susana Castañón Cervantes

Research Professor

ASSERTIVENESS IN THE HEALTH DOMAIN: FINAL REFLECTIONS AND IMPLICATIONS

ABSTRACT: This chapter underscores the role of assertiveness by critically analysing the edited collection of 12 interdisciplinary chapters using a mixed-method approach. It summarises its key points, highlighting the importance of assertiveness across the health domain: as a valuable tool for personal growth and healthy developmental trajectories leading to psychological well-being and functioning, as an interpersonal skill crucial for healthy communication and social interactions, and for building positive relationships among peers, authorities, colleagues, and in educational contexts (e.g., between teachers and students), and as a professional skill for providing quality services based on dignified care, quality clinical care, positive teamwork, and good work relationships and interactions. Lastly, it provides a means to acquire assertiveness through training and education, introducing the LADDER model.

Castañón-Cervantes, S. (2025). Assertiveness in the health domain: Final reflections and implications. In S. Castañón-Cervantes & C. Atristain-Suárez (Eds.), *Assertiveness in the health domain: The path to self-fulfilment, wellness, and professional success in emerging and developing countries* (pp. 243-251). Emerald Publishing. <https://doi.org/10.1108/978-1-83662-280-220251034>. Book Chapter.

Susana Castaños Cervantes*Research Professor*

María Concepción Atristain Suárez*Research Professor*

ASSERTIVENESS IN THE HEALTH DOMAIN: THE PATH TO SELF-FULFILMENT, WELLNESS, AND PROFESSIONAL SUCCESS

ABSTRACT: Assertiveness is a core skill that is crucial in the health domain. Its importance lies in fostering a culturally appropriate health promotion lifestyle and in the ability to confidently and respectfully express individual needs, opinions, desires, and emotions while considering and respecting the rights and perspectives of others. It is a valuable tool since it contributes to improving interpersonal relationships, quality of care, work efficiency and productivity, teamwork, psychosocial well-being, and health outcomes. This chapter aims to qualitatively analyse assertiveness as the path to self-fulfilment, wellness, and professional success. It focusses on interpersonal assertiveness, professional assertiveness, and assertiveness as a method of communication characterised by being confident, clear, and controlled. It proposes the use of the IDEAL Model to be able to communicate assertively when facing conflicts or challenges. Finally, it gives the reader a general overview of this book. Hopefully, this book will pave the way for future research on assertiveness and the health domain, thus encouraging interpersonal and professional assertiveness.

Castaños-Cervantes, S., & Atristain-Suárez, C. (2025). Assertiveness in the health domain: The path to self-fulfilment, wellness, and professional success. In S. Castaños-Cervantes & C. Atristain-Suárez (Eds.), *Assertiveness in the health domain: The path to self-fulfilment, wellness, and professional success in emerging and developing countries* (pp. 1-10). Emerald Publishing. <https://doi.org/10.1108/978-1-83662-280-220251002>. Book Chapter.

Susana Castaños Cervantes*Research Professor*

María Concepción Atristain Suárez*Research Professor*

ASSERTIVENESS IN THE HEALTH DOMAIN: THE PATH TO SELF-FULFILMENT, WELLNESS, AND PROFESSIONAL SUCCESS IN EMERGING AND DEVELOPING COUNTRIES

ABSTRACT: Assertiveness in the Health Domain explores the transformative power of assertiveness within the health sector through a holistic, interdisciplinary, and culturally sensitive lens. This compre-

hensive guide offers invaluable tools and strategies for educators, parents, caregivers, and health professionals to cultivate assertive skills, enhance the quality of care, and improve teamwork and interpersonal relationships in health-related environments and educational institutions.

Authors Susana Castaños-Cervantes and Connie Atristain-Suárez offer practical intervention techniques tailored for diverse groups including college students, children, adolescents, older adults, homemakers, and homeless girls. Coverage includes critical issues such as the doctor-patient relationship, dementia care, and the role of assertiveness in sports and health institutions. The findings are drawn from the latest research and emerging trends in assertiveness, with a focus on practices in the US, Spain, and Latin America, ensuring readers have access to the most current and relevant information in this dynamic field.

With its wide-ranging scope, theoretical and methodological depth, and practical applications, this book is an essential resource for researchers, academics, upper-level postgraduate students, and leaders in private, public, and third-sector organizations.

Castaños-Cervantes, S., & Atristain-Suárez, C. (Eds.). (2025). *Assertiveness in the health domain: The path to self-fulfilment, wellness, and professional success in emerging and developing countries*. Emerald Publishing. <https://doi.org/10.1108/9781836622802>. Article.

Susana Castaños Cervantes*Research Professor*

EXPLORING COGNITIVE-BEHAVIORAL ART THERAPY FROM A SEL APPROACH IN VULNERABLE GROUPS: A NOVEL STUDY

ABSTRACT: Few studies in low- and middle-income countries (LMICs) have addressed the mental health of vulnerable groups through cognitive-behavioral art therapy (CBAT). This study qualitatively analyzed the effectiveness of CBAT strategies in enhancing psychological well-being and functioning among 100 Mexican individuals purposefully selected from welfare services. A CBAT-informed group intervention was designed and implemented to develop life skills in accordance with the four pillars of education. The findings indicate that these strategies promote personal growth and psychological resilience, potentially increasing individuals' resilience, fostering thriving communities, enhancing social cohesion, and cultivating a sense of belonging, all while alleviating psychological dysfunction. They seem to facilitate the restoration of vulnerable populations toward healthier life trajectories, thus improving their mental health and addressing adverse conditions.

Castaños-Cervantes, S., Marroquín-Fernández, G. A., & Lezama-Mendoza, V. (2025). *Exploring cognitive-behavioral art*

therapy from a SEL approach in vulnerable groups: A novel study. *Art Therapy*, 1-27. <https://doi.org/10.1080/07421656.2025.2581333>. Article.

Susana Castaños Cervantes

Research Professor

María Concepción Atristain Suárez

Research Professor

"I'M OK, YOU'RE OK" PHILOSOPHY: PROMOTING A CULTURE OF RESPECT, EQUITY, JUSTICE, AND PEACE THROUGH ASSERTIVENESS-AN INTRODUCTION

ABSTRACT: Assertiveness is a human right essential for belonging and cultivating a culture of peace, equity, justice, and respect. Its importance lies in fostering culturally appropriate interactions and in the ability to express clearly, confidently, and respectfully personal needs, opinions, desires, and emotions while considering and respecting the rights and perspectives of others. It is a valuable tool since it contributes to improving, among other aspects, interpersonal relationships, quality of care, work efficiency and productivity, teamwork, psychosocial well-being, and health outcomes. This chapter qualitatively analyses assertiveness as a human right and as the fundamental factor for intercultural competencies, which, in turn, help establish diverse and inclusive societies. As a result, peace, justice, and equity are settled amongst communities, and a culture of belonging, enrichment, and thriving is cultivated. It examines how education paves the way for communicating, behaving assertively, and exercising the human right to be assertive. Thus, education provides the foundation for learning to live together through assertiveness. Finally, this chapter synthesises and analyses the book to give a general overview of its content. This book will pave the way for future research on assertive rights. It will encourage studies of assertiveness as a human right and as a way of promoting a culture of respect, justice, and peace within diverse, inclusive, and culturally competent societies.

Castaños-Cervantes, S., & Atristain-Suárez, C. (2024). "I'm OK, you're OK" philosophy: Promoting a culture of respect, equity, justice, and peace through assertiveness—An introduction. In S. Castaños-Cervantes & C. Atristain-Suárez (Eds.), *Assertiveness in the context of human rights, ethics, and classical virtues* (pp. 1-28). Palgrave Macmillan. https://doi.org/10.1007/978-3-031-60962-6_1. Book Chapter.

Susana Castaños Cervantes

Research Professor

PSYCHOSOCIAL CHARACTERISTICS OF MEXICAN GIRLS AND FEMALE ADOLESCENTS AT RISK OF HOMELESSNESS

ABSTRACT: Women at risk of homelessness present psychosocial deficits at a higher degree than the rest of the general population. Such features diminish their psychological functioning, well-being, and health-related quality of life. Still, few studies worldwide have addressed their psychological traits. This study examined some psychosocial characteristics (e.g. anxiety, depression, assertiveness, and emotion regulation) present in a group of Mexican females at risk of homelessness. The main findings revealed that functional emotion regulation strategies and anxiety explained 31% and 58.5% of the variance for assertiveness and depression, respectively. Results in this study support assertive behaviours and emotion regulation strategies as protective factors and serve as evidence for a risk and resilience framework. Clinical implications are that effective treatments should focus on these traits from a multicultural approach to address the psychological needs of this vulnerable group efficiently.

Castaños-Cervantes, S. (2025). Psychosocial characteristics of Mexican girls and female adolescents at risk of homelessness. In S. Castaños-Cervantes & C. Atristain-Suárez (Eds.), *Assertiveness in the health domain: The path to self-fulfilment, wellness, and professional success in emerging and developing countries* (pp. 65-88). Emerald Publishing. <https://doi.org/10.1108/978-1-83662-280-220251013>. Book Chapter.

Susana Castaños Cervantes

Research Professor

PSYCHOSOCIAL PREDICTORS OF SUICIDE RISK IN MEDICAL STUDENTS

ABSTRACT: In Mexico, suicides occur every 90 min. It ranks second among 15–19-year-olds and fifth among 10–14-year-olds, underlining the need for targeted prevention strategies. Both practicing doctors and medical students are among the groups with the highest risk of suicide. The results of our path model analysis of suicide risk show that depression and emotional dysregulation are key predictors of suicide risk. Early detection and care programs should be implemented for students with this mental disorder. In Mexican medical male students, interventions must include techniques to address the emotional dysregulation strategy of denial, while in females they should also incorporate the emotional dysregulation strategy of suppression.

Domínguez-González, A. D., & Castaños-Cervantes, S. (2024). Psychosocial predictors of suicide risk in medical students. In S. Castaños-Cervantes, A. Ojeda García, & C. L. Reitz-Krueger (Eds.), *Working with vulnerable populations: A multicultural perspective* (pp. 87-100). Springer. https://doi.org/10.1007/978-3-031-67710-6_7. Book Chapter.

Susana Castaños Cervantes
Research Professor

SEXUAL ASSERTIVENESS IN MEXICAN HOMELESS FEMALE YOUTH: A QUALITATIVE APPROACH

ABSTRACT: Homeless female youth are among the most vulnerable understudied groups worldwide. They do not know their sexual rights and are denied their right to exercise them. This study qualitatively explored the sexual assertiveness of a group of Mexican homeless female youth to identify factors shaping sexual assertiveness and plausible pathways that may explain its effects. Two hundred homeless females aged 10–19 years old participated in this study. A semi-structured interview assessing dimensions of sexual assertiveness was conducted. The main findings revealed a low level of sexual assertiveness and of exercising sexual rights, a high level of sexual violence, a lack of sexual education and knowledge, and a lack of understanding of sexual rights. This study encourages the design and implementation of effective research-based programs and policies that can positively impact the sexual health of homeless female youth.

Castaños-Cervantes, S. (2024). Sexual assertiveness in Mexican homeless female youth: A qualitative approach. In S. Castaños-Cervantes & C. Atristain-Suárez (Eds.), *Assertiveness in the context of human rights, ethics, and classical virtues* (pp. 229-246). Palgrave Macmillan. https://doi.org/10.1007/978-3-031-60962-6_12. Book Chapter.

Susana Castaños Cervantes
Research Professor

UNDERSTUDIED POPULATIONS WITHIN THE SEXUAL ASSAULT LITERATURE

ABSTRACT: This chapter explores the often-overlooked subpopulations within the domain of sexual assault, shedding light on the experiences of women who conceive in rape, homeless female youth, and male college students. Despite the extensive research attention directed toward sexual violence, these groups have received comparatively less empirical investigation, leaving significant gaps in understanding and intervention. Through a comprehensive review of existing literature and recent research findings,

this chapter illuminates the distinct vulnerabilities, challenges, and consequences faced by each understudied population.

Reitz-Krueger, C. L., Guarnera, L. A., & Castaños-Cervantes, S. (2024). Understudied populations within the sexual assault literature. In S. Castaños-Cervantes, A. Ojeda García, & C. L. Reitz-Krueger (Eds.), *Working with vulnerable populations: A multicultural perspective* (pp. 225-234). Springer. https://doi.org/10.1007/978-3-031-67710-6_16. Book Chapter.

Susana Castaños Cervantes
Research Professor

VIOLENCE AND ITS ASSOCIATED PSYCHOSOCIAL FACTORS IN MEXICAN HOMELESS FEMALES

ABSTRACT: Violence in Mexican homeless females has not been addressed. This study examined the differences in several psychosocial factors associated with violence among a group of 240 Mexican homeless females selected non-randomly. The main results showed that homeless female victims of physical or sexual violence presented a lower level of subjective well-being compared to victims of psychological violence, who instead exhibited a higher index of depression. These findings indicate that intervention strategies must focus on psychosocial factors linked to specific forms of violence in homeless females so they can achieve a healthier developmental trajectory and a higher quality of life.

Castaños-Cervantes, S. (2024). Violence and its associated psychosocial factors in Mexican homeless females. In S. Castaños-Cervantes, A. Ojeda García, & C. L. Reitz-Krueger (Eds.), *Working with vulnerable populations: A multicultural perspective* (pp. 163-179). Springer. https://doi.org/10.1007/978-3-031-67710-6_12. Book Chapter.

Susana Castaños Cervantes
Research Professor

WORKING WITH VULNERABLE POPULATIONS: FINAL REFLECTIONS AND IMPLICATIONS

ABSTRACT: Although complex and multifactorial, vulnerability reflects various trajectories with manifold implications, three primary dimensions of vulnerability—physical, psychological, and social—have been depicted across this book from a non-Western framework to accurately depict specific characteristics, interventions, and practices across multiple groups and contexts. Our authors have placed at the center of vulnerability research the perspectives and voices of those deemed vulnerable and potential

stakeholders, such as practitioners and service managers, enlightening policy and practice shortcomings and biases to be addressed. Thus, after analyzing the edited collection and the work of our contributors, we seek to critically contribute to vulnerability research with an intersectionality lens so that vulnerability and vulnerability groups in low- and middle-income countries or emerging and developing countries are reframed seeking to respond appropriately and have a positive impact that will help build more just, inclusive, equitable, and diverse contemporary societies.

Castaños-Cervantes, S., Ojeda García, A., & Reitz-Krueger, C. L. (2024). Working with vulnerable populations: Final reflections and implications. In S. Castaños-Cervantes, A. Ojeda García, & C. L. Reitz-Krueger (Eds.), *Working with vulnerable populations: A multicultural perspective* (pp. 291-294). Springer. https://doi.org/10.1007/978-3-031-67710-6_21. Book Chapter.

Susana Castaños Cervantes

Research Professor

WORKING WITH VULNERABLE POPULATIONS: A MULTICULTURAL PERSPECTIVE

ABSTRACT: This book explores vulnerability in many forms and among diverse understudied vulnerable populations worldwide from different perspectives, particularly from non-western contexts. It examines characteristics and profiles of vulnerable populations, intervention strategies, and recommendations for public policy actions in developing and emerging countries. As the world becomes increasingly connected and localities become more diverse, researchers and practitioners working to ameliorate human suffering cannot rely on one-size-fits-all solutions, especially when it comes to the most vulnerable members of society. The book argues the need for interdisciplinary research and action, and it challenges popular discourse on vulnerable groups and intervention strategies in Western societies and developed countries. In particular, it includes a Latin American perspective seldom considered in research about vulnerability worldwide. With interdisciplinary contributors from four continents, working in diverse fields such as social psychology, pedagogy, community psychology, medicine, sociology, clinical psychology, anthropology, and social work, this edited collection brings together theoretical and applied research evidence on three vulnerable population categories: physical vulnerability, psychological vulnerability, and social vulnerability. The book not only presents exhaustive solutions to any of the problems discussed therein, but it also offers examples of the considerations that should be afforded when working with groups who have unique vulnerabilities.

Castaños-Cervantes, S., Ojeda García, A., & Reitz-Krueger, C. L. (Eds.). (2024). *Working with vulnerable populations: A multi-*

cultural perspective. Springer. <https://doi.org/10.1007/978-3-031-67710-6>. Book.

Guadalupe Janette Furuzawa Carballada

Research Professor

POLYMERIZED TYPE I COLLAGEN DOWNREGULATES STAT-1 PHOSPHORYLATION THROUGH ENGAGEMENT WITH LAIR-1 IN CIRCULATING MONOCYTES, AVOIDING LONG COVID

ABSTRACT: The intramuscular administration of polymerized type I collagen (PTIC) for adult symptomatic COVID-19 outpatients downregulated hyperinflammation and improved symptoms. We inferred that LAIR1 is a potential receptor for PTIC. Thus, a binding assay and surface plasmon resonance binding assay were performed to estimate the affinity of the interaction between LAIR1 and PTIC. M1 macrophages derived from THP-1 cells were cultured with 2–10% PTIC for 24 h. Lysates from PTIC-treated THP-1 cells, macrophage-like cells (MLCs), M1, M1 + IFN- γ , and M1 + LPS were analyzed by Western blot for NF- κ B (p65), p38, STAT1, and pSTAT1 (tyrosine⁷⁰¹). Serum cytokine levels and monocyte LAIR1 expressions (Mo1 and Mo2) were analyzed by luminometry and flow cytometry in symptomatic COVID-19 outpatients on PTIC treatment. PTIC-bound LAIR1 had a similar affinity to collagen in M1 macrophages. It downregulated pSTAT1 in IFN- γ -induced M1. COVID-19 patients under PTIC treatment showed a significant decrease in Mo1 percentages and cytokines (IP-10/MIF/eotaxin/IL-8/IL-1RA/M-CSF) associated with STAT1 and an increase in the Mo2 subset. The inflammatory mediators and Mo1 downregulation were related to better oxygen saturation and decreased dyspnea, chest pain, cough, and chronic fatigue syndrome in the acute and long-term phase of infection. PTIC is an agonist of LAIR1 and downregulates STAT-1 phosphorylation. PTIC could be relevant for treating STAT1-mediated inflammatory diseases, including COVID-19 and long COVID.

Olivares-Martínez, E., Hernández-Ramírez, D. F., Núñez-Álvarez, C. A., Meza-Sánchez, D. E., Chapa, M., Méndez-Flores, S., Priego-Ranero, Á., Azamar-Llamas, D., Olvera-Prado, H., Rivas-Redonda, K. I., Ochoa-Hein, E., López-Mosqueda, L. G., Rojas-Castañeda, E., Urbina-Terán, S., Septién-Stute, L., Hernández-Gilsoul, T., Aguilar-León, D., Torres-Villalobos, G., & Furuzawa-Carballada, J. (2025). Polymerized type I collagen downregulates STAT-1 phosphorylation through engagement with LAIR-1 in circulating monocytes, avoiding long COVID. *International Journal of Molecular Sciences*, 26(3), 1018. <https://doi.org/10.3390/ijms26031018>. Article.

PROTECTIVE ROLE OF ABCC DRUG SUBFAMILY RESISTANCE TRANSPORTERS (ABCC1-7) IN INTESTINAL INFLAMMATION

ABSTRACT: The ABCC subfamily contains thirteen members. Nine of these transporters are called multidrug resistance proteins (MRPs). The MRPs have been associated with developing ulcerative colitis (UC). This study aimed to evaluate the ABCC expression in UC patients and its role in a dextran sulfate sodium (DSS)-induced colitis mice model under 5-aminosalicylates or methylprednisolone treatment and compared with control without inflammation. DSS-induced colitis mice were treated with 5-aminosalicylates (50 mg/kg 24 h) or methylprednisolone (2 mg/kg 24 h). Human rectal biopsies were obtained from UC patients. The abcc-relative mRNA levels and protein expression were determined by RT-PCR and immunohistochemistry. *abcc4*, *abcc5*, and *abcc6* mRNA levels were significantly increased in DSS-induced colitis compared to the other groups. The 5-aminosalicylate treatment dramatically increased the *abcc2* and *abcc3* mRNA levels vs. control. Methylprednisolone treatment increased *abcc1* vs. DSS-induced colitis and colitis treated with 5-aminosalicylate. Immunohistochemical analysis revealed down-regulation of ABCC1/ABCC2/ABCC5/ABCC7 in mice colitis vs. control. Treatment with 5-aminosalicylate restored ABCC5 levels, while methylprednisolone restored ABCC2/ABCC5/ABCC7 in colitis mice at similar control levels. Relative mRNA levels of *mrp1-5* were increased in active UC patients vs. control. ABCC2/ABCC4/ABCC7 were conspicuously expressed in the mucosa of 5-aminosalicylate and/or methylprednisolone-treated UC patients, while ABCC2/ABCC4/ABCC5/ABCC7 in submucosa, ABCC1/ABCC5/ABCC7 in muscular, and ABCC1/ABCC4/ABCC5/ABCC7 in serosa were expressed vs. controls. This is the first report about the differential up-regulation of the ABCC subfamily gene and protein expression in DSS-induced colitis under aminosalicylates or methylprednisolone treatment.

Fonseca-Camarillo, G., Furuzawa-Carballeda, J., Miguel-Cruz, E., Barreto-Zúñiga, R., Martínez-Benítez, B., & Yamamoto-Furusho, J. K. (2025). Protective role of ABCC drug subfamily resistance transporters (ABCC1-7) in intestinal inflammation. *Immunologic Research*, 73(1), 33. <https://doi.org/10.1007/s12026-024-09583-5>. Article.

PROTECTIVE ROLE OF SELENIUM-BINDING PROTEIN 1 (SELENBP1) IN PATIENTS WITH ULCERATIVE COLITIS

ABSTRACT: Background: The expression of selenium-binding protein 1 (SELENBP1), a molecule responsible for the absorption of selenium in the colon, is crucial for its immunoregulatory effect, but this phenomenon has not been studied in patients with UC. The present study aimed to determine the clinical outcome of SELENBP1 expression in colonic tissue from patients with UC. Methods: The relative mRNA expression of SELENBP1 was analyzed in 34 patients with UC and 20 controls. Statistical analyses were performed with SPSS 19. Results: SELENBP1 gene expression was significantly lower in patients with active UC than those with UC in remission ($p = 0.003$) and within the controls ($p = 0.04$). Overexpression of the SELENBP1 gene was associated with a more benign clinical course characterized by initial activity and more than two years of prolonged remission (OR 23.7, $p = 0.003$) and an intermittent clinical course (OR 47.5, $p = 0.001$), mild histological activity (OR 0.11; 95% CI: 1.00–1.41, $p = 0.05$) and severe histological activity (OR 0.08, 95% CI: 0.008–0.866, $p = 0.02$). SELENBP1-positive cells were found mainly in the submucosa's inflammatory infiltrate and muscular and adventitia's internal layers from patients with active UC compared to those in the control group ($p \leq 0.001$). Conclusions: The upregulation of SELENBP1 was associated with a benign clinical course of UC. This is the first report suggesting the immunoregulatory role of SELENBP1 in patients with UC.

Fonseca-Camarillo, G., Furuzawa-Carballeda, J., Priego-Ranero, Á. A., Barreto-Zúñiga, R., Martínez-Benítez, B., & Yamamoto-Furusho, J. K. (2024). Protective role of selenium-binding protein 1 (SELENBP1) in patients with ulcerative colitis. *Metabolites*, 14(12), 662. <https://doi.org/10.3390/metabo14120662>. Article.

PULL-DOWN HELLER MYOTOMY IMPROVES THE CLINICAL OUTCOME OF ADVANCED SIGMOID ACHALASIA

ABSTRACT: Introduction: Esophagectomy was considered the first line for advanced sigmoid (aSg) achalasia (esophageal angulation $< 90^\circ$), while laparoscopic Heller myotomy (LHM) has a lower percentage of success. The pull-down LHM (PD-LHM) technique has emerged as a promising and more effective rescue therapy to avoid esophagectomy for aSg achalasia. However, the long-term functional results of PD-LHM are inconclusive. Objective: To compare

the outcome of aSg achalasia ($< 90^\circ$) who underwent the PD-LHM technique with those of non-advanced (naSg) achalasia ($\geq 90^\circ$) and LHM. Patients and methods: This ambispective nested cohort study evaluated 34 achalasia patients with megaesophagus divided into two groups: (a) aSg ($< 90^\circ$; $n = 20$; 59%) PD-LHM treated, and (b) naSg ($\geq 90^\circ$; $n = 14$; 41%) LHM treated. The assessments included esophageal angulation and symptom questionnaires. All patients were clinically and manometrically evaluated before and at 1- and 12-month post-surgery intervals. Clinical outcomes focused on achieving esophageal angulation $\geq 90^\circ$ and an Eckardt score < 3 . Results: 65% of patients were men, and 65% had achalasia type I. The mean esophageal angulation in aSg was $79.6 \pm 8.8^\circ$, and in naSg was $116.3 \pm 16.3^\circ$. aSg improved to $99.5 \pm 15.2^\circ$, and 17/20 patients (85%) shifted to the naSg group. aSg significantly improved in Eckardt symptom score at 1 month (1.2 ± 1.3) vs. preoperative score (8.9 ± 1.6). The three aSg patients who experienced PD-LHM failure were male, type I achalasia, had higher preoperative IRP and LES pressure, were older, and had longer disease duration vs. success. A good clinical and manometric outcome was obtained in 85% of aSg. Conclusion: Our findings suggest that PD-LHM is an effective treatment for aSg with a success rate of 85%.

Méndez-Hernández, D. P., Moreno-Fuentes, M., Barron-Cervantes, N. M., Stenner-Escalante, A., Morales-Herrera, C. A., Aguilar-León, D., López-Mosqueda, L. G., Romero-Osorio, C. D., Coss-Adame, E., Valdovinos, M. A., Valdovinos-García, L. R., Furuzawa-Carballeda, J., & Torres-Villalobos, G. (2025). Pull-down Heller myotomy improves the clinical outcome of advanced sigmoid achalasia. *Surgical Endoscopy*, 39(11), 7514-7524. <https://doi.org/10.1007/s00464-025-12176-4>. Article.

Víctor Hugo Gálvez Zúñiga
SNII Level I

INFLUENCES ON THE EMERGENCE OF STRATEGIC VISUOMOTOR LEARNING MECHANISMS IN SCHOOL-AGED CHILDREN

ABSTRACT: Visuomotor development is based on implicit procedural and explicit strategic learning mechanisms. Given that both of these mechanisms are associated with child maturation, we sought to explore the effect of three related variables on adaptation rates: chronological age, intelligence quotient, and motor skills. In our study, 86 healthy school-aged children (grouped in 6-7, 8-9, and 10-11 years) with no reported visual or developmental disorders participated in a prism-throwing task under two different conditions. In the first condition, we introduced a wedge prism that displaces the visual field laterally. Adapting to this kind of visual perturbation relies mainly on procedural mechanisms. In the second condition, we introduced a dove prism, which reverses the visual field horizontally, allowing us to evaluate explicit strategic learning mechanisms.

Most of the children managed to adapt to the use of implicit procedures based on the error feedback, regardless of age. However, older children were able to adopt explicit strategies to counteract the optical disturbance generated by the dove prism in greater proportions, irrespective of motor ability scores or intelligence quotient. Our results suggest that adopting strategic mechanisms depends more on chronological development than on intelligence or motor skills. In contrast, implicit error-based visuomotor learning consolidates from an early age.

Galvez, V., Calderon-Villalon, J., Gómez-Moya, R., & Fernandez-Ruiz, J. (2025). Influences on the emergence of strategic visuomotor learning mechanisms in school-aged children. *Journal of Experimental Psychology: Human Perception and Performance*, 51(4), 526-533. <https://doi.org/10.1037/xhp0001291>. Article.

Desiderio Salomón Hernández Gutiérrez
SNII Level I

IBERVILLEA SONORAE (S. WATSON) GREEN A POTENTIAL RESOURCE OF BIOACTIVE COMPOUNDS: SYSTEMATIC ANALYSIS OF A MEXICAN PLANT USED IN TRADITIONAL MEDICINE

ABSTRACT: *Ibervillea sonorae* (S. Watson) Green (Cucurbitaceae) is a tuber succulent known as "wareke," which grows in dry desert landscapes in northwestern Mexico and the southwestern United States. Indigenous tribes use *I. sonorae* as a remedy against cancer, inflammation, rheumatism, skin infections, and diabetes. The great popularity of wareke in traditional medicine has motivated various working groups to investigate its pharmacological properties. The antiproliferative, antitumoral, antifungal, hypoglycemic, antiinflammatory, antioxidant, and antimicrobial potential of this plant has been established. Chemical studies showed that *I. sonorae* is a potential resource of bioactive compounds, cucurbitacin-type triterpenoids, and phytosterols, the main secondary metabolites. The objective of this chapter is to systematically analyze the phytochemical knowledge of the plant (isolated and identified compounds), describe the biological activities of different extracts, isolated ingredients, and phytopreparations, and discuss their possible applications.

Angulo Molina, A., di Cristofaro, V., Pieleas, U., López Romero, J. C., Vidal Gutiérrez, M., Hernández Gutiérrez, S., Robles Zepeda, R. E., & Torres Moreno, H. (2025). *Ibervillea sonorae* (S. Watson) Green a potential resource of bioactive compounds: Systematic analysis of a Mexican plant used in traditional medicine. In Atta-ur-Rahman (Ed.), *Studies in natural products chemistry* (Vol. 85, pp. 395-443). Elsevier. <https://doi.org/10.1016/B978-0-443-23754-6.00017-3>. Book Chapter.

Desiderio Salomón Hernández Gutiérrez
SNII Level I

Victor M. Arenas Luna
Research Professor

PARTICIPATION OF MESENCHYMAL STEM CELLS IN THE TUMOR PROCESS

ABSTRACT: Although most mesenchymal stem cell (MSCs) studies have focused on evaluating the safety and efficacy of their use as therapeutic agents in regenerative medicine, some recently published studies have highlighted the immunomodulatory role of MSCs in several pathologies, such as cancer. Multiple authors support the idea that MSCs play an essential role in tumor pathogenesis because MSCs can promote and facilitate tumor growth, angiogenesis, and metastasis. Additionally, MSCs may induce modulation of the immune response in favor of tumor growth by producing molecules such as cytokines, growth factors, and immunosuppressive molecules. Despite multiple underlying mechanisms by which MSCs promote tumor development and progression have been described, few reports have defined the mechanisms through which MSCs support immunosuppression. This chapter will present an overview analyzing the immunomodulatory properties of normal and tumor MSCs and their differences because the study of mechanisms that T-MSCs use to regulate the immune response could allow the design and development of novel strategies against cancer.

Arenas-Luna, V. M., Cisneros, B., & Hernández-Gutiérrez, S. (2024). Participation of mesenchymal stem cells in the tumor process. In K. H. Haider (Ed.), *Handbook of stem cell applications* (pp. 1023-1054). Springer. https://doi.org/10.1007/978-981-99-7119-0_37. Book Chapter.

Mario Isaac Lumbreras Márquez
Senior Researcher B, Research Professor

FETAL AND NEONATAL OUTCOMES IN FETUSES WITH AN ESTIMATED FETAL WEIGHT PERCENTILE OF 10–20 IN THE EARLY THIRD TRIMESTER: A RETROSPECTIVE COHORT STUDY

ABSTRACT: Background: Fetal size is often dichotomized as normal or abnormal using the 10th percentile of estimated fetal weight (EFW) or abdominal circumference as a cutoff. While the risk of adverse perinatal outcomes decreases with increasing fetal weight percentile, no percentile completely eliminates that risk. Objective: The aim of this study was to compare perinatal outcomes between fetuses with an EFW between the 10th and 20th percentiles and those with an EFW between the 20th and 90th percentiles (i.e., >20 and <90) at the beginning of the accelerated growth stage (28.0–

30.0 weeks' gestation). Methods: We conducted a retrospective cohort study of singleton pregnancies managed at a quaternary center in Mexico City (2017-2024). Outcomes were compared based on EFW percentiles at 28.0-30.0 weeks. The primary outcome was adverse neonatal outcome (ANeO), defined as the presence of at least one of the following: umbilical artery pH $\leq$ 7.1, 5 min Apgar $\leq$ 7, NICU admission, early neonatal hypoglycemia, non-reassuring fetal status, respiratory distress syndrome, intraventricular hemorrhage, hypoxic-ischemic encephalopathy, or perinatal death. Secondary outcomes included progression to fetal growth restriction (FGR) and low birth weight. Modified Poisson regression was used to estimate adjusted risk ratios (aRRs) with 95% confidence intervals (CIs). Results: Among 650 cases, ANeO occurred in 45.8% of fetuses in the 10th-20th percentile group vs. 29.4% in the 20th-90th percentile group (aRR: 1.51, 95% CI: 1.22-1.86; $p < 0.001$). FGR and low birth weight were also more frequent in the 10th-20th percentile group (21.1% and 27.6% vs. 6.4% and 5.8%, respectively; $p < 0.001$). Conclusions: Fetuses between the 10th and 20th percentiles at 28-30 weeks have increased risks of neonatal morbidity, FGR, and low birth weight.

Mendez-Piña, M. A., Lumbreras-Marquez, M. I., Acevedo-Gallegos, S., Velazquez-Torres, B., Rodriguez-Sibaja, M. J., Camarena-Cabrera, D. M., & Gallardo-Gaona, J. M. (2025). Fetal and neonatal outcomes in fetuses with an estimated fetal weight percentile of 10-20 in the early third trimester: A retrospective cohort study. *Diagnostics*, 15(17), 2251. <https://doi.org/10.3390/diagnostics15172251>. Article.

Mario Isaac Lumbreras Márquez
Senior Researcher B, Research Professor

FETAL CARDIAC RHABDOMYOMAS SUSCEPTIBLE TO PRENATAL TREATMENT WITH MTOR INHIBITORS: LITERATURE REVIEW AND PROPOSAL OF A PRENATAL MANAGEMENT ALGORITHM

ABSTRACT: Certain types of fetal cardiac rhabdomyomas can lead to severe complications, including intrauterine death, yet no specific criteria have been established for the prenatal use of pharmacological therapies to mitigate the impact of rhabdomyomas. We conducted a narrative review of case reports and case series published between January 1, 2000, and February 28, 2025, identified through PubMed, Scopus, Web of Science, and Google Scholar, describing the prenatal use of mammalian target of rapamycin inhibitors in this context. Thirteen studies reporting on 15 fetuses were included. Five fetuses (33.3%) had a single rhabdomyoma, and 10 (66.6%) had multiple lesions. Prenatal genetic testing for Tuberous Sclerosis Complex was performed in 9 cases (60%): 1 with a TSC1 mutation, 7 with TSC2 mutations, and 1 negative. Sirolimus

was the most frequently used inhibitor (86.6%), while everolimus was used in 2 cases (13.3%). The main indication for treatment was progressive tumor growth causing outflow obstruction and/or hemodynamic compromise, including reduced cardiac output, arrhythmias, and fetal hydrops. Therapy was initiated at a median of 30.0 weeks (IQR 26.7–33.1) and completed at 38.0 weeks (IQR 36–39). All reports documented tumor reduction and improved cardiac function, though regrowth occurred in 5 cases (33.3%) after discontinuation. No fetal or neonatal deaths were reported, and none required postnatal cardiac surgery before discharge. Based on these findings, we proposed echocardiographic criteria to identify suitable candidates, including inflow/outflow tract obstruction, severe atrioventricular valve insufficiency, tachyarrhythmia, impaired cardiac function, or hydrops, and developed a structured prenatal management algorithm. Prenatal therapy with mTOR inhibitors, therefore, appears to improve fetal cardiac function by reducing tumor burden and may contribute to better perinatal outcomes, although validation in future studies is required.

Martinez-Garcia, A., Tirado-Aguilar, O. A., Acevedo-Gallegos, S., Gallardo-Gaona, J. M., Velazquez-Torres, B., Ramirez-Calvo, J. A., Camarena-Cabrera, D. M. A., Rodriguez-Sibaja, M. J., Lumbreras-Marquez, M. I., & Copado-Mendoza, Y. (2025). Fetal cardiac rhabdomyomas susceptible to prenatal treatment with mTOR inhibitors: Literature review and proposal of a prenatal management algorithm. *Frontiers in Medicine*, 12, 1711774. <https://doi.org/10.3389/fmed.2025.1711774>. Review.

Mario Isaac Lumbreras Márquez
Senior Researcher B, Research Professor

MATERNAL, FETAL, AND NEONATAL SERIOUS ADVERSE EVENTS ASSOCIATED WITH LOW-DOSE ASPIRIN DURING THE FIRST TRIMESTER OF PREGNANCY: A SECONDARY ANALYSIS OF THE ASPIRIN SUPPLEMENTATION FOR PREGNANCY INDICATED RISK REDUCTION IN NULLIPARAS (ASPIRIN) TRIAL

ABSTRACT: Background: Low-dose aspirin (LDA) has been shown to reduce the risk of preterm preeclampsia, particularly when initiated early in pregnancy. However, the safety of starting LDA before 11 0/7 weeks of gestation remains unclear. Objective: To assess whether initiating LDA before 11 0/7 weeks of gestation is associated with increased maternal, fetal, or neonatal serious adverse events compared to later initiation. Study design: This secondary analysis of the ASPIRIN (Aspirin Supplementation for Pregnancy Indicated Risk Reduction In Nulliparas) trial included 11,879 nulliparous women with singleton pregnancies randomized to receive LDA (81 mg/d) or placebo between 6 0/7–13 6/7 weeks of gestation. Severe adverse events (ie, maternal death, antepartum hemorrhage, post-

partum hemorrhage, anemia, preeclampsia or eclampsia, preterm labor, hypertension admission, fever or infection, fetal loss, neonatal death up to 28 days, miscarriage, abortion, or medical termination of pregnancy, and congenital anomalies) were analyzed based on gestational age at LDA initiation (<11 0/7 vs ≥11 0/7 weeks). Furthermore, congenital anomalies were assessed for therapy initiated during the embryonic (ie, <9 0/7 weeks) or fetal period. Interaction tests were performed via logistic regression models on the ASPIRIN trial safety population (ie, participants who received at least one dose of LDA or placebo) and on the subset of participants who had an adherence to the exposure of ≥90%. Results: Among the 11,879 eligible participants for this secondary analysis, 62% (n=7324) initiated the allocated exposure before 11 0/7 weeks vs 38% (n=4555) that initiated LDA or placebo at a later gestational age. Furthermore, in this population, 84.4% (n=10,030) had an adherence to the intervention of 90% or more. Moreover, the proportion of adherence of ≥90% to LDA or placebo was similar between strata (84.6% [n=6195] for <11 0/7 vs 84.2% [n=3835] ≥11 0/7 weeks, P=.570). No significant differences were observed in the maternal, fetal, or neonatal adverse events described above based on the timing of LDA initiation (P>.05 for all interactions). Likewise, congenital anomalies did not significantly differ between embryonic and fetal exposure periods (interaction P-value = .095). Results remained consistent in participants who had an adherence to the exposure of ≥90%. Conclusions: LDA (81 mg/d) initiated before 11 0/7 weeks of gestation may not increase the risk of maternal, fetal, or neonatal serious adverse events or congenital anomalies. These findings provide reassuring evidence of the safety of LDA exposure during early pregnancy. El resumen está disponible en Español al final del artículo.

Rodriguez-Sibaja, M. J., Galvez-Rubalcava, N., Hagerman-Sucar, G., Alcocer-Gonzalez Camarena, P., Gomez-Woodworth, J. R., Villalpando-Juarez, M. I., Acevedo-Gallegos, S., Velazquez-Torres, B., Ramirez-Calvo, J. A., Copado-Mendoza, D. Y., & Lumbreras-Marquez, M. I. (2025). Maternal, fetal, and neonatal serious adverse events associated with low-dose aspirin during the first trimester of pregnancy: A secondary analysis of the Aspirin Supplementation for Pregnancy Indicated Risk Reduction In Nulliparas (ASPIRIN) trial. *American Journal of Obstetrics and Gynecology MFM*, 7(11), 101768. <https://doi.org/10.1016/j.ajogmf.2025.101768>. Article.

Mario Isaac Lumbreras Márquez
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PREDICTION OF PREECLAMPSIA BEFORE 11TH WEEK OF GESTATION: A SECONDARY ANALYSIS OF THE ASPIRIN TRIAL

ABSTRACT: Background: Early screening for preeclampsia is crucial for preventing adverse maternal and fetal events. Current first-tri-

mester algorithms for predicting preeclampsia are designed to evaluate individual risk between 11.0 and 13.6 weeks of gestation based on various maternal characteristics while integrating biophysical and biochemical features. However, there is limited information regarding risk assessment during earlier stages of pregnancy (i.e., <11.0 weeks gestation). Objective: To develop a prediction model for preeclampsia/eclampsia before 11.0 weeks of gestation as a proof-of-concept in a secondary analysis of the ASPIRIN trial. Study design: This study is a secondary analysis of the ASPIRIN trial, a multinational, randomized, double-blind, placebo-controlled trial. The ASPIRIN trial database, obtained from NICHD DASH, included 11,976 nulliparous pregnant women aged 18-40 with gestational ages of 6.0-13.6 weeks at randomization. Participants were assigned to receive either aspirin (81 mg/day) or placebo until 36.0 weeks or delivery. This secondary analysis included pregnancies delivered at ≥ 20.0 weeks, excluding those in the aspirin group or with gestational ages ≥ 11.0 weeks at enrollment. The composite outcome was preeclampsia/eclampsia, as reported in the ASPIRIN trial. Predictor variables available in the dataset included maternal age, education (4 levels), body mass index (BMI kg/m²), gravidity, baseline hemoglobin, baseline systolic blood pressure, and baseline diastolic blood pressure. Logistic regression, with logarithmic transformation for continuous variables, was used to develop the model. The area under the ROC curve with a 95% confidence interval (CI) estimated via bootstrap resampling (1,000 iterations) and the P-value of the Hosmer-Lemeshow statistical test are reported as discrimination and calibration measures. This study used the entire available sample using a complete case approach. Results: A total of 3421 participants met the inclusion criteria, with a cumulative incidence of preeclampsia/eclampsia of 2.9% (99/3,421). Maternal age (21.96 ± 4.13 vs 20.86 ± 3.21 , $P < .001$) and BMI (22.49 ± 4.77 vs 20.79 ± 3.55 , $P < .001$) were significantly higher in the preeclampsia/eclampsia group. Gravidity was lower ($P = .023$), and hemoglobin levels were slightly elevated (11.88 ± 1.52 g/dL vs 11.50 ± 1.61 g/dL, $P = .019$) in the preeclampsia/eclampsia group. Educational level ($P = .070$), systolic blood pressure ($P = .720$), and diastolic blood pressure ($P = .390$) showed no significant differences between groups. The logistic regression model yielded an AUC of 0.69 (95% CI 0.63-0.74), and the Hosmer-Lemeshow test P-value was 0.094, indicating acceptable discrimination and calibration. Conclusions: This proof-of-concept logistic regression model using first-trimester maternal characteristics demonstrated acceptable predictive performance for preeclampsia/eclampsia before 11.0 weeks of gestation. During this critical period, several interventions could be proposed to reduce preeclampsia risk, including medication adjustments, lifestyle changes, and appropriate referral if needed. Further studies are required to validate these findings and assess their clinical utility in different settings.

Capdeville, G., Godinez-Medina, A., Copado-Mendoza, D. Y., Acevedo-Gallegos, S., Rodriguez-Bosch, M. R., Amaya-Guel, Y., Rodriguez-Sibaja, M. J., & Lumbreras-Marquez, M. I. (2025). Prediction of preeclampsia before 11th week of gestation:

A secondary analysis of the ASPIRIN trial. *AJOG Global Reports*, 5(3), 100521. <https://doi.org/10.1016/j.xagr.2025.100521>. Article.

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SURVIVAL ASSESSMENT IN EXTREMELY PRETERM NEONATES IN A MIDDLE-INCOME SETTING

ABSTRACT: Introduction: Globally, an estimated 15.1 million preterm neonates are born annually, with 1% classified as extremely preterm (i.e., <28.0 weeks of gestation). The survival and outcomes of this vulnerable population are influenced by multiple factors, particularly gestational age, birth weight, and available medical resources. This study aimed to describe the hospital discharge survival of extremely preterm infants born in a middle-income setting. As a secondary objective, we assessed the neonatal morbidity associated with this group. Material and methods: In this cross-sectional study of singleton pregnancies, neonatal survival following extremely preterm birth was determined using three different denominators and expressed as prevalence (i.e., percentages): (1) the total number of extremely preterm births, including intra-partum fetal deaths; (2) the total number of all live births, including neonatal deaths in the delivery room, and (3) the total number of preterm neonates admitted to the neonatal intensive care unit (NICU). Neonatal morbidity was assessed as a secondary outcome. Results: There were no live births between 22.0 and 23.6 weeks of gestation. Overall mortality decreased with increasing gestational age, from 100% (22/22) at <24.0 weeks of gestation to 87% (14/16), 42% (16/38), and 21% (11/52) at a gestational age of 25, 26, and 27 weeks, respectively. The survival rate to NICU discharge among extremely preterm infants was 49% (65/132), 67% (65/97), and 69% (65/93), depending on whether survival was calculated based on all births, all live births, or NICU admissions, respectively. None of the neonates born before 24.6 weeks of gestation survived to discharge. Notably, 97.0% of NICU survivors were diagnosed with major morbidity. Conclusion: The survival rate at NICU discharge exceeds 50% from 26 weeks onwards in a middle-income setting. Importantly, survival rates varied significantly depending on the denominator used, highlighting the need to carefully select inclusion criteria in neonatal survival analyses. Notably, survival after extremely preterm birth was associated with significant morbidity.

Rodriguez-Sibaja, M. J., Herrera-Ortega, O., Lumbreras-Marquez, M. I., Morales-Barquet, D., Acevedo-Gallegos, S., Copado-Mendoza, Y., Camarena-Cabrera, D. M., & Gallardo-Gaona, J. M. (2025). Survival assessment in extremely preterm neonates in a middle-income setting. *Frontiers in Pediatrics*, 13, 1574613. <https://doi.org/10.3389/fped.2025.1574613>. Article.

HISTORY OF LEUKEMIA, REVISITED

ABSTRACT: Purpose of the review: Provide a general historical overview of leukemia, emphasizing the early discoveries that led to its characterization. Recent findings: Leukemia recognition began in the late 19th century with the advent of the microscope. Leeuwenhoek and Swammerdam described erythrocytes, while Lieutaud first observed globuli albicantes, later identified as lymphocytes by Hewson. Early case studies by Velpeau, Donné, Bennett, Craigie, Virchow, and Fuller suggested that leukocytosis could occur without infection. Virchow coined the term “leukemia,” while Bennett proposed “leucocythemia.” Neumann identified the bone marrow as the source of blood cells and leukemia, coining the term “myelogenous leukemia,” and Ehrlich classified leukemia into myeloid and lymphoid types. In 1914, Boveri linked chromosomal abnormalities to cancer, and in 1960, Nowell and Hungerford discovered the Philadelphia chromosome. The use of mustard gas in WWI led to the development of chemotherapy drugs like chlorambucil and busulfan. The Human Genome Project further advanced leukemia diagnosis and treatment. Leukemia, like many diseases, has evolved due to changes in causative factors such as viruses, bacteria, and genetic mutations, which have impacted its pathogenesis and treatment. It will undoubtedly continue to evolve, with new scientists working towards a cure for this devastating disease.

Ortiz-Hidalgo, C. (2025). History of leukemia, revisited. *Current Oncology Reports*, 27(4), 472-482. <https://doi.org/10.1007/s11912-025-01658-2>. Review.

PATHOLOGICAL AND IMMUNOHISTOCHEMICAL FEATURES OF MALIGNANT PERIPHERAL NERVE SHEATH TUMOR WITH HETEROLOGOUS RHABDOMYOBlastic DIFFERENTIATION (MALIGNANT TRITON TUMOR) IN THE CONTEXT OF THE MALIGNANT PERIPHERAL NERVE SHEATH TUMOR SPECTRUM

ABSTRACT: Malignant peripheral nerve sheath tumors (MPNST) are aggressive sarcomas arising from Schwann cells or neurofibromas, comprising ~10% of soft tissue sarcomas. Found in 8% to 13% of neurofibromatosis type 1 patients, they typically show spindle cells expressing S100 and SOX10. Some display heterologous differentiation (bone, cartilage, vessels, or glands). When rhabdomyosarcomatous features are present, they are called malignant peripheral

nerve sheath tumor with heterologous rhabdomyoblastic differentiation (malignant triton tumors), which are more prone to recurrence, metastasis, and worse outcomes. Epithelial differentiation does not affect prognosis. Despite advances in understanding MPNST biology, many pathophysiological mechanisms remain unclear. This review highlights their histopathology, focusing on malignant triton tumor.

Arias-Ruiz, L. F., & Ortiz-Hidalgo, C. (2025). Pathological and immunohistochemical features of malignant peripheral nerve sheath tumor with heterologous rhabdomyoblastic differentiation (malignant triton tumor) in the context of the malignant peripheral nerve sheath tumor spectrum. *International Journal of Surgical Pathology*. Advance online publication. <https://doi.org/10.1177/10668969251403185>. Review.

THE SECRETS OF THE TüBINGEN CASTLE KITCHEN: FRIEDRICH MIESCHER AND THE DISCOVERY OF NUCLEIN, THE CORNERSTONE OF DNA

ABSTRACT: In 1869, Friedrich Miescher, born in Basel, Switzerland, discovered a previously unknown phosphorus-rich substance in the nuclei of pus cells. Conducting his research in a laboratory set up in the kitchen of Tübingen medieval castle in Germany, and under the guidance by Professor Felix Hoppe-Seyler, Miescher primarily focused on the composition of cell nuclei. He obtained nuclear material by washing pus cells from surgical bandages provided by a nearby hospital. In 1869, Miescher described a completely new nuclear molecule that, unlike proteins, contained large amounts of phosphorus. He named this substance “nuclein,” marking the first description of DNA. Miescher passed away long before Watson, Crick, Wilkins, and Franklin announced the precise role DNA played in cells in 1953. Through his discovery, Miescher laid the groundwork for all subsequent DNA research.

Ortiz-Hidalgo, C. (2024). The secrets of the Tübingen Castle kitchen: Friedrich Miescher and the discovery of nuclein, the cornerstone of DNA. *Gaceta Médica de México*, 160(4), 443-449. <https://doi.org/10.24875/GMM.M24000932>. Article.

Gregorio Tomás Obrador Vera
Research Professor

DEVELOPMENT AND VALIDATION OF A QUESTIONNAIRE TO ASSESS THE HEALTH RELATED SOCIAL CAPITAL FOR CHRONIC KIDNEY DISEASE AMONG MEXICAN ADOLESCENTS

ABSTRACT: Background: Social Capital on health has been studied widely, to date there is no valid and reliable questionnaire that measure it in Chronic Kidney Disease (CKD). Objective: To develop, validate and assess the reliability of Social Capital related to CKD questionnaire for Mexican adolescents. Methods: An instrumental study was employed to validate a questionnaire that assesses the cognitive and structural domains of Social Capital related to CKD. The questionnaire was generated by operationalization of the constructs and validated by assessing the content, face validity, criteria and construct validity. Reliability was assessed through the Cronbach's alpha. Results: The content validity of the questionnaire was confirmed through Kendall's W of 0.925 ($p = 0.01$) and its face validity was evaluated by four focus groups. A principal component analysis on a sample of 281 adolescents indicated that 72.78% of the variance was explained by the cognitive domain and 83.20% by the structural domain. A confirmatory analysis returned a chi-squared value of 142.99 ($p = 0.05$), a CFI of 0.97, a TLI of 0.96, a RMSEA of 0.040 and a SRMR of 0.07 for the cognitive domain. Similarly, a chi-squared of 408.296 ($p < 0.001$), a CFI of 0.98, a TLI of 0.97, a RMSEA 0.03 and a SRMR of 0.06 were returned for the structural domain. The validity of the criteria was assessed through a Pearson's correlation for both the cognitive and structural domains. There was a mild-to-strongly significant correlation ($p \leq 0.001$) among items and dimensions within each domain, with correlation coefficients ranging from 0.23 to 0.83. As a determinant of the reliability of the questionnaire, the Cronbach's alpha was 0.84 and 0.94 for the cognitive and structural domain, respectively. Conclusions: A valid and reliable questionnaire has been developed to measure the influence of Social Capital on health in relation to CKD among Mexican adolescents.

Quiñones-Villalobos, C., Prado-Aguilar, C. A., Obrador-Vera, G. T., Arreola-Guerra, J. M., Padilla-López, J., Alanís-Ocádiz, A., Cisneros-García, D. L., Navarro-Rodríguez, D. C., & Tirado-Gómez, L. L. (2025). Development and validation of a questionnaire to assess the health related social capital for chronic kidney disease among Mexican adolescents. *PLoS ONE*, 20(7), e0328386. <https://doi.org/10.1371/journal.pone.0328386>. Article.

Gregorio Tomás Obrador Vera
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EPIDEMIOLOGY OF KIDNEY DISEASE IN THE ELDERLY

ABSTRACT: Concomitant with population aging, kidney disease incidence and prevalence among the elderly is growing globally. The prevalence of chronic kidney disease (CKD) increases with age and is higher in women than in men. Impaired kidney function in older people is associated with adverse outcomes. Older people are more likely to die than to reach kidney replacement therapy. Discontinuation of maintenance dialysis is frequent and a leading cause of death. Kidney transplant recipients in recent years are older than in the past on average. Conservative kidney management is an alternative therapy for end-stage kidney disease, and is especially suited for older patients with multiple comorbid conditions. Elderly patients have many risk factors for developing acute kidney injury, increasing the risk of chronic kidney disease, kidney failure, and mortality. The prevalence of glomerular diseases in the elderly is growing and faces significant diagnostic and therapeutic challenges.

Obrador, G. T. (2024). Epidemiology of kidney disease in the elderly. In H. Kramer, E. V. Lerma, & H. Koncicki (Eds.), *Kidney disease in the elderly: A case-based guide* (pp. 15-24). Springer. https://doi.org/10.1007/978-3-031-68460-9_2. Book Chapter.

Clara Luz Álvarez González de Castilla
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José María Soberanes Díez
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José Antonio Salazar Andreu
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ACCESS TO JUSTICE THROUGH ELECTRONIC LAWSUITS IN MEXICOS

ABSTRACT: Access to justice through electronic means promises to bring justice to citizens. Nonetheless, it is not sufficient for judiciaries to have platforms for online judicial proceedings if they are not used. Research on online trials with statistical support is scarce. There is a platform that enables the electronic filing of lawsuits before Mexican courts from any part of the world with internet connectivity. Therefore, this article analyses the use of electronic lawsuits nationwide and at a state level of the Mexican Republic from 2019 to 2023 and the correlation between Gross Domestic Product per capita of professional, scientific and technical services (PIB-sp-SPCyT). With official data, 1) the analyses are made with regards to the evolution by 100 thousand persons, by the proportion of all the filed lawsuits, and in connection with the compound annual growth rate, and 2) the correlation and impact of the electronic lawsuits and their impact in connection with PIBsp-SPCyT is presented. Findings include a constant increase in the use of electronic lawsuits due to several factors and a direct correlation between PIB-sp-SPCyT and the electronic filing of lawsuits.

Álvarez, C.-L., Soberanes-Díez, J. M., & Salazar-Andreu, J. A. (2024). Access to justice through electronic lawsuits in Mexico. *IDP. Revista de Internet, Derecho y Política*, (41). <https://doi.org/10.7238/idp.v0i41.429783>. Article.

Clara Luz Álvarez González de Castilla
Senior Researcher D, SNII Level III

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DIGITAL JUSTICE PLATFORMS IN MEXICO AND THE RIGHT TO JUDICIAL INFORMATION

ABSTRACT: This article presents and analyzes the current state of digital justice platforms both in the state judiciaries and in the Federal Judiciary (PJF). The research is based on information

requests submitted through the National Transparency Platform (PNT) and direct consultations on the websites of the PJF and the judicial branches of the Mexican states. Additionally, administrative regulations governing digital justice platforms were reviewed. This study contributes to the academic discussion by providing an updated and systematic analysis of the disparities between federal and state-level digital justice systems, highlighting the role of online judicial proceedings as a mechanism to enhance transparency and access to information. The findings reveal significant inequalities in the implementation and functionality of digital platforms among state judiciaries, underscoring the need for greater technological integration and policy standardization. This research fills a gap in the literature by offering empirical evidence on the effectiveness of digital justice initiatives in Mexico and proposing areas for further development to ensure broader and more equitable access to judicial information.

Álvarez, C.-L., & Soberanes Díez, J. M. (2025). Digital justice platforms in Mexico and the right to judicial information. *Estudios en Derecho a la Información*, 10(20), 3-38. <https://doi.org/10.22201/ij.25940082e.2025.20.19648>. Article.

José Juan Anzures Gurría
SNII Level I

FREEDOM OF ASSOCIATION IN MEXICO

ABSTRACT: Freedom of association has been constitutionally recognized in Mexico since the mid-19th century. But it has been in recent years that academic scholarship and case law have constructed its content and scope. It is a freedom right that requires the performance of a negative conduct on the part of the State. Its constitutionally protected scope comprises a positive, a negative, as well as a collective dimension. Additionally, it is an instrumental right through which other fundamental rights can be exercised and the constitutional and democratic Rule of Law is consolidated. The greatest academic scholarship and case law development in Mexico refers to two specific types of associations: political parties and labor unions.

Anzures Gurría, J. J. (2025). Freedom of association in Mexico. *European Journal of Comparative Law and Governance*, 12(1-2), 177-192. <https://doi.org/10.1163/22134514-bja10090>. Article.

José Juan Anzures Gurriá

SNII Level I

Miluska Fiorella Orbegoso Silva

SNII Level I

OWNERSHIP AND EXERCISE OF FUNDAMENTAL RIGHTS IN MEXICO

ABSTRACT: The paper addresses the difference between the ownership and the exercise of fundamental rights in Mexico and specifically analyses each holder of fundamental rights, such as natural persons, legal persons, foreigners, minors, disabled persons, etc. While the holding refers to the capacity of every person by virtue of belonging to the human race, the exercise of rights refers to the capacity to act in order to materialise the protected scope of each right. Although rights are universal and equal for all, the holding of each right will depend on the recognition of the norm. In the case of exercise, the legal status of the holder will determine whether this is carried out through self-exercise or hetero-exercise.

Anzures-Gurriá, J. J., & Orbegoso-Silva, M. F. (2025). Ownership and exercise of fundamental rights in Mexico. *Ius et Praxis*, 31(1), 66-83. <https://doi.org/10.4067/S0718-00122025000100066>. Article.

Fernando Batista Jiménez

Senior Researcher B, SNII Level I

REDEFINING DIGNIFIED LIFE: ANALYSIS OF THE RULING ON EUTHANASIA IN ECUADOR

ABSTRACT: This article analyzes the ruling of the Constitutional Court of Ecuador on the public action of unconstitutionality filed against Article 144 of the Comprehensive Organic Criminal Code (COIP), which classified simple homicide. The judicial decision authorized active euthanasia under specific conditions, arguing that the right to a dignified life and the free development of personality outweigh mere physical existence in cases of extreme suffering. This paper examines the case's background, the parties' arguments, the Court's legal analysis, and the ethical and legal implications of the decision. Furthermore, it reflects on the concept of human dignity and its impact on shaping fundamental rights, offering a critique of the current legal framework and its challenges in regulating euthanasia procedures.

Batista Jiménez, F. (2025). Redefining dignified life: Analysis of the ruling on euthanasia in Ecuador. *Cuestiones Constitucionales*, 26(53), e19899. <https://doi.org/10.22201/ijj.24484881e.2025.53.19899>. Review.

Juan Francisco Díez Spelz

Senior Researcher B, SNII Level I

ASSERTIVENESS AND HUMAN RIGHTS ORIGINS, EXERCISE, EDUCATION AND DUTIES: HOW ASSERTIVENESS CAN HELP US BETTER UNDERSTAND HUMAN RIGHTS

ABSTRACT: This chapter will explore the relationship between assertiveness and human rights. The concept of "rights" is present in many definitions of "assertiveness", in that being assertive means standing for one's rights in a particular manner. In that sense, the author begins by explaining the origins of the relationship between the two concepts. Afterwards, he analyses the connection between human rights and assertiveness through three aspects that help better understand both ideas: first, what it means to exercise a right; second, how assertiveness can be explained through human rights education; and lastly, he suggests that to comprehend the two ideas better, it is necessary to also think in terms of "human duties".

Díez-Spelz, J. F. (2024). Assertiveness and human rights origins, exercise, education and duties: How assertiveness can help us better understand human rights. In S. Castaños-Cervantes & C. Atristain-Suárez (Eds.), *Assertiveness in the context of human rights, ethics, and classical virtues* (pp. 31-50). Palgrave Macmillan. https://doi.org/10.1007/978-3-031-60962-6_2. Book Chapter.

Juan Francisco Díez Spelz

Senior Researcher B, SNII Level I

PHILOSOPHICAL REFLECTIONS ON POST-TRUTH, TRUTH AND LAW ONTOLOGICAL TRUTH IN LAW AND TEMPORALITY

ABSTRACT: Truth has always been one of the most disturbing topics in the philosophy of law. Currently we are experiencing a crisis of truth framed in at least two phenomena: post-truth and virtual reality. Since there cannot be stable and prosperous societies or organizations without high levels of truth, it is necessary to constantly ask ourselves about the concept of truth. To this end, the article presents legal-philosophical reflections on the current problems, as well as an approach to the problem of truth in law. Subsequently, it questions the approaches that maintain that truth cannot be preached about law in general and norms in particular, to maintain that it is possible to preach it from the perspective of ontological truth and temporality. On the one hand, by preaching truth of the law, which aims to connect reality with its purposes, and, on the other, being aware that the truth is reached from the perspective of time, being able to connect past, present and future.

Diez-Spelz, J. F. (2025). Philosophical reflections on post-truth, truth and law ontological truth in law and temporality. *Anuario de la Facultad de Derecho. Universidad de Extremadura*, (40), 69-94. <https://doi.org/10.17398/2695-7728.40.69>. Article.

Juan Francisco Díez Spelz
Senior Researcher B, SNII Level I

THINKING ABOUT “NEW RIGHTS” IN A TEMPORARY KEY: TOWARDS A TEST OF AUTHENTICITY OF HUMAN RIGHTS

ABSTRACT: The “new rights” are a phenomenon of our time, which responds to the evolutionary nature of human rights. This dynamic nature of human rights is observed, whether in the area of normative expansion or in that of interpretation. They thus try to respond to new needs, interests or circumstances. However, they are also a problematic phenomenon that can lead to their artificial proliferation. To this end, this article reflects on the legal implications of conceiving “new rights” and proposes an authenticity test based on the idea of time, in order to contribute to a better understanding of authentic human rights.

Diez Spelz, J. F. (2025). Thinking about “new rights” in a temporary key: Towards a test of authenticity of human rights. *Revista de Investigações Constitucionais*, 12(1). <https://doi.org/10.5380/rinc.v12i1.95232>. Article.

Juan Francisco Díez Spelz
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THE PROHIBITION OF ANIMAL ABUSE IN THE MEXICAN CONSTITUTION AND THE CHALLENGES OF RIGHTS-HOLDING: A CRITICAL COMMENTARY ON THE DECEMBER 2, 2024 CONSTITUTIONAL REFORM OF ARTICLES 3RD, 4TH, AND 73

ABSTRACT: This commentary provides a critical analysis of the constitutional reform published in Mexico on December 2, 2024, which amended Articles 3th, 4th, and 73 of the Constitution to include the prohibition of animal abuse, along with other duties such as care, protection, and appropriate treatment. Through a legal-philosophical approach, the study examines the normative scope of the reform, its implications for recognizing public and private duties toward animals, and the debate regarding the possible attribution of rights to non-human entities, specifically animals. The analysis places particular emphasis on the tension between deontological, utilitarian, and relational perspectives, and offers a critical reflection on the nature and limits of the concept of human rights in

light of emerging legal realities, arguing that the question of rights-holding is among the most significant challenges for human rights in the twenty-first century.

Díez-Spelz, J. F. (2025). The prohibition of animal abuse in the Mexican constitution and the challenges of rights-holding: A critical commentary on the December 2, 2024 constitutional reform of articles 3rd, 4th, and 73. *Cuestiones Constitucionales*, 27(54), e20415. Review.

Gabriela García Escobar
SNII Candidate Level

FRAGMENTATION IN THE EUROPEAN AND INTER-AMERICAN HUMAN RIGHTS COURTS REGARDING THE SCOPE OF RELIGIOUS AUTONOMY: AN ANALYSIS OF THE USE OF SOURCES AND METHODOLOGIES

ABSTRACT: Fragmentation in International Human Rights Law (IHRL) may affect the universality of human rights norms and their legitimacy. This article analyses a recent case of contradiction between the European and the Inter-American Court of Human Rights (IACHR) regarding employment contracts of religious education teachers and the scope of religious autonomy. These courts reached contradictory conclusions on key substantive issues because they used different ways of framing the issue at stake, and different legal sources and interpretative methodologies. The analysis reveals that while the European Court of Human Rights (ECHR) relied on the use of comparative law, a test of proportionality, and the margin of appreciation, the IACHR relied mainly on American domestic law and the opinions of two expert witnesses. In this case, the IACHR could learn from the approach of the ECHR to develop a more rigorous legal methodology in order to keep the coherence of the international legal system.

García Escobar, G. (2024). Fragmentation in the European and Inter-American human rights courts regarding the scope of religious autonomy: An analysis of the use of sources and methodologies. *Oxford Journal of Law and Religion*, 13(1), 67-84. <https://doi.org/10.1093/ojlr/rwae022>. Article.

Gabriela García Escobar

SNII Candidate Level

THE PARADOXES OF SURROGACY IN MEXICO: AN ANALYSIS OF THE REASONING OF THE SUPREME COURT OF JUSTICE IN LIGHT OF HUMAN RIGHTS NORMS

ABSTRACT: The experiences gathered from countries where surrogacy has been legalized are replete with abuses towards pregnant women and children. However, the defenders of this market, among them Mexico's highest judicial body, the Supreme Court of Justice of the Nation (SCJN), continue to opt for an optimistic and contractual vision, based on consent. Therefore, the objective of this article is to analyze this position in the light of International Human Rights Law and the practical experience of surrogacy. For this purpose, its legal implications in relation to human trafficking and the prohibition of the sale of children are studied. From this analysis, it is clear that the SCJN's optimism is based on uncorroborated assumptions and on a superficial and partial study of the human rights involved in this practice.

García Escobar, G. (2024). The paradoxes of surrogacy in Mexico: An analysis of the reasoning of the Supreme Court of Justice in light of human rights norms. *Prudentia Iuris*, (98). <https://doi.org/10.46553/prudentia.98.2024.9>. Article.

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Senior Researcher B, SNII Level II

DERECHO DE LAS NUEVAS TECNOLOGÍAS

ABSTRACT: Reseña del libro "Derecho de las nuevas tecnologías" de José Manuel Magaña Rufino (Coord.). El propósito de esta obra, es aportar al lector, de manera práctica y especializada, una explicación que le allegue de elementos jurídicos -históricos y actuales-, a través de los derechos de autor y la propiedad industrial, el derecho tecnológico, y el derecho civil, debatiendo nuevamente los conceptos, y proponiendo nuevas oportunidades a los abogados del futuro. Los estudios son respaldados por la legislación nacional, así como el derecho comparado, y ofrecen al lector poner en duda, así como resolver las incógnitas, que han surgido con los nuevos supuestos jurídicos tecnológicos, que irán transformando con velocidad inimaginable, el mundo como lo conocemos. Nunca antes hemos vivido la velocidad del cambio, como sucederá a partir de ahora. La presente obra reúne a grandes expertos en el Derecho de las nuevas tecnologías, que nos comparten su experiencia a efecto de explicar las nuevas soluciones a los complejos temas relacionados con esta apasionante materia.

Magaña Rufino, J. M. (2025). "Derecho de las nuevas tecnologías" de José Manuel Magaña Rufino (Coord.): México, Tirant lo Blanch, 2024, 324 páginas. *Revista Iberoamericana de la Propiedad Intelectual*, (22), 379-383. <https://doi.org/10.26422/RIPI.2025.2200.mag>. Article.

José Manuel Magaña Rufino

Senior Researcher B, SNII Level II

NEW REGULATIONS ABROAD TO MINIMIZE FOOD LOSS AND WASTE

ABSTRACT: The feeding Human Right is recognized since the Universal Declaration of Human Rights, which states in its 25th article that "Everyone has the right to a standard of living adequate for the health and well-being of himself and of his family, including food...". It has also been established, as goal 12.3 of the 12th Sustainable Development of the 2030 Agenda, to reduce by half the waste of food in the retail sale and reduce the loss and supply in the food production chains. This is not a simple ethics issue, but of human rights. During the last years there had been regulations in different European and Latin American countries in order to solve the food loss and waste (FLW) problem. As stated in the good Samaritan laws that releases the responsibility of the good faith of donors; or the laws that set the donations to food Banks of the surplus products in good conditions to be consumed; also, tax provisions that motivate donations instead of food destruction. Mexico, even though recognizes the feeding human right in Its Constitution, it doesn't have a federal regulation on FLW. But in the last years some States and Mexico City promulgated local laws in this subject. They are endorsed to the aliment contribution to food banks donations. Our purpose is to analyze the existing legislation with a proposal to avoid the FLW in a broader way which may not be endorsed to a charity vision, but to influence in the different fields where FLW is produced. A comparative law method will be used as well as the progressiveness principle. Our propose is to guarantee in a more appropriate way the human right to feeding.

Arcudia-Hernández, C. E., & Magaña-Rufino, J. M. (2025). New regulations abroad to minimize food loss and waste. In P. Aguilar-Zárate, A. K. Haghi, & R. Gómez-García (Eds.), *Reducing food loss and waste: Challenges, trends, and solutions* (pp. 59-84). Springer. https://doi.org/10.1007/978-3-031-91693-9_3. Book Chapter.

Celia Mizrahi Nedvedovich
Research Professor

THE UNCONSTITUTIONALITY OF CONSTITUTIONAL AMENDMENTS. THE ISRAELI CASE AND ITS LESSONS

ABSTRACT: This article examines the ruling in HCJ 5658/2023 Movement for Quality Government vs. the Knesset, issued by the Supreme Court of Israel, which addressed the unconstitutionality of a constitutional amendment known as “Amendment 3”. This reform eliminated the reasonableness standard in judicial review of governmental decisions, triggering an unprecedented constitutional crisis. To understand the context of this decision, the article reviews Israel’s constitutional framework and its unique “Constitution in Formation,” as well as the arguments presented by the parties involved in the litigation. The ruling analysis reveals that the Supreme Court annulled the amendment for violating fundamental principles such as the rule of law, separation of powers, and access to justice. Finally, the article reflects on the lessons this case offers for democratic systems, emphasizing the importance of an independent judiciary as a guarantor of human rights and democracy.

Mizrahi Nedvedovich, C. (2025). The unconstitutionality of constitutional amendments. The Israeli case and its lessons. *Cuestiones Constitucionales*, 26(53), e19921. <https://doi.org/10.22201/ijj/24484881e.2025.53.19921>. Article.

Celia Mizrahi Nedvedovich
Research Professor

RECOGNITION OF LIVING BEINGS THROUGH NORMATIVE GRADATION BASED ON DEPENDENCY, VULNERABILITY, AND ECOLOGICAL FUNCTION

ABSTRACT: The text examines the Mexican constitutional reform on animal protection through a critical lens that challenges the traditional legal assumptions applied to living beings, examining the limitations of the legal concept of person in relation to the ontological diversity of living beings. Drawing on an interdisciplinary approach that integrates biology, philosophy, and legal theory, it proposes a legal framework recognizing living beings through normative gradation based on their dependence, vulnerability, and ecological function. The analysis argues that only an expanded understanding of life can guide the law toward a coherent, ecologically responsible, and materially just model, capable of addressing the complexity of the living world without contradicting its own internal logic.

Mizrahi Nedvedovich, C. (2026). Recognition of living beings through normative gradation based on dependency, vulnerability, and ecological function. *Cuestiones Constitucionales*, 27(54), e20819. <https://doi.org/10.22201/ijj.24484881e.2026.54.20819>. Article.

José Edgardo Muñoz López
SNII Level II

CISG’S EVOLUTION AND CONTEMPORARY INSIGHTS: FOUR DECADES AFTER ITS INCEPTION

ABSTRACT: This handbook, edited by Zeller and Andersen, is an indispensable contribution to the field of transnational commercial law. With an introduction by Sir Roy Goode, this book presents perspectives on legal issues of international sales transactions as perceived by world leading experts, exposing pragmatic and modern aspects of everything from drafting, to uniform laws to dispute resolution.

The book divides itself between fundamental knowledge of transnational commercial law (e.g. chapters on forum shopping, CISG, Cape Town Convention, etc.) and current and topical developments (e.g. chapters on blockchain, smart contracts, metaverse, digital assets, etc.). International or transnational trade during the past 20 years has become more and more important, outstripping domestic trade as a hallmark of economic success. Model laws developed by the United Nations and other international bodies are now being transplanted or ratified by countries, so a translational element must always be considered as part of any choice of law.

Addressing a global audience, as the instruments dealt with herein apply to many states in different regions, this handbook aims not only at an undergraduate and graduate student audience but also will interest professional lawyers.

Muñoz, E., & Miranda, J. C. (2025). CISG’s evolution and contemporary insights: Four decades after its inception. In B. Zeller & C. Baasch Andersen (Eds.), *Routledge handbook on transnational commercial law* (pp. 139-161). Routledge. <https://doi.org/10.4324/9781003394822-8>. Book Chapter.

José Edgardo Muñoz López
SNII Level II

UNCONSCIOUS BIAS IN ARBITRATION: CASE LAW AND THE PATH TO FAIRNESS

ABSTRACT: This article examines the impact of unconscious bias in arbitration and, in particular, in arbitrators’ challenges. Through the analysis of recent case law – including the Swiss Sun Yang Case (2020), the ICC Court Monologue Challenge (2023), the English

Expert Case (2024) and the French Obituary Case (2023) – it highlights how unconscious bias can shape decision-making, procedural conduct and perceptions of fairness in arbitration. Arbitrators often deny partiality, yet their conduct – such as dismissiveness, unequal favour, or culturally charged remarks – can create reasonable doubts about lack of impartiality and independence, regardless of intent or awareness. While not all instances of unconscious bias warrant disqualification as an arbitrator, this article argues that unconscious bias can be properly addressed through current standards for independence and impartiality in key instruments such as the IBA Guidelines on conflict of interests in international arbitration. Finally, it advocates for bias-mitigation training and diversity to preserve arbitration's legitimacy.

Muñoz, E., & Covarrubias Miranda, J. (2025). Unconscious bias in arbitration: Case law and the path to fairness. *Journal of International Arbitration*, 42(4), 435-470. <https://doi.org/10.54648/joia2025034>. Article.

Miluska Fiorella Orbegoso Silva

SNII Level I

FREEDOM OF ASSOCIATION IN PERU

ABSTRACT: This research develops the analysis concerning the right or freedom of association in Peru. Its recognition in the Peruvian Constitutions from a historical analysis up to the current case-law from the Peruvian Constitutional Court. We will focus particularly on the analysis of the constitutionally protected content of the freedom and on some cases that have been of special interest in Peruvian legal debates. Freedom of association is recognized as a fundamental right in Peru, and its content and elements have been studied in depth by the Constitutional Court and by academic opinion. The analysis of this freedom in the Peruvian constitutional law has a long history, and its historical study allows us to understand its actual content.

Orbegoso Silva, M. (2025). Freedom of association in Peru. *European Journal of Comparative Law and Governance*, 12(1-2), 288-303. <https://doi.org/10.1163/22134514-bja10091>. Article.

Miluska Fiorella Orbegoso Silva

SNII Level I

RETHINKING PUBLIC ADMINISTRATION. A STUDY FROM A CONSTITUTIONAL THEORETICAL PERSPECTIVE

ABSTRACT: We believe that the study of Public Administration has always been carried out from an exclusive perspective of the rule of law and its classical principles, forgetting the social function that it also has. This context has led to the review of administrative action being read with a "code" that no longer exists, since it is an open secret that administrative action has changed. The State and its executive arm, the Public Administration, have gone from being a kind of "night watchman" (in Garrorena's words) to being the fullest "ex ante" guarantor of existential provision. In this order of ideas, we are of the opinion that the state continues to be a state of law, but also a social state, which requires a change in the perspective of its study. In Latin America, the demands made on the State are based on a bureaucratic understanding of its actions, which results in the inefficiency and ineffectiveness of the State and in a kind of disappointment on the part of the citizen, which even leads him to opt for informality and to reject public aid. In this sense, we believe that the European example and the reflections carried out in the last two centuries, especially in the Spanish and German doctrine, can be useful to demand a rethinking of the administrative action in Latin America, in accordance with a social state of law. Therefore, this research is based on a doctrinal study of the so-called Social State and the requirements that arise for public administration and then proposes an adjustment of the classical principles that govern administrative action: the principle of legality, the principle of reservation of rights, and administrative discretion. We start from a current context, the social state of law, and a revision of administrative action is required, which, in our opinion, has remained stagnant in classical theories. Likewise, we start from an understanding of the current public administration as provider administration, which, we argue, is the current guarantor of the fundamental rights of citizens in the social state under the rule of law. In this sense, we postulate the idea that by adjusting the actions of the administration to the requirements of the principle of administrative discretion, it will be possible to materially achieve adequate attention and protection of the citizen through a personalized service. This requires rapprochement between the administration and the citizens, always respecting and guaranteeing their fundamental rights.

Orbegoso Silva, M. (2025). Rethinking public administration: A study from a constitutional theoretical perspective. *Revista de Derecho Político*, (122), 185-214. <https://doi.org/10.5944/rdp.122.2025.44746>. Article.

Jaime Olaiz González

SNII Level I

INTERESTING TIMES IN MEXICO: CONSTITUTIONAL DEMISE WAS NOT IN THE BALLOT

ABSTRACT: This document discusses the recent constitutional overhaul proposed by President López Obrador in Mexico. The proposal includes the direct election of federal and state judges, the replacement of the Federal Judicial Council, and the abrogation of Supreme Court decisions. The governing coalition claims that the majority of the people voted for this reform, but it is more complex than that. The document highlights the regressive implications of this overhaul, including the subordination of the constitution to the legislative majority, the loss of the Supreme Court's role as an arbiter, the election of ill-prepared judges, and the deterioration of Mexico's credibility. The document emphasizes the importance of protecting democracy and preserving institutions.

Olaiz-González, J. (2024). Interesting times in Mexico: Constitutional demise was not on the ballot. *ICL Journal*, 18(3), 385-392. <https://doi.org/10.1515/icl-2024-0030>. Article.

Philippe Prince Tritto
Research Professor

Hiram Eredín Ponce Espinosa
Senior Researcher D, SNII Level I

ASSESSING AI-GENERATED LEGAL REASONING: A BENCHMARK FOR LEGAL TEXT QUALITY FROM LITERATURE REVIEW

ABSTRACT: The adoption of Large Language Models in law has sparked debate over how best to evaluate AI-generated legal reasoning. Existing benchmarks focus on surface-level accuracy, overlooking deeper dimensions such as argumentative coherence, practical usability, and alignment with jurisprudential values. This paper provides a comprehensive framework that integrates insights from formalism, interpretivism, realism, and argumentation theory to assess legal AI outputs. We first explore the philosophical foundations of legal reasoning, drawing on MacCormick's concepts of internal and external justification and Perelman's notions of audience-centered persuasion to highlight the rhetorical and moral dimensions essential for evaluation. Next, we examine structured approaches to evaluation from related fields before showing why existing benchmarks (e.g., LexGLUE, LegalBench, LegalAgentBench) only partially capture the subtleties of legal reasoning. We also contrast common law and civil law traditions to illustrate how a one-size-fits-all approach neglects the distinct roles of precedent versus codified statutes. Building on these theoretical and comparative insights, we propose a three-stage evaluation methodology that begins with automated screening for factual consistency, proceeds to expert-led rubric assessment across five dimensions (Accuracy, Reasoning, Clarity, Usefulness, and Safety), and concludes with iterative refinement through reliability checks. This structured approach, validated through a pilot study, aims to strike a balance

between scalability and nuance, equipping researchers and practitioners with a robust tool for assessing AI-generated legal texts. Unifying theoretical rigor, domain-specific practicality, and cross-jurisdictional adaptability, this framework lays a solid foundation for legal AI benchmarks and paves the way for safer, more transparent deployment of AI in law.

Prince Tritto, P., & Ponce, H. (2025). Assessing AI-generated legal reasoning: A benchmark for legal text quality from literature review. In L. Martínez-Villaseñor, B. Martínez-Seis, & O. Pichardo (Eds.), *Artificial intelligence. COMIA 2025. Communications in Computer and Information Science (CCIS)* (Vol. 2252, pp. 54-68). Springer. https://doi.org/10.1007/978-3-031-97907-1_5. Conference Paper.

Philippe Prince Tritto
Research Professor

Hiram Eredín Ponce Espinosa
Senior Researcher D, SNII Level I

CAUSAL ARTIFICIAL INTELLIGENCE IN LEGAL LANGUAGE PROCESSING: A SYSTEMATIC REVIEW

ABSTRACT: Recent advances in legal language processing have highlighted limitations in correlation-based artificial intelligence approaches, prompting exploration of Causal Artificial Intelligence (AI) techniques for improved legal reasoning. This systematic review examines the challenges, limitations, and potential impact of Causal AI in legal language processing compared to traditional correlation-based methods. Following the Joanna Briggs Institute methodology, we analyzed 47 papers from 2017 to 2024 across academic databases, private sector publications, and policy documents, evaluating their contributions through a rigorous scoring framework assessing Causal AI implementation, legal relevance, interpretation capabilities, and methodological quality. Our findings reveal that while Causal AI frameworks demonstrate superior capability in capturing legal reasoning compared to correlation-based methods, significant challenges remain in handling legal uncertainty, computational scalability, and potential algorithmic bias. The scarcity of comprehensive real-world implementations and overemphasis on transformer architectures without causal reasoning capabilities represent critical gaps in current research. Future development requires balanced integration of AI innovation with law's narrative functions, particularly focusing on scalable architectures for maintaining causal coherence while preserving interpretability in legal analysis.

Prince Tritto, P., & Ponce, H. (2025). Causal artificial intelligence in legal language processing: A systematic review. *Entropy*, 27(4), 351. <https://doi.org/10.3390/e27040351>. Review.

Philippe Prince Tritto
Research Professor

JURISTS OF THE GAPS: LARGE LANGUAGE MODELS AND THE QUIET EROSION OF LEGAL AUTHORITY

ABSTRACT: Large Language Models (LLMs) are not merely tools to assist legal professionals—they represent a deeper epistemic and normative challenge to the foundations of legal authority. While LLMs allow humans to produce outputs that convincingly simulate legal reasoning, they lack the embodied judgment, ethical intentionality, and contextual awareness that define legitimate legal decision-making. This paper argues that the social legitimacy of the legal profession relies on capacities that are not reproducible through computational systems. We first examine the epistemological limitations of LLMs, drawing on Kantian philosophy and complexity theory to show that their outputs are simulations, not acts of understanding. We then analyze how this technological shift risks reducing legal professionals to jurists of the gaps – filling in only where machines fall short – thereby hollowing out the humanistic mission of law. Against this backdrop, we call for a renewed professional ethic centered on interpretation, creativity, and normative judgment, rather than technical supplementation. The automation of law is not the end of the profession, but it could be the end of its authority – unless its practitioners reclaim what cannot be outsourced.

Prince Tritto, P., & Torres Ortega, I. C. (2025). Jurists of the gaps: Large language models and the quiet erosion of legal authority. *Masaryk University Journal of Law and Technology*, 19(2), 179-204. <https://doi.org/10.5817/MUJLT2025-2-4>. Article.

Hugo Saúl Ramírez García
Senior Researcher D, SNII Level III

BIOPIRACY

ABSTRACT: This entry explores the ethical meanings of the concept of biopiracy, linked to topics such as intellectual property rights on genetic resources, bioprospecting, traditional knowledge, right to food, and food policy. It highlights the critical function of biopiracy related to worldwide tendencies: privatization and technification.

Ramírez García, H. S. (2016). Biopiracy. In H. ten Have (Ed.), *Encyclopedia of global bioethics* (pp. 367-372). Springer. https://doi.org/10.1007/978-3-319-09483-0_57. Book Chapter.

José María Soberanes Díez
Senior Researcher B, SNII Level II

EQUALITY BEFORE THE LAW IN THE RULES OF THE SECOND MEXICAN EMPIRE, 1864-1867

ABSTRACT: The main goal of this article is to discuss a significant aspect of the Second Mexican Empire: its legislation, particularly the norms related to human rights and equality before the law. The methodology first consisted of reviewing and discussing the ideas about equality before the law from both the conservative and monarchist groups that brought Maximilian to the throne, as well as the liberal and republican groups that opposed the empire. Secondly, these ideas were contrasted with how equality was reflected in the norms issued by the second Mexican emperor. A main result of this study is to demonstrate that, paradoxically, it was liberal ideas that supported the imperial legislation.

Soberanes Díez, J. M., & Soberanes Fernández, J. L. (2024). Equality before the law in the rules of the Second Mexican Empire, 1864-1867. *Revista de Estudios Histórico-Jurídicos*, (46), 199-217. <https://doi.org/10.4151/ISSN.07176260-Num.46-Full-text.1290>. Article.

José María Soberanes Díez
Senior Researcher B, SNII Level II

THE PROVISIONAL FUNDAMENTAL LAWS OF MEXICO IN THE 19TH CENTURY; LAS LEYES FUNDAMENTALES PROVISIONALES DE MÉXICO EN EL SIGLO XIX

ABSTRACT: This study explores the concept of provisional constitutions, conceived as temporary frameworks designed to govern nations during periods of transition, contrasting with traditional permanent constitutions. It focuses on the role of these fundamental laws in 19th-century Mexico and, through the analysis of their political context, content, and motivations for adoption, highlights the significance of provisionality as a key tool for political reorganization in scenarios of urgency and a lack of constituent legitimacy.

Soberanes Díez, J. M., & Soberanes Fernández, J. L. (2025). The provisional fundamental laws of Mexico in the 19th century. *Historia Constitucional*, (26), 575-606. <https://doi.org/10.17811/hc.v0i26.1140>. Article.

Claudia Ariadna Acero Ortega

Research Professor

ANTIMICROBIAL ACTIVITY OF CINNAMON, TEA TREE, AND THYME ESSENTIAL OILS AGAINST PATHOGENIC BACTERIA ISOLATED FROM TILAPIA (*Oreochromis spp.*) IN AQUACULTURE FARMS

ABSTRACT: Overexploitation has led to a rise in pathogenic bacteria within aquaculture, increasing reliance on antibiotics, and developing microorganism resistance. This situation underscores the need to explore alternatives with a reduced ecological impact. Metabolites derived from essential oils have demonstrated antimicrobial properties that can inhibit or diminish the activity of various microorganisms. In this study, the antimicrobial efficacy of cinnamon (*Cinnamomum zeylanicum*), tea tree (*Melaleuca alternifolia*), and thyme (*Thymus vulgaris*) essential oils against pathogenic bacteria (*Aeromonas*, *Pseudomonas*, *Shewanella*, *Comamonas*, *Vibrio*, *Acinetobacter*, and *Empedobacter*) isolated from tilapia (*Oreochromis spp.*) brooded in Hidalgo State, Mexico, were investigated. Diffusion tests were conducted using discs infused with 12 different antibiotics and discs infused with essential oils at concentrations of 15, 10, and 5 μ L each. Minimal inhibitory concentration tests were performed using a 96-well microplate format. All bacterial strains exhibited multi-resistance to various antibiotics; however, thyme and cinnamon effectively inhibited the tested bacteria at the lowest concentrations, while tea tree oil was the least effective. The findings suggest the potential incorporation of thyme and cinnamon as an alternative prevention to decrease the use of antibiotic treatment.

Terrazas-Pineda, K. A., Alamilla-Beltrán, L., Acero-Ortega, C. A., Damas-Espinoza, J. A., Calderón-Domínguez, G., Mora-Escobedo, R., Vega-Sánchez, V., & Gómez-de Anda, F. R. (2025). Antimicrobial activity of cinnamon, tea tree, and thyme essential oils against pathogenic bacteria isolated from tilapia (*Oreochromis spp.*) in aquaculture farms. *Molecules*, 30(13), 2799. <https://doi.org/10.3390/molecules30132799>. Article.

Sergio Erick García Barrón

SNII Candidate Level

CONSUMERS' DRIVERS OF PERCEPTION AND PREFERENCE OF FERMENTED FOOD PRODUCTS AND BEVERAGES: A SYSTEMATIC REVIEW

ABSTRACT: The fermentation of food products is a transformation and preservation process in which different metabolites are generated, contributing to consumer health. In this sense, this systematic review aims to analyze the factors that guide the perception and preference for fermented foods. In addition, different perspectives are proposed based on the findings. The systematic search was carried out in four databases: Emerald Insight, Science Direct, Wiley Online Library, and Multidisciplinary Digital Publishing Institute. The keywords used were (Title/Abstract): fermented products, overall liking, purchase intention, expectations, emotions, interculturality, perception, and consumers. Ninety-two articles ($n = 92$) were selected and classified. The factors identified were (1) biological and physiological, (2) extrinsic product characteristics, (3) intrinsic product characteristics, (4) psychological, (5) situational, and (6) sociocultural. Intrinsic product characteristics were the most relevant, while the situational factors were the least studied. Our main contribution was a multidisciplinary approach to addressing the different factors in an integrated way, allowing a broader perspective of both products and consumers. This approach could help the reader understand consumer behavior and propose product improvements.

García-Barrón, S. E., Carmona-Escutia, R. P., Herrera-López, E. J., Leyva-Trinidad, D. A., & Gschaedler-Mathis, A. (2025). Consumers' drivers of perception and preference of fermented food products and beverages: A systematic review. *Foods*, 14(5), 713. <https://doi.org/10.3390/foods14050713>. Review.

Sergio Erick García Barrón

SNII Candidate Level

Claudia Ariadna Acero Ortega

Research Professor

INFLUENCE OF TRADITIONAL VANILLA CURING ON ITS PHYSICOCHEMICAL PROPERTIES AND AROMATIC PROFILE

ABSTRACT: Vanilla is native to Mexico and has social-cultural and economic importance. Its sensory characteristics are developed during the curing process, which is associated with the region where it is carried out since the know-how of each locality is involved. In this sense, this work aimed to evaluate the influence of the curing process. Four different processes from four regions (SJA, SLP, CQ and EPM) were considered, taking into account two curing conditions. Additionally, sample control was considered. The moisture content, protein, ether extract, ash and pH were ana-

lyzed. The aromatic profile was evaluated by the RATA methodology and liking level. Except for ash content, the process influenced the other physicochemical parameters. The moisture contents of SLP and CQ samples from Period 1, as well as SLP samples from Period 2, comply with the current Mexican Standard. SJA vanilla was "slightly" accepted in both periods, surpassing the control sample. In contrast, the CQ sample was the least preferred. Thirty-five aromatic descriptors were generated. At the sensory level, a clear separation of vanillas was observed according to the type of curing. The attributes described included caramel, dry fruit, fruity, honey, maltol, rancid, sweet, tree bark, vanilla and ashes, which boosted the liking level. On the other hand, the descriptors chemical, moisture, dairy, spicy, wood and lipids had a negative effect, proving that these factors can alter the aromatic balance, giving an unpleasant smell and reducing preference. It was confirmed that the curing process influences physicochemical parameters, the aromatic profile and the liking level. However, it would be necessary to consider other variables.

Perez-Viveros, I. J., García-Barrón, S. E., Hernández-Rodríguez, B. E., Barrera-Rodríguez, A. I., Acero-Ortega, C. A., & Espejel-García, A. (2025). Influence of traditional vanilla curing on its physicochemical properties and aromatic profile. *Foods*, 14(9), 1652. <https://doi.org/10.3390/foods14091652>. Article.

Sergio Erick García Barrón

SNII Candidate Level

SENSORY CHARACTERIZATION AND CONSUMER PREFERENCES OF TEQUILA

ABSTRACT: Tequila is one of the emblematic beverage of Mexican culture. In recent years, tequila consumption has increased, in that sense it is necessary to have quality control that ensures constant quality. In that sense, sensory evaluation can be a tool to contribute to this. In addition, consumer science can contribute to the study and understanding of the factors that influence the choice of a product, which in this case is tequila. Therefore, this chapter addresses the possible contributions of sensory evaluation and consumer science to the tequila industry. Different studies that have been carried out on tequila are shown, ranging from sensory characterization to non-sensory attributes that influence the choice of a tequila.

García-Barrón, S. E., Carmona-Escutia, R. P., & Lazo Zamalloa, O. (2025). Sensory characterization and consumer preferences of tequila. In A. Gschaedler Mathis, E. J. Herrera-López, M. R. Kirchmayr, & M. Arellano Plaza (Eds.), *The science of tequila* (pp. 269-296). Academic Press. <https://doi.org/10.1016/B978-0-443-29100-5.00011-4>. Book Chapter.

Ana Gabriela Ramírez Gutiérrez

Research Professor

SUSTAINABLE AND VIABLE ADOPTION OF NEW TECHNOLOGIES IN ENTERPRISES

ABSTRACT: The present chapter seeks to outline two significant aspects concerning the transformations of the second decade of the twenty-first century. The significance of organizational readiness for implementing new technologies developed since the rise of Industry 4.0, supported by the TOE model, is crucial. It emphasizes the importance of handling intricate systems using organizational cybernetics to establish sustainable systems, a crucial aspect of Industry 5.0. From the initial industrial revolution to the Fourth Industrial Revolution, successfully adjusting to innovation has become a vital factor for technological achievement and organizational longevity, although its transformation procedures have not been sustainable. This study analyzes the TOE model and discusses its integration within the systemic paradigm to help organizations create sustainable systems within the framework of industry 5.0, emphasizing the context of Latin America.

García, P. S., Ramírez-Gutiérrez, A. G., & Matamoros, O. M. (2025). Sustainable and viable adoption of new technologies in enterprises. In A. Teran-Bustamante & M. Velázquez Salazar (Eds.), *Digital transformation and innovation in organizations: A Latin American perspective* (pp. 191-216). Palgrave Macmillan. https://doi.org/10.1007/978-3-031-90794-4_8. Book Chapter.

Ana Gabriela Ramírez Gutiérrez

Research Professor

VIABLE AND SUSTAINABLE MODEL FOR ADOPTION OF NEW TECHNOLOGIES IN INDUSTRY 4.0 AND 5.0: CASE STUDY ON PELLET MANUFACTURING

ABSTRACT: This manuscript presents the development and testing of a novel model designed to help organizations, particularly small and medium-sized enterprises (SMEs), address the challenges of integrating new technologies within the frameworks of Industry 4.0 and 5.0. The proposed model is a metamodel that evaluates organizational and contextual vulnerabilities concerning both existing technologies and potential external technologies under consideration for adoption. It synthesizes three foundational frameworks: the Viable System Model (VSM), the principles of viable and sustainable systems, and the Technology, Organization, and Environment (TOE) Model. The findings demonstrate the practical applicability of this model in an SME context, showcasing its ability to facilitate the gradual and sustainable adoption of new technologies. By aligning business needs with technological solutions and leveraging insights

from computer science and organizational cybernetics, the model adapts to varying levels of technological adoption, integrating organizational dynamics and business evolution to support the implementation of emerging technologies.

Solano García, P., Ramírez-Gutiérrez, A. G., Morales Matamoros, O., & Coria Páez, A. L. (2025). Viable and sustainable model for adoption of new technologies in Industry 4.0 and 5.0: Case study on pellet manufacturing. *Applied System Innovation*, 8(1), 14. <https://doi.org/10.3390/asi8010014>. Article.

Pablo Arce Gargollo

Research Professor

Mónica del Carmen Meza Mejía

Senior Researcher C, SNII Level I

Gabriel González Nares

Associate Researcher, Research Professor

QUIROGA'S EDUCATIONAL PROPOSAL AS SEEN BY HIS SECRETARY CRISTOBAL CABRERA

ABSTRACT: Cristóbal de Cabrera, secretary of Vasco de Quiroga, compiled one of the first testimonials about the educational proposal in the pueblo-hospital settlements in the New Spain. Cabrera's perspective has been less studied among the large Quiroga's researches. Because of this, the aim of this paper is to show the configuring moments of the pueblo-hospital, in Santa Fe de la Laguna, Michoacán, in three different documents: 1. Carta al conde de Osorno (1531), 2. Reglas y ordenanzas de un pueblo-hospital (ca. 1547), both by Vasco, and 3. Cabrera's De solicitanda infidelium conversione (1582). Firstly, the Michoacán territory was contextualized, before and after the Conquest. Secondly, it is explained the arrival of Quiroga and Cabrera with the Second Audiencia of the New Spain. Finally, the development of the three moments of Quiroga's project is sketched, as brought to reality with the evangelization, the techniques of craft, and the civil life under new referents. It is concluded that the pueblo-hospital was a territory pacifying institution and mending of the Primer Audiencia against the purépecha people. For future studies it would be advisable to contrast this perspective with that of other witnesses of those three referred moments.

Arce-Gargollo, P., Meza-Mejía, M. del C., & González-Nares, G. (2025). Quiroga's educational proposal as seen by his secretary Cristóbal Cabrera. *Perseitas*, 13, 396-426. <https://doi.org/10.21501/23461780.5060>. Article.

Donovan Barba Reynoso

Research Professor

A SCHÜTZIAN APPROACH TO THE DEVELOPMENT OF THE STOCK OF KNOWLEDGE AND IDENTITY OF HIGH SCHOOL TEACHERS: A PHENOMENOLOGICAL STUDY IN GUADALAJARA, MEXICO

ABSTRACT: This article explores how high school teachers construct their stock of knowledge and its impact on their professional identity. Through in-depth interviews with teachers from both public and private institutions in Guadalajara, Mexico, the study employs Alfred Schütz's phenomenological sociology to analyze the integration of disciplinary and educational knowledge. Findings indicate that teachers live through tensions between their original professions and their educational responsibilities, shaping their identities through social interactions and experiential learning. The study further reveals that institutional support and continuous professional development play a pivotal role in facilitating this integration. By highlighting the dynamic nature of teacher identity formation, this research highlights the need for interdisciplinary training programs that bridge subject-matter expertise and pedagogical skills. Future studies should explore adaptive learning models and mentorship programs that enhance the transition for professionals entering the teaching field.

Barba-Reynoso, D. (2025). A Schützian approach to the development of the stock of knowledge and identity of high school teachers: A phenomenological study in Guadalajara, Mexico. *Schutzian Research*, 17, 103-126. <https://doi.org/10.5840/SCHUTZ2025176>. Article.

Jacobo José Brofman Epelbaum

Senior Researcher A, SNII Candidate Level

FASTING AND COGNITIVE LOAD-RELATED CHANGES IN QUANTITATIVE EEG MEASURES DURING AN N-BACK TASK

ABSTRACT: Fasting might affect attentional processes; however, its effects on quantitative electroencephalographic activity (qEEG) remain unclear. We used an n-back task to assess the effects of an 18-hour fasting period on behavior and qEEG absolute power. 26 participants performed the experimental task with two cognitive load levels during fasting and regular breakfast in different sessions. Artifact-free EEG epochs were selected for further analysis between conditions. The higher cognitive load affected accuracy, which decreased, while frontal and parietal theta power increased. We also found greater absolute theta power magnitudes for the left-frontocentral locations and a significant interaction between cognitive load and recording site, reflecting the greater increase in left-central parietal locations. Alpha increased in left-frontocentral locations. Although fasting did not considerably vary EEG power, there was a relevant fasting-related increase in theta power over frontal areas, probably reflecting transient changes in cognitive control mechanisms.

Ávila-Garibay, A., González-Garrido, A. A., Gómez-Velázquez, F. R., Brofman-Epelbaum, J. J., Vélez-Pérez, H., Romo-Vázquez, R., & Gallardo-Moreno, G. B. (2025). Fasting and cognitive load-related changes in quantitative EEG measures during an N-back task. *International Journal of Psychological Research*, 18(1), 59-68. <https://doi.org/10.21500/20112084.6690>. Article.

Mónica Camargo Martínez

Research Professor

BETWEEN VOCATION AND PROFESSIONALIZATION: WHAT DOES IT MEAN TO BE A UNIVERSITY TEACHER TODAY

ABSTRACT: The cultural transformations experienced by the occidental world since the decade of 1960 led to a modification of the relationship that the teachers used to have with their educational profession. They went over from a vocation to a profession without further ado. This is the idea that François Dubet puts forward in his analysis of what he calls the "decline of the institution". In this article, we started by considering this theory in order to put to the test its pertinence and to understand the relationship that the university teachers construct with their profession. By means of interviews in a private university, we demonstrate that what prevails is a conception and a relation with the teaching labor that can be assimilated with a vocational commitment based on a belief in a "missionary" dimension of university teaching.

Camargo-Martínez, M., & Médor, D. (2024). Between vocation and professionalization: What does it mean to be a university teacher today. *Revista Mexicana de Investigación Educativa*, 29(101), 205-228. Article.

Javier Fernández de Castro de León

SNII Candidate Level

EVALUATION OF A METHODOLOGY FOR ENTREPRENEURSHIP TRAINING FROM THE PERSPECTIVE OF SECONDARY EDUCATION TEACHERS

ABSTRACT: Introducción: La relevancia del emprendimiento se evidencia en la Nueva Escuela Mexicana, así como en los Objetivos de Desarrollo Sostenible (ODS) y en las tendencias laborales propuestas por The World Economic Forum. El objetivo de este estudio consiste en evaluar una metodología de formación del emprendimiento (Metodología 3e) desde la perspectiva de profesores de secundaria que participaron en un estudio piloto desarrollado en

el Estado de Aguascalientes (México) durante el ciclo escolar 2022-23. Metodología: Se desarrolló un estudio cuantitativo, con diseño no experimental, de tipo transversal y con alcance exploratorio y descriptivo. Participaron 38 docentes de siete escuelas públicas, a quienes se les administró un instrumento diseñado para el fin del estudio. Resultados: El profesorado valora positivamente la metodología, subrayando los proyectos innovadores que parten de los intereses y habilidades de los estudiantes, la calidad del libro de texto, así como las asesorías brindadas por los responsables de la metodología. Se identifica limitaciones, como el acompañamiento docente inicial, la dificultad para ingresar a la plataforma digital y el logro de ciertos conocimientos. Discusión: Los resultados se discuten respecto a textos identificados en la literatura sobre metodologías didácticas para la formación del emprendimiento, reconociendo que son escasas las publicaciones relativas al tema. Conclusión: La evaluación de la metodología proporciona a sus diseñadores información útil para la consolidación de sus fortalezas, así como para la ideación e implementación de estrategias para su mejora continua.

Fernández-de-Castro, J. (2025). Evaluation of a methodology for entrepreneurship training from the perspective of secondary education teachers. *European Public and Social Innovation Review*, 10, 1-15. <https://doi.org/10.31637/epsir-2025-1454>. Article.

María Teresa Hernández Herrera

Research Professor

Julieta Domínguez Soberanes

Senior Researcher A, SNII Level I

URBAN GARDEN PROJECT: IMPROVEMENT FOOD SOVEREIGNTY AND SOCIO-EMOTIONAL SKILLS IN A AGUASCALIENTES MEXICO VULNERABLE NEIGHBORHOOD

ABSTRACT: Introduction: The article shows the results of the urban garden workshop in a vulnerable neighborhood of Aguascalientes. The literature shows that projects that involve the SDGs as well as educational innovation require community participation to achieve the proposed effectiveness. Methodology: The methodology followed is Participatory Action Research, from a workshop for two groups of girls between 6 and 12 years old. Activities were carried out that met two objectives. Those related to food sovereignty and those with personal and community development. Results: The development of awareness about food sovereignty is shown with learning regarding the distinction between sowing, planting and germination, the planning and execution of sowing and those related to personal and community development, specifically focused on the emotional level / emotional and in autonomy and responsibility.

Discussion: It is shown that food sovereignty must be anchored with experiences and personal development for meaningful participation to truly exist. Conclusions: reflection on the implications of workshops that raise awareness among participants regarding food sovereignty and at the same time promote the integral development of their participants.

Hernández Herrera, M. T., Aguilar Hernández, J., Domínguez-Soberanes, J., López-Anaya, J. H., & Medrano-Medina, D. (2025). Urban garden project: Improvement food sovereignty and socio-emotional skills in a Aguascalientes Mexico vulnerable neighborhood. *European Public and Social Innovation Review*, 10, 4. <https://doi.org/10.31637/epsir-2025-1272>. Article.

Humberto Martínez Camacho

Research Professor

GENERATIVE ARTIFICIAL INTELLIGENCE AND UNIVERSITY LIBRARIES IN LATIN AMERICA

ABSTRACT: This article explores the use of generative artificial intelligence in Latin American university libraries, discussing both its potential benefits and challenges. It emphasizes how generative artificial intelligence, which is capable of generating text, video, images, music, and code, is revolutionizing library operations by automating tasks and enhancing research and reference services. The research involved a literature review and interviews with library directors from six prominent universities, revealing varied levels of generative artificial intelligence adoption, from experimental to fully integrated within institutional frameworks. The challenges include staff resistance, training deficiencies, and technological constraints. The study is optimistic about the future of generative artificial intelligence in academic libraries, recommending ongoing training and clear policy development for its successful and ethical implementation. Major service providers like EBSCO, Clarivate, and Elsevier are also noted for their role in supporting this digital transition.

Martínez-Camacho, H., Saavedra-Alamillas, C., Pacheco-Mendoza, J., & Machin-Mastromatteo, J. D. (2025). Generative artificial intelligence and university libraries in Latin America. *IFLA Journal*, 51(3), 647-659. <https://doi.org/10.1177/03400352251348246>. Article.

Mónica del Carmen Meza Mejía

Senior Researcher C, SNII Level I

Erika Xóchitl Rangel Barajas

Research Professor

María Fernanda Haro Álvarez

Research Professor

CHARACTERIZING COGNITIVE LEARNING PREFERENCES AMONG FIRST-YEAR UNIVERSITY STUDENTS IN MEXICO CITY

ABSTRACT: Students develop cognitive preferences for learning. Empirical evidence suggests that the changes in educational modality brought about by the COVID-19 lockdowns have altered learning patterns. Consequently, a study aimed at optimizing academic processes is needed. General objective: To identify the cognitive learning preferences of first-year university students and examine their relationship with five variables: academic term (X1), field of knowledge (X2), reading speed (X3), reading comprehension (X4), and gender (X5), before, during, and after the COVID-19 lockdowns. Research was conducted between 2017 and 2024 at a university in Mexico City, involving 9,220 first-year students, (52,31 men and 47,69% women), from five fields of knowledge. The study followed a quantitative, non-experimental, and retrospective design with a correlational approach. The phenomenon was observed in its natural context without manipulating the variables. The instrument used was the Honey-Alonso Learning Styles Questionnaire. Students of all genders predominantly displayed a Reflective learning style across all fields of knowledge, with the Active style being the least prevalent. The Reflective-Theoretical combination was the most dominant learning style. Correlations between Y1 and X3, X4 revealed higher scores among Reflective learners. Relationships between Y1 and X1, X2 showed a predominance of the Reflective style before and during lockdowns. After returning to in-person learning, the Reflective-Theoretical association became more prominent. A decline in reading speed (X3) and reading comprehension (X4) was observed over time. The findings indicate that certain fields of knowledge tend to favor specific cognitive learning style; learning styles shifted in trend and pattern across both genders during the transition from in-person to virtual learning; and negative correlations were found between learning style and the reading-related variables during the study period.

Meza Mejía, M. del C., Valadez García, A., Rangel Barajas, E. X., & Haro Álvarez, M. F. (2025). Characterizing cognitive learning preferences among first-year university students in Mexico City. *Revista Complutense de Educación*, 36(4), 433-446. <https://doi.org/10.5209/rced.96433>. Article.

Claudia Fabiola Ortega Barba
Senior Researcher B, SNII Level I

Mónica del Carmen Meza Mejía
Senior Researcher C, SNII Level I

Sara Elvira de Jesús Galbán Lozano
Senior Researcher B, SNII Level I

IMPLICATIONS OF DIGITAL TRANSFORMATION ON ORGANIZATIONAL CULTURE IN A HIGHER EDUCATION INSTITUTION

ABSTRACT: Education 5.0 is a paradigm that seeks to humanize work environments by integrating technology into the processes of the educational institution. This paper aims to identify the implications that the process of digital transformation in a higher education institution has had on the organizational culture, for which a qualitative study was conducted with the participation of those responsible for the different areas of digital transformation to answer the question: What implications has the process of digital transformation in a higher education institution had on the organizational culture? It is concluded that the human factor strengthened by a robust organizational culture promotes continuous openness to technological developments and their implications in the different processes of the university task.

Ortega-Barba, C. F., Galbán-Lozano, S. E., & Meza-Mejía, M. C. (2025). Implications of digital transformation on organizational culture in a higher education institution. In A. Teran-Bustamante & M. Velázquez Salazar (Eds.), *Digital transformation and innovation in organizations: A Latin American perspective* (pp. 163-189). Palgrave Macmillan. https://doi.org/10.1007/978-3-031-90794-4_7. Book Chapter.

Erik Miguel Ortiz Díaz
Research Professor

Humberto Martínez Camacho
Research Professor

Jorge Alejandro Peña Landeros
Research Professor

CREATING ONOMASTIC SOCIAL NETWORK MAPS OF BOOKS USING THEIR INDEXES. CASE STUDY: 'PAPYRUS: THE INVENTION OF BOOKS IN THE ANCIENT WORLD'

ABSTRACT: This paper proposes a methodology to create social networks using subject and onomastic indexes from books to facil-

itate content analysis in monographic works. Books have not been largely studied in this context because their contents have not been digitized as in comparison with scientific research articles. However, indexes have been proven as a useful tool to identify relations between terms or characters mentioned inside the texts. This technique is based in the co-presence among these elements and they further visualization, offering a new perspective for structural analysis within Social Sciences and Humanities books.

The book 'Papyrus: The Invention of Books in the Ancient World' has been used as a study object to illustrate this technique and its possibilities.

Repiso, R., Ortiz-Díaz, E. M., Martínez-Camacho, H., & Peña-Landeros, J. A. (2025). Creating onomastic social network maps of books using their indexes. Case study: 'Papyrus: The invention of books in the ancient world'. *Learned Publishing*, 38(4), e2029. <https://doi.org/10.1002/leap.2029>. Article.

Erik Miguel Ortiz Díaz
Research Professor

LIBRARY INSTRUCTION AND RESEARCH TRAINING IN THE CONTEXT OF ARTIFICIAL INTELLIGENCE

ABSTRACT: The librarian has played a crucial role throughout history, evolving from a guardian of humanity's collective memory to guiding the use of collections and, in recent years, a trainer in the use of information and emerging digital technologies. Currently, the librarian is an active collaborator who understands scientific communication processes and the mechanisms for improving high-impact academic production.

Saavedra-Alamilas, C., Pacheco-Mendoza, J., Ortiz, E. M., Hamzaoui, Y., & Astbury, M. (2024). Library instruction and research training in the context of artificial intelligence. In *Encyclopedia of libraries, librarianship, and information science* (Vol. 2, pp. V2:623-V2:629). Elsevier. <https://doi.org/10.1016/B978-0-323-95689-5.00122-X>. Book Chapter.

Daniela Salgado Gutiérrez
Research Professor

CHARACTER EDUCATION FORMATION PROGRAM AS AN EPIPHANY AND TRANSFORMATIONAL EXPERIENCE FOR EDUCATIONAL PRINCIPALS IN MÉXICO

ABSTRACT: This qualitative, phenomenological study assessed the impact of PRIMED and vLACE teacher training programs on 23 Mexican educators within six school leadership teams, through the project “Character education leadership program for Mexican public schools”. Aiming to cultivate leaders fostering character education, the study revealed an epiphanic personal transformation among participants, crucial for genuine character culture. This research provides evidence that such formative experiences profoundly reshape public school principals’ professional purpose, embracing their role in shepherding school culture and serving as virtuous role models. This program offers a promising prototype for future character education leadership training in Mexican public schools.

Salgado, D., Bernal, A., Dabdoub, J. P., Berkowitz, M. W., & Bier, M. C. (2025). Character education formation program as an epiphany and transformational experience for educational principals in México. *Research in Human Development*, 22(1), 23-55. <https://doi.org/10.1080/15427609.2025.2524298>. Article.

Rodrigo Sosa Sánchez
Senior Researcher B, SNII Level I

ASSESSING ACUTE EFFECTS OF METHYLPHENIDATE AND MODAFINIL ON INHIBITORY CAPACITY, TIME ESTIMATION, ATTENTIONAL LAPSES, AND COMPULSIVE-LIKE BEHAVIOR IN RATS

ABSTRACT: Medications known as ‘cognitive enhancers’ are increasingly being consumed off-label by healthy people, raising concerns about their safety. The aim of our study was to profile behavioral performance upon oral administration of methylphenidate (2.5 mg/kg) and modafinil (64 mg/kg) - two popular cognitive enhancers - and upon their discontinuation. We modeled cognitively demanding challenges in neurotypical individuals using a behavioral task where Wistar - Lewis rats had to withhold responses for a specified time to obtain food rewards. This task allowed us to extract several measures of behavioral performance associated with clinically meaningful indices, such as compulsive-like responding, incapacity to wait (impulsivity), time estimation (precision and accuracy), and attentional lapses. Our study design involved examining these behavioral indices in subjects administered either methylphenidate, modafinil, or vehicle. We found that subjects administered modafinil obtained fewer rewards and were less efficient in reward pursuing than the vehicle group; this result was likely due to a drug-induced inability to wait. Upon modafinil discontinuation, subjects earned more rewards but did not entirely catch up with the vehicle group. As for methylphenidate, neither favorable nor unfavorable effects were found in our main analyses. However, an exploratory analysis of changes in behavioral performance within sessions suggested

that methylphenidate fostered favorable, yet short-lived, effects. We discuss our results in terms of the risks and cost-benefits of doses above or below the effective dose of cognitive enhancement drugs.

Sosa, R., Espinosa-Villafranca, P., Saavedra, P., Chávez-Hernández, M. E., Leal-Galicia, P., Lago, G., Mata, F., Mata-Luévanos, J., Rodríguez-Serrano, L. M., Tapia-De-Jesús, A., & Buenrostro-Jáuregui, M. (2025). Assessing acute effects of methylphenidate and modafinil on inhibitory capacity, time estimation, attentional lapses, and compulsive-like behavior in rats. *Behavioural Pharmacology*, 36(2-3), 76-96. <https://doi.org/10.1097/FBP.0000000000000815>. Article.

Rodrigo Sosa Sánchez
Senior Researcher B, SNII Level I

EVALUATING FUTURE THINKING PRIMING EFFECTS ON DELAY DISCOUNTING AMONG YOUNG ADULT DRINKERS

ABSTRACT: The extent to which an individual prefers smaller immediate rewards over larger delayed rewards is referred to as delay discounting. Higher discounting is associated with addictive behaviors and reducing it may aid in their prevention or treatment. Consequently, interventions that decrease discounting—such as Future Thinking Priming (FTP)—have attracted research interest; however, the literature on young adults with binge drinking remains scarce. This study aimed to evaluate the effect of Future Thinking Priming (FTP) on delay discounting among individuals who engage in binge and low-risk drinking. We assessed delay discounting in 86 participants divided into two groups (future-oriented priming or control), using a pretest-posttest design. The results did not provide evidence that FTP reduces delay discounting in this sample. This null effect may reflect the fact that successful priming interventions are typically detected with large sample sizes, underscoring the need to examine potential moderators such as self-efficacy and affective valence. Finally, we found a strong correlation between pretest and posttest discounting measures, consistent with studies characterizing delay discounting as a trait variable.

García-Rangel, F., Reyes-Huerta, H., dos Santos, C. V., Sosa, R., & Martínez, K. (2025). Evaluating future thinking priming effects on delay discounting among young adult drinkers. *International Journal of Psychological Research*, 18(2), 33-46. <https://doi.org/10.21500/20112084.7551>. Article.

Rodrigo Sosa Sánchez
Senior Researcher B, SNII Level I

THE ADAPTIVE VALUE OF BEHAVIORAL INHIBITION

ABSTRACT: To effectively pursue goals, agents often must learn how approaching their goals feels to streamline their path. When finally reaching an actual goal, the sensory cues experienced immediately before become new targets for the agent's future pursuits. Even if adaptively sound, this process has its drawbacks. Cues regularly paired with goals but occasionally leading to diverting paths can trap agents in systematic setbacks, ultimately undermining goal attainment — a phenomenon known as *proxy failure*. These misleading cues constitute an evolutionary pressure potentially driving the emergence of supporting mechanisms to disengage from counterproductive pursuits. *Behavioral inhibition* — the capacity to suppress an otherwise occurring action — is a suitable candidate for this role, and, importantly, it can be materialized through different execution pathways. The present paper explores a plausible environmental constraint leading to proxy failure through simulation and demonstrates how a simple implementation of behavioral inhibition can rescue effective goal pursuit.

Sosa, R. (2025). The adaptive value of behavioral inhibition. *Current Opinion in Behavioral Sciences*, 63, 101523. <https://doi.org/10.1016/j.cobeha.2025.101523>. Review.

Rodrigo Sosa Sánchez
Senior Researcher B, SNII Level I

YEAB: YEAB EASE THE ANALYSIS OF BEHAVIOR

ABSTRACT: In recent years, with the advent of open-source programming languages such as R and Python, there has been a resurgence of the DIY spirit in the experimental analysis of behavior and, more broadly, in experimental psychology. This paper introduces YEAB, an R package that streamlines the processing and analysis of data from numerous common behavioral paradigms. Key features include automated extraction of raw data from MED-PC output files, flexible modeling of interresponse times (including mixture-exponential approaches), single-trial analysis for fixed-interval and peak procedures, and model fitting of delay discounting data in intertemporal choice tasks. By consolidating core functions into one accessible package, YEAB empowers researchers to efficiently handle multi-level data structures, promote reproducible workflows, and expand the scope of behavioral experimentation. Collectively, these functionalities facilitate robust, transparent analyses, fostering open-science practices and supporting innovative exploration in EAB and related fields.

Alcalá, E., Saavedra, P., García-Rangel, F., Sosa, R., Reyes, V., & Buriticá, J. (2025). YEAB: YEAB Ease the analysis of behavior. *Behavior Research Methods*, 57(7), 199. <https://doi.org/10.3758/s13428-025-02720-4>. Article.

Virginia Aspe Armella
Senior Researcher D, SNII Level III

ARISTOTLE AND NEW SPAIN

ABSTRACT: This book is a detailed exploration of the Hispanic intellectual context and the different Aristotelian traditions that prevailed until the 16th century. Through a review and contextualisation of Aristotelian thinkers and texts, it argues that a unique Aristotelian tradition was formed in New Spain.

The characteristic differences of Novohispanic Aristotelianism are a consequence of five factors: contact with the autochthonous cultures of America, the impact of the colonial organisation, the influence of the Salamanca humanist tradition, the presence of the Italian Aristotelianism of Renaissance translators in the university curricula and in the intellectual polemics of the time, and a peculiar assimilation of primitive and Old Testament Christianity in relation to indigenous people. This book analyses the works of Alonso de la Veracruz, Bartolomé de las Casas, Bernardino de Sahagún, Sor Juana Inés de la Cruz, Carlos de Sigüenza y Góngora, and Francisco Xavier Clavijero, reconsidering them in light of the history of ideas in New Spain and the contributions of Byzantine translators. It also offers a reflection on the problem of addressing Mexican colonial sources.

This volume will be of interest to undergraduate and postgraduate philosophy students, as well as to researchers focused on Aristotle, Renaissance philosophy, or Latin American studies.

Aspe Armella, V. (2025). *Aristotle and New Spain*. Routledge. <https://doi.org/10.4324/9781032706009>. Book.

Virginia Aspe Armella
Senior Researcher D, SNII Level III

THE INFLUENCE OF CICERO IN THE AMERICAS: A PRELIMINARY APPROACH THROUGH BARTOLOMÉ DE LAS CASAS

ABSTRACT: In this paper I make a preliminary analysis of the imprint of Marcus Tullius Cicero in New Spain, especially in works by Bartolomé de las Casas (16th century), although other authors influenced by Cicero are briefly discussed as well. The analysis consists of a comparison of Cicero's works *De oratore* and *De officiis* with Bartolomé de las Casas's *The Only Way to Attract All Peoples to the True Religion*. Cicero's influence on Las Casas is not merely rhetorical, as is often argued, but involves important philosophical notions: the sense of justice, the rejection of the exclusion of the most disadvantaged, and a differentiated concept of "equality".

Aspe Armella, V. (2025). The influence of Cicero in the Americas: A preliminary approach through Bartolomé de las Casas. *Revista Española de Filosofía Medieval*, 32(1), 167-174. <https://doi.org/10.21071/refime.v32i1.18191>. Article.

Fernando Cano Jorge
Research Professor

CONNEXIVE LOGIC: NEW OLD CHALLENGES

ABSTRACT: After the intense attention the relevance logic community and its friends gave to McCall's ideas on connexive implication during the late 1960s and nearly all the 1970s, studies on connexive principles faded in the 1980s. By the 1990s, Claudio Pizzi was the only person working systematically on them. In fact, the connexive principles seemed forgotten even by relevance logicians, once their main researchers. Moreover, these principles were never seriously considered by paraconsistent logicians outside the Australasian-centered movement, to mention the two brands of non-classical logic more akin to the ideas underlying the connexive principles. Maybe Richard Routley's vocal comments about the alleged uselessness of connexivity for paraconsistency contributed to that fate of connexive logics. According to him, for any connexive logic X (and with N standing for a negation), $A, NA \vdash_x B$ either vacuously valid—for a formula and its negation would cancel each other, making them both untrue—or it is invalid but only at the cost of making contradictions logically inert, that is, they do not entail anything, perhaps only themselves.

Cano-Jorge, F., & Estrada-González, L. (2025). Connexive logic: New old challenges. *Logic Journal of the IGPL*, 33(6), jzaf001. <https://doi.org/10.1093/jigpal/jzaf001>. Article.

Fernando Cano Jorge
Research Professor

CONNEXIVE ARITHMETIC FORMULATED RELEVANTLY

ABSTRACT: Following the strategy in [15] to develop inconsistent models for relevant arithmetics, we formulate a connexive variant of arithmetic by replacing the conditional of $RM3$ with the Belikov–Loginov conditional. We obtain thus the connexive logic $cRM3$ which serves as a base logic for arithmetics $cRM3^i$, $cRM3^{\sharp}$, $cRM^{\sharp}$, $cRMn^i$, and cRM^{ω} . We compare these with their counterparts $RM3^i$, $RM^{\sharp}$ and RM^{ω} that extend relevant arithmetic $R^{\sharp}$.

Cano-Jorge, F., & Estrada-González, L. (2026). Connexive arithmetic formulated relevantly. *Logic Journal of the IGPL*, 34(1). <https://doi.org/10.1093/jigpal/jzaf052>. Article.

Fernando Cano Jorge

Research Professor

GATES AND CIRCUITS VIA DUNN SEMANTICS

ABSTRACT: Computer hardware is heavily reliant on classical logic, but could we use some non-classical logic instead? In this paper I suggest an alternative model of implementation of logic gates in electronics. In particular, I propose a model that takes descriptions of logical connectives through means of Dunn semantics and implements them as logic gates by using a double current system: one for truth and one for falsity, instead of the classical use of a single current for both values. The outcome of this proposal should pave the way to new models of non-classical and even contra-classical computation based on paraconsistent, paracomplete and para-normal logics.

Cano-Jorge, F. (2025). Gates and circuits via Dunn semantics. *Journal of Logic and Computation*, 35(4), exaf033. <https://doi.org/10.1093/logcom/exaf033>. Article.

Fernando Cano Jorge

Research Professor

ON STRONG AND WEAK LOGICS FOR PARAconsistent COMPUTABILITY

ABSTRACT: One tradition in relevant and paraconsistent logics has been to develop systems intended for applications to arithmetic and computability theory. The aspiration, as in Meyer and others, is to recover enough working mathematics for real computation, but without the limitative results of Turing, Gödel, etc.; or more cautiously, as in Dunn, to respect relevance and with that be insulated against the possibility of a genuine inconsistency. We distill these goals into GUIDING QUESTIONS, and study the options for logics within a range of relevant systems. We focus on strong truth functional logics RM3 and PAC and their expansions, with application to inconsistent arithmetics. We argue that this approach, while having many virtues, does not fully answer our guiding questions. This points to weak relevant logics like Routley/Sylvan's DKQ, Brady's MCQ, and Logan and Boccuni's DL2Q*f. The recurring theme is that paraconsistent computability struggles with functionality. A method for advancing on the 'function problem' is sketched with Kleene's theorem as a worked example.

Weber, Z., & Cano-Jorge, F. (2025). On strong and weak logics for paraconsistent computability. *Journal of Applied Logics*, 12(5), 1349-1381. <https://hdl.handle.net/10523/46756>. Article.

André Laks

Senior Researcher D, Research Professor

JACOB THE CYNIC: PHILOSOPHERS AND PHILOSOPHY IN JACOB BURCKHARDT'S GRIECHISCHE CULTURGESCHICHTE

ABSTRACT: Jacob Burckhardt, the famous historian of Renaissance and Greek culture that Nietzsche highly appreciated, famously said that 'What is of interest to [him] is not so much to see how far the Greeks took philosophy as to see how far philosophy took them.' The phrase encapsulates the fascinating tension that pervades Burckhardt's attitude towards Greek philosophy: whereas he was fundamentally hostile to philosophical doctrines, in particular because philosophers were themselves doctrinally hostiles to art, he also highly praised philosophy in as much as the embodiment of one of the great achievements of Greek culture, the development of the 'free personality'. This explains why the Cynics, with little doctrine and much life, were his preferred philosophers.

Laks, A. (2020). Jacob the Cynic: Philosophers and philosophy in Jacob Burckhardt's *Griechische Culturgeschichte*. In V. Caston (Ed.), *Oxford studies in ancient philosophy* (Vol. 57, pp. 369-382). Oxford University Press. <https://doi.org/10.1093/oso/9780198850847.003.0012>. Article.

André Laks

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SOULS AND COSMOS BEFORE PLATO: FIVE SHORT DOXOGRAPHICAL STUDIES

ABSTRACT: This article shows how two basic meanings of *psukhē* – namely 'breath' and 'life' – may have helped Platonising or for that matter Stoicising doxographers to lend to various pre-Platonic philosophers the view that the world is 'ensouled'. I do not try to systematically reconstruct how these cosmo-philosophers conceived the relationship between the world and what was to become 'the soul'. I do suggest, however, that framing the problem in terms of 'breath' and 'life' helps us in getting a more adequate understanding both of the authentic evidence and of the history of its reception. Indeed, to the extent that it is possible, I try to reconstruct the interpretive steps that led, with various degrees of legitimacy, from the original wording to its Platonising or Stoicising deformations, which remain all too often the framework of analysis in modern interpreta-

tions. Five case studies are considered: Thales, Anaximenes, Heraclitus, some Pythagoreans and Alcmeon.

Laks, A. (2021). Souls and cosmos before Plato: Five short doxographical studies. In R. Salles (Ed.), *Cosmology and biology in ancient philosophy: From Thales to Avicenna* (pp. 8-28). Cambridge University Press. <https://doi.org/10.1017/9781108873970.002>. Book Chapter.

Mauricio Lecón Rosales
Senior Researcher C, SNII Level II

FRANCISCO SUÁREZ AND THE BAROQUE LAUGH

ABSTRACT: In his Commentary on Aristotle's *De Anima*, Francisco Suárez offers a detailed account of the psychology and physiology of laughter, along with the description of laughter as a voluntary and free act. This marked a significant shift in the understanding of laughter which was previously seen as an unmoderated physiological reaction. In this paper I argue that Suarez's philosophy influenced the creation of the cultural paradigm of the Baroque. Thus, the philosophy of Francisco Suárez is a structuring antecedent of the Baroque since, among other reasons, it outlines the human possibility of choosing to laugh at the vicissitudes of a vanishing and transitory world.

Lecón Rosales, M. (2024). Francisco Suárez and the Baroque laugh. *Revista de Hispanismo Filosófico*, (29), 63-79. <https://doi.org/10.15366/rhf.2024.29.003>. Article.

Mauricio Lecón Rosales
Senior Researcher C, SNII Level II

HANDS UP, BOZO! THE DIFFICULTIES OF ARRESTING HUMOUR

ABSTRACT: Humour is an elusive topic within the legal sphere. Contemporary discourse frequently struggles with whether comedians should be legally accountable for their often-controversial humour, juxtaposing the intricacies of humour's nature against the principle of free speech. This article aims to demonstrate the inadequacy of judicial resources in addressing humorous expressions. Initially, I examine the varied judicial treatments of humour across different legal systems. Subsequently, I highlight the inherent difficulties in criminalizing humour, whether through aesthetic judgments or evaluations of the comedian's intentions, as both tend to result in an excessive interpretation of the performer's expression and motives. In the third section, I critique the models proposed by Godioli and Mosaka, discussing the benefits and limitations of these frameworks in establishing a legal standard for assessing when humour

crosses the line and its adjudication in court. Ultimately, I contend that humour, particularly that of comedians, ought to be evaluated from a societal perspective, exempting it from legal constraints. I propose alternative solutions to confront offensive humour that bypass formal justice systems, such as enhancing media literacy, endorsing comedians who champion social values, and deterring the patronage of certain comedic genres.

Lecón, M. (2024). Hands up, Bozo! The difficulties of arresting humour. *European Journal of Humour Research*, 12(4), 67-81. <https://doi.org/10.7592/EJHR2024.12.4.936>. Article.

David Xavier Levystone
SNII Level I

"NOT TO HAVE A DOG" (AR., RH. II 1401A18-19)

ABSTRACT: Among the proverbs that Aristotle uses as examples in the *Rhetoric*, one formula has perplexed editors and commentators of the text: "it is most shameful not to have a dog". Different explanations have been proposed for the meaning of this common saying and, hence, of Aristotle's argument in this passage. None of them is entirely satisfactory. I propose to understand the meaning of this proverb from the popular use of the term κύων, "dog", in late erotic poetry and in classical comedy, which associate the dog with the masculine sexual organ.

Levystone, D. (2025). "Not to have a dog" (Ar., Rh. II 1401a18-19) ["No tener perro" (Ar., Rh. II 1401a18-19)]. *Hypnos*, 54(1), 15-30. <https://hypnos.org.br/index.php/hypnos/article/view/727>. Article.

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THE LITERAL (PHTH OR ΦΑΝΕΡΑ / ZĀHIR) AND THE HIDDEN (VTIONOIA / BĀṬIN) IN PHILO OF ALEXANDRIA AND THE ISLAMIC PHILOSOPHICAL TRADITION

ABSTRACT: In his well-known work on Philo of Alexandria, Harry A. Wolfson argues that Philonic philosophy is the preamble to the "religious philosophies" of the three Abrahamic traditions. Among several coincidences and similarities between Philo and each of the religious philosophies, Wolfson highlights one particularly important: all three traditions found in their respective Scriptures two meanings, one literal (ῥητή or φανερά) and one hidden (ὕψινοια). Each of these philosophical traditions sought—in its own way—an allegorical method of interpretation. Such a method

the Church Fathers learned directly from Philo. And from the Church Fathers it would have been transmitted, according to Wolfson, to Islam and Judaism. The most widespread version among historians of philosophy has been that neither Islam nor Judaism had direct contact with Philo. In any case, it could have been an indirect influence. Despite the ambiguities in this regard, this article aims to elucidate possible similarities between the notions of ρητή or φανερά and ὑπόνοια and their Arabic equivalents, *ẓāhir* and *bāṭin*.

López-Farjeat, L. X. (2025). The literal (ρητή or φανερά / *ẓāhir*) and the hidden (υπόνοια / *bāṭin*) in Philo of Alexandria and the Islamic philosophical tradition. *Anales del Seminario de Historia de la Filosofía*, 42(2), 311-323. <https://doi.org/10.5209/ashf.96483>. Article.

Leonardo Ruiz Gómez

Senior Researcher D, SNII Level II

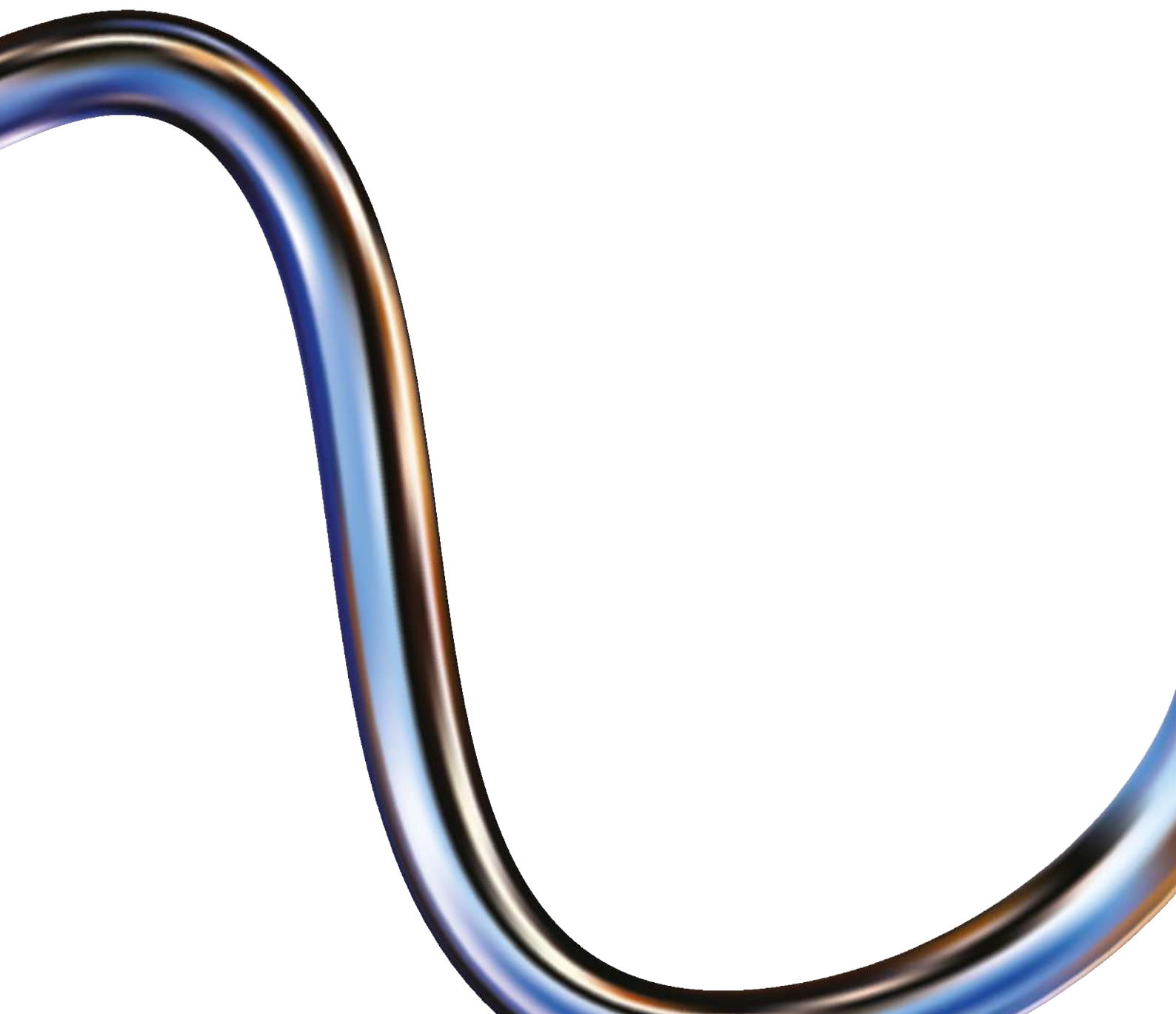
THE EVOLUTION OF THE LEIBNIZIAN NOTION OF “PRIMARY MATTER” AND ITS SCHOLASTIC BACKGROUND

ABSTRACT: This paper aims to clarify the evolution of the notion of primary matter in Leibniz’s philosophy. The analysis takes the scholastic discussion on the reality of primary matter as a framework to explain the development of Leibniz’s ideas. It will be shown that Leibniz argued in his earlier writings for a conception of primary matter as some sort of being (similarly in line with some scholastic philosophers like Scoto, Ockam, and Suarez). In contrast, in his mature metaphysics, he deployed this primary matter of reality, approaching Aquinas’s position in a creative and novelty manner.

Ruiz-Gómez, L. (2024). The evolution of the Leibnizian notion of “primary matter” and its scholastic background. *Cauriensia*, 19, 737-758. <https://doi.org/10.17398/2340-4256.19.737>. Article.



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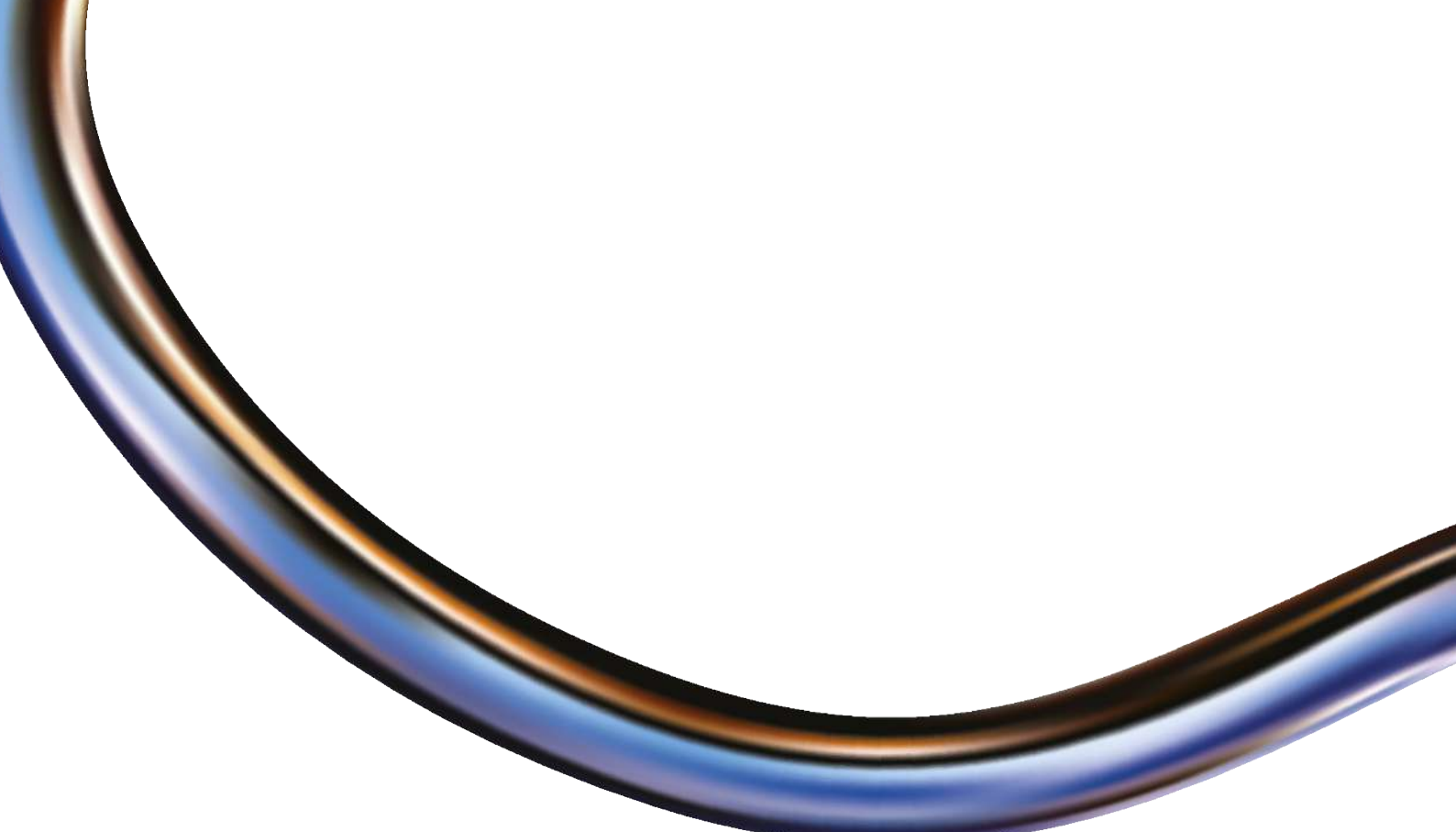
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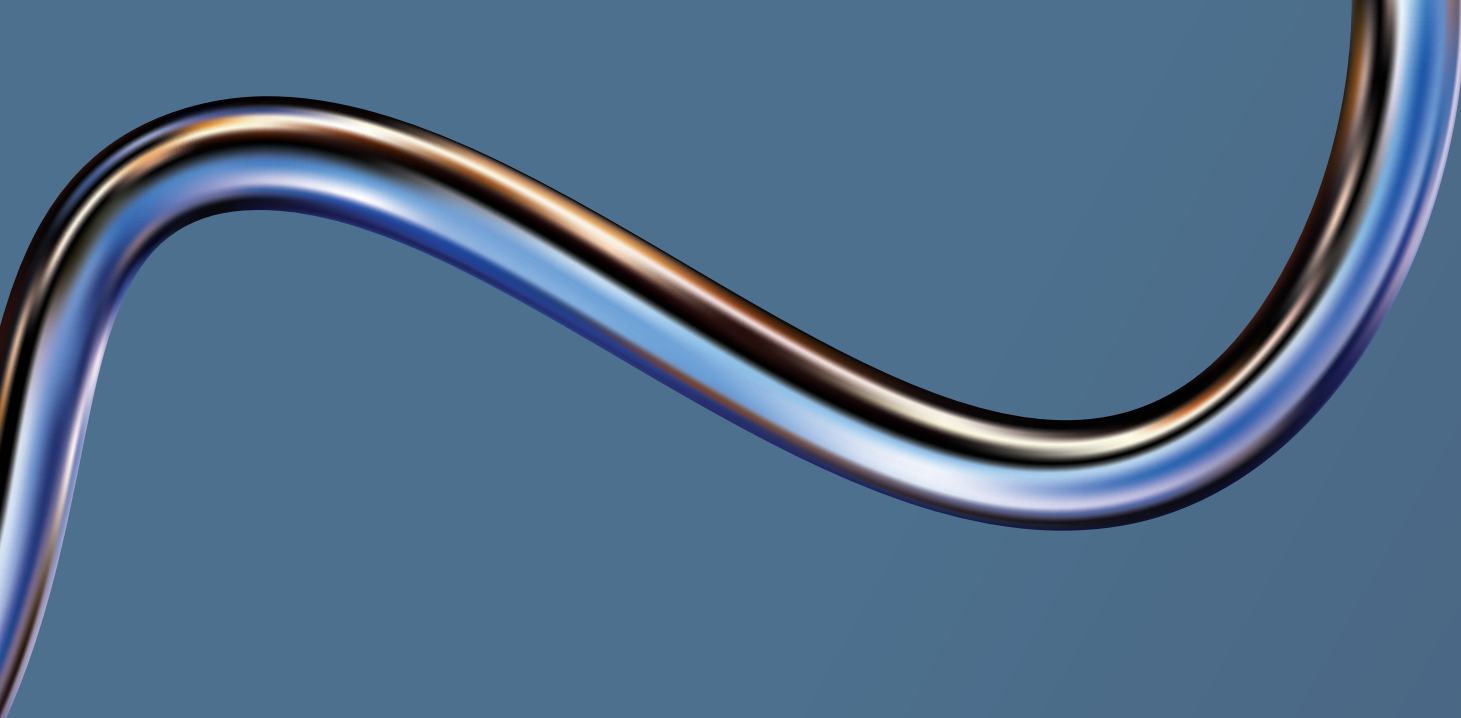


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