

Informe de Producción Científica

2019



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Informe de Producción Científica

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Presentación

Hace cinco años que la Universidad Panamericana se propuso el objetivo de convertirse en una universidad de investigación e influencia. Este objetivo, sin duda, nos ha llevado a tratar de mejorar e incidir sobre nuestro entorno cultural, social, técnico y económico. Se puede afirmar que, gracias a las directrices estratégicas que han marcado los Consejos de Rectoría y el Institucional de Investigación, así como al trabajo y dedicación de nuestros profesores, cada año vamos dando pasos importantes hacia el logro de ese objetivo.

En el presente Informe de Producción Científica, que corresponde a las publicaciones del año 2019, se materializa gran parte del esfuerzo que la comunidad académica de la Universidad Panamericana realiza todos los días por aportar a la generación de nuevo conocimiento e impulsar la investigación científica de alto nivel.

En el 2019 hemos obtenido un crecimiento muy importante con respecto al año anterior, logrando así la mayor producción visible en la historia de la institución y manteniendo un crecimiento consistente desde el año 2012. Según datos de Scopus, en 2019 nos hemos posicionado como la tercera institución privada del país, en lo referente a la publicación de productos científicos indexados.

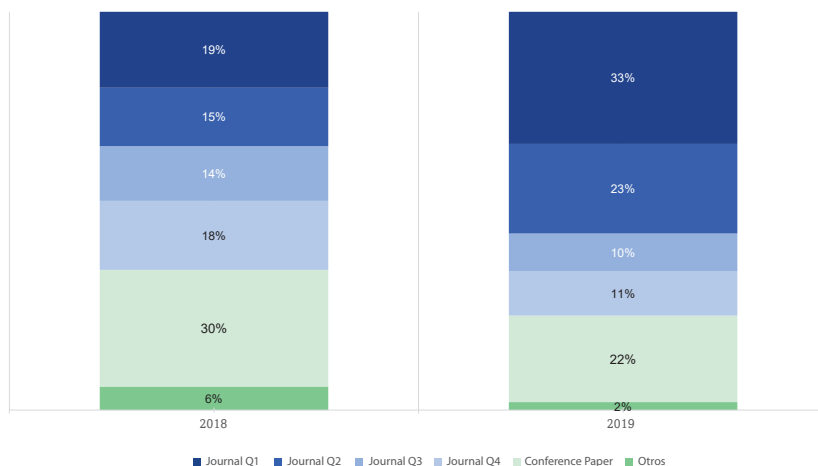
Desde el Consejo Institucional de Investigación, deseo externar nuestro más sincero reconocimiento y agradecimiento a toda la comunidad académica y directiva de la universidad, en especial a aquellos cuyos logros se ven plasmados en el presente informe.



Dr. Abraham Mendoza Andrade
Director Institucional de Investigación
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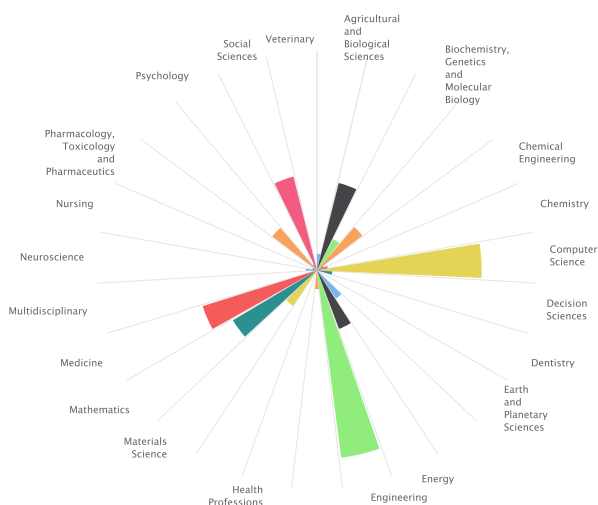
Numeralia

Figura 1. Comparativo de calidad entre las publicaciones de 2018-2019



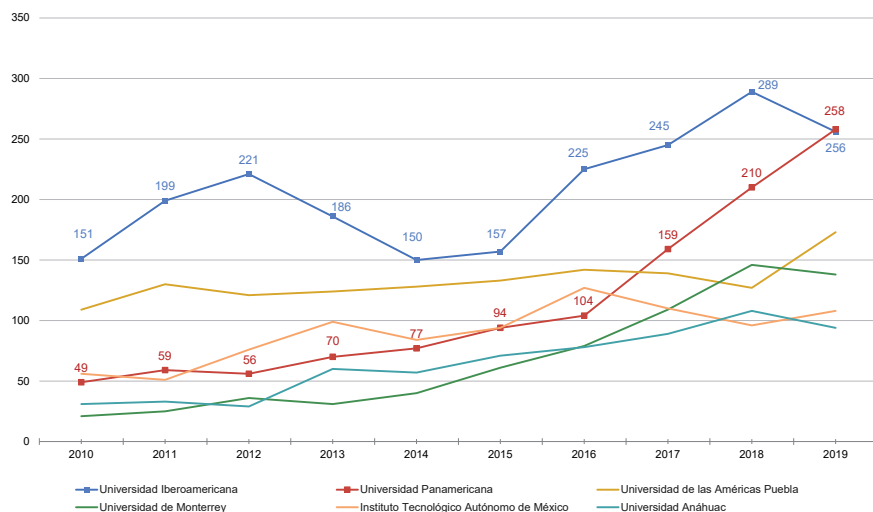
Fuente: datos de Scopus.

Figura 2. Perfil de áreas temáticas



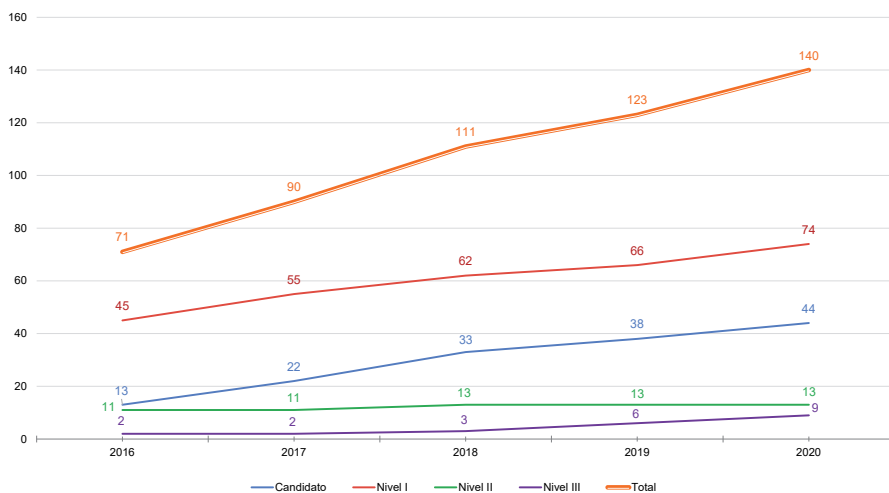
Fuente: Scimago con datos de Scopus.

Figura 3. Benchmark de Universidades Privadas Mexicanas 2010-2019



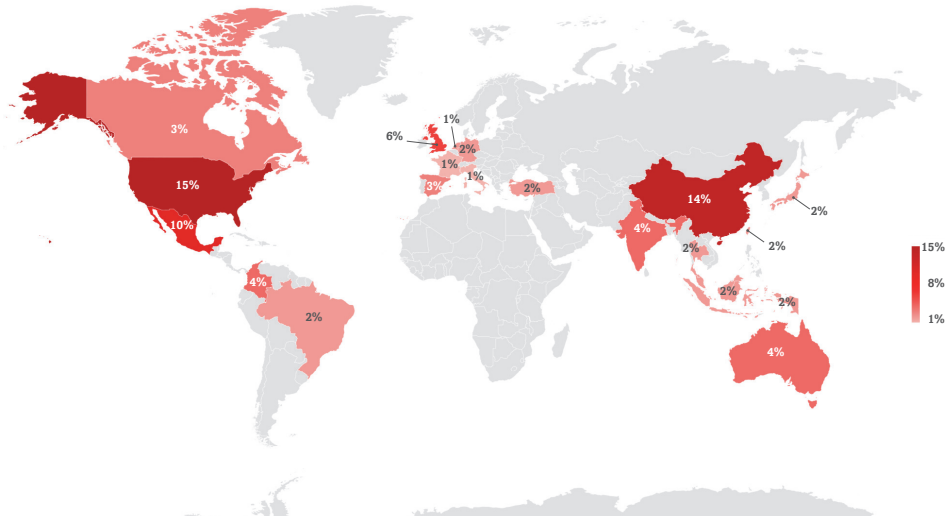
Fuente: datos de Scopus, universidades privadas con menos de 1000 publicaciones por año.

Figura 4. Miembros del Sistema Nacional de Investigadores



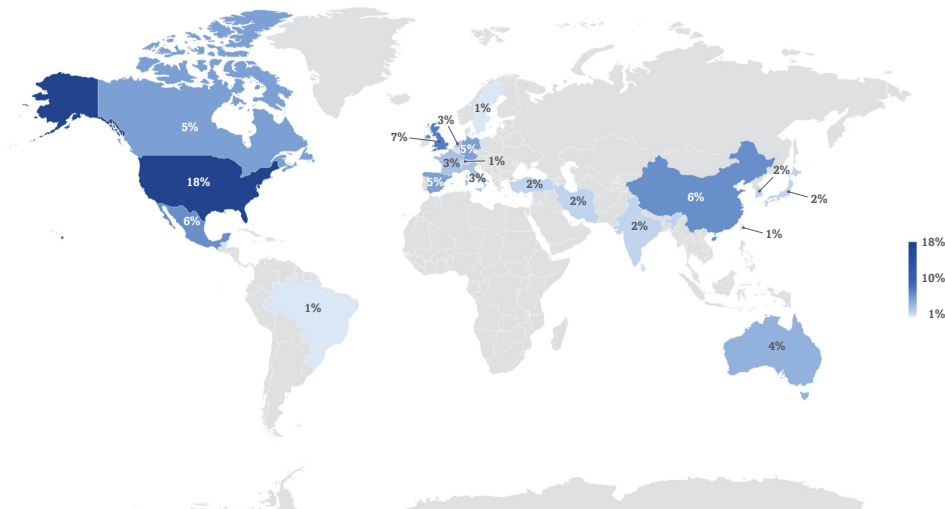
Fuente: elaboración propia con datos del CONACYT.

Figura 5. Principales lectores de nuestras publicaciones en el mundo



Fuente: Elsevier con tecnología de Bing.

Figura 6. Principales lugares de citación de nuestras publicaciones en el mundo



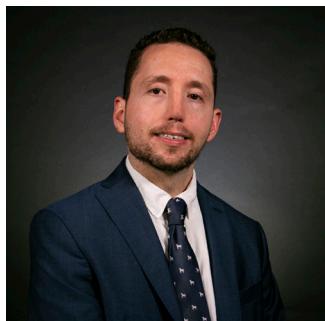
Fuente: Elsevier con tecnología de Bing.





Centro de Innovación Educativa





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TEACHING UNDERGRADUATE STUDENTS ENTREPRENEURSHIP SKILLS: A BOOT CAMP FOR HIGH IMPACT TECHNOLOGICAL BUSINESS PROJECTS

ABSTRACT. The methodology of the study was qualitative in order to understand and describe the experiences of undergraduate students attending the i-Lab camp. Data came from a questionnaire with open-ended questions sent to the students participants. In addition, individual interviews with the students were conducted.

Preliminary findings focus on how entrepreneurship influenced the development of undergraduate students. They strengthened some skills such as teamwork, synthesis, analysis, self directed learning, leadership, negotiation, empathy, and critical thinking. Students described their experiences in i-Lab as very challenging but rewarding. In addition to hard work and the sacrifices they had to make in order for their projects to come through, they shared the importance of living the methodology, their personal growth, and how the experience enhanced their decision-making skills.

Alongside this results, the findings provides insights to move to a student centered model. Higher Education Institutions need to include experiential learning projects and partner with different centers inside and outside the university to reshape the curricula and provide different learning experiences.

Alemán-Juárez, A., Capetillo-García, W., García-Higuera, M. D. (2018), "Teaching Undergraduate Students Entrepreneurship Skills: A Boot Camp for High Impact Technological Business Projects". *12th International Technology, Education and Development Conference*: 8078-8084, doi: [10.21125/inted.2018.1953](https://doi.org/10.21125/inted.2018.1953). Conference Paper.

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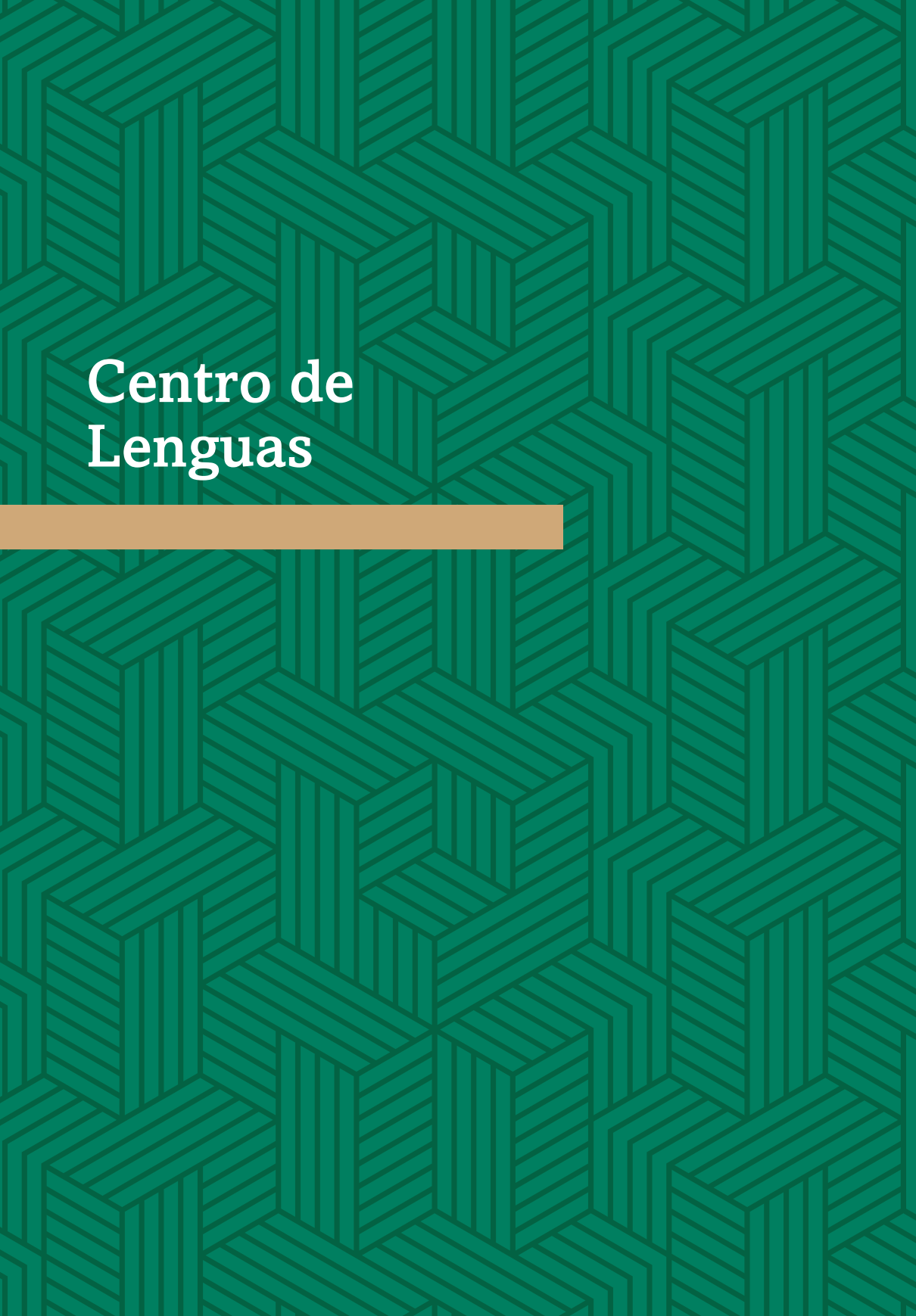
María del Carmen García Higuera

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THE USE OF GAMIFICATION TO FACILITATE LEARNING OF MULTIMEDIA SUBJECTS IN UNDERGRADUATE EDUCATION STUDENTS

ABSTRACT. In this sense, this paper questions the learning relevance of Gamification, especially in a context of education students in Mexico. It describes the experiences of 144 college students, at Escuela de Pedagogía (School of Pedagogy), Universidad Panamericana, campus Ciudad de México who had taken a full-semester multimedia workshop with game design principles. The purpose of the study was to better understand their learning experiences of taking a class with such a methodology. The objective of this course is that students learn to use technology and multimedia tools and apply them to educational contexts, such as videos, podcasts, infographics, websites and webinars. For this reason, a platform called Classcraft was implemented throughout the course, using Gamification elements to generate interest, empathy and class engagement. ©2017, IATED.

Alemán-Juárez, A., Becerra-Mariscal, A. E., García-Higuera, M. D. (2017), "The Use of Gamification to Facilitate Learning of Multimedia Subjects in Undergraduate Education Students". *9th International Conference on Education and New Learning Technologies*: 3175-3181, doi: [10.21125/edulearn.2017.1674](https://doi.org/10.21125/edulearn.2017.1674). Conference Paper.



Centro de Lenguas





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MAKING ENGLISH SPEAKERS: MAKERSPACES AS CONSTRUCTIVIST LANGUAGE ENVIRONMENTS

ABSTRACT. A makerspace is a constructivist learning environment (CLE) where learning takes place by creating objects. This paper describes a makerspace applied to second language learning in a university context. The course design and operation, along with its results were analyzed based on activity theory. The results at the end of the course revealed that students improved or maintained their language skill level on a par with their counterparts in traditional English classes. © 2018 Asociacion Mexicana de Maestros de Ingles MEXTESOL A.C. All rights reserved.

Alley W. (2018), "Making English speakers: Makerspaces as constructivist language environments", *Mextesol Journal* 42(4). Article.

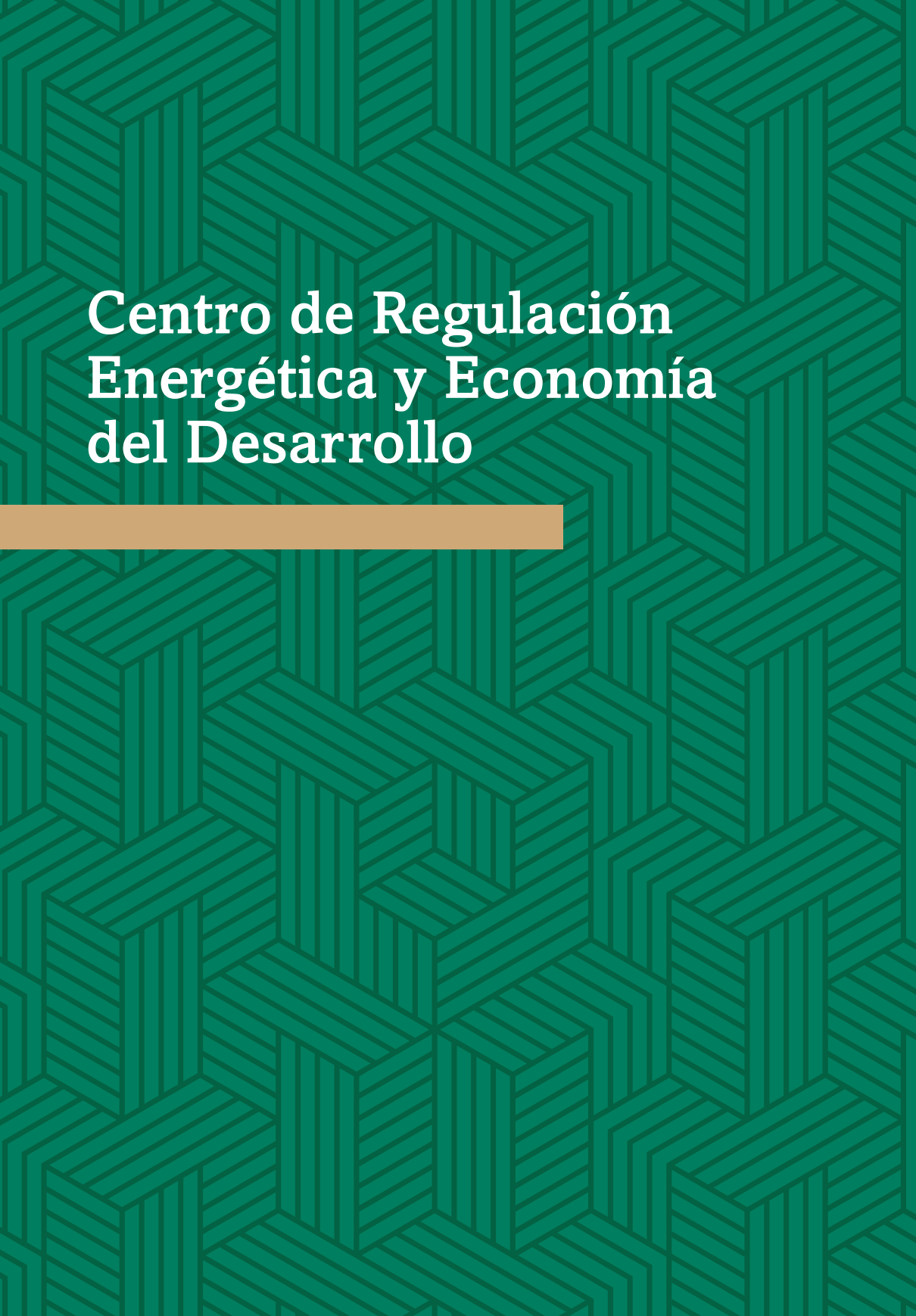
Carmin Carmen Ludivina Montante Resendiz

Profesor Investigador

BUILDING COMMUNITIES OF PRACTICE IN A LANGUAGE SITUATED LEARNING SETTING

ABSTRACT. Communities of practice is a term that has begun gaining grounds in various settings especially in business and recently in education (Argyris, 2008; Göhlich, 2016; Lave & Wegner, 1991). The purpose of this case study is to look into how students measure their personal perceptions of their educational community; how they rate their educator within that community of practice as a result of this perception; and how organizational learning theory (OL) helps explain this intricate relationship between the student's perception of their community and their rating of their professor. Rovai, Wighting, & Lucking's (2004) Classroom and Community Inventory, in addition to the course evaluation, was adapted to measure classroom and community levels of satisfaction. At the end of the 16-week semester, learners' self-reflection provided a glimpse of how communities can develop within a higher education setting. © 2019 Asociacion Mexicana de Maestros de Ingles MEXTESOL A.C. All rights reserved.

Montante, C.C.L. (2019), "Building communities of practice in a language situated learning setting", *Mextesol Journal* 43(4). Article.



Centro de Regulación Energética y Economía del Desarrollo





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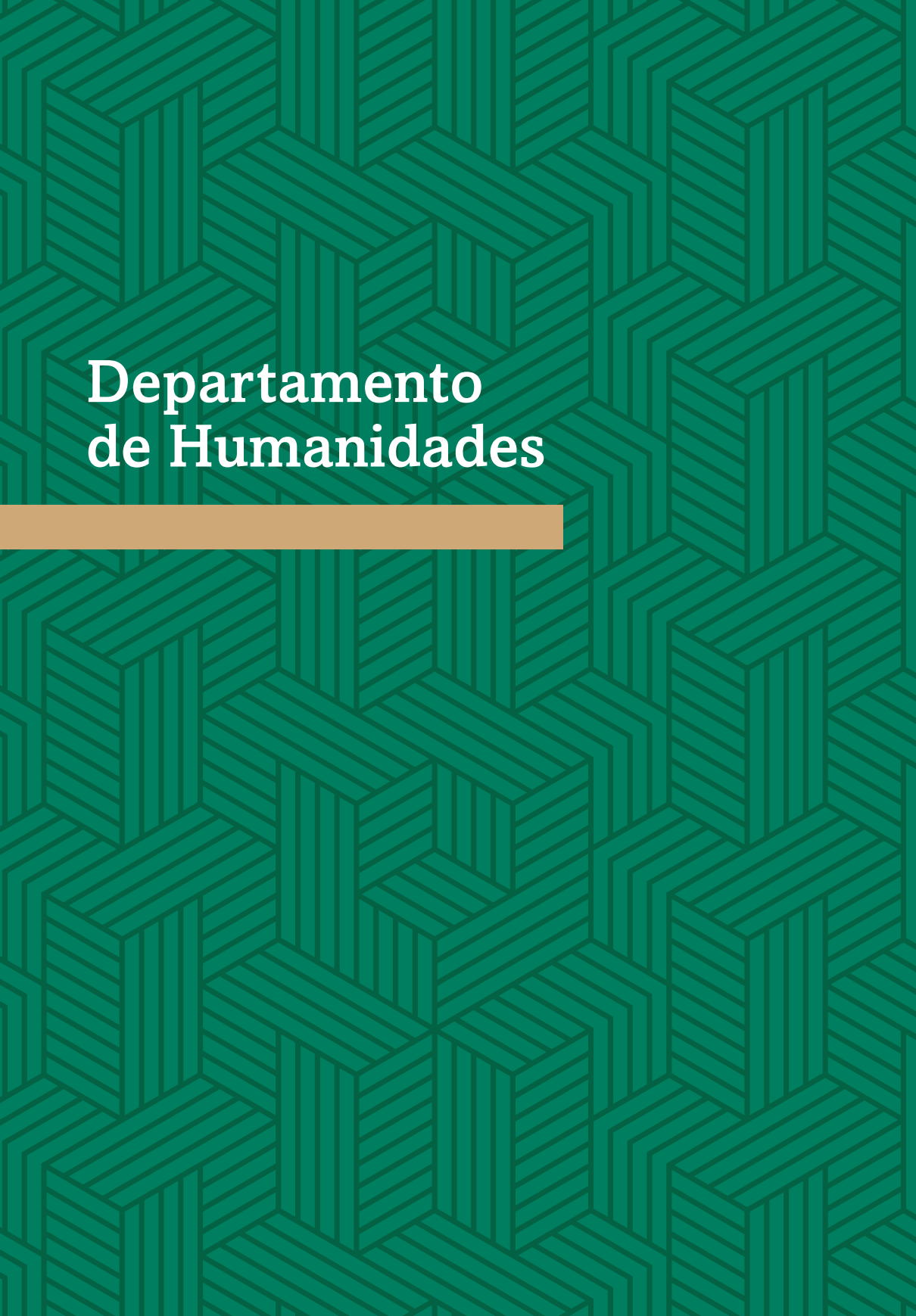
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**GENERATION COSTS, INVESTMENT AND PRICES IN MEXICO'S ELECTRICITY SECTOR
[COSTOS DE GENERACIÓN, INVERSIÓN Y PRECIOS DEL SECTOR ELÉCTRICO EN MÉXICO]**

ABSTRACT. Electricity prices have seen a consistent upward trend since the implementation of Mexico's electricity market reform (emr). This has been interpreted by some as a failure of the emr. In this paper we study the determinants of such price increases. We calculate the generation cost curve of the Federal Electricity Commission prior to the entry into force of the reform. We then construct daily data on average prices during the emr. We also finally study the relationship between prices and transmission congestion rents. Our main results indicate that the most profitable types of generation technology are the ones resulting from the emr. Likewise, price increases have taken place despite the existence of a considerably larger number of competitors in the generation sector. Lastly, the strong correlation between prices and congestion revenues is evidence that the increase in prices under the emr is mainly due to the growing congestion in the national electricity transmission network rather than due to an inefficient competitive market design in the generation sector. © 2019 Universidad Nacional Autónoma de México, Facultad de Economía. Este es un artículo Open Access bajo la licencia CC BY-NC-ND (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Enríquez A., Ramírez J. C., Rosellón J. (2019), "Generation costs, investment and prices in Mexico's electricity sector [Costos de generación, inversión y precios del sector eléctrico en México]", *Investigación Económica* 78(309): 58-79, doi: [10.22201/fe.01851667p.2019.309.70119](https://doi.org/10.22201/fe.01851667p.2019.309.70119). Article.



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¹ Colaboración en un artículo publicado en la Escuela de Pedagogía (p. 48).

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PRESUPPOSITIONS, REQUIREMENTS AND EFFECTS OF RECIPROCAL DONATION ON KAROL WOJTYŁA'S LOVE AND RESPONSIBILITY [PRESUPUESTOS, EXIGENCIAS Y EFECTOS DE LA DONACIÓN RECÍPROCA EN AMOR Y RESPONSABILIDAD DE KAROL WOJTYŁA]

ABSTRACT. This paper is an attempt to show that Karol Wojtyła's Love and Responsibility portrayed the necessary set of elements to demonstrate the effects of mutual donation-in love-between a man and a woman. In the first part, I will state Wojtyła's presuppositions: the distinction between object and subject, the sense of pleasure and the meaning of sexual tendency, as well as the personalistic norm. The second part deals with the demands of the mutual donation, as explained by Wojtyła. Finally, in the third part, I will reflect on the unfolding of the Wojtylian reflections on mutual donation, taking them to their last consequences. © 2019 Centro de Investigación Social Avanzada. All rights reserved.

Villalobos L. M. A. (2019), "Presuppositions, requirements and effects of reciprocal donation on Karol Wojtyła's love and responsibility [Presupuestos, exigencias y efectos de la donación recíproca en Amor y responsabilidad de Karol Wojtyła]", *Open Insight* 10(18): 101-124, doi: [10.23924/oi.v10n18a2019.pp%25p.287](https://doi.org/10.23924/oi.v10n18a2019.pp%25p.287). Article.

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LA PROPUESTA DE NEWMAN PARA UNA FORMACIÓN HUMANISTA

ABSTRACT. John Henry Newman promovió la Universidad Católica de Irlanda (1852-1858) y fue su primer Rector (1854-1858). Su interés fue responder a la pregunta ¿cómo formar la inteligencia de jóvenes laicos con el fin de fortalecer su estructura mental y proporcionarles una visión amplia de la realidad? Su respuesta fue: el saber ha de ser el fin de la universidad, con la promoción del conocimiento de las humanidades, por el gusto de aprender, además de la preparación profesional correspondiente a la disciplina a ejercer. De esta manera Newman logra aunar la educación tradicional con aquella que busca su impacto práctico. El objeto del artículo es mostrar la trascendencia, por medio de la vida y obra de John Henry Newman, que conlleva una adecuada formación intelectual humanista y el impacto que alcanza una persona culta, en su contexto y en las

siguientes generaciones. © 2018, The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group.

Athié R. (2018), "La propuesta de Newman para una formación humanista", *Church, Communication and Culture* 3(1): 22-35, doi: [10.1080/23753234.2018.1426994](https://doi.org/10.1080/23753234.2018.1426994). Article.

José Enrique Ávila Palet

Investigador Titular B, SNI Nivel Candidato

THE DEVELOPMENT OF CRITICAL THINKING ABILITIES IN UNIVERSITY STUDENTS BY MEANS OF PROBLEM-BASED LEARNING [EL DESARROLLO DEL PENSAMIENTO CRÍTICO EN ESTUDIANTES UNIVERSITARIOS POR MEDIO DEL APRENDIZAJE BASADO EN PROBLEMAS]

ABSTRACT. Competency-based education seeks to develop cognitive skills that allow the students to generate critical thinking, that can be understood as the student's ability to solve problems within and outside the classroom. The purpose of this study was to find out to what extend the problem-based learning system could be useful for developing the generic competences of critical thinking. The authors used a mixed method with embedded and trans-sectional design applied in a group of 27 students enrolled in the first four-month period of the subject Introduction to Nutrition and Dietetics (Introducción a la Nutrición y Dietética), part of the study program of the degree in Nutrition at a private university of Iguala, Guerrero. The study is based on individual generic competences questionnaire, section of adapted critical thinking (Olivares et al., 2013: 9) and the observation framework for the critical thinking abilities (Facione, 1990: 15). The results show that the mentioned technique has a positive effect for the abilities related to judgment in a specific situation, with objective and subjective data.

Núñez-López S., Ávila-Palet J. E., Olivares-Olivares S. L. (2017). "The development of critical thinking abilities in university students by means of problem-based learning [El desarrollo del pensamiento crítico en estudiantes universitarios por medio del Aprendizaje Basado en Problemas]", *Revista Iberoamericana de Educación Superior* 12(2): 46-65, doi: [10.22201/issue.20072872e.2017.23.3012](https://doi.org/10.22201/issue.20072872e.2017.23.3012). Article.

Claudio César Calabrese Ruíz

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ARGUMENTS FOR THE UNDERSTANDING OF GOD IN CLEMENT OF ALEXANDRIA: ORPHIC INFLUENCES IN STROMATA V [LOS ARGUMENTOS PARA LA COMPRENSIÓN DE DIOS EN CLEMENTE DE ALEJANDRÍA: INFLUJOS ÓRFICOS EN STROMATA V]

ABSTRACT. In this article, we examine the incorporation of Orphic texts applied to the understanding of God according to Clement of Alexandria in Stromata V, within the process of receiving Hellenistic culture into the interpretation of the revealed data. Our explanation takes as its starting points the cultural context of Hellenism and its understanding of the cosmos and the divine as well as the form of allegorical interpretation of myth in Orphic verses. With philological method, we observe Clement's mode of appropriation by differentiating the original quote in its context, the present context, and the hermeneutic intention. © 2019 Servicio de Publicaciones de la Universidad de Navarra. All rights reserved.

Calabrese C. C. (2019), "Arguments for the understanding of god in clement of alexandria: Orphic influences in stromata v [Los argumentos para la comprensión de Dios en Clemente de Alejandría: Influjos órficos en Stromata V]", *Scripta Theologica* 51(1): 41-66, doi: [10.15581/006.51.1.41-66](https://doi.org/10.15581/006.51.1.41-66). Article.

Claudio César Calabrese Ruíz

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Ethel Beatriz Junco de Calabrese

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EVITA: THE ARGENTINIAN ERINYE THE CONSTRUCTION OF PERONISM IN A FEMININE LETTER [EVITA: LA ERINIA ARGENTINA LA CONSTRUCCIÓN DEL PERONISMO CON LETRA FEMENINA]

ABSTRACT. We propose a reading of La razón de mi vida, based on the description of the narrator's character, the justification before her detractors and the consolidation of her qualities, propitious for the diffusion of her political cause. Primitive feminine traits are enhanced in the configuration of Evita as a character, which are sustained in the mythical figure of the Erinyes. In the list of characteristics, we intend to show the effectiveness of the mythical paradigm in the doctrinal logic, which configures a matrix capable of exacerbating the oppressed powers of the community statute, and inaugurating a model of social justice. © 2019 Universidad Complutense de Madrid. All rights reserved.

Calabrese, C. C., Junco, E. (2019), "Evita: The Argentinian erinye the construction of peronism in a feminine letter [Evita: La Erinia Argentina La construcción del peronismo con letra femenina]", *Amaltea* 11: 27-39, doi: [10.5209/amal.62788](https://doi.org/10.5209/amal.62788). Article.

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REPRESENTATION OF THE CHRISTIAN TITAN: THE SHIRTLESS PERONIST [REPRESENTACIÓN DEL TITÁN CRISTIANO: EL DESCAMISADO PERONISTA]

ABSTRACT. We propose the exploration of the term descamisado as a nuclear metaphor of Argentine politics of the 20th century, through a hermeneutic approach to Eva Perón's work. We establish a connection with the background of the term, to verify the originality of the new creation according to the author's profile; we observe the conditions of verisimilitude and the attributions of symbolization as distinctive features; we determine, finally, the mythical and religious correlations, useful to the pre-rational framework, that give solidity and permanence to the metaphor; we value the transformation of reality, indispensable to ideological discourse, operated by language. © 2019, Universitat Jaume I. All rights reserved.

Calabrese, C. C., Junco, E. (2019), "Representation of the christian titan: The shirtless peronist [Representación del titán cristiano: El descamisado peronista]", *Cultura, Lenguaje y Representación* 22: 7-20, doi: [10.6035/CLR.2019.22.1](https://doi.org/10.6035/CLR.2019.22.1). Article

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TIME CONSCIOUSNESS IN ST. AGUSTIN AND HUSSERL. THE ORIGINAL MODES OF SUBJECTIVITY [CONCIENCIA DEL TIEMPO EN SAN AGUSTÍN Y EN HUSSERL. LOS MODOS ORIGINARIOS DE LA SUBJETIVIDAD]

ABSTRACT. This article presents Saint Agustín as a starting point for Husserl's reflection on time and the correlation between memory and Erinnerung. Husserl's phenomenological research on the internal consciousness of time starts from the reflection of St. Augustine on the same problem. In this works, time can be measured because there is distentio animi. In Husserl, Die Erinnerung places us in the face of an infinite "before" connection,

because all perceptions are to be found on a relationship of multiplicity of perceptions. Both thinkers are united by the vocation to account for their own immanence. © 2019, Universidad de los Lagos. All rights reserved.

Calabrese, C. C. (2019), "Time consciousness in St. Agustín and Husserl. The original modes of subjectivity", *Alpha-Revista de Artes Letras y Filosofía* 48: 109-122, doi: [10.32735/S07118-2201201900048620](https://doi.org/10.32735/S07118-2201201900048620). Article.

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THE IMAGE OF HUMANITIES IN DOKTOR FAUSTUS BY THOMAS MANN [LA IMAGEN DE LAS HUMANIDADES EN DOKTOR FAUSTUS DE THOMAS MANN]

ABSTRACT. We start from the consideration of the knowledge of the humanities, and of the consequent humanistic formation, to observe its interference and justification in the cultural results, according to the narrative of Thomas Mann. With the framework of the historical situation of the author and within the confrontation between the bourgeois and the artist, we analyze the author's diagnosis of the capitalist epoch and its exhaustion; we stop at the idea of evolution-transition operated by art, in particular by music, as a language to renew tradition. The description of the fictional forms is made through the apparent contrast of Doktor Faustus between the witness narrator, Serenus Zeitblom, and the protagonist, Adrián Leverkühn, who reveals the unity of vision. The conclusions refer to the dubious energy of the knowledge of the humanities, and to the complicity of their mutations, under the paradigm of instrumental rationality, to favor the crisis of the Western individual. © 2018 Universidad Pontificia de Salamanca, Servicio de Publicaciones. All Rights Reserved.

Calabrese C. C., Junco E. (2018), "The image of humanities in Doktor Faustus by Thomas Mann [La imagen de las humanidades en Doktor Faustus de Thomas Mann]", *Cuadernos Salmantinos de Filosofía* 45: 85-108. Article.

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SNI Nivel I

ERNST CASSIRER: A BIOLOGICAL FOUNDATION FOR THE DEFINITION OF HUMAN BEING AS "SYMBOLIC ANIMAL" [ERNST CASSIRER: UNA FUNDAMENTACIÓN BIOLÓGICA DE LA DEFINICIÓN DEL SER HUMANO COMO "ANIMAL SIMBÓLICO"]

ABSTRACT. This paper analyses the biological foundation of a new definition of human nature, as proposed by Ernst Cassirer. Based on the state of the art, Cassirer's Philosophy relies, for the most part, on the biological research in order to develop a definition of the human being's symbolic nature. It will be shown that Cassirer's analysis considers three key elements: 1) Uexküll theoretical biology; 2) aphasia and apraxia studies; 3) and a detailed philosophical consideration of both former and latter elements. The ensemble of all three elements offers a new perspective on the biological fundamentals in which the Neokantian philosopher supports his definition of human being as a symbolic animal. © 2019 Centro de Investigación Social Avanzada. All rights reserved.

Urzúa G. A. E. (2019), "Ernst Cassirer: A biological foundation for the definition of human being as 'symbolic animal' [Ernst Cassirer: una fundamentación biológica de la definición del ser humano como 'animal simbólico']", *Open Insight* 10(18): 125-144, doi: [10.23924/oi.v10n18a2019.pp125-144.289](https://doi.org/10.23924/oi.v10n18a2019.pp125-144.289). Article.

Gustavo Adolfo Esparza Urzúa

SNI Nivel I

THE HUMANITIES IN J. A. COMENIO AND E. CASSIRER. IMAGE AND SYMBOL ON THE UNITY OF THE GROUNDS AND THE FORMATIVE PROCESS OF HUMAN BEING [LAS HUMANIDADES EN J. A. COMENIO Y E. CASSIRER. IMAGEN Y SÍMBOLO EN LA UNIDAD DE LOS FUNDAMENTOS Y LOS PROCESOS FORMATIVOS DEL SER HUMANO]

ABSTRACT. In this paper it is set that the aim of Humanities is the universal formation of human being according to his own singularity. Nevertheless, the stress between the objective (universal) and the reality (singular) arise the question of how is possible to achieve the general goals. Base on the concept of "image" and "symbol" in Comenius' pedagogy and Cassirer's philosophy, I will argue –following the pedagogue– that the relation between singular and universal is possible through a didactical methodology, which assumes the «image» as a «symbol» to promote all the uni-

versal principles in everyone. Since the neokantian, I will set that the concept of «image» is the way to coordinate the subject conception with the universal principles, through specific «symbolic forms». Along the exposition, I notice that with both theories is possible to rethink the general function of humanities. © 2018 Universidad Pontificia de Salamanca, Servicio de Publicaciones. All Rights Reserved.

Esparza G. (2018), "The humanities in J. A. Comenio and E. Cassirer. Image and symbol on the unity of the grounds and the formative process of human being [Las humanidades en J. A. Comenio Y E. Cassirer. Imagen y símbolo en la unidad de los fundamentos y los procesos formativos del ser humano]", *Cuadernos Salmantinos de Filosofía* 45: 59-83. Article.

Vicente de Haro Romo

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KANT'S CLARIFICATION OF THE AMPHIBOLY OF MORAL CONCEPTS [LA ACLARACIÓN KANTIANA DE LA ANFIBOLOGÍA DE LOS CONCEPTOS MORALES]

ABSTRACT. In this paper I discuss an «episodic section» in Kant's Doctrine of Virtue, which is the second part of the *Metaphysics of Morals*: «the Amphibology of the moral Concepts of Reflection». It is the section where Kant explains how duties with regard to Nature and God are in fact duties to oneself. This paper engages with this Kantian argumentative strategy and explains it as enabling and fruitful. © 2019 Centro de Investigación Social Avanzada. All rights reserved.

de Haro Romo V. (2019), "Kant's clarification of the amphiboly of moral concepts [La aclaración kantiana de la anfibología de los conceptos morales*]", *Open Insight* 10(19): 41-59, doi: [10.23924/oiv.10n19a2019.pp%25p.352](https://doi.org/10.23924/oiv.10n19a2019.pp%25p.352). Article.

Ethel Beatriz Junco de Calabrese

Investigador Titular D, SNI Nivel I

BROTHER'S MANDATE: ANTIGONE FOR POSTMODERNITY [EL MANDATO DEL HERMANO: ANTÍGONA PARA LA POSMODERNIDAD]

ABSTRACT. Of the many possible readings of Sophocles' *Antigone*, we highlight the nature of the tragic conflict, which has its roots in previous values to the established social order, and which can be considered useful material for re-founding the political status in postmodernity. From the text commentary, we note that Antigone does not

attack the social order, but she hopes to consolidate it on an imperturbable basis that embodies the critique of instrumental rationality, inaugurated by sophistry and revived successively in modernity. This affirms existentially the ethics of fraternal love as a humanization of the order of the universe. We propose to extend the notion of consanguineous brother and extend it to the idea of brother as "the other" in the framework of postmodern societies, spaces of multicultural intention, to have a principle of ethical rescue. In this re-reading, the archaic notions of religiosity, funeral honor, and family piety are updated. © 2019, Universidad de los Lagos. All rights reserved.

Junco E. (2019), "Brother's mandate: Antigone for postmodernity [El mandato del hermano: Antígona para la posmodernidad]", *Alpha* 2019(48): 55-65, doi: [10.32735/S0718-2201201900048616](https://doi.org/10.32735/S0718-2201201900048616). Article.

Ethel Beatriz Junco de Calabrese

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KNOWLEDGE AND COMMUNION: LA ERÓTICA BY LEOPOLDO MARECHAL [CONOCIMIENTO Y COMUNIÓN: LA ERÓTICA DE LEOPOLDO MARECHAL]

ABSTRACT. El legado del argentino Leopoldo Marechal (1900–1970) no se entiende fuera de la tradición intelectual que se forjó como autodidacta y que supo articular con creciente coherencia en una cosmovisión completa. Conoció las ideas troncales de la filosofía griega y de la teología cristiana y las conjugó literariamente en todos los géneros que cultivó, desde su juventud hasta el fin de sus días; ya sea en la lírica y en su configuración de imágenes para infinitos de la memoria o del deseo, como en la narrativa con la visión melancólica y satírica de la historia y de sus héroes, supo elevar a dimensión mítica lo aparentemente profano. Por lecturas directas o textos críticos, la recepción de autores está encabezada por Platón y por Dante. Con las ideas platónicas, incorpora también el aristotelismo y el neoplatonismo plotiniano; con la obra de Dante asume el cristianismo antiguo y la tradición medieval, Pseudo-Dionisio, Agustín, Buenaventura, Isidoro de Sevilla, Tomás de Aquino. Las influencias se integran como una red orgánica (Barcia ix).

Junco E., Cattedra, O. (2015), "Knowledge and communion: La Erótica by Leopoldo Marechal [Conocimiento y comunión: La Erótica de Leopoldo Marechal]", *Confluencia: Revista Hispánica de Cultura y Literatura* 34(1): 61-72, doi: [10.1353/cnf.2018.0038](https://doi.org/10.1353/cnf.2018.0038). Article.

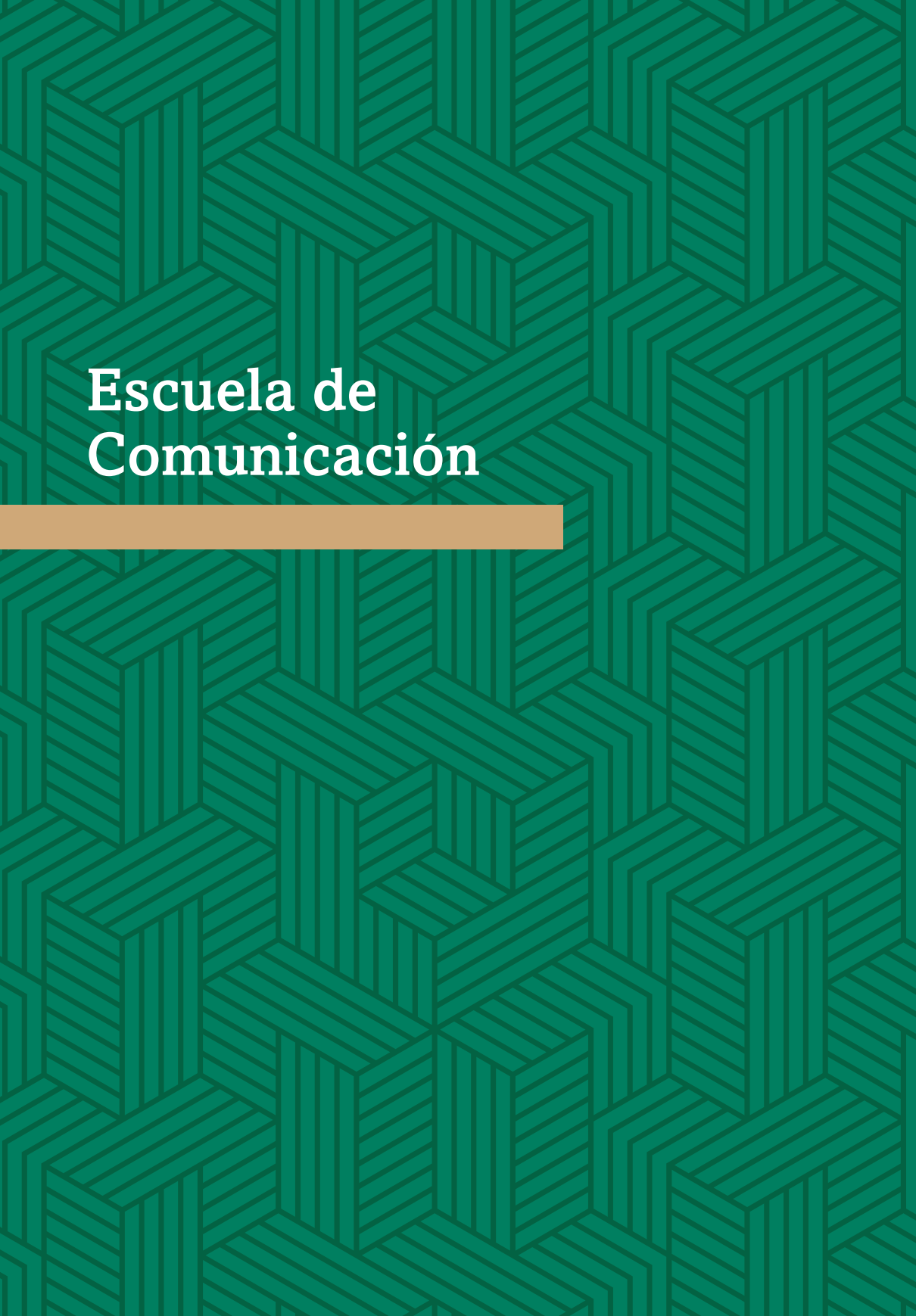
José María Llovet Abascal

SNI Nivel Candidato

**THE PSYCHOLOGICAL ORIGIN OF
EMPIRICAL CONCEPTS IN THE CRITIQUE OF
PURE REASON [EL ORIGEN PSICOLÓGICO
DE LOS CONCEPTOS EMPÍRICOS EN LA
CRÍTICA DE LA RAZÓN PURA]**

ABSTRACT. How do empirical concepts are, according to Kant, originated in the understanding? In this paper I want to show that the construction of empirical concepts is a task that corresponds to the schematism of the faculty of judgement, and that this construction should not to be identified, as it is usually done, with the process of comparison, reflection and abstraction explained by this author in the *Logic Jäsche*. It is rather by means of a psychological process that certain representational content of sensible nature is «intellectualized» -through what I call empirical schematism- to originate the empirical concept. According to my reading, schematism, as a capacity, not only makes possible the application of a category to an intuition, but it is responsible also of the construction and of a further application of empirical concepts to intuitions. © 2019 Centro de Investigación Social Avanzada. All rights reserved.

Llovet Abascal, J. M. (2019), "The psychological origin of empirical concepts in the critique of pure reason [El origen psicológico de los conceptos empíricos en la Crítica de la razón pura]", *Open Insight* 10(19): 81-98, doi: [10.23924/oj.v10n19a2019.pp%25p.323](https://doi.org/10.23924/oj.v10n19a2019.pp%25p.323). Article.



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FRAMING OF THE NORTH AMERICAN FREE TRADE AGREEMENT (NAFTA) IN THE OPINION PUBLISHED BY THE MEXICAN PRESS: THE FIRST FOUR MONTHS OF TRUMP [FRAMING DEL TRATADO DE LIBRE COMERCIO DE AMÉRICA DEL NORTE (TLCAN) EN LA OPINIÓN PUBLICADA POR LA PRENSA MEXICANA: LOS PRIMEROS CUATRO MESES DE TRUMP]

ABSTRACT. One of the promises of Donald Trump's election campaign was the renegotiation of the North American Free Trade Agreement (NAFTA), signed in 1994 by the United States, Canada and Mexico. Since Trump has been in office, has the Mexican press reflected the concerns and prospects that renegotiating NAFTA would have for the country? This could be verified with an analysis of the pieces of opinion, in which different authors can offer their interpretation without the constraints of objectivity and impartiality. This article, using framing and rhetorical criticism as a methodological basis, offers an analysis of the opinion pieces about NAFTA that were published in two Mexican newspapers (El Universal and Reforma) during the first four months of Donald Trump's government. © 2018 Universidad Complutense de Madrid. All Rights Reserved.

Azpiroz Manero M. L. (2018), "Framing of the North American Free Trade Agreement (NAFTA) in the opinion published by the Mexican Press: The first four months of trump [Framing del Tratado de Libre Comercio de América del Norte (TLCAN) en la opinión publicada por la prensa mexicana: Los primeros cuatro meses de Trump]", *Estudios Sobre el Mensaje Periodístico* 24(2): 1077-1103, doi: [10.5209/ESMP.62203](https://doi.org/10.5209/ESMP.62203). Article.

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THE MEDIA IN PARAGUAY: A LOCKED NATION IN TIMES OF CHANGE

ABSTRACT. With the rise of Spanish language media around the world, The Handbook of Spanish Language Media provides an overview of the field and its emerging issues. This Handbook will serve as the definitive source for scholars interested in this emerging field of study; not only to provide background knowledge of the various issues and topics relevant to Spanish language media, but also to establish directions for future research in this rapidly growing area. This volume draws on the expertise of authors and collabo-

rators across the globe. The book is an essential reference work for graduate students, scholars, and media practitioners interested in Spanish language media, and is certain to influence the course of future research in this growing and increasingly influential area.

Béjar, L. G. (2009), "The media in Paraguay: A locked nation in times of change". In Alan B. Albarran (ed.), *The Handbook of Spanish Language Media* (Abingdon: Routledge), 183-188. Book Chapter.

María Elena Gutiérrez Rentería

Profesor Investigador

MEDIA MANAGEMENT AND ECONOMICS RESEARCH IN LATIN AMERICA CHALLENGES AND OPPORTUNITIES FOR SCHOLARS IN THE FIELD

ABSTRACT. Winner of the 2019 Robert Picard Book Award. The Handbook of Media Management and Economics has become a required reference for students, professors, policy makers and industry practitioners. The volume was developed around two primary objectives: assessing the state of knowledge for the key topics in the media management and economics fields; and establishing the research agenda in these areas, ultimately pushing the field in new directions. The Handbook's chapters are organized into parts addressing the theoretical components, key issues, analytical tools, and future directions for research. With its unparalleled breadth of content from expert authors, the Handbook provides background knowledge of the various theoretical dimensions and historical paradigms, and establishes the direction for the next phases of research in this evolving arena of study. Updates include the rise of mobile and social media, globalization, audience fragmentation and big data.

María Elena Gutiérrez Rentería (2018), "Media Management and Economics Research in Latin America Challenges and Opportunities for Scholars in the Field". In Alan B. Albarran, Bożena Mierzejwska and Jaemin Jung (eds.), *Handbook of Media Management and Economics*, 2nd Edition (Abingdon: Routledge), 80-91. Book Chapter.

María Elena Gutiérrez Rentería

Profesor Investigador

THE MEDIA INDUSTRY IN MEXICO

ABSTRACT. With the rise of Spanish language media around the world, The Handbook of Spanish Language Media provides an overview of the field and its emerging issues. This Handbook

will serve as the definitive source for scholars interested in this emerging field of study; not only to provide background knowledge of the various issues and topics relevant to Spanish language media, but also to establish directions for future research in this rapidly growing area. This volume draws on the expertise of authors and collaborators across the globe. The book is an essential reference work for graduate students, scholars, and media practitioners interested in Spanish language media, and is certain to influence the course of future research in this growing and increasingly influential area.

Renneria, M. E. G. (2009), "The media industry in Mexico". In Alan B. Albarran (ed.), *The Handbook of Spanish Language Media* (Abingdon: Routledge), 34-46. Book Chapter.

José Luis Ortiz Garza

Profesor Investigador

María Fernanda Vidal Correa

SNI Nivel I

PUBLIC OPINION SURVEYS AND USA FOREIGN POLICY TOWARDS LATIN AMERICA IN THE SECOND WORLD WAR

ABSTRACT. In this paper, the roles of public opinion polls and agency in foreign policymaking are examined. Based on documents uncovered from the National Archives and Rockefeller Archive Center, this paper presents a more comprehensive picture of the history of public opinion surveys and the shaping of US bureaucracy in their relation to foreign affairs. Further, the paper contends that policymakers are interested in public views pertaining to foreign policy issues, but that private interests (serving their own interpretations of national interest) shape public views, using new techniques as guiding tools. © 2019 The Authors. *Bulletin of Latin American Research* © 2019 Society for Latin American Studies. Published by John Wiley & Sons Ltd, 9600 Garsington Road, Oxford OX4 2DQ, UK and 350 Main Street, Malden, MA 02148, USA.

Garza J. L. O., Vidal-Correa F. (2019), "Public Opinion Surveys and USA Foreign Policy Towards Latin America in the Second World War", *Bulletin of Latin American Research* 38(4): 503-516, doi: [10.1111/blar.12988](https://doi.org/10.1111/blar.12988). Article in Press.

Josefina del Carmen Santana Villegas

SNI Nivel I

USING PROBLEM-BASED LEARNING TO TEACH RESEARCH METHODS AT THE UNDERGRADUATE LEVEL

ABSTRACT. Problem-based learning (PBL) has been used to teach university courses in a variety of fields. This article reports on its use to teach basic research skills to undergraduate students in two different fields of study (Accounting and Communication) at a Mexican university. Because PBL works with ill-structured problems and fosters critical-thinking and problem-solving skills and because it leads to long-term retention, it is suitable as a learning approach at a basic research methods course, where it appears to be underused. Participants (N = 102) were asked to work in teams to carry out a research project and prepare an abstract which they sent to an international conference. Teams were video and audio recorded as they worked on their project, and the data were analyzed following the precepts of interaction analysis. Other data sources were participant interviews, student-created documents, and student evaluations of the course. Participants show evidence of co-construction of knowledge and of increased critical thinking. © Common Ground, Eduardo Peñalosa-Castro, Josefina C. Santana.

Peñalosa-Castro E., Santana J. C. (2018), "Using problem-based learning to teach research methods at the undergraduate level", *International Journal of Learning in Higher Education* 26(1): 1-10, doi: [10.18848/2327-7955/CGP/V26I01/1-10](https://doi.org/10.18848/2327-7955/CGP/V26I01/1-10). Article.

María Fernanda Vidal Correa

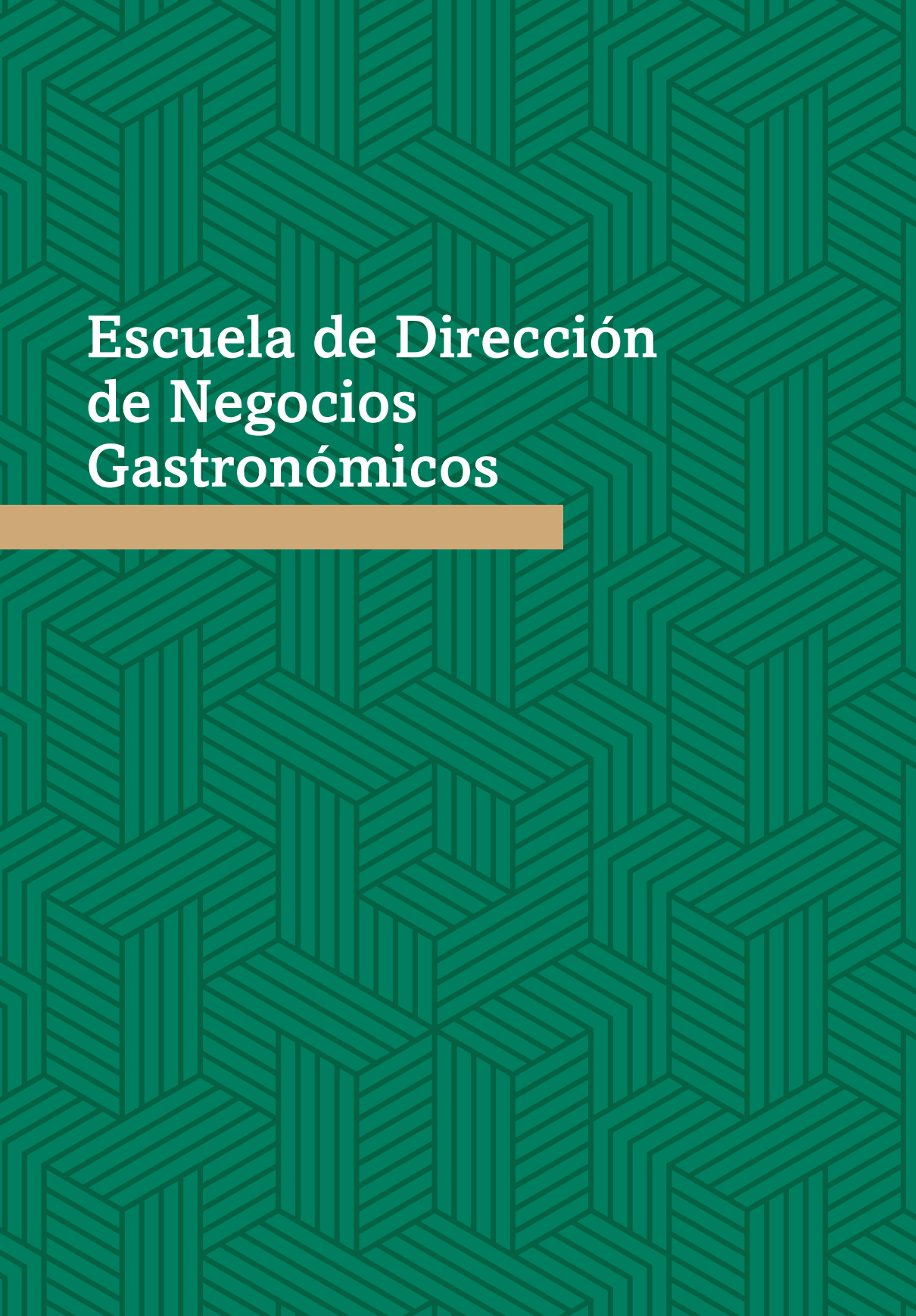
SNI Nivel I

THE STRENGTH OF INDEPENDENT CANDIDATES AND THEIR OPPORTUNITIES TO CONTEND VIS-À-VIS POLITICAL PARTIES IN MEXICO [LA FORTALEZA DE LAS CANDIDATURAS INDEPENDIENTES Y SUS OPORTUNIDADES DE COMPETENCIA FRENTE A LOS PARTIDOS POLITICOS EN MEXICO]

ABSTRACT. This research aims to offer theoretical and empirical elements that contribute to the debate about independent candidates. The central argument is that although these types of nominations may be necessary for democratization in Mexico, the design of the electoral system continues to favour political parties. Based on the analysis of the 2014-2015 electoral process, this essay sustains that regulations do not compensate for institutional disadvantages independent can-

didates experience with respect to political parties. This essay examines regulations controlling access to the ballot and public funds. The study employs aggregated data, including nominations and final figures on federal and local councils, governorships and municipal presidencies. A descriptive method was followed with data collection from official sources and electoral archives. © 2019 Universidad Nacional Autonoma de Mexico. All rights reserved.

Vidal-Correa F (2019), "The strength of independent candidates and their opportunities to contend vis-à-vis political parties in Mexico [La fortaleza de las candidaturas independientes y sus oportunidades de competencia frente a los partidos políticos en Mexico]", *Revista Mexicana de Ciencias Políticas y Sociales* 64(235): 427-462, doi [10.22201/fcpys.2448492xe.2019.235.61729](https://doi.org/10.22201/fcpys.2448492xe.2019.235.61729). Article.



Escuela de Dirección de Negocios Gastronómicos





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¹ Colaboración en tres artículos publicados en la Facultad de Ingeniería (pp. 105, 114 y 143).

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[Colaboración: Facultad de Ingeniería]

José Sebastián Gutiérrez Calderón

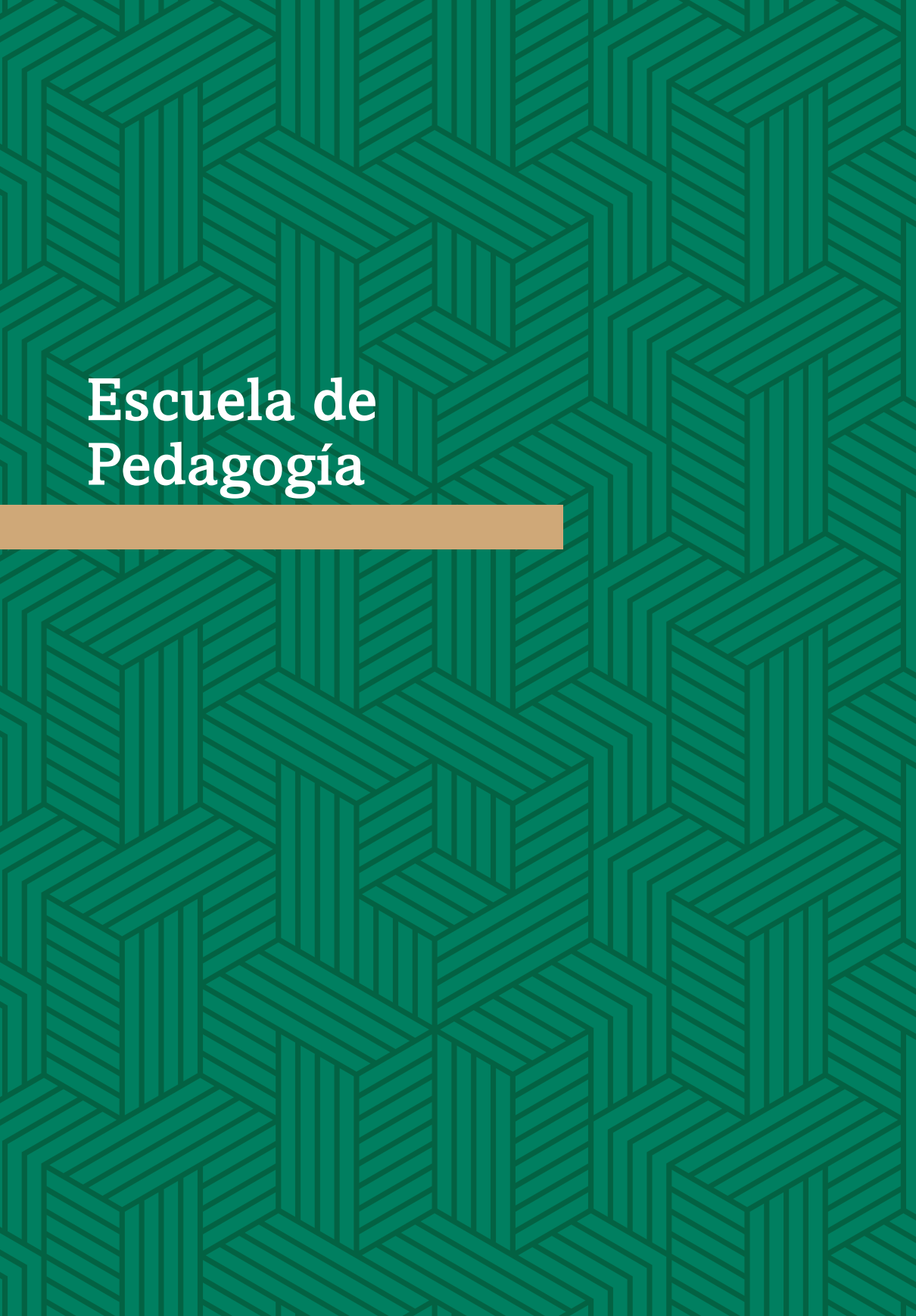
Investigador Titular D, SNI Nivel I

[Colaboración: Facultad de Ingeniería]

LIKING PRODUCT LANDSCAPE: GOING DEEPER INTO UNDERSTANDING CONSUMERS' HEDONIC EVALUATIONS

ABSTRACT. The use of graphical mapping for understanding the comparison of products based on consumers' perceptions is beneficial and easy to interpret. Internal preference mapping (IPM) and landscape segmentation analysis (LSA) have successfully been used for this propose. However, including all the consumers' evaluations in one map, with products' overall liking and attributes' perceptions, is complicated; because data is in a high dimensional space some information can be lost. To provide as much information as possible, we propose the liking product landscape (LPL) methodology where several maps are used for representing the consumers' distribution and evaluations. LPL shows the consumers' distribution, like LSA, and also it superimposes the consumers' evaluations. However, instead of superimposing the average overall liking in one map, this methodology uses different maps for each consumer's evaluation. Two experiments were performed where LPL was used for understanding the consumers' perceptions and compared with classic methodologies, IPM and cluster analysis, in order to validate the results. LPL can be successfully used for identifying consumers' segments, consumers' preferences, recognizing perception of product attributes by consumers' segments and identifying the attributes that need to be optimized. © 2019 by the authors.

Sánchez, C. N., Domínguez-Soberanes, J., Escalona-Buendía, H. B., Graff, M., Gutiérrez, S., Sánchez, G. (2019), "Liking product landscape: Going deeper into understanding consumers' hedonic evaluations", *Foods* 8(10), 461, doi: [10.3390/foods8100461](https://doi.org/10.3390/foods8100461). Article.



Escuela de Pedagogía





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¹ Colaboración en un artículo publicado en la Facultad de Ciencias Económicas y Empresariales (p. 78).

² *Idem.*

Mónica del Carmen Meza Mejía

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[Colaboración: Departamento de Humanidades]

CHARACTER EDUCATION AMONG MEXICAN INDIGENOUS PEOPLES. CONTINUITY, RUPTURE AND VINDICATION [LA FORMACIÓN DEL CARÁCTER EN LOS INDÍGENAS MEXICANOS. CONTINUIDADES, RUPTURAS Y REIVINDICACIONES]

ABSTRACT. From the philosophical perspective of education, this article aims to stress the educational ideals of the Mexican indigenous tradition, showing how its emphasis on character education has persisted in speeches and special mnemonic technologies, and to show that the educational ideals of training for fulfillment are part of human nature itself. Thus, both the ancient idea of the “heart face” of the ancient Mexicans, preserved during the colonial period, and the current concept of the “good life” of the Tzeltal people of Chiapas, conceptualize the integrity of character education and may coincide with the Greek classic ideals which we know from the contributions of Plato and Aristotle in defense of prudential practical knowledge and the virtuous life. © 2019 Servicio de Publicaciones de la Universidad de Navarra. All rights reserved.

Del Carmen Meza Mejía, M., Pavón, S. A. (2019), “Character education among Mexican indigenous peoples. Continuity, rupture and vindication [La formación del carácter en los indígenas mexicanos. Continuidades, rupturas y reivindicaciones]”, *Estudios Sobre Educación* 37: 33-49, doi: [10.15581/004.37.33-49](https://doi.org/10.15581/004.37.33-49). Article.

Mónica del Carmen Meza Mejía

SNI Nivel I

THE INFLUENCE OF THE USE OF THE GAMIFICATION TO IMPROVE ACADEMIC PERFORMANCE IN HIGH SCHOOL STUDENTS

ABSTRACT. Society today is faced with a number of changes that have developed from the incorporation of new information and communication technologies, digital applications and social networks, which have been used each time more easily and frequently by people of all ages and social strata.

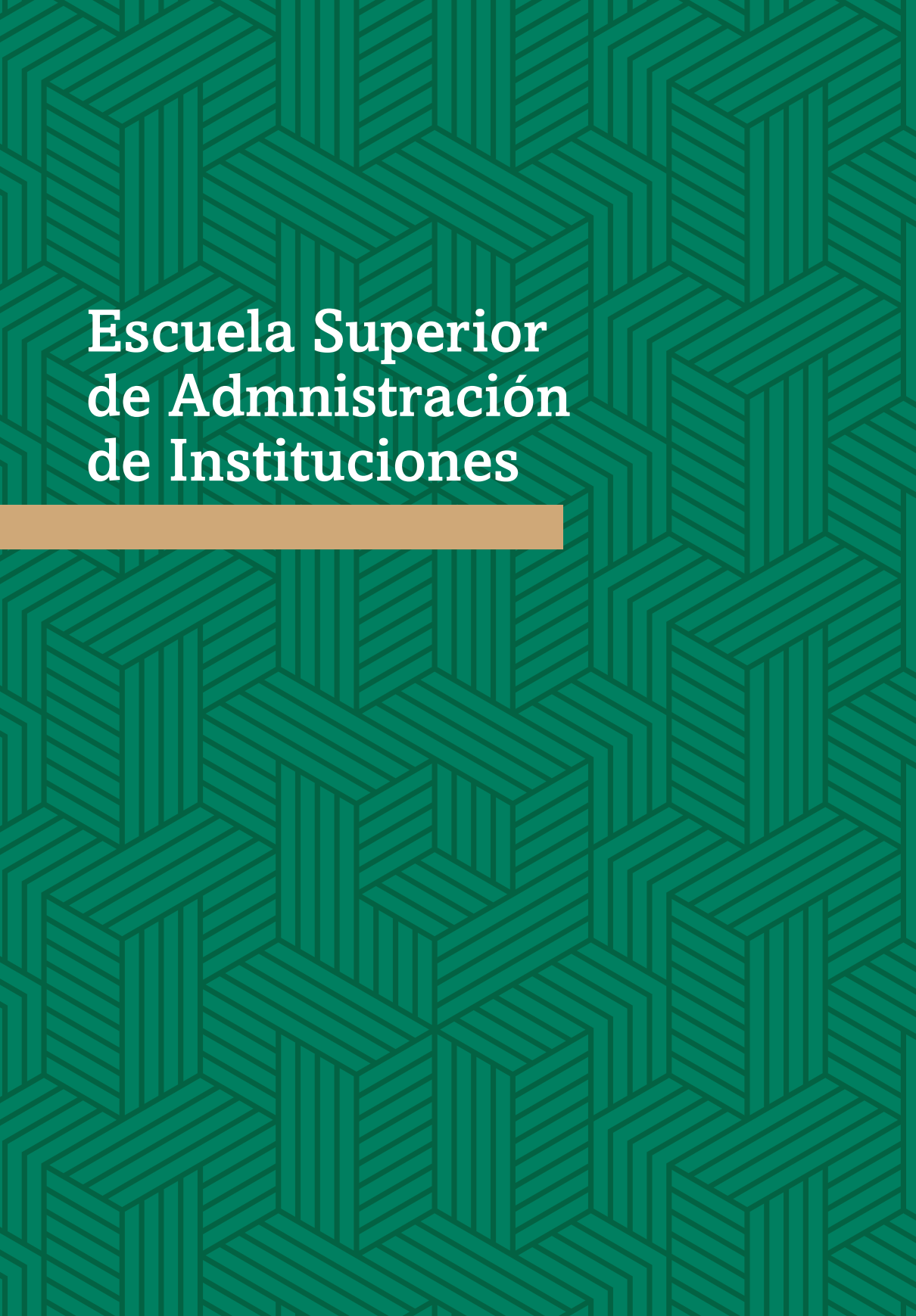
This has led to that within the formal education, mainly at the high school, consider the possibility of integrating technological tools in educational plans and programs in order to generate

greater innovation and respond to the needs of the new learners.

For the development of the present investigation is considered necessary the search of learning and teaching strategies based on the new educational trends, such as the Gamification, in order to promote behaviors and habits that lead students to the development of competences and improve academic outcomes. In addition, it is intended to know the influence of the use of the Gamification to improve the academic performance of high school students.

In order to develop the present study, we will make use of the Inventory of Learning Strategies and Study (Fernández Liporace, Alvarez & Uriel, 2010) which will help in obtaining the desired information. The question is: how does the use of the Gamification will contribute to the improvement of the academic performance? For which, it will be necessary to consider the partial evaluations and activities gamified that were implemented during the academic period from August to December 2017.

Aguilera, B. V., Martinez, E. A., Mejía, M. M. (2018), “The Influence of the Use of the Gamification to Improve Academic Performance in High School Students”, *12th International Technology, Education and Development Conference*: 7258-7266, doi: [10.21125/int-ed.2018.1705](https://doi.org/10.21125/int-ed.2018.1705). Conference Paper.



Escuela Superior de Administración de Instituciones





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¹ Colaboración en un artículo publicado en la Facultad de Ciencias Económicas y Empresariales (p. 74).

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[En el momento de indexación, el profesor pertenecía a la Escuela de Administración de Instituciones]

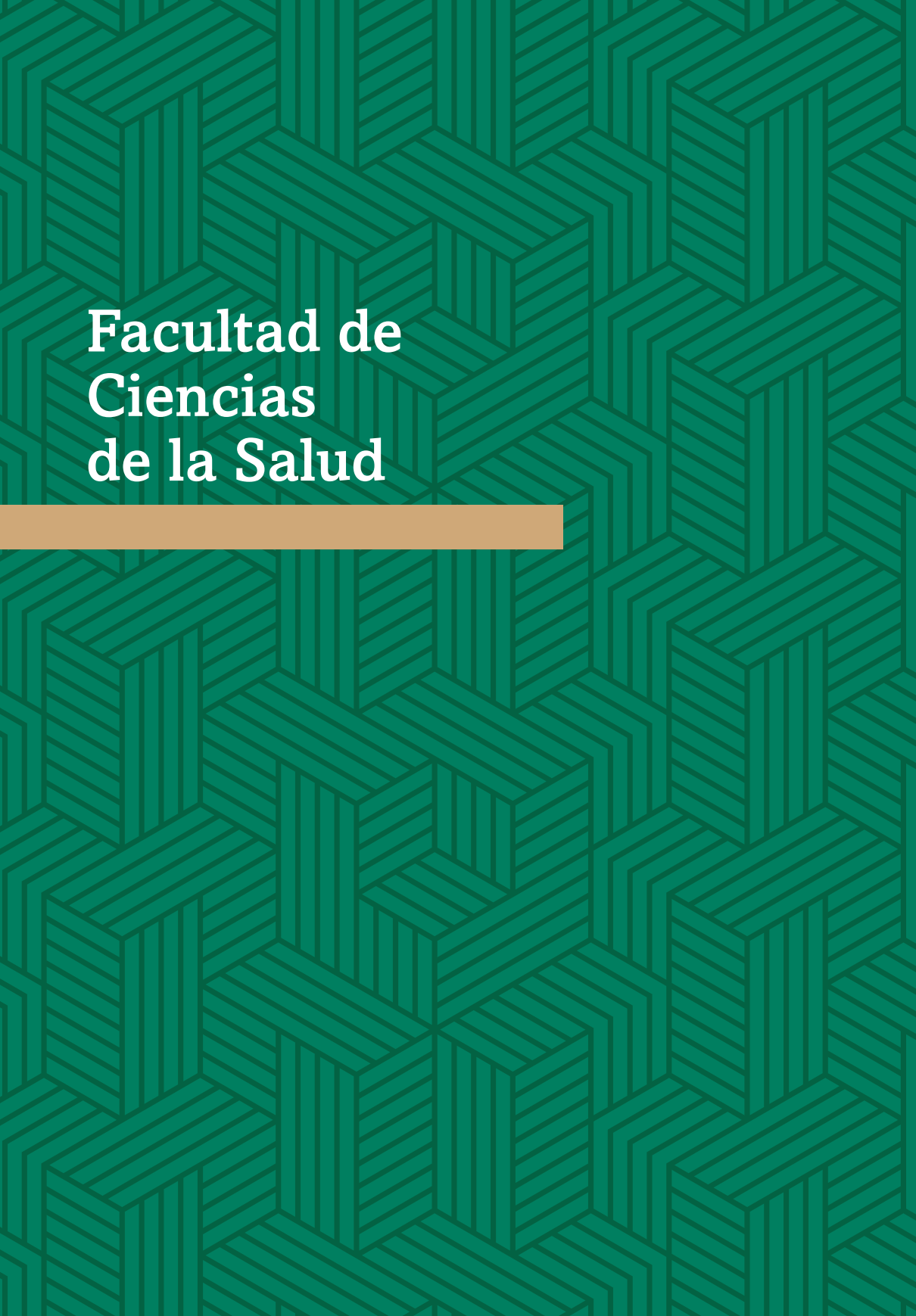
Friné Velázquez Contreras

Profesor Investigador

DEVELOPMENT AND CHARACTERIZATION OF A BIODEGRADABLE PLA FOOD PACKAGING HOLD MONOTERPENE-CYCLODEXTRIN COMPLEXES AGAINST ALTERNARIA ALTERNATA

ABSTRACT. The fungi of the genus *Alternaria* are among the main pathogens causing post-harvest diseases and significant economic losses. The consumption of *Alternaria* contaminated foods may be a major risk to human health, as many *Alternaria* species produce several toxic mycotoxins and secondary metabolites. To protect consumer health and extend the shelf life of food products, the development of new ways of packaging is of outmost importance. The aim of this work was to investigate the antifungal capacity of a biodegradable poly (lactic acid) (PLA) package filled with thymol or carvacrol complexed in β -cyclodextrins (β -CDs) by the solubility method. Once solid complexes were obtained by spray drying, varying proportions (0.0%, 1.5%, 2.5%, and 5.0 wt%) of β -CD-thymol or β -CD-carvacrol were mixed with PLA for packaging development by injection process. The formation of stable complexes between β -CDs and carvacrol or thymol molecules was assessed by Fourier-transform infrared spectroscopy (FTIR). Mechanical, structural, and thermal characterization of the developed packaging was also carried out. The polymer surface showed a decrease in the number of cuts and folds as the amount of encapsulation increased, thereby reducing the stiffness of the packaging. In addition, thermogravimetric analysis (TGA) revealed a slight decrease in the temperature of degradation of PLA package as the concentration of the complexes increased, with β -CD-carvacrol or β -CDs-thymol complexes acting as plasticisers that lowered the intermolecular forces of the polymer chains, thereby improving the breaking point. Packages containing 2.5% and 5% β -CD-carvacrol, or 5% β -CD-thymol showed *Alternaria alternata* inhibition after 10 days of incubation revealing their potential uses in agro-food industry. © 2019 by the authors.

Friné, V. C., Hector, A. P., Manuel, N. S., Estrella, N. D., Antonio, G. J. (2019), "Development and characterization of a biodegradable PLA food packaging hold monoterpene-cyclodextrin complexes against *Alternaria alternate*", *Polymers* 11(10), 1720, doi: [10.3390/polym11101720](https://doi.org/10.3390/polym11101720). Article.



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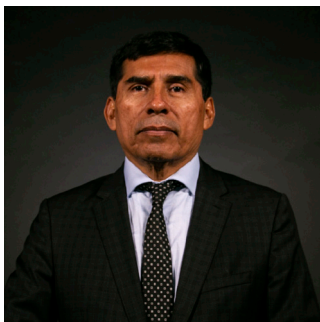


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¹ Colaboración en un artículo publicado en la Facultad de Filosofía (p. 90).

¹ *Idem.*



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THE EPISTEMOLOGICAL STATUS OF BIOETHICS [EL ESTATUTO EPISTEMOLÓGICO DE LA BIOÉTICA]

ABSTRACT. Bioethics, rather than a well-defined science, seems to more closely resemble a “field” of issues and problems that has been steadily expanding since the 70s. In the beginning, it essentially focused on medicine and biotechnology; but today includes other topics as well, such as animal care and environmental protection, health policies and bio-law. The recent and extremely significant progress in medical technology has produced several new moral problems that are not covered by traditional rules and general ethics. It is, however, possible, and even necessary, to take decisions regarding these new problems, and here resides the novelty and most valuable contribution of bioethics. The novelty also derives from the remarkable complexity of the more typical bio-ethical debates. For these reasons, bioethics could be presented as a paradigm of what ethics must constitute in the context of a technological civilization. It is a discipline that looks for a meeting point between technology and moral conscience. Given these fundamental characteristics, it is possible to sketch a special epistemological status for bioethics: this discipline adopts an interdisciplinary method based on a systemic approach as well as on the ability to cope with the phenomena of complexity. Thus, bioethics acquires a holistic point of view that allows for a connection between the simplest and most complex levels. Finally, we will show how bioethics takes advantage of the doctrinal and cultural differences brought about in our time by globalization. © 2019 CSIC.

Agazzi, E. (2019), “The epistemological status of bioethics [El estatuto epistemológico de la bioética]”, *Arbor* 195(792), a500, doi: [10.3989/arbor.2019.792n2001](https://doi.org/10.3989/arbor.2019.792n2001). Article.

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COMPARISON OF SYMPTOMS OF HYPERACTIVITY AND IN ATTENTION IN ADOLESCENTS WITH AND WITHOUT A HISTORY OF PREGNANCY [COMPARACIÓN DE SÍNTOMAS DE HIPERACTIVIDAD E INATENCIÓN EN ADOLESCENTES CON Y SIN ANTECEDENTES DE EMBARAZO]

ABSTRACT. Introduction: Teenage pregnancy has a negative impact both on mother's health and on her offspring quality life and development. In

spite of its important social relevance, behavioral factors that can favor its occurrence have not been extensively explored. Objective: To compare symptoms of inattention and hyperactivity between adolescents with and without a history of pregnancy. Method: A sociodemographic record and the attention deficit hyperactivity disorder questionnaire (ADD) of the Neuropsi instrument were applied to 60 adolescents: 30 cases and 30 controls. The ADD was answered by the adolescents themselves, as well as by a close relative (parent or spouse) or by one of their teachers. Results: From the perspective of others (parents and teachers), adolescents with a history of pregnancy showed more symptoms of attention deficit and higher attention deficit and hyperactivity overall score (both $p \geq 0.01$). In addition, ADD overall score was found to be associated with adolescent pregnancy (OR = 1.11, 95% CI = 1.01-1.24, $p = 0.036$). Conclusions: Symptoms of attention deficit and hyperactivity can represent another factor associated with teenage pregnancy. © 2018, Academia Nacional de Medicina. All rights reserved.

Aldrete-Cortez V., Tafoya S. A., Meillon F., Poblano A., Ayala-Yáñez R., Mansilla-Olivares A. (2018), “Comparison of symptoms of hyperactivity and inattention in adolescents with and without a history of pregnancy [Comparación de síntomas de hiperactividad e inatención en adolescentes con y sin antecedentes de embarazo]”. *Gaceta Médica de México* 154(6): 657-664, doi: [10.24875/GMM.18004248](https://doi.org/10.24875/GMM.18004248). Article.

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FETAL GROWTH RESTRICTION: FROM POLYVAGAL THEORY TO DEVELOPMENTAL IMPAIRMENTS?

ABSTRACT. Background: The Polyvagal theory argues that behavioral modulation is a fundamental neurodevelopmental process that depends on autonomic regulation. Objective: The present study aimed to assess sleep architecture in newborns with fetal growth restriction (FGR) using polysomnography as an indicator of Polyvagal theory. Methods: We studied polysomnography recordings from 68 preterm infants, 34 with FGR and 34 born with appropriate growth for gestational age (AGA), who were matched according to the corrected age for prematurity (CA). Total sleep time, arousals, the percentage of quiet sleep, active sleep, indeterminate sleep, and heart rate were compared between the groups. Linear multiple regression analyses were used to evaluate polysomnography data for the FGR and AGA groups. Results: Average heart rate was significantly lower in most FGR groups compared with

AGA groups, and small to large effect sizes were observed in several sleep responses when comparing these groups. In the lineal regression model the CA explains significantly the differences in heart rate, controlled by FGR ($p = .012$). Additionally, there was evidence that sleeping states show similar trends, that is, increases in quiet and indeterminate sleep, as well as decreases in active sleep when CA was controlled by FGR. Conclusion: FGR probably intensifies the unfavorable effect of preterm birth in the responses evaluated by polysomnography. It seems that FGR is associated with alteration in sleep regulation and with differences in heart rate modulation, which may serve as a strategy to preserve energy and such differences likely underlie neurodevelopmental impairments in affected newborns. © 2019 The Japanese Society of Child Neurolog.

Aldrete-Cortez V., Poblano A., Tafoya S. A., Ramírez-García L. A., Casasola C. (2019), "Fetal growth restriction: From Polyvagal theory to developmental impairments?", *Brain and Development* 41(9): 769-775, doi: [10.1016/j.braindev.2019.04.014](https://doi.org/10.1016/j.braindev.2019.04.014). Article.

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Profesor Investigador

DECREASED AUTONOMY IN COMMUNITY-DWELLING OLDER ADULTS

ABSTRACT. Purpose: The present study aims to explore characteristics associated with low perception of autonomy among community-dwelling older adults. Patients and methods: This original research was derived from a cross-sectional study based on the study COSFOMA with information from 1,252 (60 years and older) community-dwelling older adults whose data was obtained through a questionnaire that included sociodemographic characteristics, as well as different scales of geriatric assessment. The perception of autonomy was evaluated with the autonomy sub-scale of the Quality of Life Scale of Older Adults from the World Health Organization (World Health Organization Quality of Life of Older Adults, WHOQOL-OLD). Results: The mean (SD) age of the 1,252 community-dwelling older adults participating in the study was 68.5 (7.2) years. The average perception of autonomy was 65.3 (18.2) points out of 100. In the final logistic regression model, schooling <6 years (Odds Ratio, OR = 2.1, 95% Confidence Interval, CI = 1.5–2.9), low social support (OR = 1.6, 1.2–2.2), low spirituality (OR = 2.6, 95% CI = 1.9–3.4), presence of cognitive impairment (OR = 1.9, 95% CI = 1.4–2.5), anxiety (OR = 1.7, 95% CI = 1.2–2.5), and limitation in activities of daily living (ADL) (OR = 1.6, 95% CI = 1.1–2.2) were statistically associated with the presence of low autonomy in older adults.

Conclusion: The perception of autonomy among community-dwelling older adults is moderate. Social support and spirituality, as well as cognitive impairment, anxiety, and limitations in ADL, play a significant role for degree of perceived autonomy in this population. Health professionals can use this information to promote participation in decision-making processes through programs that improve quality of life. © 2019 Sánchez-García et al.

Sánchez-García, S., García-Peña, C., Ramírez-García, E., Moreno-Tamayo, K., Cantú-Quintanilla, G.R. (2019), "Decreased autonomy in community-dwelling older adults", *Clinical Interventions in Aging* 14: 2041-2053, doi: [10.2147/CIA.S225479](https://doi.org/10.2147/CIA.S225479). Article.

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EFFECT OF ORAL NUTRITIONAL SUPPLEMENTATION WITH AND WITHOUT EXERCISE ON NUTRITIONAL STATUS AND PHYSICAL FUNCTION OF ADULT HEMODIALYSIS PATIENTS: A PARALLEL CONTROLLED CLINICAL TRIAL (AVANTE-HEMO STUDY)

ABSTRACT. Objective: Protein energy wasting affects the nutritional status (NS) and physical function (PF) of dialysis patients. Among the different anabolic strategies to improve NS and PF, oral nutritional supplementation (ONS) and resistance exercise (RE) or aerobic exercise (AE) have been shown to be effective. Nevertheless, the combination of both anabolic strategies has not been completely evaluated. The aim of this study is to assess the effect of exercise combined with ONS versus ONS without exercise during hemodialysis sessions on PF and NS indicators. Methods: Young hemodialysis patients (29 ± 9.3 years) with predominantly unknown causes of renal disease (80%) were divided into the following 3 groups during a period of 12 weeks: (1) ONS ($n = 15$), (2) ONS + RE ($n = 15$), and (3) ONS + AE ($n = 15$). Anthropometric, biochemical, PF, and quality of life measurements were recorded at baseline and after 3 months. Repeated measures analysis of variance and effect sizes (Cohen's d) were used to assess the effect of exercise and nutrition (ISRCTN registry 10251828). Results: At the completion of the study, the ONS and ONS + RE groups exhibited statistically significant increases in body weight, body mass index, and in the percentage of fat mass ($P < .05$); the greatest effect sizes were observed in the ONS + RE group ($d = 0.30$ for body weight, $d = 0.63$ for body mass index, and $d = 0.90$ for the percentage of fat mass). Groups with RE and AE had statistically significant increases and large effect sizes in the

six-minute walk test (RE: $d = 0.94$, $P = .02$; AE: $d = 1.11$, $P = .03$), sit-to-stand test (RE: $d = 0.81$, $P = .041$; AE: $d = 1.20$, $P = .002$), timed up and go test (RE: $d = 1.04$, $P = .036$; AE: $d = 1.6$, $P = .000$), and muscle strength (RE: $d = 1.01$, $P = .000$; AE: $d = 0.60$, $P = .003$). Regarding quality of life, the ONS + RE group had more areas of improvement at the end of the study, followed by the ONS + AE group. No statistically significant differences were found in the repeated measures ANOVA. Conclusions: The combination of exercise with ONS had larger effects on PF than on ONS alone. Further studies to examine the impact of exercise on the effect of oral nutritional supplementation in dialysis patients are indicated. © 2019 National Kidney Foundation, Inc.

Martin-Alemañy, G., Espinosa-Cuevas, M. D. L. Á., Pérez-Navarro, M., Wilund, K. R., Miranda-Alatríste, P., Cortés-Pérez, M., García-Villalobos, G., Gómez-Guerrero, I., Cantú-Quintanilla, G., Ramírez-Mendoza, M., Valdez-Ortiz, R. (2019), "Effect of Oral Nutritional Supplementation With and Without Exercise on Nutritional Status and Physical Function of Adult Hemodialysis Patients: A Parallel Controlled Clinical Trial (AVANTE-HEMO Study)", *Journal of Renal Nutrition*, doi: [10.1053/j.jrn.2019.06.010](https://doi.org/10.1053/j.jrn.2019.06.010). Article in Press.

Guillermo Rafael Cantú Quintanilla

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QUALITY OF MEDICAL CARE FROM AN BIOETHICAL POINT OF VIEW IN AN OPHTHALMOLOGICAL HOSPITAL IN MEXICO CITY [CALIDAD DE LA ATENCIÓN MÉDICA DESDE UN PUNTO DE VISTA BIOÉTICO EN UN HOSPITAL OFTALMOLÓGICO DE CIUDAD DE MÉXICO]

ABSTRACT. Objective: To analyze the perception of the quality of medical care from a bioethical point of view. Methods: Cross-sectional, analytical, descriptive and quantitative study. We used two questionnaires to assess the perception of medical care regarding bioethical principles. We did a descriptive and bivariate analysis with each one of the variables, and we obtained a score of the questions related to the bioethical principles. Results: We included 252 participants and found that during medical care, the following principles were met: 14% Autonomy, 72% Beneficence, 51% Dignity, 30% Integrity, 42% Justice, 52% No Maleficence and 27% Vulnerability. 3% obtained all the bioethical principles. Conclusions: One of the significant challenges of medicine is the implementation of quality models of medical care, which guarantee that patients receive medical

care that takes into account bioethical principles. © 2019, Organización Panamericana de la Salud. All rights reserved.

Chávez, E. R., Estrada, D. C., Quintanilla, G. C. (2019), "Quality of medical care from an bioethical point of view in an ophthalmological hospital in Mexico city [Calidad de la atención médica desde un punto de vista bioético en un hospital oftalmológico de ciudad de México]", *Acta Bioethica* 25(2): 235-242, doi: [10.4067/S1726-569X2019000200235](https://doi.org/10.4067/S1726-569X2019000200235). Article.

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THE HORIZON OF MEDICAL ATTENTION IN PEDIATRICS: WHAT TO DO IN THE CASE OF CHILDREN WHO ARE IN ABANDONMENT, CONFLICT, HARM OR DANGER SITUATIONS IN COMBINATION WITH A SEVERE DISEASE? [EL HORIZONTE DE LA ATENCIÓN MÉDICA EN PEDIATRÍA: ¿QUÉ HACER EN EL CASO DE NIÑOS QUE SE ENCUENTRAN EN SITUACIÓN DE ABANDONO, CONFLICTO, DAÑO O PELIGRO, AUNADO A UNA ENFERMEDAD GRAVE?]

ABSTRACT. Background: Laws refer that minors do not have the capability to give informed consent for their own medical attention. However, there are special conditions in which they are allowed to decide about their health. The greater the judgement and experience limitations in minors, the less weight is given to the values and objectives they express. Also, the more adverse consequences might be, the higher the level of authority that is demanded to decide on behalf of the minor, thus granting the State the capability to guarantee the well-being of the minor. Case report: 12-year-old female patient with a diagnosis of acute lymphoblastic leukemia, with precarious social and family background; evolution of the disease obstructed by the disregard of the treatment due to her unsanitary and extreme poverty conditions. Both of her parents died soon after the start of the treatment and she was kept under the care of her half-sister of legal age. The work and the ethical dilemma of the pediatrician and the staff of Hospital Infantil de México Federico Gómez are exposed within the building of support -networks with the objective of prioritizing the minor's well-being, without allowing family break-up or disintegration, thus succeeding in her recovery. Conclusions: The case was submitted to the Hospital Bioethics Committee. Inter-institutional support networks were built in order to improve dynamics of the family, thus solving the needs of the minor. Despite the misfortune of the situation, the disease was successfully over-

come. Copyright: © 2018 Permanyer. [Introducción: Las leyes refieren que los menores no tienen la capacidad para dar su consentimiento informado para su propia atención médica; sin embargo, hay condiciones especiales en las que se les permite determinar lo referente a su salud. Cuanto mayores sean las limitaciones de juicio y experiencia en los menores, menos peso se otorga a los valores y objetivos que expresan; cuanto más adversas sean las consecuencias, se deberá exigir un nivel más alto de autoridad para decidir en nombre del menor, dejando al Estado la capacidad de garantizar el bienestar del menor. Caso clínico: Niña de 12 años con diagnóstico de leucemia linfoblástica aguda LI, con antecedentes familiares y sociales precarios; evolución entorpecida por el desapego al tratamiento y sus condiciones insalubres y pobreza extrema. Ambos padres fallecieron al poco tiempo de iniciar su tratamiento, quedando ella al cuidado de su medio hermana mayor de edad. Se exponen la labor y el dilema ético del oncólogo tratante y del personal del Hospital Infantil de México Federico Gómez en la creación de redes de apoyo con el objetivo de priorizar el bienestar de la menor, sin dar lugar al quebrantamiento y la desintegración familiar, consiguiendo exitosamente su recuperación. Conclusiones: El caso fue sometido al Comité de Bioética Hospitalaria. Se formaron redes de apoyo interinstitucionales para intervenir en la dinámica familiar, resolviendo los requerimientos de la menor, y se consiguió con éxito superar la enfermedad].

Guadarrama-Orozco, J. H., Cantú-Quintanilla, G. R., Ávila-Montiel, D., Altamirano-Bustamante, M., Peláez-Ballestas, I., Caballero-Velarde, C., Juárez-Villagas, L. E., Vega-Morell, N., Kelly-García, J., Hoyos-Bermea, A., Dorantes-Acosta, E., Gamboa-Marrufo, J. D., Muñoz-Hernández, O., Garduño-Espinosa, J. (2018), "The horizon of medical attention in pediatrics: what to do in the case of children who are in abandonment, conflict, harm or danger situations in combination with a severe disease? [El horizonte de la atención médica en pediatría: ¿qué hacer en el caso de niños que se encuentran en situación de abandono, conflicto, daño o peligro, aunado a una enfermedad grave?]", *Boletín médico del Hospital Infantil de México* 75(3): 166-177, doi: [10.24875/BMHIM.M18000022](https://doi.org/10.24875/BMHIM.M18000022). Article.

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LACK OF DELTA-SARCOGLYCAN (SGCD) RESULTS IN RETINAL DEGENERATION

ABSTRACT. Age-related macular degeneration (AMD) is the leading cause of central vision loss and severe blindness among the elderly population. Recently, we reported on the association of the SGCD gene (encoding for δ -sarcoglycan) polymorphisms with AMD. However, the functional consequence of Sgcd alterations in retinal degeneration is not known. Herein, we characterized changes in the retina of the Sgcd knocked-out mouse (KO, Sgcd^{-/-}). At baseline, we analyzed the retina structure of three-month-old wild-type (WT, Sgcd^{+/+}) and Sgcd^{-/-} mice by hematoxylin and eosin (H&E) staining, assessed the Sgcd-protein complex (α -, β -, γ -, and ϵ -sarcoglycan, and sarcospan) by immunofluorescence (IF) and Western blot (WB), and performed electroretinography. Compared to the WT, Sgcd^{-/-} mice are five times more likely to have retinal ruptures. Additionally, all the retinal layers are significantly thinner, more so in the inner plexiform layer (IPL). In addition, the number of nuclei in the KO versus the WT is ever so slightly increased. WT mice express Sgcd-protein partners in specific retinal layers, and as expected, KO mice have decreased or no protein expression, with a significant increase in the α subunit. At three months of age, there were no significant differences in the scotopic electroretinographic responses, regarding both a- and b-waves. According to our data, Sgcd^{-/-} has a phenotype that is compatible with retinal degeneration. © 2019 by the authors. Licensee MDPI, Basel, Switzerland.

Perez-Ortiz, A. C., Peralta-Ildefonso, M. J., Lira-Romero, E., Moya-Albor, E., Brieua, J., Ramirez-Sanchez, I., Clapp, C., Luna-Angulo, A., Rendon, A., Adan-Castro, E., Ramirez-Hernández, G., Diaz-Lezama, N., Corral-Vázquez, R.M., Estrada-Mena, F.J. (2019), "Lack of delta-sarcoglycan (Sgcd) results in retinal degeneration", *International Journal of Molecular Sciences* 20(21), 5480, doi: [10.3390/ijms20215480](https://doi.org/10.3390/ijms20215480). Article.

THEORY OF MIND IMPAIRMENT IN HUNTINGTON'S DISEASE PATIENTS AND THEIR RELATIVES

ABSTRACT. Huntington disease (HD) is an autosomal dominant genetic disorder characterized by movement disorders, cognitive impairment, and psychiatric symptoms. Relatives of HD patients experience a great burden as the latter suffer from altered social conduct and deterioration of interpersonal relationships. Theory of mind (ToM) is the ability to attribute mental states (to oneself and others). Deficits in ToM are thought to have a role in the changes in empathy and interpersonal difficulties that HD patients face. Methods: We conducted a cross sectional study to compare ToM task scores of patients with mild to moderate HD, their relatives (spouse or at-risk first-degree relative with a negative gene test) and controls. Individuals with dementia or depression were excluded. The ToM test battery included Spanish versions of the Reading Mind in the Eyes Test (RMET), Happé's Strange Stories (Social and Physical Stories subtests) and the Hinting Task. Results: The series comprised 12 HD patients, 12 relatives and 12 controls. The HD patients showed lower affective ToM scores than controls (RMET 19 [3.5] vs 23.9 [2.7], $p = 0.016$). Cognitive ToM tasks scores were lower in HD patients than controls as well (Happé's Social Stories 9 [2.6] vs 13 [1.9], $p = 0.001$; the Hinting Task 13.6 [3.4] vs 17.5 [4.0], $p = 0.009$). In the Hinting Task, HD relatives had lower scores in than controls (13 [3.2] vs 17.5 [4.0], $p = 0.009$) and similar scores to controls in the rest of the battery. Conclusion: The HD patients with mild to moderate disease severity and their relatives show ToM deficits. © 2019 Associacao Arquivos de Neuro-Psiquiatria. All rights reserved.

Bayliss, L., Galvez, V., Ochoa-Morales, A., Chávez-Oliveros, M., Rodríguez-Agudelo, Y., Delgado-García, G., Boll, M.C. (2019), "Theory of mind impairment in Huntington's disease patients and their relatives", *Arquivos de Neuro-Psiquiatria* 77(8): 574-578, doi: [10.1590/0004-282X20190092](https://doi.org/10.1590/0004-282X20190092). Article.

Desiderio Salomón Hernández Gutiérrez

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EFFECT OF FUNCTIONALIZED CARBON NANOTUBES AND THEIR CITRIC ACID POLYMERIZATION ON MESENCHYMAL STEM CELLS IN VITRO

ABSTRACT. The effects of acid-functionalized and polycitric acid- (PCA-) polymerized carbon

nanotubes (CNTs) in contact with the extracellular membrane of mesenchymal stem cells (MSC), a genetically unmodified cell line with differentiation capability, was evaluated with different cellular parameters. The modified CNTs show differences in the analyzed biological behaviors, that is, intracellular incorporation, cell proliferation, apoptosis, and cytotoxicity as compared with those unpolymerized nanotubes. Due to the reduced cellular uptake of polymerized CNTs, PCA-polymerized CNTs are less cytotoxic and are associated with less apoptotic cell death than the acid-functionalized ones. The effects of nitrogen-doped CNTs (CNx) is also reported, showing that functionalized undoped CNTs present strong stimulation of cell proliferation, whereas functionalized and polymerized CNxs stimulate an apoptotic behavior. The study of MSCs in contact with CNTs and PCA is challenging due to the complexity of its various signaling components. Our results provide basis for further studies aimed to understand the relevant role that the interaction of these nanotubes with extracellular membrane could have a crucial structure for tissue grafting. © 2018 Rosa L. Garnica-Gutiérrez et al.

Garnica-Gutiérrez R. L., Lara-Martínez L. A., Palacios E., Masso F., Contreras A., Hernández-Gutiérrez S., Cervantes-Sodi F. (2018), "Effect of functionalized carbon nanotubes and their citric acid polymerization on mesenchymal stem cells in vitro", *Journal of Nanomaterials* 2018, 5206093, doi: [10.1155/2018/5206093](https://doi.org/10.1155/2018/5206093). Article.

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Víctor Manuel Arenas Luna

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STEM CELLS: SEARCHING PREDISPOSITION TO CARDIAC COMMITMENT BY SURFACE MARKERS EXPRESSION [CÉLULAS MADRE: BUSCANDO MARCADORES DE SUPERFICIE CELULAR QUE PREDISPONGAN COMPROMISO DE DIFERENCIACIÓN CARDIACA]

ABSTRACT. It is well-known that cardiovascular diseases are the leading cause of death worldwide, and represent an important economic burden to health systems. In an attempt to solve this problem, stem cell therapy has emerged as a therapeutic option. Within the last 20 years, a great variety of stem cells have been used in different myocardial infarction models. Up until now, the use of cardiac stem cells (CSCs) has seemed to be the best option, but the inaccessibility and scarcity of these cells make their use unreliable. Additionally, there is a high risk as they have to be obtained directly from the heart of the patient.

Unlike CSCs, adult stem cells originating from bone marrow or adipose tissue, among others, appear to be an attractive option due to their easier accessibility and abundance, but particularly due to the probable existence of cardiac progenitors among their different sub-populations. In this review an analysis is made of the surface markers present in CSCs compared with other adult stem cells. This suggested the pre-existence of cells sharing specific surface markers with CSCs, a predictable immunophenotype present in some cells, although in low proportions, and with a potential of cardiac differentiation that could be similar to CSCs, thus increasing their therapeutic value. This study highlights new perspectives regarding MSCs that would enable some of these sub-populations to be differentiated at cardiac tissue level. © 2017 Instituto Nacional de Cardiología Ignacio Chávez.

Lara-Martínez L. A., Gutiérrez-Villegas I., Arenas-Luna V. M., Hernández-Gutiérrez S. (2018), "Stem cells: searching predisposition to cardiac commitment by surface markers expression [Células madre: buscando marcadores de superficie celular que predispongan compromiso de diferenciación cardíaca]", *Archivos de Cardiología de México* 88(5): 483-495, doi: [10.1016/j.acmx.2017.12.001](https://doi.org/10.1016/j.acmx.2017.12.001). Article.

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Profesor Investigador

PAIN DISTRACTION DURING AMBULATORY SURGERY: VIRTUAL REALITY AND MOBILE DEVICES

ABSTRACT. I Virtual reality (VR) pain distraction has been applied across medical, surgical, and behavioral healthcare domains, marking a shift in pain attenuation practices. However, there is little research that has been performed to compare the efficacy of traditional head-mounted displays (HMDs) versus portable VR devices. The present study evaluated 44 outpatients in need of lipoma resection. Randomized into two groups - HMD versus mobile phone VR - participants navigated pain distraction virtual environments while undergoing surgery. Vital signs and subjective pain measurements via a visual analog scale were taken before, during, and after the surgery. Results indicate that the HMD group reported greater pain reduction than the Mobile group. Overall, this study points to the efficacy of nonpharmacological pain attenuation practices. Although both systems reduced pain during surgery, the clinically validated VR environments seen in the HMD group were more effective. This study does show that inexpensive solutions can work in surgical settings. Future research should be performed to identify the most effective VR pain distraction systems. © 2019, Mary Ann Liebert, Inc.

Mosso Vázquez J. L., Mosso Lara D., Mosso Lara J. L., Miller I., Wiederhold M. D., Wiederhold B. K. (2019), "Pain Distraction during Ambulatory Surgery: Virtual Reality and Mobile Devices". *Cyberpsychology, Behavior, and Social Networking* 22(1): 15-21, doi: [10.1089/cyber.2017.0714](https://doi.org/10.1089/cyber.2017.0714). Article.

Nalu Navarro Álvarez

SNI Nivel III

DEVELOPMENT OF TRANSPLANTABLE B-CELL LYMPHOMAS IN THE MHC-DEFINED MINIATURE SWINE MODEL

ABSTRACT. Background: Establishment of transplantable tumors in clinically relevant large animals allows translational studies of novel cancer therapeutics. Methods: Here we describe the establishment, characterization, and serial transplantation of a naturally occurring B-cell lymphoma derived from a unique, highly inbred subline of Massachusetts General Hospital (MGH) major histocompatibility complex (MHC)-defined miniature swine. Results: The lymphoblastic cell line (LCL) originated from peripheral blood of a 2.5 year old female swine leukocyte antigen (SLA) dd-inbred miniature swine breeder demonstrating clinical signs of malignancy. Flow cytometric phenotypic analysis of subclones derived from the original cell line revealed surface markers commonly expressed in a B-cell lineage neoplasm. A subclone of the original LCL was transplanted into mildly-conditioned histocompatible miniature swine and immunocompromised NOD.Cg-Prkdc scid Il2rg tm1Wjl/SzJ (NSG) mice. Tissue and blood samples harvested 2 weeks following subcutaneous and intravenous injection in a highly inbred SLAdd pig were cultured for tumor growth and phenotypic analysis before serial transfer into NSG mice. Evidence of tumor growth in vivo was found in all tumor cell recipients. In vitro growth characteristics and surface phenotype were comparable between the original and serially transplanted tumor cell lines. Conclusions: These results indicate the feasibility of developing a large-animal transplantable tumor model using cells derived from spontaneously occurring hematologic malignancies within the highly inbred miniature swine herd. © 2019 The Author(s).

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CHRONIC KIDNEY DISEASE IN CHILDREN AGED 6-15 YEARS AND ASSOCIATED RISK FACTORS IN APIZACO, TLAXCALA, MEXICO, A PILOT STUDY

ABSTRACT. Introduction: Tlaxcala, a small state in central Mexico, has the highest prevalence of chronic kidney disease (CKD) deaths in population aged 5-14 in Mexico, most of them with unknown etiology. Objective: To determine the prevalence of CKD in apparently healthy pediatric population in Apizaco, Tlaxcala. Methods: A cross-sectional pilot study was carried out in children deemed as healthy; subjects with previous diagnosis of CKD were excluded. Informed consent was obtained in all cases. A physical examination was performed, a questionnaire was applied. Blood and urine samples were obtained for serum creatinine, urinalysis, and microalbumin/creatinine ratio. A second and third evaluation was performed after 6 and 18 months in those found with urinary anomalies/CKD to confirm the diagnosis. Results: One hundred and nine subjects completed physical examination, which are the biological samples. Median age was 12 years. CKD stage 2 was confirmed in 5 subjects in the sixth month confirmation visit (4.6%). One patient accepted renal biopsy and Alport Syndrome was found. In a robust multivariate analysis, the risk factors related to reduction in the glomerular filtration rate were males $-5.15 \text{ mL/min/1.73 m}^2$ ($p = 0.002$), older participants as by $-1.58 \text{ mL/min/1.73 m}^2$ per year ($p < 0.0001$), and among participants living close to a river $-3.76 \text{ mL/min/1.73 m}^2$ ($p = 0.033$). Discussion/Conclusion: The prevalence of CKD in the population studied in Apizaco Tlaxcala was confirmed in 4.6 cases per 100 inhabitants between 6 and 15 years. Males, older age, and living close to a river were the risk predictive factors. More studies are needed to determine the causes of the high CKD prevalence in this population. © 2019 S. Karger AG, Basel. Copyright: All rights reserved.

Ortega-Romero, M., Méndez-Hernández, P., Cruz-Angulo, M. D. C., Hernández-Sánchez, A. M., Álvarez-Elias, A. C., Muñoz-Arizpe, R., Sales-Heredia, F., Aguilar-Madrid, G., Juárez-Perez, C. A., Soto, V., Valadés, T., Olvera-Rivas, N., Obrador-Vera, G. T., Barbier, O. C., Medeiros, M. (2019). "Chronic Kidney Disease in Children Aged 6-15 Years and Associated Risk Factors in Apizaco, Tlaxcala, Mexico, a Pilot Study". *Nephron* 143(4): 264-273, doi: [10.1159/000502481](https://doi.org/10.1159/000502481). Article.

CURRENT STATE AND CHALLENGES FOR ORGAN DONATION AND TRANSPLANTATION IN MEXICO

ABSTRACT. Mexico, officially called the United Mexican States, is in the southern part of North America. It is a democratic republic comprised of 32 states, in addition to its capital, Mexico City. The Mexican territory has an area of 1964375 km^2 , which makes it the 14th biggest country in the world and the third largest in Latin America. Mexico borders the United States of America in the north and Guatemala and Belize in the south (Figure 1). It is the 11th most populous country in the world, with an estimated population of over 132 million people (as of 2018). Although most people speak Spanish, the official language, there are 67 indigenous dialects. In 2015, the Human Development Index was 0.762, ranking Mexico as number 77 worldwide. The Mexican economy is the second largest in Latin America and the 11th in the world. ©2019 Transplantation NLM (Medline).

Reyes-Acevedo R., Obrador G. T., Alberú-Gómez J., Gracida-Juárez C., André Madrigal J., Aburto-Morales S. (2019), "Current State and Challenges for Organ Donation and Transplantation in Mexico". *Transplantation* 103(4): 648-650, doi: [10.1097/TP.0000000000002474](https://doi.org/10.1097/TP.0000000000002474). Article.

Gregorio Tomás Obrador Vera

SNI Nivel III

POTASSIUM HOMEOSTASIS AND MANAGEMENT OF DYSKALEMIA IN KIDNEY DISEASES: CONCLUSIONS FROM A KIDNEY DISEASE: IMPROVING GLOBAL OUTCOMES (KDIGO) CONTROVERSIES CONFERENCE

ABSTRACT. Potassium disorders are common in patients with kidney disease, particularly in patients with tubular disorders and low glomerular filtration rate. A multidisciplinary group of researchers and clinicians met in October 2018 to identify evidence and address controversies in potassium management. The issues discussed encompassed our latest understanding of the regulation of tubular potassium excretion in health and disease; the relationship of potassium intake to cardiovascular and kidney outcomes, with increasing evidence showing beneficial associations with plant-based diet and data to suggest a paradigm shift from the idea of dietary restriction toward fostering patterns of eating that are associated with better outcomes; the paucity of data on the effect of dietary modification in restoring abnormal serum potassium to the normal range; a novel diagnostic algorithm

for hypokalemia that takes into account the ascendency of the clinical context in determining cause, aligning the educational strategy with a practical approach to diagnosis; and therapeutic approaches in managing hyperkalemia when chronic and in the emergency or hospital ward. In sum, we provide here our conference deliberations on potassium homeostasis in health and disease, guidance for evaluation and management of dyskalemiias in the context of kidney diseases, and research priorities in each of the above areas. © 2019 International Society of Nephrology.

Clase, C. M., Carrero, J. J., Ellison, D. H., Grams, M. E., Hemmelgarn, B. R., Jardine, M. J., Kovesdy, C. P., Kline, G. A., Lindner, G., Obrador, G. T., Palmer, B. F., Cheung, M., Wheeler, D. C., Winkelmayer, W. C., Pecoits-Filho, R., Ashuntantang, G. E., Bakker, S. J. L., Bakris, G. L., Bhandari, S., Burdmann, E. A., Campbell, K. L., Charytan, D. M., Clegg, D. J., Cuppari, L., Goldsmith, D., Hallan, S. I., He, J., Herzog, C. A., Hoenig, M. P., Hoorn, E. J., Leipziger, J. G., Leonberg-Yoo, A. K., Lerma, E. V., Lopez-Almaraz, J. E., Malyszko, J., Mann, J. F. E., Marklund, M., McDonough, A. A., Nagahama, M., Navaneethan, S. D., Pitt, B., Pochynyuk, O. M., Proença de Moraes, T., Rafique, Z., Robinson, B. M., Roger, S. D., Rossignol, P., Singer, A. J., Smyth, A., Sood, M. M., Walsh, M., Weir, M. R., Wingo, C. S. (2019). "Potassium homeostasis and management of dyskalemia in kidney diseases: conclusions from a Kidney Disease: Improving Global Outcomes (KDIGO) Controversies Conference", *Kidney International* 97(1): 42-61, doi: [10.1016/j.kint.2019.09.018](https://doi.org/10.1016/j.kint.2019.09.018). Conference Paper.

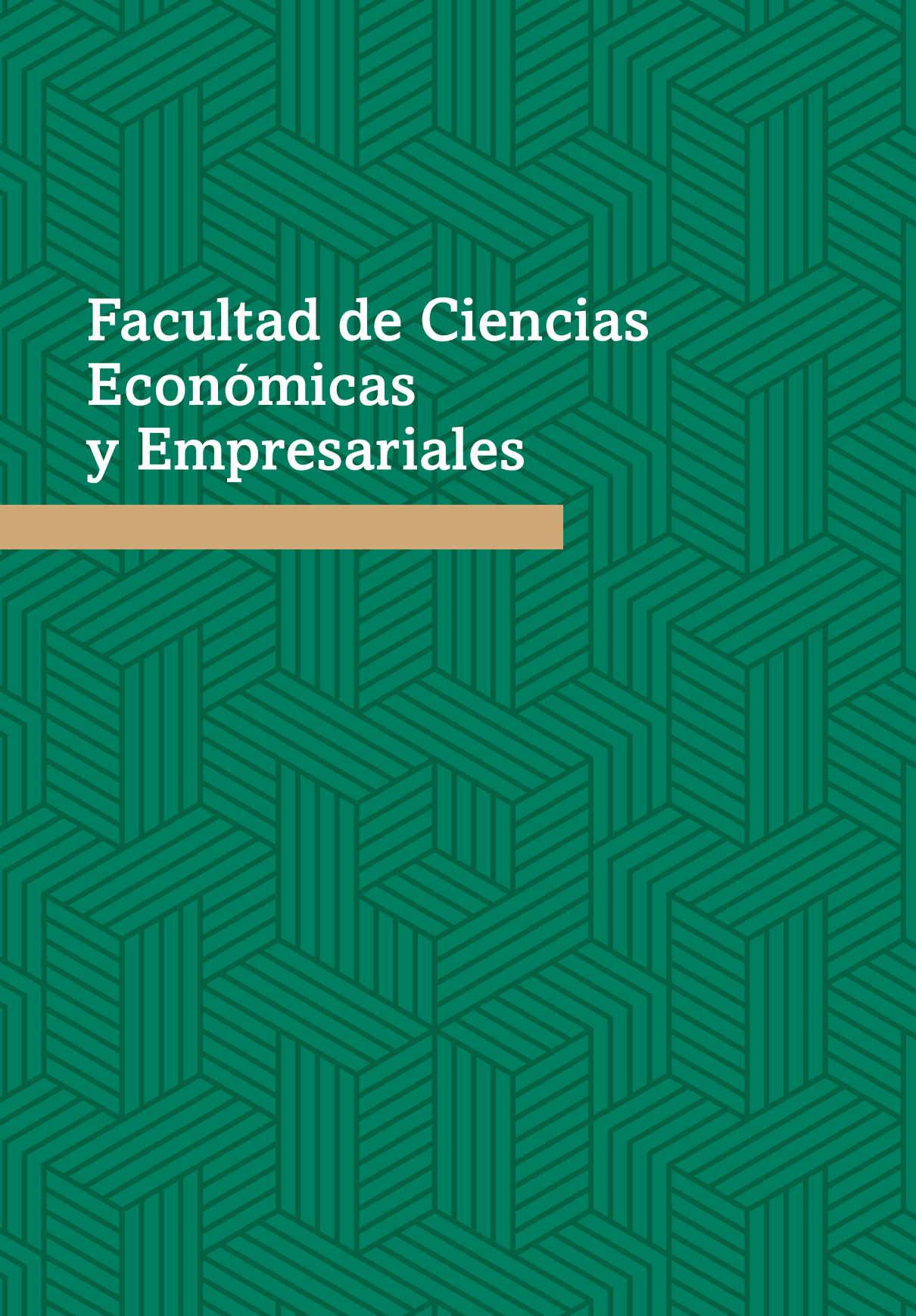
Lourdes Velázquez González

SNI Nivel 1

MEDICINE IN MEXICAN PRE-HISPANIC THOUGHT

ABSTRACT. Many people are still convinced that the indigenous medicine was in a stage of admixture with witchcraft and magic, more or less as it is believed for medicine to be practiced among so called «primitive» civilizations. This conviction is contradicted by what the first Spanish conquerors explicitly declared regarding medicine they encountered in the new land of conquest, and it is even more in contradiction with the very clear distinctions that «scientific» doctors of Mexico prior to the arrival of Cortés expressed in their texts, in which they separated clearly their way of conceiving and practicing medicine from the practices of the sorcerers, curators and charlatans.

Velasquez, L. (2018), "Medicine in Mexican Pre-Hispanic Thought". *Rivista Di Filosofia Neo-Scolastica* 110(4): 751-758, doi: [10.26350/001050_000080](https://doi.org/10.26350/001050_000080). Article.



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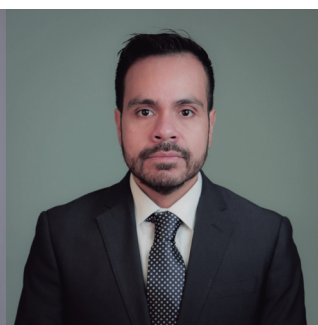
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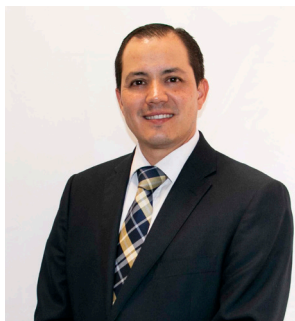
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WATER PRICING MODELS IN MEXICO ACCORDING TO SOCIAL CRITERIA [MODELOS TARIFARIOS DE AGUA EN MÉXICO SEGÚN CRITERIOS SOCIALES]

ABSTRACT. The purpose of this article was to propose a typology of pricing models based on social criteria. In particular, two approaches are proposed in this study: differentiation of users and vulnerable groups. Thirty-two cities of Mexico were grouped according to their abiding by the aforementioned approaches, to observe the behavior of their average management indicators. It turns out that the user differentiation approach makes a higher-rate model more feasible although the efficiency of the operating entity is lower than that of vulnerable groups. In the latter, the rate is lower, and therefore, management efficiency is greater. Likewise, it is observed that regardless of the pricing approach, higher rates are followed by lower consumption. It is concluded that increases in water rates should be accompanied by greater efficiency in the operation; because it is useless to enter financial resources into an entity if these will be wasted. © 2018 Instituto Mexicano de Tecnología del Agua. All rights reserved.

Briseño H. (2018), "Water pricing models in Mexico according to social criteria [Modelos tarifarios de agua en México según criterios sociales]", *Tecnología y Ciencias del Agua* 9(6): 173-192, doi: [10.24850/j-ty-ca-2018-06-08](https://doi.org/10.24850/j-ty-ca-2018-06-08). Article.

Alba Violeta Corona Cabrera

Profesor Investigador

THE SUN IS NO FUN WITHOUT RAIN: PHYSICAL ENVIRONMENTS AFFECT HOW WE FEEL ABOUT YELLOW ACROSS 55 COUNTRIES

ABSTRACT. Across cultures, people associate colours with emotions. Here, we test the hypothesis that one driver of this cross-modal correspondence is the physical environment we live in. We focus on a prime example – the association of yellow with joy, – which conceivably arises because yellow is reminiscent of life-sustaining sunshine and pleasant weather. If so, this association should be especially strong in countries where sunny weather is a rare occurrence. We analysed yellow-joy associations of 6625 participants from 55 countries to investigate how yellow-joy associations varied geographically, climatologically, and seasonally. We assessed the distance to the equator, sunshine, precipitation, and daytime hours. Consistent with our hypotheses, partici-

pants who live further away from the equator and in rainier countries are more likely to associate yellow with joy. We did not find associations with seasonal variations. Our findings support a role for the physical environment in shaping the affective meaning of colour. © 2019.

Jonauskaitė D., Abdel-Khalek A. M., Abu-Akel A., Al-Rasheed A.S., Antonietti J. P., Åsgeirsson Á. G., Atitsogbe K. A., Barma M., Barratt D., Bogushevskaya V., Bouayed Meziane M. K., Chamseddine A., Charenbloom T., Chkonia E., Ciobanu T., Corona V., Creed A., Dael N., Daouk H., Dimitrova N., Doorenbos C. B., Fomins S., Fonseca-Pedrero E., Gaspar A., Gizdic A., Griber Y. A., Grimshaw G. M., Hasan A. A., Havelka J., Hirnstein M., Karlsson B. S. A., Katembu S., Kim J., Konstantinou N., Laurent E., Lindeman M., Manav B., Marquardt L., Mefoh P., Mroczko-Wasowicz A., Mutandwa P., Ngabolo G., Oberfeld D., Papadatou-Pastou M., Perchtold C.M., Pérez-Albéniz A., Pouyan N., Rashid Soron T., Roinishvili M., Romanyuk L., Salgado Montejó A., Sultanova A., Tau R., Uusküla M., Vainio S., Vargas-Soto V., Volkan E., Wasowicz G., Zdravković S., Zhang M., Mohr C. (2019), "The sun is no fun without rain: Physical environments affect how we feel about yellow across 55 countries", *Journal of Environmental Psychology* 66, 101350, doi: [10.1016/j.jenvp.2019.101350](https://doi.org/10.1016/j.jenvp.2019.101350). Article.

Fernando Cruz Aranda

SNI Nivel I

Antonia Terán Bustamante

Investigador Titular A, SNI Nivel Candidato

VALUATION OF AN INVESTMENT PROJECT IN RESEARCH AND DEVELOPMENT IN THE PHARMACEUTICAL INDUSTRY [VALORACIÓN DE UN PROYECTO DE INVERSIÓN EN INVESTIGACIÓN Y DESARROLLO EN LA INDUSTRIA FARMACÉUTICA]

ABSTRACT. In this paper, the evaluation of the investment project in research and development for the innovation and of great impact in the pharmaceutical industry is presented. The project evaluation is done through an American type real call option, based on binomial trees incorporating the expected volatility of the expected cash flows in order to determine the benefit of postponing the project three years, providing flexibility to investors in their decision making. Besides, in the valuation of a real option associated with the project, fuzzy sets theory is incorporated in the process of assigning possibilities to the branches of a tree. The value of the American type real call option to postpone the project are between 24.83 % and 51.22% of the investment, and the value of real option, using fuzzy logic is between 9.91% and 23.13% of the investment in a pessimistic scenario, and of the

10.04% and 39.08% of investment in an optimistic scenario, and for a experts scenario the option premium is between 10.00% and 26.91% of the investment, these are better results. © 2019 Universidad Nacional Autónoma de México.

Aranda F. C., Bustamante A. T. (2019), "Valuation of an investment project in research and development in the pharmaceutical industry [Valoración de un proyecto de inversión en investigación y desarrollo en la industria farmacéutica]", *Contaduría y Administración* 64, doi: [10.22201/fca.24488410e.2018.1717](https://doi.org/10.22201/fca.24488410e.2018.1717). Article.

Rafael Garduño Rivera

SNI Nivel II

ECONOMIC INTEGRATION AND REGIONAL CONVERGENCE: EFFECTS OF NAFTA ON LOCAL CONVERGENCE IN MEXICO, 1980-2008

ABSTRACT. Continental integration processes can alter traditional development axes. Paelinck and Polèse's work in 1999 explains that in the case of Mexico there is a tension between the U.S. border and the rest of the country: Mexico's integration in the NAFTA should have reduced the U.S. border attraction, extending the growth to territories located between this border and Mexico City. To test this hypothesis, we propose a spatial conditional β -convergence model that uses as regressors both the distances to the U.S. border and to Mexico City, together with other control variables. This model is applied to the period from 1980 to 2008 using GVA at the municipality level. Working with municipal-level data allows to observe convergence patterns across space and identify the effects of location. The time-span studied distinguishes between before and after NAFTA. Estimates based on Mundlak's approach were obtained for time-invariant regressors. Results show that during the pre-NAFTA period there was a general process of convergence, but it is mainly explained by the faster growth of municipalities located near to the U.S. border. However, post-NAFTA, convergence in municipalities disappeared and the effect of distance to the U.S. border reversed its sign, as predicted in Paelinck and Polèse's model. © 2019, © 2019 Informa UK Limited, trading as Taylor & Francis Group.

Díaz-Dapena A., Fernández-Vázquez E., Garduño-Rivera R., Rubiera-Morollón F. (2019), "Economic integration and regional convergence: effects of NAFTA on local convergence in Mexico, 1980-2008", *Applied Economics* 51(50): 5515-5527, doi: [10.1080/00036846.2019.1616064](https://doi.org/10.1080/00036846.2019.1616064). Article.

Rafael Garduño Rivera

SNI Nivel II

TECHNICAL EFFICIENCY IN THE MEXICAN AUTOMOTIVE INDUSTRY, 1988-2008 [LA EFICIENCIA TÉCNICA DE LA INDUSTRIA AUTOMOTRIZ EN MÉXICO, 1988-2008]

ABSTRACT. This work evaluates the impact of productive specialization on the technical efficiency of the automotive industry in Mexico (1988-2008), using the production-possibility frontier method on a regional scale and considering its regional localization. To this end, an index of regional specialization in said sector was calculated, in addition to a technical efficiency index for the automotive industry using the stochastic frontier model (Battese and Coelli, 1995). The findings that were obtained suggest that specialization has a positive impact on productive efficiency in the units of analysis, and further, demonstrate that education levels and the localization of automotive plants in the northern and central regions of the country contribute to decreasing levels of productive inefficiency. © 2019 Universidad Nacional Autónoma de México. All rights reserved.

González, E. D., Zepeda, J. C. L., Rivera, R. G. (2019), "Technical efficiency in the Mexican automotive industry, 1988-2008 [La eficiencia técnica de la industria automotriz en México, 1988-2008]", *Problemas del Desarrollo* 50(199): 141-175, doi: [10.22201/ieec.20078951e.2019.199.68192](https://doi.org/10.22201/ieec.20078951e.2019.199.68192). Review.

Santiago González Gómez

SNI Nivel Candidato

THE TRIPS AGREEMENT IMPLEMENTATION IN MEXICO. IMPLICATIONS FOR SOCIAL RESPONSIBILITY AND DEVELOPMENT

ABSTRACT. The relation between intellectual property vs international commerce can be either positive, or negative, favoring certain countries with better technological infrastructure or increasing their international commerce, but it might also represent a barrier to commerce in case of abuse with its implementation. It could also be an impediment for social responsibility, remarkably in case of developing nations. This research focuses on intellectual property rights in Mexico, its effects on international competitiveness, and analyzes the influence of the TRIPS1 Agreement on Mexico's technological upgrade, modernization and industrialization and the effects it has on the social responsibility aspects, such as human rights, poverty eradication and the relation between supply chain and sustainability. © Foundation of International Studies, 2019 © CSR, 2019.

González-Gómez S., García-Santillán A. (2019), "The TRIPS agreement implementation in Mexico. Implications for social responsibility and development", *Journal of International Studies* 12(2): 46-65, doi: [10.14254/2071-8330.2019/12-2/3](https://doi.org/10.14254/2071-8330.2019/12-2/3). Article.

Andrée Marie López Fernández

SNI Nivel I

BUSINESS LEADERSHIP AND MARKET COMPETITIVENESS: NEW PARADIGMS FOR DESIGN, GOVERNANCE, AND PERFORMANCE

ABSTRACT. Competitive paradigms, which are constantly being shifted, and turbulent environmental conditions, which today are a constant, tend to dictate rather than inform strategic decision making regarding an organization's status quo and desired outcomes. As such, there is a need for organizational leaders to re-examine current practices. This book provides insight into business dynamics and the internal and external factors that, when strategically aligned, provide satisfaction, added value, and enhanced performance. © The Editor(s).

López-Fernández A. M. (2018), *Business Leadership and Market Competitiveness. New Paradigms for Design, Governance, and Performance* (Cham: Palgrave Pivot/Springer Nature), doi: [10.1007/978-3-030-03347-7](https://doi.org/10.1007/978-3-030-03347-7). Book.

Andrée Marie López Fernández

SNI Nivel I

INTERNAL CORPORATE SOCIAL RESPONSIBILITY AND LEADERSHIP EFFECTS ON VOICE MANAGEMENT AND ORGANISATIONAL PERFORMANCE: ANALYSIS OF COLLABORATOR PERCEPTIONS ACROSS ORGANISATIONS IN MEXICO

ABSTRACT. Corporate social responsibility (CSR) has been studied and analysed from multiple perspectives, such as social and economic, and internal and external viewpoints; and increasingly implemented in organisations worldwide, notwithstanding line of business and/or size. Internal corporate social responsibility (iCSR) focuses exclusively on collaborator complexities, including collaborator voice and voice management. Leadership is perhaps the primary source of iCSR principles and practices, or those responsible for internal engagement; they are also in charge of promoting, encouraging and managing collaborator voice; yet, do leadership's traits determine

practices regarding collaborator voice encouragement, as well as the latter's influence on organisational performance? This collaborator-centric study describes the relationship between leadership, iCSR, and collaborator voice, as well as collaborator perceptions, across five different types/sizes of socially responsible organisations. © 2019 Inderscience Enterprises Ltd.

López Fernández, A. M. (2019), "Internal corporate social responsibility and leadership effects on voice management and organisational performance: Analysis of collaborator perceptions across organisations in Mexico", *International Journal of Business Excellence* 19(2): 151-167, doi: [10.1504/IJBEX.2019.102236](https://doi.org/10.1504/IJBEX.2019.102236). Article.

Andrée Marie López Fernández

SNI Nivel I

PERSUASION AND DISSUASION VIA SOCIAL NETWORKING SITES: THE INFLUENCE OF WORD-OF-MOUTH ON CONSUMER ACTIVISM

ABSTRACT. Today, more than ever, consumers have access to a vast amount of data and information regarding most anything. Internet access is the key to the world of information and social media the key to a boundless platform for both firms and consumers to have their voices heard. The Internet lets people around the world expand their real life network to a virtual one (Lee and Lee 2010); this is quite visible with the social connections and interactions that are possible via social media. The very existence of the latter has proven to be a game changer when it comes to consumer behavior, particularly within consumers' process of purchase decision making. © The Editor(s) (if applicable) and The Author(s), under exclusive licence to Springer International Publishing AG, part of Springer Nature 2019.

López-Fernández A. M. (2018), "Persuasion and dissuasion via social networking sites: The influence of word-of-mouth on consumer activism". In Rajagopal and Ramesh Behl, *Business Governance and Society: Analyzing Shifts, Conflicts, and Challenges* (Cham: Springer Nature), 251-270, doi: [10.1007/978-3-319-94613-9_15](https://doi.org/10.1007/978-3-319-94613-9_15). Book Chapter.

Enrique Martín Murillo Othón

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**EXAMINING THE DRIVERS OF
EMPLOYEE BRAND UNDERSTANDING:
A LONGITUDINAL STUDY**

ABSTRACT. Purpose: The purpose of this study is to extend previous research by using a longitudinal design to examine the differential contribution of brand understanding (BU) drivers at various moments in the early tenure of service employees. Employee BU is a prerequisite of brand promise delivery among service employees. Previous studies, using cross-sectional samples, established that brand-oriented recruitment, training and leadership are significant BU drivers. Design/methodology/approach: A three-wave survey was collected from a 105-member panel of recent hires at a restaurant chain that displayed a strong brand culture and adopted internal brand management (IBM) practices. Structural equation models with carryover effects were estimated to measure the impact of BU drivers on Day 1, as well as at four and seven months of tenure. In addition, a latent growth model of BU was estimated using random coefficients modeling. Findings: Results show a significant positive effect of IBM practices on BU at each point in time; however, despite this, by the seven month milestone, BU is still not fully developed. Research limitations/implications: As with most organizational longitudinal studies, there was sample attrition because of the high turnover that characterizes the restaurant industry. This attrition is not believed to be correlated with the variables measured in the study. Practical implications: Managers seeking a differentiated customer experience should not assume new hires attain a good understanding of the service brand even after the first seven months of tenure. Hence, brand training and leadership should extend well beyond this time frame. Originality/value: This study is the first, as per the authors' understanding, to use a longitudinal design to model BU as a dynamic variable because it befits the learning trajectories of new employees. © 2019, Emerald Publishing Limited.

Murillo E., King C. (2019), "Examining the drivers of employee brand understanding: a longitudinal study", *Journal of Product and Brand Management* 28(7): 893-907, doi: [10.1108/JPBM-09-2018-2007](https://doi.org/10.1108/JPBM-09-2018-2007). Article.

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**TOWARDS A SHARED UNDERSTANDING
OF THE SERVICE EXPERIENCE – A
HOSPITALITY STAKEHOLDER APPROACH**

ABSTRACT. Purpose: The purpose of this paper is to start a conversation on achieving a shared understanding among hospitality service co-creation participants. Adopting a stakeholder and service eco-systems approach, attention is drawn to the necessity for all service experience participants to have a shared understanding of the service experience and their role within it, for a sustained competitive advantage to be realized. Informed by community of practice (CoP) thinking, a road map of research questions is advanced encouraging insight into a macro level phenomenon that, traditionally, is only ever considered at the micro service encounter level. Design/methodology/approach: A thorough multidisciplinary review of the literature was undertaken, providing an opportunity to present a viewpoint on the strategic implications of providing a sustainable competitive advantage via the hospitality service experience. Findings: To achieve a shared understanding across the Hospitality Service Experience Eco-System, potential tensions among stakeholders are highlighted. Accounting for such barriers, institutional arrangements, combining organizational CoPs that are bridged by designated boundary objects, is advanced. Given the novel approach of applying a traditionally organizational phenomenon at a macro multi-stakeholder level, several research questions are proposed to inform thinking about this neglected perspective. Originality/value: Acknowledging the innovation, agility and resources required to maintain a competitive service experience, the paper emphasizes the importance of adopting a macro perspective to effective service management. The hope is to stimulate academic interest to inform understanding as to how to build this capability as well as enhance practitioner interest in promoting stakeholders' CoP for the benefit of the entire Hospitality Service Experience Eco-System. © 2019, Emerald Publishing Limited.

King C., Murillo E., Wei W., Madera J., Tews M. J., Israeli A. A., Kong L. (2019), "Towards a shared understanding of the service experience – a hospitality stakeholder approach", *Journal of Service Management* 30(3):410-428, doi: [10.1108/JOSM-11-2018-0375](https://doi.org/10.1108/JOSM-11-2018-0375). Article.

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WHY DO EMPLOYEES RESPOND TO HOSPITALITY TALENT MANAGEMENT: AN EXAMINATION OF A LATIN AMERICAN RESTAURANT CHAIN

ABSTRACT. Purpose: In consideration that the purpose of talent management is to attract and nurture productive employees for the benefit of the hospitality organization, this study aims to examine why employees respond in such favorable ways. Recognizing beneficial employee behavior advances a hospitality organization through their ability to deliver an experience that aligns with the promoted brand promise, inspiration is drawn from both the strategic human resource management as well as the internal brand management literature. The power of this approach is illustrated through a survey of employees of a Latin American restaurant chain with a long-standing policy of values-based recruiting, inclusive talent management and progressive people management practices. Design/methodology/approach: Informed by literature, employee perception of their relationship with the organization (i.e., relationship orientation) and alignment with the brand's values (i.e., brand fit) were considered drivers of favorable employee attitudes and behavior as a result of hospitality talent management practices. These were hypothesized to positively influence employee confidence and motivation as reflected in organization-based self-esteem (OBSE) and brand motivation, which in turn drive employee brand-aligned behavior. A survey measured the variables of interest with the same employees over two time periods, matched using employees' identification code, resulting in 199 complete surveys. The structural model was estimated using partial least squares (PLS). Findings: Relationship orientation and brand fit were significant drivers of OBSE and brand motivation, respectively. In turn, they had a significant effect on employee brand-aligned behavior. Model estimation complied with all PLS quality criteria. Research limitations/implications: Traditional talent management practices that tend to focus on the transactional benefits of the job/career can be strengthened by leveraging strong organizational relationships as well as engagement with the hospitality brand. In turn, employees have the confidence and motivation to exhibit brand-aligned behavior, a path to competitive advantage, which may also act as a buffer helping employees manage the stress of hospitality jobs. Originality/value: Understanding why employees respond favorably to hospitality talent management practices, beyond simply transactional, monetary reasons, is important to designing relevant and timely

initiatives that have the potential to enhance organizational performance. © 2019, Emerald Publishing Limited.

Murillo E., King C. (2019), "Why do employees respond to hospitality talent management: An examination of a Latin American restaurant chain", *International Journal of Contemporary Hospitality Management* 31(10): 4021-4042, doi: [10.1108/IJCHM-10-2018-0871](https://doi.org/10.1108/IJCHM-10-2018-0871). Article in Press.

Juan Enrique Núñez Ríos

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A SYSTEMS SCIENCE APPROACH TO STRUCTURE HUMAN CAPITAL MANAGEMENT IN MEXICAN LODGING SMES

ABSTRACT. This work addresses the process of human capital management in Mexican tourism SMEs. This process affects operations given its limited capability to respond to changes in the environment and binding activities congruently with the coordination and management components. This paper adopted the systemic method, addressed through the soft systems methodology to conduct a diagnosis and propose a conceptual model to outline a solution. The relevant systems of this construct were operationalised and contrasted with the analytical hierarchy process. The results show 90% consistency; this indicates that the model reliably represents the reality in which SMEs under study operate and proposed interrelations are acceptable to foster equilibrium. The implications of adopting a systemic perspective require reflecting on the processes of people management, as well as transit from a functionalist approach to an integral one. Copyright © 2019 Inderscience Enterprises Ltd.

Núñez-Ríos, J. E., Sánchez-García, J. Y., Tejeida-Padilla, R., Soto-Pérez, M. (2018), "A systems science approach to structure human capital management in Mexican lodging SMEs", *International Journal of Applied Systemic Studies* 8(4): 279-299, doi: [10.1504/IJASS.2018.103761](https://doi.org/10.1504/IJASS.2018.103761). Article.

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HUMAN CAPITAL MANAGEMENT INNOVATION FOR MEXICAN LODGING THROUGH AUTOPOIESIS AND SELF-ORGANISATION

ABSTRACT. In the context of the Mexican hospitality sector, Small and Medium Enterprises (SMEs) are considered important agents given their participation in the generation of jobs and new business relations, nevertheless their closure rate in the first two years of operation is high. In addition, these companies face structural problems that limit their capabilities to attenuate the variety of the environment and, simultaneously, improve their operations. This paper, presents a proposal through the complementarity between the Soft Systems Methodology and the Viable System Model to build a structure that allows the human capital management to influence a state of self-organisation based on precepts of the Autopoiesis Theory. As a result, a model that integrates self-regulation, autonomy and learning to support self-management of human capital was obtained to adapt continuously to its current context. © 62nd Annual Meeting of the International Society for the Systems Sciences, ISSS 2018: Innovation and Optimization in Nature and Design.

Núñez-Ríos J. E., Sánchez-García J. Y., Tejeida-Padilla R., Coria-Páez A. L. (2018), "Human capital management innovation for Mexican lodging through autopoiesis and self-organisation", *62nd Annual Meeting of the International Society for the Systems Sciences, ISSS 2018: Innovation and Optimization in Nature and Design*: 125-140. Conference Paper.

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INNOVATION IN SERVICES: A VIABLE SYSTEM MODEL DESIGN FOR TOURIST MSMES INTEGRATION IN MÉXICO

ABSTRACT. In the context of micro, small and medium-sized tourism enterprises (MSMEs), flexibility and heterogeneity can be characteristics that add value to them. However, the lack of integration to treat, both its operation as the environment, makes it difficult to understand the various problems to which they are exposed. The previous, stresses the need for these human activity systems

to coexist in a changing environment, an organisation that seeks to its operation and maintenance. In this regard, this work takes up the concept of complementarity from the perspective of Systems Science. In this sense, complementarity refers to the beneficial adaptation of the heterogeneous capabilities of tourism companies and to contribute to the innovation of their services to achieve the basic objective of a living system, that is to say, to survive and evolve with its environment. The Soft Systems Methodology and the Viable System Model were used, obtaining, as a result, a construct that proposes to order and amplify the internal variety, allowing to counteract the external variety. © 62nd Annual Meeting of the International Society for the Systems Sciences, ISSS 2018: Innovation and Optimization in Nature and Design.

Sánchez-García J. Y., Núñez-Ríos J. E., Badillo-Piña I. (2018), "Innovation in services: A viable system model design for tourist MSMES integration in México", *62nd Annual Meeting of the International Society for the Systems Sciences, ISSS 2018: Innovation and Optimization in Nature and Design*: 141-153. Conference Paper.

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[Colaboración: Escuela Superior de Administración de Instituciones]

SYSTEMS THINKING APPROACH TO SUSTAINABLE PERFORMANCE IN RAMSAR SITES

ABSTRACT. This article explores and validates the integrated use of the viable system model (VSM) and the partial least squares path modeling (PLS-PM) approach to assess the sustainable management of RAMSAR sites carrying out economic activities. This work adopts a systems-thinking approach integrating systemic methodologies in three phases: (1) the VSM was first used to develop a conceptual model of the organisational problem; (2) PLS-PM was used to propose a construct to outline a solution, as well as to statistically validate the relationships proposed in the conceptual model; finally, (3) through the VSM, the relationships between actors were rethought in order to promote sustainable performance. The results obtained suggest that the joint use of VSM and PLS-PM is an effective approach that

aids in the identification of relational and structural pathologies affecting the observed RAMSAR systems. It also proved useful to suggest that relationships can lead to the sustainable performance of the sites under study. It should be noted that the framework of systemic tools is constrained in its application to the organisational domain: assessing two RAMSAR areas in Mexico. Methodologically, this is the first application of the integrated use of VSM and PLS-PM to analyse the management and viability/sustainability of RAMSAR areas from an organisational perspective, opening a new avenue for the analysis and optimisation of management of such areas. This study provides tools to support actors and academics related to RAMSAR sites and opens up a discussion on how to rethink the organisational interactions in order to improve RAMSAR sites' adaptive capabilities. © 2019 by the authors.

Sánchez-García, J. Y., Ramírez-Gutiérrez, A. G., Núñez-Ríos, J. E., Cardoso-Castro, P. P., Rojas, O. G. (2019), "Systems thinking approach to sustainable performance in RAMSAR sites", *Sustainability* (Switzerland) 11(22), 6469, doi: [10.3390/su11226469](https://doi.org/10.3390/su11226469). Article.

Adrián Ramírez Nafarrate

SNI Nivel II

ANALYTICS MEETS PORT LOGISTICS: A DECISION SUPPORT SYSTEM FOR CONTAINER STACKING OPERATIONS

ABSTRACT. A Decision Support System (DSS) is proposed in this paper for improving container stacking operations. This DSS addresses the stacking problem for import containers via a two-step strategy. First, dwell times are predicted for each container using analytics techniques. This prediction is used as an input for a mathematical programming model that minimizes container rehandles heuristically. Numerical examples are presented using data from the Port of Arica in Chile as a case study. The results confirm the virtues of the proposed DSS to effectively support planning decisions at the container yard. Furthermore, results also show good performance of the operations at the yard in terms of rehandles in comparison with the current practices of this port terminal and well-known stacking strategies. © 2019 Elsevier B.V.

Maldonado S., González-Ramírez R.G., Quijada F., Ramírez-Nafarrate A. (2019), "Analytics meets port logistics: A decision support system for container stacking operations", *Decision Support Systems* 121: 84-93, doi: [10.1016/j.dss.2019.04.006](https://doi.org/10.1016/j.dss.2019.04.006). Article.

Adrián Ramírez Nafarrate

SNI Nivel II

PREDICTIVE ANALYTICS FOR HOSPITAL ADMISSIONS FROM THE EMERGENCY DEPARTMENT USING TRIAGE INFORMATION

ABSTRACT. In this paper, we investigate the predictive factors of hospital admissions from the emergency department (ED) in various classification models and evaluate their performance. We analyze data from a major hospital in a metro area in the United States with an approximately 50,000 ED visits per year using logistic regression, artificial neural network, decision tree, random forest, support vector machine and extreme gradient boosting methods. The predictive accuracy of the models are evaluated in multiple experiments in which data volume on training and validation varied with multiple years of data. The data set also included a set of observations from a year when an influenza pandemic occurred, which made the data set statistically different. The extreme gradient boosting algorithm (XGBoost) gives the highest area under curve (AUC) statistic and it stands out as one of the fastest algorithms. However, a less sophisticated model, such as simple logistic regression model, also performs well in a reasonable computational time. We also evaluate performance of models with correct classification of patient admission from the emergency department. In our experiments, increasing data volume for model training and validation do not change performances of models significantly, since we have used a large number of observations in initial training and validation experiments. However, support vector machines (SVM) show notable decrease in AUC statistic while model accuracy of the XGBoost algorithm increases. In addition, increasing the data volume slightly increases the AUC statistic for the XGBoost algorithm (i.e., from 83% to 86%) while other methods show slight decreases. Using the most accurate and efficient predictive model for ED admissions would help hospitals design a decision support systems for efficient information flow from the triage at the ED to both outpatient and inpatient units in case of admissions, as basic administrative data with patient acuity information can provide predictions for bed capacity planning. © 2018 Elsevier B.V.

Araz O. M., Olson D., Ramirez-Nafarrate A. (2019), "Predictive analytics for hospital admissions from the emergency department using triage information", *International Journal of Production Economics* 208: 199-207, doi: [10.1016/j.ijpe.2018.11.024](https://doi.org/10.1016/j.ijpe.2018.11.024). Article.

Román Rodríguez Aguilar

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HOUSEHOLD EXPENDITURE IN HEALTH IN MEXICO, 2016

ABSTRACT. The aim of this research is to evaluate the financial protection of public health insurance by analyzing the percentage of households with catastrophic expenditure in health (HCEH) in Mexico and its relationship with the condition of poverty, the state, the condition of insurance, and the items of health expenditure. A special emphasis was placed on the poorest households (income quintile I). Method: The National Household Income and Expenditure Survey 2002-2016 was used to estimate the percentage of HCEH. The analysis was carried out with Stata-SE 12. Results: in 2016 there was 2.13% of HCEH (1.82-2.34%, N = 657,474). Conclusions: the percentage of HCEH decreased in recent years, although in 2016 it increased slightly, improving financial protection in health. This decrease seems to have stagnated, maintaining inequities in access to health services, especially in the rural population without affiliation to any health institution. © 2020, Springer Nature Switzerland AG.

Rodríguez-Aguilar, R., Rivera-Peña, G., Ramírez-Pérez, H. X. (2020), "Household Expenditure in Health in Mexico, 2016", *Advances in Intelligent Systems and Computing* 1072: 662-670, doi: [10.1007/978-3-030-33585-4_64](https://doi.org/10.1007/978-3-030-33585-4_64). Conference Paper.

Román Rodríguez Aguilar

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José Antonio Marmolejo Saucedo

SNI Nivel II

[Colaboración: Facultad de Ingeniería]

ESTIMATION OF ELECTRICITY PRICES IN THE MEXICAN MARKET

ABSTRACT. This paper presents an alpha stable regression model to estimate prices in the Mexican Electric Market. This market began operations in February 2016. The observed prices show great fluctuations in the observed data due to diverse aspects, a seasonality of the demand, the availability of fuel and the problems of congestion in the electrical network. It is relevant in a market context to have a price estimation as accurate as possible for the decision making of supply and demand. This paper proposes a methodology of the price estimation through the application of

stable alpha regressions, since the behavior of the electric market has shown the presence of heavy tails in its price distribution. © 2020, Springer Nature Switzerland AG.

Rodríguez-Aguilar, R., Marmolejo Saucedo, J. A., Vasant, P. (2020), "Estimation of Electricity Prices in the Mexican Market", *Advances in Intelligent Systems and Computing* 1072: 11-17, doi: [10.1007/978-3-030-33585-4_2](https://doi.org/10.1007/978-3-030-33585-4_2). Conference Paper.

Román Rodríguez Aguilar

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SNI Nivel II

[Colaboración: Facultad de Ingeniería]

PRICES OF MEXICAN WHOLESALE ELECTRICITY MARKET: AN APPLICATION OF ALPHA-STABLE REGRESSION

ABSTRACT. This paper presents a proposal to estimate prices in the Mexican Wholesale Electric Market, which began operations in February 2016, which is why it moves from a scheme with a single bidder to a competitive market. There are particularities in the case of the Mexican market, the main one being the gradual increase in the number of competitors observed until now and, on the other hand, the geographic and technical characteristics of the electric power generation. The observed prices to date show great fluctuations in the observed data due to diverse aspects; among the stems we can mention the own seasonality of the demand of electrical energy, the availability of fuel, the problems of congestion in the electrical network, as well as other risks such as natural hazards. For the above, it is relevant in a market context to have a price estimation as accurate as possible for the decision-making of supply and demand. This paper proposes a methodology for the generation of electricity price estimation through the application of stable alpha regressions, since the behavior of the electric market has shown the presence of heavy tails in its price distribution. © 2019 by the authors.

Rodríguez-Aguilar R., Marmolejo-Saucedo J. A., Retana-Blanco B. (2019), "Prices of Mexican Wholesale Electricity Market: An application of alpha-stable regression", *Sustainability* (Switzerland) 11(11), 3185, doi: [10.3390/su11113185](https://doi.org/10.3390/su11113185). Article.

Omar Guillermo Rojas Altamirano

SNI Nivel I

AN EMPIRICAL ANALYSIS OF THE RELATIONSHIPS BETWEEN CRUDE OIL, GOLD AND STOCK MARKETS

ABSTRACT. Oil and gold are used as investment assets and so they are closely related to the evolution of stock market indices, given that any influence on decisions about investment portfolios can affect stock market returns. Consequently, it is important for investors to analyze the direction of influence between crude oil, gold and stock markets when designing and implementing their investment strategies. Thus, this paper studies the direction of the causality among the three markets for the US case. In doing so, we apply linear and non-linear Granger causality tests for daily data from the Great Moderation onwards. Evidence is provided as to the importance of considering the possibility of nonlinear relationships between the three markets, a feature which cannot be revealed using conventional linear causality tests which would therefore lead to an information loss about the true link. The results for the full sample indicate that the causality goes in all directions, which implies that changes in the stock market returns may be monitored by observing changes in the returns of the two commodity markets considered (and vice versa). This may help to design substitution investment strategies. The results also indicate that the direction of influence between markets does not exhibit material differences between various subsamples, with the exception of the causality relationship between the two commodity markets. This may in part help explain the contradictory results and mixed conclusions found in previous related literature.

Coronado, Semei; Jimenez-Rodriguez, Rebeca; Rojas, Omar (2018), "An Empirical Analysis of the Relationships between Crude Oil, Gold and Stock Markets", *Energy Journal* 39: 193-207, doi: [10.5547/01956574.39.SI1.scor](https://doi.org/10.5547/01956574.39.SI1.scor). Article.

Omar Guillermo Rojas Altamirano

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Manuel Soto Pérez

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SELF-EFFICACY AND JOB SATISFACTION AS ANTECEDENTS OF CITIZENSHIP BEHAVIOUR IN PRIVATE SCHOOLS

ABSTRACT. This study evaluates the citizenship behaviour of customers and employees from a private school and aims to identify if variables like

teachers' self-efficacy and job satisfaction precede such a behaviour. The study was developed in the teaching field, where parents are considered as customers, teachers are employees from private schools that teach 6 to 18 years old students. The method consists of personal surveys applied to teachers and parents in order to measure their perceptions and opinions. The quantitative analysis applied was structural equation modelling. Results confirmed a positive and significant relationship between teachers' self-efficacy, job satisfaction, organisational citizenship behaviour (OCB) and promoter citizenship behaviour. The study revealed that it is more probable that if a school has teachers showing a good level of self-efficacy, intrinsic job satisfaction and OCB, customers will be more satisfied and would recommend their private school to friends and relatives. Copyright © 2019 Inderscience Enterprises Ltd.

Soto M., Rojas O. (2019), "Self-efficacy and job satisfaction as antecedents of citizenship behaviour in private schools", *International Journal of Management in Education* 13(1): 82-96, doi: [10.1504/IJMIE.2019.096472](https://doi.org/10.1504/IJMIE.2019.096472). Article.

Germán Roberto Scalzo Molina

SNI Nivel I

A GENEALOGY OF THE GIFT

ABSTRACT. This chapter takes a look at the gift, in which academic interest has recently grown, especially after the release of Benedict XVI's social encyclical *Caritas in Veritate*. It outlines a genealogy of the gift, briefly presenting the three main stages of its evolution: (1) the ceremonial gift, typical of the ancient world and found in the cultural anthropological approach that the French tradition later adopted (Mauss, Caillé, Hénaff, etc.); (2) the moral gift, which Aristotle first outlined to explain the emergence of the city; and (3) the personal gift, developed in the Middle Ages thanks to Christian Revelation and its corresponding idea of the person. © 2017, Springer International Publishing AG.

Scalzo G. (2017), "A Genealogy of the Gift", *Perspectives on Philosophy of Management and Business Ethics* (Cham: Springer), 31-45, doi: [10.1007/978-3-319-46973-7_3](https://doi.org/10.1007/978-3-319-46973-7_3). Book Chapter.

Germán Roberto Scalzo Molina

SNI Nivel I

ARISTOTELIAN PHRONESIS AS A KEY FACTOR FOR LEADERSHIP IN THE KNOWLEDGE-CREATING COMPANY ACCORDING TO IKUJIRO NONAKA [A FRÕNESE ARISTOTÉLICA COMO FATOR-CHAVE PARA A LIDERANÇA NA EMPRESA CRIADORA DE CONHECIMENTO SEGUNDO IKUJIRO NONAKA] [LA FRÕNESIS ARISTOTÉLICA COMO FACTOR CLAVE PARA EL LIDERAZGO EN LA EMPRESA CREADORA DE CONOCIMIENTO SEGÙN IKUJIRO NONAKA]

ABSTRACT. In the last decades, there has been an increasing interest on knowledge in the business realm. Japanese scholar Ikujiro Nonaka was among the main theoretical and practical contributors to knowledge creation in organizations, as well as a promoter of including practical reason in the research of business topics such as decision-making, knowledge management, ethics and leadership. In his theory, a Western classical tradition, namely the virtue of phronesis, is combined with the Japanese notion of Ba (context-based learning), to explain the way people engage in communities of practice as opportunities for learning. This paper describes his theory of knowledge creation, pointing to phronetic leadership skills as essential drivers of knowledge creation in organizations, in light of the Western classical tradition. Finally, it discusses the scope and limits of Nonaka's contribution, as well as some challenges it posits in order to make the business realm a true space for learning and human flourishing. © 2019, Pontificia Universidad Javeriana. All rights reserved.

Scalzo G., Fariñas G. (2019), "Aristotelian phronesis as a key factor for leadership in the knowledge-creating company according to Ikujiro Nonaka [A frõnese aristotélica como fator-chave para a liderança na empresa criadora de conhecimento segundo Ikujiro Nonaka] [La frõnesis aristotélica como factor clave para el liderazgo en la empresa creadora de conocimiento según Ikujiro Nonaka]", *Cuadernos de Administración* 31(57): 19-44, doi: [10.11144/Javeriana.cao31-57.ap-klf](https://doi.org/10.11144/Javeriana.cao31-57.ap-klf). Article.

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MEANING IN PROFESSIONAL ETHICS: THE CASE OF BUSINESS STUDENTS [SIGNIFICADO DE LA ÉTICA PROFESIONAL: EL CASO DE ESTUDIANTES DE CIENCIAS EMPRESARIALES]

ABSTRACT. This qualitative research aims to present the significance and experiences that economics and business students report to have acquired in professional ethics classes at the university level. Professional ethics, by nature, is both theoretical and practical, which means that the theory that students learn must be applied to real situations. In this sense, what students learn serves as a paradigm for action. Among the most significant findings herein was that students value the ethical training offered by the university as a complement to their technical training, however, they consider innovative strategies in teaching fundamental to their classroom experience. Students share that the significance they acquire about ethics ranges from the personal to the professional and the social, highlighting the eminently relational nature of this subject. © 2019 Universidad Nacional de Educación a Distancia. All rights reserved.

Scalzo G., Galbán-Lozano S. E., Ortega-Barba C. F. (2019), "Meaning in professional ethics: The case of business students [Significado de la ética profesional: el caso de estudiantes de ciencias empresariales]", *Revista de Humanidades* (Spain) 36: 233-252, doi: [10.5944/rdh.36.2019.20197](https://doi.org/10.5944/rdh.36.2019.20197). Article.

Germán Roberto Scalzo Molina

SNI Nivel I

VIRTUES AND THE COMMON GOOD IN PRODUCTION

ABSTRACT. This chapter reflects on the nature of production and the conceptual differences between action and production. It explores the purpose of the business firm as a community of people, as well as the issues that arise therefrom related to the virtue of justice and property rights. The chapter draws attention to the issues concerning production and the environment that emerged with modernity and industrialization. It presents the Aristotelian view of production as subordinate to ethics and politics, and how that view shifted in modernity. The chapter brief-

ly shows the evolution of organization theory, from a technical account of the firm to a comprehensive idea of cooperative work, thanks to intrinsic and transcendent motivations. Finally, it explains how Catholic Social Teaching (CST) has consistently called for a moral order of production, emphasizing human dignity and service to the common good.

Scalzo G. (2018), "Virtues and the Common Good in Production". In Alejo José G. Sison, Ignacio Ferrero, and Gregorio Guitián (eds.), *A Virtue Ethics and Common Good Approach* (London: Routledge), 82-98. Book Chapter.

Edgar Demetrio Tovar García

SNI Nivel II

EXPORT AND IMPORT COMPOSITION AS DETERMINANTS OF BILATERAL TRADE IN GOODS: EVIDENCE FROM RUSSIA

ABSTRACT. Conventional theory and several empirical studies state that incomes and exchange rates are the key determinants of the trade balance. Here, we argue that export and import composition are also key explanatory variables because some goods are inelastic and/or with a high added value, directly and indirectly affecting income and price elasticities and trade balance. Thus, if exports and/or imports significantly consist of price inelastic products, then, a positive and a negative effect, respectively, should be expected on the trade balance. Using bilateral trade data and dynamic panel models, we found that the ratio of exports of crude petroleum and natural gas (price inelastic goods) to total exports is significantly and positively associated with the Russian trade balance in goods. For its part, Russian imports of high-tech goods (income elastic and price inelastic with a high added value) show a negative association. The goods balance of Russia also responded to changes in relative income, but there is only weak evidence of reactions to changes in the exchange rate. These findings partially explain the persistent surplus in the Russian trade balance and current account. © 2019, © 2019 Informa UK Limited, trading as Taylor & Francis Group.

Tovar-García, E. D. (2019), "Export and import composition as determinants of bilateral trade in goods: evidence from Russia". *Post-Communist Economies* 31(4): 530-546. Article.



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AN ATTEMPT TO CREATE CRIOLLOS ELITES: AMERICAN KNIGHTS COMPANY OF GUARDIAS DE CORPS [UN INTENTO DE FORMACIÓN DE ÉLITES CRIOLLAS: LA COMPAÑÍA DE CABALLEROS AMERICANOS DE LAS GUARIDAS DE CORPS]

ABSTRACT. This paper analyzes a little-known and short circumstance but it is particularly relevant: The establishment of a Knights' Company in Real Cuerpo de Guardias de Corps. The Royal Guards are known for their elite carácter. The close relationships with the King could mean a stunning promotion in the military career or the Access to relevant public positions. With the official name of Segunda Compañía Española de Caballeros Americanos during the reign of Carlos IV, it opened the possibility for American loyal vassals to work in the select Real Cuerpo de Guardias de Corps. © 2019, Institute for Social, Political and Legal Studies. All rights reserved.

Baltar Rodríguez, J. F., Andreu Gálvez, M. (2019), "An attempt to create criollos elites: American Knights Company of Guardias de Corps [Un intento de formación de élites criollas: La compañía de Caballeros Americanos de las Guaridas de Corps]", *Glossae* 16: 1-23. Article.

Eric H. Leroux

Profesor Investigador

TRADE IN SERVICES AND THE PACIFIC ALLIANCE: CONTRASTING AMBITIONS WITH REALITY

ABSTRACT. The Pacific Alliance (PA) is a trade-liberalizing initiative that is dutifully espousing pre-existing models of services rule-making reflected in, on the one hand, the North American Free Trade Agreement (NAFTA), and on the other, the World Trade Organization General Agreement on Trade in Services (GATS). The services disciplines agreed to date among PA partners draws on both models, presumably drawing on what is considered to be the best elements of each model. This chapter delves on the main problem of such an approach insofar as both models are arguably flawed, no longer reflect the reality of contemporary services trade, nor tackle issues that will be centrally important to the future of PA members' service sectors and trade in the coming decades. Liberalization prospects in services are today intrinsically linked to cross-border trade, and more specifically to E-Commerce, where market access and non-discrimination issues are no longer the main or sole barriers to cross-border commerce.

Meanwhile, cross-border-trade commitments in other sectors are unlikely to be expanded any time soon since the underlying concerns relate more to regulatory issues than to traditional political economy demands for protection. Looking forward, prospects for deepened trade and investment liberalization in services will depend more on the recognition and harmonization of domestic regulation than on the negotiation of commitments in accordance with standard market access and non-discrimination principles. The achievement of a free-movement-of-services objective will remain elusive unless and until Pacific Alliance countries think outside the confines of existing models and negotiate further trade liberalization more along the lines of the mutual recognition principle, provided, again, that PA Members are committed to achieving significant trade and investment liberalization in services.

Leroux, E. H. (2019), "Trade in Services and the Pacific Alliance: Contrasting Ambitions with Reality". In Pierre Sauvé, Rodrigo Polanco Lazo y José Manuel Álvarez Zárate (eds.), *Pacific Alliance in a World of Preferential Trade Agreements. Lessons in Comparative Regionalism* (Cham: Springer), 155-162, doi: [10.1007/978-3-319-78464-9_8](https://doi.org/10.1007/978-3-319-78464-9_8). Book Chapter.

Miguel Ángel Marmolejo Cervantes

SNI Nivel I

STATE CONTROL IN THE AFTERMATH OF PETROLEUM POLICY AND GOVERNANCE REFORM IN MEXICO: CAPABLE OF FULFILLING CONSTITUTIONAL OBJECTIVES?

ABSTRACT. When extracting petroleum, a constitutional goal for the Mexican state is to optimize income for the state and to contribute to the long-term development of Mexico. In order to achieve this, Mexico has undergone extreme institutional and legal reforms, opening up fields for private participants, encouraging investment and reforming the governance framework. This article analyses the post-reform changes in light of Nelson's criteria of state intervention, concluding that while Mexico has shifted from an autocratic form of participatory intervention to a form akin to that of Norway, there are further reforms necessary in order for the development of Mexico's petroleum resources to achieve the goals of optimizing income and contributing to the long-term development of the Mexico. Such reforms include legislative reform of the Hydrocarbons Law 2014 to include mandatory field optimization, akin to section 4-1 of the Norwegian Petroleum Activities Act, and a legal requirement for development to aid the Mexican industrial sector and stimulate industrial and economic development, which will

significantly contribute to the long-term development of the Mexican nation. Furthermore, the article concludes that although the current Mexican governance framework is capable of delivering the goals of optimization of revenue and long-term development of Mexico, the success will depend on political stability, consensus and a reduction in corruption, which present major challenges to Mexico. © The Author(s) 2019.

Marmolejo-Cervantes, M., Hunter, T.S. (2019), "State control in the aftermath of petroleum policy and governance reform in Mexico: Capable of fulfilling constitutional objectives?", *Journal of World Energy Law and Business* 12(2): 169-195, doi: [10.1093/jwelb/jwz006](https://doi.org/10.1093/jwelb/jwz006). Article.

Miguel Ángel Marmolejo Cervantes

SNI Nivel I

THEORY OF CREATED RISK TO THEORY REGULATED RISK IN HYDROCARBON MATTER [DE LA TEORÍA DEL RIESGO CREADO A LA TEORÍA DEL RIESGO REGULADO EN MATERIA DE HIDROCARBUROS]

ABSTRACT. The hydrocarbon industry in Mexico has undergone fundamental changes in recent years. This article analyzes the legal implications to determine the configuration of civil liability in said industry, with the aim of demonstrating that the hydrocarbon industry, under the paradigm of the new energy regulation in the country, does not fit within the 'theory of created risk', but within a new theory called 'regulated risk theory', whose ultimate rationale consists in the application of a safe standard that allows the administration of dangerous risks, taking into account technological innovation and international standards of security, thus passing from an absolute and unlimited risk, to an manageable and mitigable one. © 2019, Universidad Nacional Autónoma de México. All rights reserved.

Marmolejo Cervantes, M. Á. (2019), "Theory of created risk to theory regulated risk in hydrocarbon matter [De la teoría del riesgo creado a la teoría del riesgo regulado en materia de hidrocarburos]", *Boletín Mexicano de Derecho Comparado* 51(154): 107-145, doi: [10.22201/ijj.24484873e.2019.154.14139](https://doi.org/10.22201/ijj.24484873e.2019.154.14139). Article.

Jorge Eduardo Medina Villanueva

SNI Nivel Candidato

VICTIM FAULT AND COMPARATIVE NEGLIGENCE: EXPLANATION OF A HISTORICAL CONFUSION IN THE LIGHT OF ROMAN WRITINGS [CULPA DE LA VÍCTIMA Y COMPENSACIÓN DE CULPAS EXPLICACIÓN DE UNA CONFUSIÓN HISTÓRICA A LA LUZ DE LOS TEXTOS ROMANOS]

ABSTRACT. Since Roman times the legal consequence arising from the idea that the victim somehow contributed to their own harm was that his/her right to be indemnified was completely ruled out. As of the 18th and 19th century, based on Roman writings, it was thought that this was due to the "comparative negligence", that is, compensating between faults, repealing one another. We consider this is an inaccurate historical interpretation of the Roman sources, which we will demonstrate herein. © 2019 Ediciones Universitarias de Valparaíso. All rights reserved.

Villanueva J. E. M. (2019), "Victim fault and comparative negligence: Explanation of a historical confusion in the light of Roman writings [Culpa de la víctima y compensación de culpas explicación de una confusión histórica a la luz de los textos Romanos]", *Revista de Estudios Histórico-Jurídicos* 41:69-86. Article.

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DUTY TO RENEGOTIATE AND CONTRACT ADAPTATION IN CASE OF HARDSHIP

ABSTRACT. This article examines the situations in which hardship takes place and offers a substantiated analysis about the desirability or necessity of certain remedies under domestic laws, model hardship clauses and international legal instruments. The authors submit that the duty to renegotiate as well as the remedies of contract adaptation and/or termination by a court or arbitral tribunal, although present in several legal systems, are neither necessary nor desirable under current trade practice and dispute resolution methods. The authors take the view that the traditional remedies, e.g. exemption of damages, duty to mitigate loss and/or avoidance of contract by a party's declaration, may serve, more adequately, the interests of contracting parties in hardship scenarios.

Schwenzer I., Muñoz E. (2019), "Duty to renegotiate and contract adaptation in case of hardship", *Uniform Law Review* 24(1): 149-174, doi: [10.1093/ulr/unz009](https://doi.org/10.1093/ulr/unz009). Review.

**SURVEY IN GENERAL POPULATION
REGARDING TERMS RELATED TO
END-OF-LIFE DECISIONS [ENCUESTA
EN POBLACIÓN ABIERTA RESPECTO
A TÉRMINOS RELACIONADOS CON
DECISIONES AL FINAL DE LA VIDA]**

ABSTRACT. Introduction: Concepts related to end-of-life decisions, such as euthanasia, palliative care, advance directives and therapeutic obstinacy, are poorly understood by the general population, which, when facing a terminal situation, is not prepared to choose the best option. Objective: Pilot study (n = 544) to find out what the open population understands about terms used in end-of-life situations in four cities of the Mexican Republic. Method: Survey via Internet with 18 questions about different terms. It was a descriptive, cross-sectional study. Statistical analysis was carried out. Results: People older than 18 years who were not engaged in health-related professional activities were selected. Conclusions: Most terms related to end-of-life decisions were found not to be interesting to or understood by a part of the population. The least recognized term was therapeutic obstinacy (62.8%), and the most widely known, palliative care (91%); there was confusion between the terms euthanasia and assisted suicide (47.8%). Age and education level had more influence in the results, than other demographic variables. © 2019 Academia Nacional de Medicina. All rights reserved.

Pichardo-García L. M. G., Casas-Martínez M. L. L., Jaimes-Palomera M., Sotelo-Méndez A. G., Sosa-Delgado A. P., Quintero-Luna A., López-Vergara-Anaya T. I., Aguilar-Juárez J. A. (2019), "Survey in general population regarding terms related to end-of-life decisions [Encuesta en población abierta respecto a términos relacionados con decisiones al final de la vida]", *Gaceta Médica de México* 155(2): 149-155, Article.



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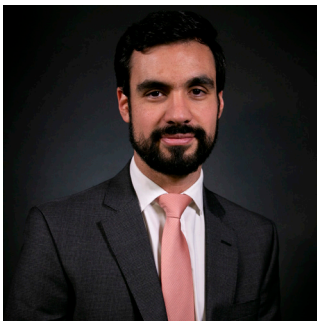
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**INTERDISCIPLINARY BIOETHICS
REFLECTION ON GENETIC EDITING
WITH CRISPR-CAS IN GERMINAL
LINE IN THE CONTEXT OF
TRANSHUMANISM [REFLEXIÓN BIOÉTICA
INTERDISCIPLINARIA EN TORNO A LA
EDICIÓN GENÉTICA CON CRISPR-CAS EN
LÍNEA GERMINAL EN EL CONTEXTO DEL
TRANSHUMANISMO]**

ABSTRACT. The purpose of this article is to explain some of the implications of using the CRISPR-Cas technique in the germinal line for non-therapeutic purposes, in the context of transhumanism. After giving a brief explanation about the nature of this technique, the state of the question is offered in relation to the current international regulations. Afterwards, the consequences of the development of this technique within the framework of the transhumanism project are observed and it offers legal, political and anthropological reflections on these consequences. © 2019 Centro de Investigación Social Avanzada. All rights reserved.

De La Luz Casas Martínez M., Armella V. A., Derive S., González-Del-Rincón M. L., Soto D. I., García H. S. R., Ross A., Ruiz-Gómez L., Añorve V. A. T. (2019), "Interdisciplinary bioethics reflection on genetic editing with CRISPR-Cas in germinal line in the context of transhumanism [Reflexión bioética interdisciplinaria en torno a la edición genética con CRISPR-Cas en línea germinal en el contexto del transhumanismo]", *Open Insight* 10(18): 185-213, doi: [10.23924/oj.v10n18a2019.pp%25p.326](https://doi.org/10.23924/oj.v10n18a2019.pp%25p.326). Review.

Eduardo Óscar Charpenel Elorduy*Investigador Titular B, SNI Nivel I***KANT'S CONCEPTION OF LEGAL CHANGE**

ABSTRACT. Democratic legal systems have recently been subject to rapid and multi-directional processes of change. There are numerous sociological, technological, ideological, or purely political processes which result in law's amendment and transformation. This book argues that this legal change is best understood from a political philosophy perspective. This can be used as an interpretative device to understand the ongoing processes of change as well as their outcomes such as new laws, judicial interpretations, or constitutional amendments. The work has three main objectives: to provide deeper understanding of the problems of legal change within the diversity of Western political and legal thought; to examine the development of the processes of change in terms of their normative and prudential acceptability; to interpret actual processes of change with a view to the general theoretical and normative background. The book is divided into three parts: Part I sets the scene and is focused on the general issues important for understanding and evaluating legal change from the perspective of political philosophy; Part II focuses on the spectrum of politico-philosophical justifications present in the political culture of democratic states; Part III offers selected case studies to specify and apply the philosophical ideas in the previous parts. The book will be a valuable resource for students and scholars of law and jurisprudence, including comparative legal studies and human rights law, political theory, and philosophy.

Charpenel E. (2019), "Kant's conception of legal change". In Maciej Chmielinski and Michal Rupniewski (eds.), *The Philosophy of Legal Change. Theoretical Perspectives and Practical Processes* (Abingdon: Routledge), 124-137. Book Chapter.

André Laks*Investigador Titular D, SNI Nivel III***WHAT IS PRE-SOCRATIC ETHICS?**

ABSTRACT. The field of ancient Greek ethics is increasingly emerging as a major branch of philosophical enquiry, and students and scholars of ancient philosophy will find this Companion to be a rich and invaluable guide to the themes and movements which characterised the discipline from the Pre-Socratics to the Neo-Platonists. Several chapters are dedicated to the central figures of Plato and Aristotle, and others explore the ethical thought of the Stoics, the Epicureans, the Skeptics, and Plotinus. Further chapters examine

important themes that cut across these schools, including virtue and happiness, friendship, elitism, impartiality, and the relationship between ancient eudaimonism and modern morality. Written by leading scholars and drawing on cutting-edge research to illuminate the questions of ancient ethics, the book will provide students and specialists with an indispensable critical overview of the full range of ancient Greek ethics.

Laks A. (2017), "What Is Pre-Socratic Ethics?". In Christopher Bobonich (ed.), *The Cambridge Companion to Ancient Ethics* (California: Cambridge University Press), 11-29. Book Chapter.

David Xavier Levystone

SNI Nivel Candidato

REMPARTS ET PHILOSOPHIE AUX Ve ET IVe SIÈCLES AV.J.-C.

ABSTRACT. The main disciples of Socrates criticize the use of city walls. However, their attacks are less grounded in a deep strategic reflexion than related to the traumatic consequences of Pericles' strategy at the beginning of the Peloponnesian war. The Lacedemonians' opposition to the erection of surrounding walls is more likely linked to their aristocratic ideology and interests than to moral imperatives. Though Plato and Xenophon's motives are to avoid political divisions in the city, their positions on fortifications reveal their aristocratic bias and the question of the walls appears to be part of a more general questioning on the spatial and political organisation of the city. On that issue, Aristotle criticises Plato from a pragmatic point of view and defends the use of walls, but under strict conditions only. The Spartan and Socratic critique of the building of the walls, as well as Aristotle reluctance to fully accept them, could be traced back to a common Greek archaic ideal.

David Xavier Levystone (2019), "Remparts et philosophie aux Ve et IVe siècles av.J.-C.", *Mnemosyne* 72(5): 736-765, doi: [10.1163/1568525X-12342527](https://doi.org/10.1163/1568525X-12342527). Article.

David Xavier Levystone

SNI Nivel Candidato

WHAT RULES AND LAWS DOES SOCRATES OBEY?

ABSTRACT. Socrates' thought of justice and obedience to laws is motivated by a will to avoid the destructive effects of Sophistic criticisms and theories of laws. He thus requires-against theories of natural law-an almost absolute obedience to the law, as far as this law respects the legal system

of the city. But, against legal positivism, Socrates would not admit that a law is just simply because it is a law: he is looking for the true Just. However, as often in Socratic philosophy, Socrates cannot accept that two equally justified and legitimate rights or moral values conflict. © 2019 Universidad Panamericana. All rights reserved.

Lévystone, D. (2019), "What rules and laws does socrates obey?", *Tópicos (México)* 57: 399-430, doi: [10.21555/top.v0i57.1024](https://doi.org/10.21555/top.v0i57.1024). Article.

Luis Xavier López Farjeat

Investigador Titular D, SNI Nivel III

José Alfonso Ganem Gutiérrez

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[Colaboración: Departamento de Humanidades]

ARISTOTLE'S CATEGORIES IN THE ISLAMIC MILIEU THROUGH THE SYRIAC TRADITION

ABSTRACT. In recent years, the publication of several remarkable studies and translations centering on Eastern Christianity has drawn the attention of scholars interested in the reconstruction of the reception and dissemination of philosophical and medical works. These texts played a central role for adapting and adopting Greek philosophy into the Christian cultural setting of the Middle West, as well as the Islamic milieu. As is well known, Syriac translations are an important link for the interpretation of philosophical and theological concepts in Arabic.

The aim of this article is to trace the influence and adaptation of Aristotle's Categories in medieval Christian and Islamic contexts, particularly the way in which the Christian interpretation of this text provided helpful arguments for defining the nature of Christ and the Trinity, as well as the essence of divine attributes, by Christian and Muslim thinkers, respectively. Our hypothesis is that the Syriac version of the Categories and its interpretations played an influential role among Eastern Christians and, through this tradition, it is possible to trace the influence on Islamic discussions on divine attributes.

López-Farjeat, L. X., Ganem Gutiérrez, J. A. (2019), "Aristotle's Categories in the Islamic Milieu Through the Syriac Tradition", *Muslim World* 109(4): 546-560, doi: [10.1111/muwo.12309](https://doi.org/10.1111/muwo.12309). Article.

Luis Xavier López Farjeat
Investigador Titular D, SNI Nivel III

THE SYRIAC TRADITION AS AN INTERMEDIARY IN TRANSMITTING GREEK PHILOSOPHY TO THE ISLAMIC CONTEXT: ARISTOTLE'S CATEGORIES [LA TRADICIÓN SIRIACA COMO INTERMEDIARIA EN LA TRANSMISIÓN DEL PENSAMIENTO FILOSÓFICO GRIEGO AL ENTORNO ISLÁMICO: LAS CATEGORÍAS DE ARISTÓTELES]

ABSTRACT. The aim of this paper is to examine the importance of the Syriac tradition in transmitting Greek philosophy to the Islamic context, starting with an introduction of some historical-philosophical aspects emphasizing the role of Christian Syriac translators. This is followed by a study of the impact of Aristotle's Categories on the creation of the philosophical vocabulary used to formulate the Trinitarian dogma in the Christian tradition, and on the discussions concerning divine attributes within Islamic theology. Through these two examples, I reveal how the Syriac philosophical tradition influenced some Islamic theologians, and argue that the translation work done by Eastern Christians was remarkably important in specific cases. © 2019 Colegio de Mexico, A.C., Departamento de Publicaciones. All rights reserved.

López-Farjeat L. X. (2019), "The Syriac tradition as an intermediary in transmitting Greek philosophy to the Islamic context: Aristotle's categories [La tradición siríaca como intermediaria en la transmisión del pensamiento filosófico griego al entorno islámico: Las Categorías de Aristóteles]", *Estudios de Asia y África* 54(1): 27-55, doi: [10.24201/ea.v54i1.2368](https://doi.org/10.24201/ea.v54i1.2368). Review.

José Alberto Ross Hernández
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THE CAUSALITY OF THE PRIME MOVER IN METAPHYSICS Λ

ABSTRACT. The aim of this paper is to propose a critical revision of the traditional interpretation of Met. Λ , according to which the Aristotelian Prime Mover is the final cause that explains the eternal movement of the heaven, rather than a formal or an efficient cause postulated for the same purpose. The importance of this discussion is widely acknowledged, and it is a subject upon which there is no unanimous agreement among interpreters. The different accounts of the causal relationship between the Unmoved Mover and the physical world have given rise to one of the most recurrent controversies in the history of the trans-

mission of the Corpus Aristotelicum, and it is a question that does not admit simple or simplistic answers.

Ross, A (2016), "The Causality of the Prime Mover in Metaphysics Λ ". In Christoph Horn (ed.), *Aristotle's Metaphysics Lambda - New Essays* (Berlin: De Gruyter), 207-228. Book Chapter.

Leonardo Ruiz Gómez
Profesor Investigador

LEIBNIZ'S ANALYSIS SITUS. INFINITESIMALS AS SITUATIONAL STRUCTURES [LEIBNIZ Y EL ANALYSIS SITUS. LOS INFINITESIMALES COMO ESTRUCTURAS SITUACIONALES]

ABSTRACT. The analysis situs is a geometrical project developed by Leibniz during his years in Paris. The aim of this paper is to outline the notion of "situational structure" through the main ideas of the analysis situs. This notion should explain the relation between this geometrical project and his metaphysics, dynamics and the infinitesimal calculus. This should shed some light on some important Leibnizian notions such as infinitesimals, im-petus and conatus. © 2019 Servicio de Publicaciones de la Universidad de Navarra. All rights reserved.

Ruiz-Gómez L. (2019), "Leibniz's analysis situs. Infinitesimals as situational structures [Leibniz y el analysis situs. Los infinitesimales como estructuras situacionales]", *Anuario Filosófico* 52(3), doi: [10.15581/009.52.3.003](https://doi.org/10.15581/009.52.3.003). Article.

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THE RELATIONSHIP BETWEEN THE PRINCIPLE OF IDENTITY OF INDISCERNIBLES AND THE PRINCIPLE OF SUFFICIENT REASON IN THE LEIBNIZ-CLARKE CORRESPONDENCE

ABSTRACT. The aim of this paper is to render a detailed analysis of the correspondence with Clarke in order to shed some light in the relationship between the Principle of Identity of Indiscernibles and the Principle of Sufficient Reason. Most of the secondary literature takes for granted that Leibniz derives the Principle of Identity of Indiscernible from the Principle of Sufficient Reason in at least some parts of the correspondence. This would render the Principle of Identity of Indiscernibles a merely contingent truth and not a necessary principle. I will argue that this inter-

pretation is misleading, and that Leibniz never abandoned the idea that the Principle of Identity of Indiscernibles is a necessary truth. Although he is continuously using the Principle of Sufficient Reason in his argumentation, he keeps in parallel a strong argumentation that entails the necessity of the Principle of Identity of Indiscernibles. To achieve this goal, it will be necessary to point out first some contextual facts that may determine a correct understanding of the correspondence. It will be also necessary to frame the discussion about the principles into the broader debate on the possibility of Newtonian space. Finally, it will be shown that the mentioned hypothesis is supported by textual evidence throughout the entire correspondence. © 2017 Franz Steiner Verlag Wiesbaden GmbH. All right reserved.

Ruiz-Gómez L. (2017), "The relationship between the principle of identity of indiscernibles and the principle of sufficient reason in the Leibniz-Clarke correspondence", *Studia Leibnitiana* 49(1): 96-110, doi: [10.25162/SL-2017-0005](https://doi.org/10.25162/SL-2017-0005). Article.

Héctor Jesús Zagal Arreguín

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MUSIC IN ARISTOTLE [LA MÚSICA EN ARISTÓTELES]

ABSTRACT. Aristotle claims that music is essential for the citizen's education. Music, it seems, causes or moderates passions. Therefore, character's education through music is fundamental to the pólis, since political stability depends on the citizen's moral stability. Secondly: if, for what is said in Poetics, music is an imitation, then it is through music that we obtain certain knowledge. But what is the object of music's imitation? In Politics, Aristotle claims that music imitates passions, because music, for its acoustical origin, does not need any sign to refer passions. However, music is itself a passion. Then music is direct, as an imitation, that it is indeed way more important for the character's education. That is its political relevance. This conclusion, on the other hand, leads us to claim that Aristotle does not hold a figurative concept of art. © 2019 Centro de Investigacion Social Avanzada. All rights reserved.

Arreguín H. Z. (2019), "Music in Aristotle [La música en Aristóteles]", *Open Insight* 10(19): 149-163, doi: [10.23924/oi.v10n19a2019.pp%25p.358](https://doi.org/10.23924/oi.v10n19a2019.pp%25p.358). Article.

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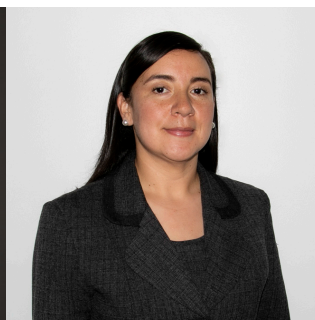
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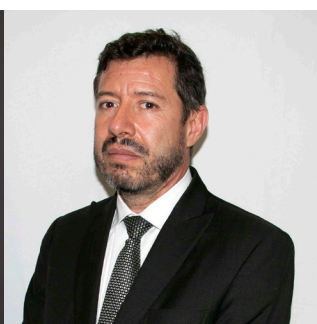
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² Colaboración en un artículo publicado en la Facultad de Ciencias de la Salud (p. 60).



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⁵ Colaboración en un artículo publicado en la Facultad de Ciencias de la Salud (p. 60).



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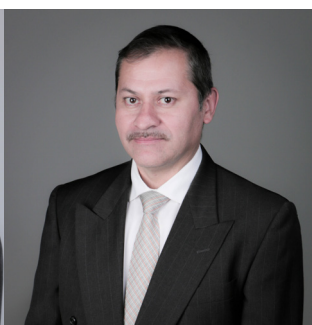
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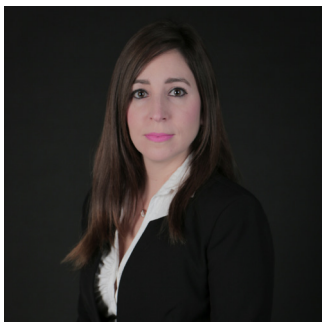
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⁶ Colaboración en un artículo publicado en la Escuela de Dirección de Negocios Gastronómicos (p. 44).



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GRADIENT DESCENT-BASED OPTIMIZATION METHOD OF A FOUR- BAR MECHANISM USING FULLY CARTESIAN COORDINATES

ABSTRACT. Machine vibrations often occur due to dynamic unbalance inducing wear, fatigue, and noise that limit the potential of many machines. Dynamic balancing is a main concern in mechanism and machine theory as it allows designers to limit the transmission of vibrations to the frames and base of machines. This work introduces a novel method for representing a four-bar mechanism with the use of Fully Cartesian coordinates and a simple definition of the shaking force (ShF) and the shaking moment (ShM) equations. A simplified version of Projected Gradient Descent is used to minimize the ShF and ShM functions with the aim of balancing the system. The multi-objective optimization problem was solved using a linear combination of the objectives. A comprehensive analysis of the partial derivatives, volumes, and relations between area and thickness of the counterweights is used to define whether the allowed optimization boundaries should be changed in case the mechanical conditions of the mechanism permit it. A comparison between Pareto fronts is used to determine the impact that each counterweight has on the mechanism's balancing. In this way, it is possible to determine which counterweights can be eliminated according to the importance of the static balance (ShF), dynamic balance (ShM), or both. The results of this methodology when using three counterweights reduces the ShF and ShM by 99.70% and 28.69%, respectively when importance is given to the static balancing and by 83.99% and 8.47%, respectively, when importance is focused on dynamic balancing. Even when further reducing the number of counterweights, the ShF and ShM can be decreased satisfactorily. © 2019 by the authors.

Orvañanos-Guerrero, M. T., Sánchez, C. N., Rivera, M., Acevedo, M., Velázquez, R. (2019), "Gradient descent-based optimization method of a four-bar mechanism using fully cartesian coordinates", *Applied Sciences* (Switzerland) 9(19), 4115, doi: [10.3390/app9194115](https://doi.org/10.3390/app9194115). Article.

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OPTIMUM BALANCING OF THE FOUR- BAR LINKAGE USING FULLY CARTESIAN COORDINATES

ABSTRACT. This article presents the design optimization of the four-bar linkage for the reduction of the Shaking Force and the Shaking Moment. It is followed a novel procedure based on fully Cartesian Coordinates (Natural Coordinates) and the use of counterweights. These counterweights with as little restrictive constraints on their geometric parameters as possible. No particular counterweight shape in advance is assumed. The analytical equations for the linear momentum and for the angular momentum are obtained, resulting in equations expressed in terms on the mass and the coordinates of the center of mass of the counterweights. These expressions are then used to obtain the Shaking Force and the Shaking Moment of the system in a very direct way. To solve the inverse dynamics problem the inversion of the transpose of the Jacobian matrix, associated to the kinematic constraints, is not required. The links' masses are restricted only by imposing positive mass values. As a novelty, the most influencing optimization variables are identified using a global sensitivity analysis method, leading to a reduction on the number of optimization variables. The minimization is done using Evolutionary Computation. The results obtained are validated by simulations, and compared to those presented in previous representative works. © 2003-2012 IEEE.

Acevedo, M., Orvananos, T., Velazquez, R., Haro, E. (2019), "Optimum Balancing of the Four-Bar Linkage Using Fully Cartesian Coordinates", *IEEE Latin America Transactions* 17(6), 8896821: 983-990, doi: [10.1109/TLA.2019.8896821](https://doi.org/10.1109/TLA.2019.8896821). Article.

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SHAKING MOMENT BALANCING OF A FOUR-BAR MECHANISM USING ACTUATION REDUNDANCY

ABSTRACT. Shaking moment balancing of force-balanced mechanisms is typically achieved by the use of counter-inertias that, in general, are very large. This leads to a substantial increase in the total mass of the linkage. In opposition to these traditional methods a novel, simple and direct method that takes advantage of actuation redundancy is proposed. The method can be generalized to any force balanced planar mechanism and is based on the solution of the inverse dynamics problem. The method is exemplified through the shaking moment balancing of a four-bar mechanism, previously balanced by force, following a didactic approach. Effectiveness of the method is verified by dynamic simulation. © 2019, Springer Nature Switzerland AG.

Acevedo M., Orvañanos T., Velázquez R. (2019), "Shaking Moment Balancing of a Four-Bar Mechanism Using Actuation Redundancy", *Mechanisms and Machine Science* 73: 3319-3327, doi: [10.1007/978-3-030-20131-9_328](https://doi.org/10.1007/978-3-030-20131-9_328). Book Chapter.

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USING FULLY CARTESIAN COORDINATES TO CALCULATE THE SUPPORT REACTIONS OF MULTI-SCALE MECHANISMS

ABSTRACT. It is well known that machine vibrations often occur due to dynamic unbalance. They induce noise, wear, and fatigue problems that prevent many machines from attaining their full potential. Dynamic balancing of mechanisms allows to limit the transmission of vibrations to the base, an advantage that could be exploited in hand tools, machinery, vehicles moving in free space and robots. This work presents a method for representing a four-bar mechanism with the use of Fully Cartesian coordinates and its equations for calculating the shaking force (ShF) and the shaking moment (ShM). Such method can be applied and it is useful for the analysis of multi-scale (meso/micro/nano) mechanisms. The projected Gradient Descent is used to minimize the ShF and ShM functions with the aim of balancing the system. The Taylor's theorem was used for calculating the step length. The multiobjective optimization problem was solved using a linear combination of the objectives. The result of this methodology reduces successfully the ShF and the ShM by 31% and 65%, respectively. © 2018 IEEE.

Orvananos-Guerrero M. T., Sanchez C. N., Davalos-Orozco O., Rivera M., Velazquez R., Acevedo M. (2019), "Using Fully Cartesian Coordinates to Calculate the Support Reactions of Multi-Scale Mechanisms", *Proceedings - 2018 Nanotechnology for Instrumentation and Measurement, NANOJIM 2018*, 8688610, doi: [10.1109/NANOJIM.2018.8688610](https://doi.org/10.1109/NANOJIM.2018.8688610). Conference Paper.

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OPTIMAL DESIGN OF CLASSROOM SPACES IN NATURALLY-VENTILATED BUILDINGS TO MAXIMIZE OCCUPANT SATISFACTION WITH HUMAN BIOEFFLUENTS/BODY ODOR LEVELS

ABSTRACT. Inadequate indoor air quality in education buildings has been reported to cause health problems, contagion, poor academic performance and absenteeism of occupants. To minimize these adverse effects, the use of natural ventilation systems and hybrid ventilation systems in buildings have increased in recent years. This paper presents the development of a novel optimization model that provides the capability of optimizing education building design in order to maximize occupant satisfaction in the classrooms space in terms of perception of human bioeffluents/body odor while minimizing the construction cost. The multi-objective optimization model is developed in three main stages: (1) model formulation stage that identifies relevant design variables, objective functions and constraints; (2) model implementation stage that executes the optimization computations; and (3) model evaluation stage that analyses the performance of the developed model using an application example. The findings of this performance analysis illustrates the capability of the developed optimization model to generate a wide range of optimal trade-offs solutions, where each provides a unique and optimal trade-off between occupant satisfaction with human bioeffluents/body odor levels and its construction cost. This enables designers to generate and analyze these optimal trade-offs and accordingly identify an optimal set of design decisions that maximize satisfaction with human bioeffluents/body odor levels of occupants while complying with specified budget constraint. © 2019 Elsevier Ltd.

Acosta-Acosta, D. F., El-Rayes, K. (2020), "Optimal design of classroom spaces in naturally-ventilated buildings to maximize occupant satisfaction with human bioeffluents/body odor levels", *Building and Environment* 169, 106543, doi: [10.1016/j.buildenv.2019.106543](https://doi.org/10.1016/j.buildenv.2019.106543). Article.

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CONSUMER ACCEPTANCES THROUGH FACIAL EXPRESSIONS OF ENCAPSULATED FLAVORS BASED ON A NANOTECHNOLOGY APPROACH

ABSTRACT. This paper presents a new methodology for analyzing consumer preferences and acceptance of food flavors through facial emotion recognition. In this study, we applied a method based on nanotechnology to produce encapsulations of several flavor profiles. Facial expressions were detected through the Microsoft Kinect sensor and video images of 120 volunteers tasting five different flavor samples were obtained. A neural network was trained to measure emotions through facial expressions in every frame. Then, the combination of the consumer's evaluations, the frame number interval where the consumers tried the sample, and the expressions found in the videos were used to solve a regression problem using different supervised learning techniques: Support Vector Machines for regression and Multilayer Perceptron and Regression Trees to predict whether a specific taste might be accepted or rejected. We show that this methodology could be used in food marketing. © 2018 IEEE.

Alvarez V. M., Dominguez-Soberanes J., Sanchez C. N., Gutierrez S., Lopez B., Quiroz R., Mendoza D. E., Buentia H. E., Velazquez R. (2019), "Consumer Acceptances Through Facial Expressions of Encapsulated Flavors Based on a Nanotechnology Approach", *Proceedings - 2018 Nanotechnology for Instrumentation and Measurement, NANOIM 2018*, 8688613, doi: [10.1109/NANOIM.2018.8688613](https://doi.org/10.1109/NANOIM.2018.8688613). Conference Paper.

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CHARACTERIZATION AND DETERMINATION OF THE TOXICOLOGICAL RISK OF BIOCHAR USING INVERTEBRATE TOXICITY TESTS IN THE STATE OF AGUASCALIENTES, MÉXICO

ABSTRACT. Following a quantitative analysis of adequate feedstock, comprising 11 woody biomass species, four biochars were generated using a Kon-Tiki flame curtain kiln in the state of Aguascalientes, Mexico. Despite the high quality (certified by European Biochar Certificate), the biochars contain substantial quantities of hazardous substances, such as polycyclic aromatic hydrocarbons, polychlorinated dibenzo-p-dioxins and dibenzofurans, polychlorinated biphenyls, and heavy metals, which can induce adverse effects if wrongly applied to the environment. To assess the toxicity of biochars to non-target organisms, toxicity tests with four benthic and zooplanktonic invertebrate species, the ciliate *Paramecium caudatum*, the rotifer *Lecane quadridentata*, and the cladocerans *Daphnia magna* and *Moina macrocopa* were performed using biochar elutriates. In acute and chronic toxicity tests, no acute toxic effect to ciliates, but significant lethality to rotifers and cladocerans was detected. This lethal toxicity might be due to ingestion/digestion by enzymatic/mechanic processes of biochar by cladocerans and rotifers of toxic substances present in the biochar. No chronic toxicity was found where biochar elutriates were mixed with soil. These data indicate that it is instrumental to use toxicity tests to assess biochars' toxicity to the environment, especially when applied close to sensitive habitats, and to stick closely to the quantitative set-point values. © 2019 by the authors.

Flesch F., Berger P., Robles-Vargas D., Santos-Medrano G. E., Rico-Martínez R. (2019), "Characterization and determination of the toxicological risk of biochar using invertebrate toxicity tests in the state of Aguascalientes, México", *Applied Sciences* (Switzerland) 9(8), 1706, doi: [10.3390/app9081706](https://doi.org/10.3390/app9081706). Article.

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A NOVEL ARTIFICIAL ORGANIC CONTROL SYSTEM FOR MOBILE ROBOT NAVIGATION IN ASSISTED LIVING USING VISION-AND NEURAL-BASED STRATEGIES

ABSTRACT. Robots in assisted living (RAL) are an alternative to support families and professional caregivers with a wide range of possibilities to take care of elderly people. Navigation of mobile robots is a challenging problem due to the uncertainty and dynamics of environments found in the context of places for elderly. To accomplish this goal, the navigation system tries to replicate such a complicated process inspired on the perception and judgment of human beings. In this work, we propose a novel nature-inspired control system for mobile RAL navigation using an artificial organic controller enhanced with vision-based strategies such as Hermite optical flow (OF) and convolutional neural networks (CNNs). Particularly, the Hermite OF is employed for obstacle motion detection while CNNs are occupied for obstacle distance estimation. We train the CNN using OF visual features guided by ultrasonic sensor-based measures in a 3D scenario. Our application is oriented to avoid mobile and fixed obstacles using a monocular camera in a simulated environment. For the experiments, we use the robot simulator V-REP, which is an integrated development environment into a distributed control architecture. Security and smoothness metrics as well as quantitative evaluation are computed and analyzed. Results showed that the proposed method works successfully in simulation conditions. © 2018 Hiram Ponce et al.

Ponce H., Moya-Albor E., Brievea J. (2018), "A Novel Artificial Organic Control System for Mobile Robot Navigation in Assisted Living Using Vision-and Neural-Based Strategies", *Computational Intelligence and Neuroscience* 2018, 4189150, doi: [10.1155/2018/4189150](https://doi.org/10.1155/2018/4189150). Article.

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NON-CONTACT BREATHING RATE MONITORING SYSTEM BASED ON A HERMITE VIDEO MAGNIFICATION TECHNIQUE

ABSTRACT. In this paper we present a new non-contact strategy to estimate the breathing rate based on the Eulerian motion magnification technique and a system based on different images processing steps. After the magnification procedure, a ROI is selected manually, an enhancement algorithm based on an adaptive histogram equalization is applied and finally the frames are binarized using the Otsu algorithm. Morphological operations are carry out on the video frames and a tracking temporal strategy is implemented to estimate the breathing rate. The magnification procedure was carried out using an Hermite decomposition. We have tested the method on three subjects in four positions (seat, lying face down, lying face up and lying in fetal position). The motion magnification approach is compared to the Laplacian decomposition strategy computing the mean absolute error. © SPIE. Downloading of the abstract is permitted for personal use only.

Brieua J., Moya-Albor E., Rivas-Scott O., Ponce H. (2018), "Non-contact breathing rate monitoring system based on a Hermite video magnification technique", *Proceedings of SPIE - The International Society for Optical Engineering 10975*, 1097504, doi: [10.1117/12.2513608](https://doi.org/10.1117/12.2513608). Conference Paper.

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SEGMENTATION AND MOTION ESTIMATION APPLIED TO FETAL HEART ANALYSIS USING A MULTI-TEXTURE ACTIVE APPEARANCE MODEL AND AN OPTICAL FLOW APPROACH

ABSTRACT. In this work we present a combination of segmentation and motion estimation methods applied to left ventricle evaluation in fetal echocardiographic images which are used for prenatal diagnosis. In our proposed scheme, several features

of the ultrasound images are computed and used for both algorithms. A multiresolution framework is employed for the segmentation and motion estimation tasks. The segmentation is achieved using a multi-texture active appearance model based on the Hermite transform. The analysis is performed using the appearance models provided by Hermite coefficients up to third order. The multiresolution approach allows to obtain a robust segmentation to extract the shape of the left ventricle. The obtained results in the segmentation step are used for the motion estimation algorithm. The left ventricle is the structure used for evaluation. The main goal is to determinate the heart movement of fetal heart which can be used for disease detection, characterization and further analysis. Results of the motion estimation process are analyzed and compared with other techniques applied to heart ultrasound data. © SPIE. Downloading of the abstract is permitted for personal use only.

Vargas-Quintero L., Moya-Albor E., Escalante-Ramírez B., Camargo Marín L., Guzmán Huerta M., Brieua J. (2018), "Segmentation and motion estimation applied to fetal heart analysis using a multi-texture active appearance model and an optical flow approach", *Proceedings of SPIE - The International Society for Optical Engineering 10975*, 1097513, doi: [10.1117/12.2512142](https://doi.org/10.1117/12.2512142). Conference Paper.

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THOUGHTS AND EMOTION ASSIMILATION AND DETONATION THROUGH VR FOR PEOPLE WITH ASD

ABSTRACT. This study proposes a new tool based on Virtual Reality (VR) as a complement in the treatment of people diagnosed with Autism Spectrum Disorder (ASD). VR tools have been established in last years as a new option in learning and practising new skills during the treatment. In this work, a VR application is developed simulating several environments corresponding to different types of emotions according to the Gestalt school of psychology. The VR application was tested in five male teenagers diagnosed with ASD of level one according to the DSM-5 during the therapy sessions. A qualitative evaluation of the VR application is carried out by the therapist during the session. It is observed and annotated which emotions have been detonated by the VR application giving to the therapist new information for the subsequent sessions. © SPIE. Downloading of the abstract is permitted for personal use only.

Hernandez-Mosti J. P., Cañete Alavez M., Vaillard Martinez J., Reza Becerril D., Moya-Albor E., Brieve J. (2018), "Thoughts and emotion assimilation and detonation through VR for people with ASD", *Proceedings of SPIE - The International Society for Optical Engineering* 10975, 109750C, doi: [10.1117/12.2513061](https://doi.org/10.1117/12.2513061). Conference Paper.

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MULTI-FRAMEWORKS DEVELOPMENT FOR THE MEDICAL DEVICE DESIGN PROCESS AS A CRITICAL FACTOR FOR INNOVATION

ABSTRACT. The process of innovation in the design of medical devices is complex. The analysis of the user, the disease stage of the patient and the fact that all clinical histories are different generates a series of variables that are a challenge for any Medical Device designer. The traditional industrial design uses frameworks to control information and visualize future scenarios to understand the user experience; this allows the designer to anticipate behaviour and design the object according to the needs of the users. Industrial design framework and medical device design framework differ significantly since the design of medical devices requires the analysis of multi-frameworks for a single object. This generates a very complex brief for any designer. This theoretical work argues that prior knowledge of the multi-framework in the design process of medical devices might help the designer to visualize the spectrum of the problem and focuses its efforts on reducing frames.

Cortés-Chavez F., Rossa-Sierra A., Gonzalez-Muñoz E. L., Aceves-Gonzalez C., Manzano-Hernandez P., Giovanna-Trotta M. (2020), "Multi-frameworks development for the medical device design process as a critical factor for innovation", *Advances in Intelligent Systems and Computing* 957: 227-234, doi: [10.1007/978-3-030-20451-8_22](https://doi.org/10.1007/978-3-030-20451-8_22). Conference Paper.

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USER ATTITUDES TOWARDS WHEELCHAIRS: A MEXICAN CASE STUDY WITH SPECIAL FOCUS ON VULNERABLE WHEELCHAIR USERS AND WHEELCHAIR ASSISTANTS

ABSTRACT. In Mexico, wheelchair users face discrimination and attacks on their dignity. To improve this situation, products that consider the needs of the whole population, while highlighting those of vulnerable groups, need to be developed. Nevertheless, little efforts have been made to acknowledge how vulnerable Mexican users and wheelchair assistants perceive this device. Hence, this research aims at gathering a deeper understanding of how the latter users feel towards current wheelchairs and where they perceive areas of opportunity. Semi-structured interviews were made to retrieve information about variables like wheelchair characteristics' prioritization, pain-points and wearing. Some of the most relevant results include the need to implement elements that consider natural body functions like sweating, and the misfit of wheelchair-user dimensioning. With these study's findings and by considering vulnerable groups, we aspire to provide insights for wheelchair design, that if satisfied, could help to create more inclusive devices and thus, more inclusive environments.

Manzano-Hernandez P., Trotta M. G., Aceves-Gonzalez C., Rossa-Sierra A., Cortes-Chavez F. (2020), "User attitudes towards wheelchairs: A Mexican case study with special focus on vulnerable wheelchair users and wheelchair assistants", *Advances in Intelligent Systems and Computing* 954: 282-291, doi: [10.1007/978-3-030-20444-0_27](https://doi.org/10.1007/978-3-030-20444-0_27). Conference Paper.

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FULL IMAGE RECONSTRUCTION WITH REDUCED SPECKLE NOISE, FROM A PARTIALLY ILLUMINATED FRESNEL HOLOGRAM, USING A STRUCTURED RANDOM PHASE

ABSTRACT. In computer generated holograms, a random phase is added to spread out the object wave, but this introduces a strong speckle noise in the reconstructed image. Spreading out the object wave helps to record a large object in a smaller hologram. We propose a random repeated

and displaced phase, which reduces the speckle noise in the reconstructed image and spreads out the object information in a limited area. The phase is independent of the object, and it could be calculated by sections reducing the hologram computing time. We present simulated and experimental results that prove the improvement in quality of the reconstructed image and the whole object reconstruction, using only a small part of the hologram. © 2019 Optical Society of America.

Cruz López, M. (2019), "Full image reconstruction with reduced speckle noise, from a partially illuminated Fresnel hologram, using a structured random phase", *Applied Optics* 58(8): 1917-1923, doi: [10.1364/AO.58.001917](https://doi.org/10.1364/AO.58.001917). Article.

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EVALUATION OF BIAS ON THE PROBABILITY OF COLLAPSE FROM AMPLITUDE SCALING USING SPECTRAL-SHAPE-MATCHED RECORDS

ABSTRACT. Although for many years it was thought that amplitude scaling of acceleration time series to reach a target intensity did not introduce any bias in the results of nonlinear response history analyses, recent studies have showed that scaling can lead to an overestimation of deformation demands with increasing scale factors. Some studies have suggested that the bias can be explained by differences in spectral shape between the response spectra of unscaled and scaled records. On the basis of these studies, some record selection procedures assume that if records are selected using spectral-shape-matching procedures, amplitude scaling does not induce any bias on the structural response. This study evaluates if bias is introduced on lateral displacement demands and seismic collapse risk estimates even when spectral shape is carefully taken into consideration when selecting ground motions. Several single-degree-of-freedom and multiple-degree-of-freedom systems are analyzed when subjected to unscaled and scaled ground motions selected to approximately match the mean and the variance of the conditional spectrum at the target level of intensity. Results show that an explicit consideration of spectral shape is not enough to avoid a systematic overestimation of lateral displacement demands and collapse probabilities as the scale factor increases. Moreover, the bias is observed in practically all cases for systems with strength degradation and it increases with decreasing period and decreasing lateral strength relative to the strength required to remain elastic. Key reasons behind the bias

are presented by evaluating input energy, causal parameters, and damaging pulse distributions in unscaled and scaled ground motion sets. © 2019 John Wiley & Sons, Ltd.

Dávalos H., Miranda E. (2019), "Evaluation of bias on the probability of collapse from amplitude scaling using spectral-shape-matched records", *Earthquake Engineering and Structural Dynamics* 48(8): 970-986, doi: [10.1002/eqe.3172](https://doi.org/10.1002/eqe.3172). Article.

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EVALUATION OF THE SCALING FACTOR BIAS INFLUENCE ON THE PROBABILITY OF COLLAPSE USING SA(T1) AS THE INTENSITY MEASURE

ABSTRACT. Amplitude scaling is a common approach to modify recorded ground motions to achieve a desired intensity level. The possible bias introduced by scaling the amplitude of ground motions when using the first-mode spectral ordinate as the intensity measure is evaluated using intensity-based analyses. This study evaluates whether upward scaling introduces bias in lateral displacement demands, but more importantly, in the probability of collapse. The latter, which is of utmost importance, has received little attention in previous studies. Analyses were conducted using degrading single-degree-of-freedom and multiple-degree-of-freedom systems with different fundamental periods of vibration and normalized strengths subjected to different sets of recorded accelerograms requiring different scale factors to reach a target intensity. The results demonstrate that this type of amplitude scaling introduces a bias in which lateral displacement demands and collapse estimates are increasingly overestimated with an increasing scale factor and that the bias is strongly dependent on the period and lateral strength of the system. Furthermore, the bias is considerably larger in collapse risk estimates. © 2019 Earthquake Spectra. All rights reserved.

Dávalos H., Miranda E. (2019), "Evaluation of the scaling factor bias influence on the probability of collapse using SA(T1) as the intensity measure", *Earthquake Spectra* 35(2): 679-702, doi: [10.1193/011018EQS007M](https://doi.org/10.1193/011018EQS007M). Article.

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FILTERED INCREMENTAL VELOCITY: A NOVEL APPROACH IN INTENSITY MEASURES FOR SEISMIC COLLAPSE ESTIMATION

ABSTRACT. This study evaluates the performance of a new intensity measure, referred to as filtered incremental velocity FIV3, which is computed using time-domain features extracted from an acceleration time series and is aimed at the evaluation of structural collapse. This novel approach focuses on the area under a small number of acceleration pulses in the ground motion instead of focusing on the peak response of linear elastic oscillators as in many recently proposed measures of ground motion intensity. FIV3 is developed based on previous research that has highlighted the close relation between the incremental velocity of a ground motion and its potential to induce large inelastic incursions on structures. However, unlike the original definition of incremental velocity which provides a single level of intensity for a ground motion, this new intensity measure is period-dependent and computed as the sum of the three largest incremental velocities obtained from a low-pass filtered ground acceleration time series. Efficiency and sufficiency with respect to several ground motion parameters such as magnitude, source-to-site-distance, spectral shape, scale factor, and duration are carefully evaluated and compared against those computed with some traditional and recently proposed intensity measures using collapse results from a four-story reinforced concrete frame. Results indicate that FIV3 leads to lower variability of collapse estimates and therefore higher efficiency as well as high sufficiency compared with those of other ground motion intensity parameters indicating that this new intensity measure is a promising parameter for structural collapse risk assessment. © 2019 John Wiley & Sons, Ltd.

Dávalos H., Miranda E. (2019), "Filtered incremental velocity: A novel approach in intensity measures for seismic collapse estimation", *Earthquake Engineering and Structural Dynamics* 48(12): 1384-1405, doi: [10.1002/eqe.3205](https://doi.org/10.1002/eqe.3205). Article in Press.

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A NOVEL NON-COUPLED NON-ISOLATED DOUBLE-INPUT BIDIRECTIONAL HIGH- GAIN CONVERTER FOR HYBRID ENERGY STORAGE SYSTEM

ABSTRACT. In this paper, a novel non-coupled non-isolated double-input bidirectional high-gain converter is proposed for integrating hybrid energy storage systems (HESS) to DC micro-grids. The converter does not use the traditional techniques such as coupled-inductor or multi-winding transformer to achieve high-gain, hence problems such as voltage spikes or circulating currents are not present. It also has the ability of charging and discharging battery and supercapacitor independently. Moreover, it only utilizes six switches, which is less than its counterparts use. In addition, unlike other high gain converters it uses only three active switches in every mode, so conduction losses are decreased by a steep rate. The steady-state analysis of proposed converter is presented, to validate the analysis, detailed PSICE simulations were carried out for calculating the precise gain of converter and power losses in several cases. Finally, a lab prototype of the converter is constructed, and experimental results are presented. © 2019 IEEE.

Mohammadi, P., Samanbakhsh, R., Hernandez, F. D., Koohi, P., Ibanez, F. (2019), "A novel non-coupled non-isolated double-input bidirectional high-gain converter for hybrid energy storage system", *PEDG 2019 - 2019 IEEE 10th International Symposium on Power Electronics for Distributed Generation Systems*, 8807609: 531-536, doi: [10.1109/PEDG.2019.8807609](https://doi.org/10.1109/PEDG.2019.8807609). Conference Paper.

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María José Quintana Hernández

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MICROSCALE MECHANICAL PROPERTIES TESTING AND SIMULATION

ABSTRACT. Characterization of mechanical properties at a micro and nano scale has become increasingly important for manufactured parts, though facilities with accurate and state-of-the-art equipment are scarce, expensive and not always available. For this reason, equipment already in use for traditional characterization can be used to analyze micro and even nano phenomena if calculations and simulations are combined with models representing testing procedures, such as hardness indentation or micro-machining of

bending beams. The understanding of the interaction between phases in the material and more accurate finite element models of grains or precipitates with different geometries can contribute in measuring the behavior of very small zones of a manufactured part and design quality control or inspection protocols. © 2018 IEEE.

Gonzalez R., Sanchez-Moreno J. M., Quintana M. J. (2019), "Microscale Mechanical Properties Testing and Simulation", *Proceedings - 2018 Nanotechnology for Instrumentation and Measurement, NANOIM 2018*, 8688619, doi: [10.1109/NANOIM.2018.8688619](https://doi.org/10.1109/NANOIM.2018.8688619). Conference Paper.

Salvador Gutiérrez Alcalá

Profesor Investigador

PREDEFINED-TIME ROBUST CONTOUR TRACKING OF ROBOTIC MANIPULATORS

ABSTRACT. Robotic tasks are primarily defined to comply to spatial and time constraints, and in several of such tasks, it is required to track a nominal contour depending just on spatial coordinates, without involving the time variable in the definition of such a contour, in contrast to conventional trajectory tracking schemes. With the aim to satisfy the salient requirements of these robotic tasks, this paper presents an integrated robust controller. The contour is encoded by using a robust velocity field, such that, any particle immerse in such field converges in predefined-time to a predefined vicinity of the given contour. Then, a robust controller is proposed to enforce the velocity field, in turns, in predefined-time. In this sense, a predefined-time-precision contour tracking is assured, by considering a robust controller that does not assume the exact knowledge of the robot parameters for its real-time implementation. Numerical simulations are conducted to highlight the reliability of the proposed scheme. © 2019 The Franklin Institute.

Muñoz-Vázquez A. J., Sánchez-Torres J. D., Gutiérrez-Alcalá S., Jiménez-Rodríguez E., Loukianov A. G. (2019), "Predefined-time robust contour tracking of robotic manipulators". *Journal of the Franklin Institute* 356(5): 2709-2722, doi: [10.1016/j.jfranklin.2019.01.041](https://doi.org/10.1016/j.jfranklin.2019.01.041). Article.

José Sebastián Gutiérrez Calderón

Investigador Titular D, SNI Nivel I

Pedro Manuel Rodrigo Cruz

SNI Nivel I

A LOW COST PRESENCE DETECTION SYSTEM FOR SMART HOMES

ABSTRACT. In a world where people aim to achieve as most comfort as possible, new technologies have been developed in order to make their lives easier. Home automation is an area with many opportunities, which is emerging as a complement to the conventional use of electronic equipment like lighting accessories, air conditioning systems or even curtains, which allow a degree of independence by incorporating sensor equipment, aiming for efficiency and smart performance. A low-cost smart person detection system is presented, with the implementation of a PIR sensor and its connection through an app called Blynk, which allows the user to receive notifications every time the sensor detects presence. © 2018 IEEE.

Alvarez J., Acero A., Gutierrez S., Rodrigo P. M., Lay-Ekuakille A. (2018), "A low cost presence detection system for smart homes", *Proceedings of the 2018 3rd IEEE International Conference on Research in Intelligent and Computing in Engineering, RICE 2018 2018-January*, 8627901, doi: [10.1109/RICE.2018.8627901](https://doi.org/10.1109/RICE.2018.8627901). Conference Paper.

José Sebastián Gutiérrez Calderón

Investigador Titular D, SNI Nivel I

AN INTEGRATED ARCHITECTURE FOR MONITORING AND CONTROL THE TEMPERATURE OF DIFFERENT PLATFORMS BASED ON INTERNET OF THINGS

ABSTRACT. This article describes the development of a monitoring system for the automation and temperature control of the electronics laboratory in the engineering building of the Universidad Panamericana Aguascalientes. The system is designed to turn on or off a fan using a global controller based on the data obtained by a temperature sensor, this data is sent through internet to a platform in the Google Firebase cloud and at the same time they are visualized in another monitoring platform through JSON (JavaScript Object Notation), allowing to graph in real time the temperature data and the moment of the fan turning on or off. The global controller is able to show the image of the building being monitored in real time by changing the color of the room depending on the temperature: in case it is higher than 28

degrees, the fan will turn on and the room will change color to red, if it is less than 18 degrees, it will change to blue and if it is between those two temperatures, it will change to yellow. This article proposes a novel concept of communication for the internet of things, since it allows sending information from a global controller without the possibility of storing data to another one that allows saving them through JSON. © 2018 IEEE.

Gutiérrez S., Barrientos E., Alvarez J., Cardona M. (2018), "An integrated architecture for monitoring and control the temperature of different platforms based on internet of things", *Proceedings of the 2018 IEEE 38th Central America and Panama Convention, CONCAPAN 2018*, 8596403, doi: [10.1109/CONCAPAN.2018.8596403](https://doi.org/10.1109/CONCAPAN.2018.8596403). Conference Paper.

José Sebastián Gutiérrez Calderón

Investigador Titular D, SNI Nivel I

Hiram Eredín Ponce Espinosa

SNI Nivel I

AN INTELLIGENT FAILURE DETECTION ON A WIRELESS SENSOR NETWORK FOR INDOOR CLIMATE CONDITIONS

ABSTRACT. Wireless sensor networks (WSN) involve large number of sensor nodes distributed at diverse locations. The collected data are prone to be inaccurate and faulty due to internal or external influences, such as, environmental interference or sensor aging. Intelligent failure detection is necessary for the effective functioning of the sensor network. In this paper, we propose a supervised learning method that is named artificial hydrocarbon networks (AHN), to predict temperature in a remote location and detect failures in sensors. It allows predicting the temperature and detecting failure in sensor node of remote locations using information from a web service comparing it with field temperature sensors. For experimentation, we implemented a small WSN to test our sensor in order to measure failure detection, identification and accommodation proposal. In our experiments, 94.18% of the testing data were recovered and accommodated allowing of validation our proposed approach that is based on AHN, which detects, identify and accommodate sensor failures accurately. © 2019 by the authors. Licensee MDPI, Basel, Switzerland.

Gutiérrez S., Ponce H. (2019), "An Intelligent Failure Detection on a Wireless Sensor Network for Indoor Climate Conditions", *Sensors* (Switzerland) 19(4), 854, doi: [10.3390/s19040854](https://doi.org/10.3390/s19040854). Article.

José Sebastián Gutiérrez Calderón

Investigador Titular D, SNI Nivel I

Pedro Manuel Rodrigo Cruz

SNI Nivel I

DOMOTIC CONTROL SYSTEM FOR BLINDS WITH ZIGBEE COMMUNICATION MOBILE DEVICE

ABSTRACT. In this paper, a mobile device based domotic control system that allows blinds/curtains to be controlled through Zigbee communication is presented. The main intention of this development is to get a prototype of a domotic system implementing open-source software and low-cost hardware to reduce the development cost and provide a functional environment, which can interact with user through mobile technology, having the capability of operating home devices such as roller shades, providing high comfort level and user satisfaction in homes. The prototype implementation of the proposed system is evaluated based on the electrical consumption after functionality tests. © 2018 IEEE.

Gutierrez S., Acero C., Rodrigo P. M. (2018), "Domotic control system for blinds with zigbee communication mobile device", *Proceedings of the 2018 3rd IEEE International Conference on Research in Intelligent and Computing in Engineering, RICE 2018* 2018-January, 8627899, doi: [10.1109/RICE.2018.8627899](https://doi.org/10.1109/RICE.2018.8627899). Conference Paper.

José Sebastián Gutiérrez Calderón

Investigador Titular D, SNI Nivel I

EXTENDING THE AUTONOMY OF A BATTERY FOR ELECTRIC MOTORCYCLES

ABSTRACT. Electric motorcycles use a battery storage system and a controlled inverter (motor drive) to drive the wheels. Given that the sale of electric motorcycles is expected to grow significantly over the next decade, the aim of this research is to add a supercapacitor storage system to this simple network in order to extend the autonomy of the motorcycle. This paper analyzes and demonstrates the benefits of two different structures for adding a supercapacitor bank to a lithium-ion battery pack: a passive filter and a buffer for the battery. The advantages of each structure are presented and design guidelines are provided. In addition, we propose a synthetic inductor filter typology based on the two analyzed structures in order to increase the autonomy of the motorcycle. Simulations and experimental results using real data validate the analysis. This paper then uses real data extracted from an elec-

tric motorcycle to compare the four topologies: batteries only, the passive filter, the buffer, and the synthetic inductor semi-active hybrid storage system. The comparison shows that battery capacity is extended up to 7.8% with a smoother current profile. However, due to the losses from the added converter in cascade, the net capacity of the whole system is extended only up to 3.7%. Therefore, improvements in the dc/dc converter can further increase the entire system capacity. © 1967-2012 IEEE.

Ibanez F. M., Beizama Florez A. M., Gutierrez S., Echeverria J. M. (2019), "Extending the Autonomy of a Battery for Electric Motorcycles", *IEEE Transactions on Vehicular Technology* 68(4), 8632735: 3294-3305, doi: [10.1109/TVT.2019.2896901](https://doi.org/10.1109/TVT.2019.2896901). Article.

José Sebastián Gutiérrez Calderón

Investigador Titular D, SNI Nivel I

LOW COST PROTOTYPE FOR MONITORING AND REMOTE CONTROL IN GREENHOUSE FOR HOMES

ABSTRACT. The emergence of new technologies and the opening of hardware and software platforms for the development of embedded systems, has facilitated the design, integration, and development of new communication monitoring and control systems. In recent years, the world population has grown rapidly, so the demand for fresh and healthy foods has increased its demand. Besides that, there is a widespread search for a more natural and healthy alimentation, that is why there is a tendency for people to start growing and harvesting their own food. The main objective of this paper is to design and develop the automation of a greenhouse for self-consumption using a free development platform, which accelerates the integration process, reducing time and execution costs. © 2018 IEEE.

Gutierrez E., Gutierrez S., Becerril J. A., Rodriguez F. (2019), "Low cost prototype for monitoring and remote control in greenhouse for homes", *2018 IEEE International Autumn Meeting on Power, Electronics and Computing, ROPEC 2018*, 8661433, doi: [10.1109/ROPEC.2018.8661433](https://doi.org/10.1109/ROPEC.2018.8661433). Conference Paper.

José Sebastián Gutiérrez Calderón

Investigador Titular D, SNI Nivel I

Ramiro Velázquez Guerrero

SNI Nivel I

PASSIVE VIBRATION CONTROL IN A CIVIL STRUCTURE: EXPERIMENTAL RESULTS

ABSTRACT. The problem of vibrations in civil structures is common; nevertheless, its negative effects can be significantly reduced using structural control methods with intention of maintaining structural welfare as much as possible. This work deals with the study of structural vibration control in a model of a civil-like structure, which consists of three-level building with a tuned mass damper implemented as a passive vibration absorber, mounted on the top of the structure, to attenuate the harmonic vibrations provided by an electromagnetic actuator connected at the base of the primary system. The action of the tuned mass damper is evaluated from an energy approach. The dissipation of energy in the overall system is conducted in an experimental way, where the passive control technique is designed to minimize the undesirable forced dynamic response of the main structure via the tuned mass damper. Experimental results are provided to show the effective performance of the proposed passive vibration absorption scheme to suppress resonant frequency harmonic excitations disturbing the primary system, evaluating the performance energy and contribution of the dissipative device for the energy release in the overall system. © The Author(s) 2019.

Enriquez-Zárate J., Abundis-Fong H. F., Velázquez R., Gutiérrez S. (2019), "Passive vibration control in a civil structure: Experimental results", *Measurement and Control* (United Kingdom) 52(7-8): 938-946, doi: [10.1177/0020294019847715](https://doi.org/10.1177/0020294019847715). Article in Press.

José Sebastián Gutiérrez Calderón

Investigador Titular D, SNI Nivel I

Claudia Nallely Sánchez Gómez

Profesor Investigador

Julieta Domínguez Soberanes

Profesor Investigador

[Colaboración: Escuela de Dirección de Negocios Gastronómicos]

SELECTING CRACKLING PRODUCT BASED ON SENSORY ANALYSIS BY DIFFERENT STATISTICAL DATA APPROACHES

ABSTRACT. Cracklings, which is a well-known product in Mexico, are obtained by frying the pork skin. Up to know no attempt to formulate chicken cracklings has been done. Therefore, in order to take advantage of chicken byproducts, during this experiment two different chicken cracklings prototypes were developed and compared with the pork ones. When a food prototype is ready, sensory analysis, which is related on how a food product is appreciated by the human senses must be performed. Which makes the consumers' acceptance a key for achieving an economical success in the food industry. In this paper four different products are analyzed: pork or chicken crackling, with or without sauce. For this analysis the acceptance of these products was tested by each consumer based on their perception (hedonic scales) with values ranging 1 to 10. In order to understand the distribution of the consumers' grading, a dimensionality reduction technique based on evolutive algorithms that plot the consumers' in a 2D-plane based on their grades distances was proposed and compared with PCA. To reinforce this understanding, the distance matrix and the dendrogram of hierarchical clustering were used. A Liking Product Landscape is proposed, where the distribution of the product grades and of the consumers are shown in the same graph. The most accepted products are the ones with sauce, in particular the pork crackling product was the most accepted one. © 2017 IEEE.

Sánchez-Gutiérrez G., Domínguez-Soberanes J., Rodríguez-Serrano G., Escalona-Buendía H., Sánchez C. N., Gutiérrez S., Graff M. (2018), "Selecting crackling product based on sensory analysis by different statistical data approaches", *2017 IEEE International Autumn Meeting on Power, Electronics and Computing, ROPEC 2017* 2017-January, Conference Paper.

José Antonio Marmolejo Saucedo

SNI Nivel II

Román Rodríguez Aguilar

SNI Nivel II

[Colaboración: Facultad de Ciencias Económicas y Empresariales]

A TIMETABLING APPLICATION FOR THE ASSIGNMENT OF SCHOOL CLASSROOMS

ABSTRACT. In this manuscript a group of students from an university of Mexico develop a user-friendly university timetabling tool based on a spreadsheet and using Open-Solve optimization software. The developed tool uses 0–1 integer programming to maximize the number of classes with their respective teacher allocated to a classroom in a certain time schedule. It does not solve only one specific case, the user can introduce each semester's specific information to the spreadsheet and the tool will automatically generate a schedule that maximizes the number of classes assigned using the given time and classroom resources. Each semester the available times and the teacher can be changed for each class according to the needs for that specific semester. The user does not need to be someone who understands linear programming. The tool is developed on a user-friendly way so that the staff of the school can use it without help from the developers. In this paper we will show how this tool was developed for a smaller example and how it works with a real case. © 2020, Springer Nature Switzerland AG.

Marmolejo-Saucedo, J. A., Rodríguez-Aguilar, R. (2020), "A Timetabling Application for the Assignment of School Classrooms", *Advances in Intelligent Systems and Computing* 1072: 1-10, doi: [10.1007/978-3-030-33585-4_1](https://doi.org/10.1007/978-3-030-33585-4_1). Conference Paper.

José Antonio Marmolejo Saucedo

SNI Nivel II

DECOMPOSITION ALGORITHM FOR IRREGULAR PLACEMENT PROBLEMS

ABSTRACT. A placement problem of irregular 2D&3D objects in a domain (container) of minimum area (volume), that related to the field of Packing and Cutting problems is considered. Placement objects may be continuously translated and rotated. A general nonlinear programming model of the problem is presented employing the phi-function technique. We propose a decomposition algorithm that generalizes previously published compaction algorithms of searching for local optimal solutions for some packing and cutting problems. Our decomposition algorithm

reduces the optimization placement problem to a sequence of nonlinear programming subproblems of considerably smaller dimension. © 2020, Springer Nature Switzerland AG.

Romanova, T., Stoyan, Y., Pankratov, A., Litvinchev, I., Marmolejo, J. A. (2020), "Decomposition Algorithm for Irregular Placement Problems", *Advances in Intelligent Systems and Computing* 1072: 214-221, doi: [10.1007/978-3-030-33585-4_21](https://doi.org/10.1007/978-3-030-33585-4_21). Conference Paper.

José Antonio Marmolejo Saucedo

SNI Nivel II

Margarita Hurtado Hernández

SNI Nivel Candidato

DIGITAL TWINS IN SUPPLY CHAIN MANAGEMENT: A BRIEF LITERATURE REVIEW

ABSTRACT. The rapid interest in the continuous improvement of supply chain management systems has motivated the development of digital tools in the automation of business problems. Currently, companies must continually adapt to changing conditions with respect to the management of their supply chain. However, the lack of real-time data available and responsive planning systems make this adaptation difficult. The current situation of the technology of digital twins is to migrate to the digital. More and more companies will develop and introduce their own digital twins in their business processes. This manuscript presents a literature review of the current context of digital twins. A total of 4884 searches combining keywords with respect to digital twins were analyzed. The years analyzed in the databases were 2017–2019. © 2020, Springer Nature Switzerland AG.

Marmolejo-Saucedo, J. A., Hurtado-Hernandez, M., Suarez-Valdes, R. (2020), "Digital Twins in Supply Chain Management: A Brief Literature Review", *Advances in Intelligent Systems and Computing* 1072: 653-661, doi: [10.1007/978-3-030-33585-4_63](https://doi.org/10.1007/978-3-030-33585-4_63). Conference Paper.

José Antonio Marmolejo Saucedo

SNI Nivel II

IMPACT OF MANAGERS AND HUMAN RESOURCES ON THE SUPPLY CHAIN PERFORMANCE

ABSTRACT. Current competitive, complex, and uncertain markets drive companies toward increasing active collaboration among human resources involved in a supply chain. Increasing employee participation and supply chain collabora-

tion results in increasing the performance, competitiveness, and, consequently, economic success for companies. In this article, a structural equation model is proposed with three independent latent variables (role of managers, learning environment, employee competencies) and one dependent latent variable (supply chain performance), where six hypotheses to measure their relationships are proposed. The model is validated with data obtained from 284 valid responses to a survey applied to supply chain managers and engineers in the Mexican manufacturing sector. The findings revealed a positive relationship among latent variables, and in terms of magnitude, the role of managers reported the largest effect on the supply chain learning environment. © Springer Nature Switzerland AG 2020.

Mendoza-Fong, J. R., García-Alcaraz, J. L., Marmolejo-Saucedo, J. A., Díaz-Reza, J. R. (2020), "Impact of managers and human resources on the supply chain performance", *Intelligent Systems Reference Library* 166: 3-23, doi: [10.1007/978-3-030-26488-8_1](https://doi.org/10.1007/978-3-030-26488-8_1). Book Chapter.

José Antonio Marmolejo Saucedo

SNI Nivel II

FOREWORD

ABSTRACT. Technological tools and computational techniques have enhanced the healthcare industry. These advancements have led to significant progress and novel opportunities for biomedical engineering. Nature-Inspired Intelligent Techniques for Solving Biomedical Engineering Problems is a pivotal reference source for emerging scholarly research on trends and techniques in the utilization of nature-inspired approaches in biomedical engineering. Featuring extensive coverage on relevant areas such as artificial intelligence, clinical decision support systems, and swarm intelligence, this publication is an ideal resource for medical practitioners, professionals, students, engineers, and researchers interested in the latest developments in biomedical technologies.

Marmolejo, J. A. (2018), "Foreword". In Utku Kose, Gur Emre Guraksin, and Omer Deperlioglu (eds.), *Nature-Inspired Intelligent Techniques for Solving Biomedical Engineering Problems* (Hershey: IGI Global) XVII-XVIII. Book Chapter.

José Antonio Marmolejo Saucedo

SNI Nivel II

ORGANIZATIONAL SYSTEMS CONVERGENCE WITH THE INDUSTRY 4.0 CHALLENGE

ABSTRACT. The concept of Industry 4.0 consists of the digital technologies introduction in companies. It is the way to call the phenomenon of digital transformation applied to the production industry. The problem faced by organizations is that they assimilate the global idea of Industry 4.0 and the technical aspects associated with it. Industry 4.0 is highly linked to technologies such as the Internet of things, which favors predictive analysis, based on the information collected through these solutions, making it easier for companies to anticipate consumer requests. It is necessary that companies can readjust and plan their operations quickly and accurately to respond to the new demands of consumers. The products proliferation will continue to increase in the coming years, in a context that will allow greater customization. Therefore, companies must take advantage of market analysis to improve their supply chains and meet the demands of their users, since the customization of products requires a clear connection with production capabilities. The objective of the research is to describe the properties of Industry 4.0, to propose a measurement system according to the principles of the supply chain, by means of the descriptive and comparative research method. © Springer Nature Switzerland AG 2019.

Pérez-Lara M., Saucedo-Martínez J. A., Marmolejo-Saucedo J. A., Salais-Fierro T. E. (2018), "Organizational systems convergence with the industry 4.0 challenge". In García Alcaraz, J. L., Rivera Cadavid, L., González-Ramírez, R. G., Leal Jamil, G., and Chong, M. (eds.), *Best Practices in Manufacturing Processes. Experiences from Latin America* (Cham: Springer), 411-431, doi: [10.1007/978-3-319-99190-0_19](https://doi.org/10.1007/978-3-319-99190-0_19). Book Chapter.

José Antonio Marmolejo Saucedo

SNI Nivel II

PREDICTION OF ELECTROENCEPHALOGRAM TIME SERIES WITH ELECTRO-SEARCH OPTIMIZATION ALGORITHM TRAINED ADAPTIVE NEURO- FUZZY INFERENCE SYSTEM

ABSTRACT. Nowadays, artificial intelligence is widely used in many biomedical-oriented problems. Because of obtained effective and efficient results, the use of intelligent solution mechanisms by artificial intelligence techniques is mainly

focused on healthcare applications. Moving from the explanations, the objective of this paper is to provide an adaptive neuro-fuzzy inference system (ANFIS) trained by a recent optimization algorithm: electro-search optimization (ESO) for predicting the electroencephalogram (EEG) time series. In detail, the research was directed to the EEG time series showing chaotic characteristics so that an effective hybrid system can be designed for having an idea about future states of human brain activity in the case of possible diseases. The developed ANFIS-ESO system was evaluated with five different EEG time series and the obtained findings were reported accordingly. In addition, the ANFIS-ESO system was compared with alternative techniques-systems in order to see the performances according to different systems. In the end, it is possible to mention that the ANFIS-ESO system provides well-enough results in terms of predicting EEG time series. As a result of encouraging results, ANFIS-ESO is currently used actively for real cases. © 2013 IEEE.

Saucedo J. A. M., Hemanth J. D., Kose U. (2019), "Prediction of Electroencephalogram Time Series with Electro-Search Optimization Algorithm Trained Adaptive Neuro-Fuzzy Inference System", *IEEE Access* 7, 8625417: 15832-15844, doi: [10.1109/ACCESS.2019.2894857](https://doi.org/10.1109/ACCESS.2019.2894857). Article.

José Antonio Marmolejo Saucedo

SNI Nivel II

THE ROLE OF ADVANCED MANUFACTURING TECHNOLOGIES IN PRODUCTION PROCESS PERFORMANCE: A CAUSAL MODEL

ABSTRACT. Advanced manufacturing technologies (AMT) require considerable investments that managers often avoid, which makes it difficult to link their production operations with the benefits reported in literature review. The present paper shows a structural equation model that integrates four latent variables to measure the relationship between the levels of advanced manufacturing technologies implementation (Stand-Alone Intermediate and Integrated Systems), as well as the benefits obtained in the productive systems. The variables are related to each other using six hypotheses in order to realise how the AMT implementation level affects the benefits obtained from a quantitative and statistical point of view. The model is evaluated through the partial least square technique with data from 383 responses to a survey. Findings show that Stand-Alone Systems contribute more to obtaining Production Benefits, followed by Integrated Systems and Intermediate Systems. Finally, a sensitivity analysis based on

conditional probabilities was performed to evaluate scenarios at different implementation levels in AMT to know how they facilitate the acquisition of the benefits offered. © 2019 by the authors.

Díaz-Reza, J. R., Mendoza-Fong, J. R., Blanco-Fernández, J., Marmolejo-Saucedo, J. A., García-Alcaraz, J. L. (2019), "The role of advanced manufacturing technologies in production process performance: A causal model", *Applied Sciences* (Switzerland) 9(18), 3741, doi: [10.3390/app9183741](https://doi.org/10.3390/app9183741). Article.

José Antonio Marmolejo Saucedo

SNI Nivel II

Claudia Yohana Arias Portela

Profesor Investigador

THE USE OF AGENT-BASED MODELS BOOSTED BY DIGITAL TWINS IN THE SUPPLY CHAIN: A LITERATURE REVIEW

ABSTRACT. Supply chain management has become an essential and integral part of business, it allows to reach out company's success and customer satisfaction because it has the power to boost customer service, reduce operating costs and improve the financial standing of a company by keeping and improving competitive advantages. In the current market with a fiercer competition, shorter product life cycles, changes in technologies, and increasingly interconnected economies; supply chain management is boosted by means of mind-boggling technological innovations like Digital Twins and Agent-Based Model. Since supply chains are now building with increasingly complex and collaborative interdependencies, Agent-Based Models are an extremely useful tool when representing such relationships, to obtain a formal and more simplified description of a system (that can be as complex as the relationships between the agents of all the supply chain, from the supplier, the manufacturer, to the distributor of a product or service) and as an optimization technique for mitigation of risk. While Digital Twins are new solutions elements for enable real-time digital monitoring and control or an automatic decision maker with a higher efficiency and accuracy. © 2020, Springer Nature Switzerland AG.

Orozco-Romero, A., Arias-Portela, C. Y., Marmolejo-Saucedo, J. A. (2020), "The Use of Agent-Based Models Boosted by Digital Twins in the Supply Chain: A Literature Review", *Advances in Intelligent Systems and Computing* 1072: 642-652, doi: [10.1007/978-3-030-33585-4_62](https://doi.org/10.1007/978-3-030-33585-4_62). Conference Paper.

Félix Orlando Martínez Ríos

Profesor Investigador

José Antonio Marmolejo Saucedo

SNI Nivel II

A NEW HEURISTIC ALGORITHM TO SOLVE CIRCLE PACKING PROBLEM INSPIRED BY NANOSCALE ELECTROMAGNETIC FIELDS AND GRAVITATIONAL EFFECTS

ABSTRACT. In this paper, we present a new algorithm for the fast and efficient solution of the Packing problem in two dimensions. The packing problem consists in finding the best arrangement of objects (many geometrical forms) in a specific space called container. This new algorithm is inspired by the observations of nanometric scale electromagnetic fields. We use the electromagnetic theory of the electric field to calculate the best position to place a circular object in a configuration of other circular objects previously packing. Also, in this new algorithm we simulate two processes called »gravity» and »shaken» that compact the distribution of the objects placed in the container and allow to minimize the unoccupied space. © 2018 IEEE.

Martínez-Ríos F., Marmolejo-Saucedo J. A., Murillo-Suárez A. (2019), "A new heuristic algorithm to solve Circle Packing problem inspired by nanoscale electromagnetic fields and gravitational effects", *Proceedings - 2018 Nanotechnology for Instrumentation and Measurement, NANOIM 2018*, 8688621, doi: [10.1109/NANOIM.2018.8688621](https://doi.org/10.1109/NANOIM.2018.8688621). Conference Paper.

Félix Orlando Martínez Ríos

Profesor Investigador

ENHANCING ACUTE ORAL TOXICITY PREDICTIONS BY USING CONSENSUS MODELING AND ALGEBRAIC FORM-BASED OD-TO-2D MOLECULAR ENCODES

ABSTRACT. Quantitative structure-activity relationships (QSAR) are introduced to predict acute oral toxicity (AOT), by using the QuBiLS-MAS (acronym for quadratic, bilinear and N-Linear maps based on graph-theoretic electronic-density matrices and atomic weightings) framework for the molecular encoding. Three training sets were employed to build the models: EPA training set (5931 compounds), EPA-full training set (7413 compounds), and Zhu training set (10 152 compounds). Additionally, the EPA test set (1482 compounds) was used for the validation of the QSAR models built on the EPA training set, while the ProTox (425 compounds) and T3DB (284 compounds) external sets were employed for

the assessment of all the models. The k-nearest neighbor, multilayer perceptron, random forest, and support vector machine procedures were employed to build several base (individual) models. The base models with REPA-training ≥ 0.75 (R = correlation coefficient) and MAEE-PA-training ≤ 0.5 (MAE = mean absolute error) were retained to build consensus models. As a result, two consensus models based on the minimum operator and denoted as M19 and M22, as well as a consensus model based on the weighted average operator and denoted as M24, were selected as the best ones for each training set considered. According to the applicability domain (AD) analysis performed, model M19 (built on the EPA training set) has MAETest-AD = 0.4044, MAEProTox-AD = 0.4067 and MAET3DB-AD = 0.2586 on the EPA test set, ProTox external set, and T3DB external set, respectively; whereas model M22 (built on the EPA-full set) and model M24 (built on the Zhu set) present MAEProTox-AD = 0.3992 and MAET3DB-AD = 0.2286, and MAEProTox-AD = 0.3773 and MAET3DB-AD = 0.2471 on the two external sets accounted for, respectively. These outcomes were compared and statistically validated with respect to 14 QSAR methods (e.g., admetSAR, ProTox-II) from the literature. As a result, model M22 presents the best overall performance. In addition, a retrospective study on 261 withdrawn drugs due to their toxic/side effects was performed, to assess the usefulness of prospectively using the QSAR models proposed in the labeling of chemicals. A comparison with regard to the methods from the literature was also made. As a result, model M22 has the best ability of labeling a compound as toxic according to the globally harmonized system of classification and labeling of chemicals. Therefore, it can be concluded that the models proposed, especially model M22, constitute prominent tools for studying AOT, at providing the best results among all the methods examined. A freely available software was also developed to be used in virtual screening tasks (<http://tomocomd.com/apps/ptoxra>). © 2019 American Chemical Society.

García-Jacas C. R., Marrero-Ponce Y., Cortés-Guzmán F., Suárez-Lezcano J., Martínez-Ríos F. O., García-González L. A., Pupo-Meriño M., Martínez-Mayorga K. (2019), "Enhancing Acute Oral Toxicity Predictions by using Consensus Modeling and Algebraic Form-Based 0D-to-2D Molecular Encodes", *Chemical Research in Toxicology* 32(6): 1178-1192, doi: [10.1021/acs chemrestox.9b00011](https://doi.org/10.1021/acs chemrestox.9b00011). Article.

María de Lourdes Martínez Villaseñor

SNI Nivel I

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A CONCISE REVIEW ON SENSOR SIGNAL ACQUISITION AND TRANSFORMATION APPLIED TO HUMAN ACTIVITY RECOGNITION AND HUMAN-ROBOT INTERACTION

ABSTRACT. Human activity recognition deals with the integration of sensing and reasoning aiming to understand better people's actions. Moreover, it plays an important role in human interaction, human-robot interaction, and brain-computer interaction. When these approaches have to be developed, different efforts from signal processing and artificial intelligence are considered. In that sense, this article aims to present a concise review of signal processing in human activity recognition systems and describe two examples and applications both in human activity recognition and robotics: human-robot interaction and socialization, and imitation learning in robotics. In addition, it presents ideas and trends in the context of human activity recognition for human-robot interaction that are important when processing signals within that systems. © The Author(s) 2019.

Martínez-Villaseñor L., Ponce H. (2019), "A concise review on sensor signal acquisition and transformation applied to human activity recognition and human-robot interaction", *International Journal of Distributed Sensor Networks* 15(6), doi: [10.1177/1550147719853987](https://doi.org/10.1177/1550147719853987). Article.

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A SURVEY OF MACHINE LEARNING APPROACHES FOR AGE RELATED MACULAR DEGENERATION DIAGNOSIS AND PREDICTION

ABSTRACT. Age Related Macular Degeneration (AMD) is a complex disease caused by the interaction of multiple genes and environmental factors. AMD is the leading cause of visual dysfunction and blindness in developed countries, and a rising cause in underdeveloped countries. Currently, retinal images are studied in order to identify drusen in the retina. The classification of these images allows to support the medical diagnosis. Likewise, genetic variants and risk factors are studied in order to make predictive studies of the disease,

which are carried out with the support of statistical tools and, recently, with Machine Learning (ML) methods. In this paper, we present a survey of studies performed in complex diseases under both approaches, especially for the case of AMD. We emphasize the approach based on the genetic variants of individuals, as it is a support tool for the prevention of AMD. According to the vision of personalized medicine, disease prevention is a priority to improve the quality of life of people and their families, as well as to avoid the inherent health burden. © Springer Nature Switzerland AG 2018.

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SNI Nivel I

MACHINE LEARNING APPROACH FOR PRE-ECLAMPSIA RISK FACTORS ASSOCIATION

ABSTRACT. The preeclampsia/eclampsia syndrome is a multisystem disorder that usually includes cardiovascular changes, hematologic abnormalities, hepatic and renal impairment, and neurologic or cerebral manifestations. Preeclampsia (PE) is a clinical syndrome that afflicts 3-5% of pregnancies and it is a leading cause of maternal mortality, especially in developing countries. To understand in greater depth the preeclampsia/eclampsia syndrome, we applied some well-known Machine Learning (ML) techniques. ML has been successfully applied to medical research to improve the diagnosis and the prevention of complex diseases and syndromes. In our contribution, we have created a supervised model to predict if a patient suffers the disease. This model has been optimized by selecting the best features and by optimizing the threshold when predicting a class. We used these techniques to point out the most related features of the patients to the disease. Finally, we used interpretability techniques to extract and visualize through a decision tree the most relevant associations of the disease with the patients' features. © 2018 Association for Computing Machinery.

Martínez-Velasco A., Martínez-Villaseñor L., Miralles-Pechuán L. (2018), "Machine learning approach for pre-eclampsia risk factors association", *ACM International Conference Proceeding Series*: 232-237, doi: [10.1145/3284869.3284912](https://doi.org/10.1145/3284869.3284912). Conference Paper.

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SNI Nivel I

A METHOD TO IMPROVE SPEED OF TRAINING ALGORITHM IN ARTIFICIAL HYDROCARBON NETWORKS

ABSTRACT. Artificial hydrocarbon networks (AHN) is a supervised machine learning method inspired on chemical carbon networks that simulate heuristic chemical rules involved within organic molecules to represent the structure and behavior of data. However, training AHN depends on a relevant number of parameters. In that sense, the original training algorithm presents some issues to find suitable parameters in a reasonable amount of time. Thus, this paper proposes a new training algorithm for AHN based on the concept of extreme learning machines, to update weight parameters related to the molecular functions. To evaluate the effectiveness of the proposed algorithm, binary classification and regression tests are performed over real public datasets from a central data repository specialized in machine learning problems. The results obtained validated that the updating of the weight parameters using the new training algorithm in the molecular structures is efficient and maintains the expected results of model accuracy. In addition, this work increased up to 24.88% the speed of the training phase in contrast to the original algorithm. © 2019 IEEE.

Souza, P. V. D. C., Ponce, H., Martínez-Villaseñor, L. "A method to improve speed of training algorithm in artificial hydrocarbon networks", *Conference Proceedings - IEEE International Conference on Systems, Man and Cybernetics 2019-October*, Article number 8914372: 1913-1919. Conference Paper.

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SNI Nivel I

CHALLENGES IN DATA ACQUISITION SYSTEMS: LESSONS LEARNED FROM FALL DETECTION TO NANOSENSORS

ABSTRACT. Falls are a major public health problem in elderly people often causing fatal injuries. It is important to assure that injured people receive assistance as quick as possible. Fall detection systems have gain more relevance nowadays. As more databases and fall detection systems are developed, there is more need to identify the challenges encountered in building and creating them. This paper addresses pre-processing,

inconsistency and synchronization challenges that occur when creating a multimodal database for fall detection. We present different algorithms used to tackle these issues. We describe the issues and the corresponding solutions in order to document the lessons learned that could help others in data acquisition for multimodal databases. Applying the solutions to the issues found so far, we acquired an organized multimodal database for fall detection with 17 subjects. Furthermore, these lessons learned can be applied for data nanosensors acquisition and storage. © 2018 IEEE.

Penafort-Asturiano C. J., Santiago N., Nunez-Martinez J. P., Ponce H., Martinez-Villasenor L. (2019), "Challenges in Data Acquisition Systems: Lessons Learned from Fall Detection to Nanosensors", *Proceedings - 2018 Nanotechnology for Instrumentation and Measurement, NANOFIM 2018*, 8688609, doi: [10.1109/NANOFIM.2018.8688609](https://doi.org/10.1109/NANOFIM.2018.8688609). Conference Paper.

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DEEP LEARNING FOR MULTIMODAL FALL DETECTION

ABSTRACT. Fall detection systems can help providing quick assistance of the person diminishing the severity of the consequences of a fall. Real-time fall detection is important to decrease fear and time that a person remains laying on the floor after falling. In recent years, multimodal fall detection approaches are developed in order to gain more precision and robustness. In this work, we propose a multimodal fall detection system based on wearable sensors, ambient sensors and vision devices. We used long short-term memory networks (LSTM) and convolutional neural networks (CNN) for our analysis given that they are able to extract features from raw data, and are well suited for real-time detection. To test our proposal, we built a public multimodal dataset for fall detection. After experimentation, our proposed method reached 96.4% in accuracy, and it represented an improvement in precision, recall and F-{1}-score over using single LSTM or CNN networks for fall detection. © 2019 IEEE.

Martinez-Villasenor, L., Ponce, H., Perez-Daniel, K. "Deep learning for multimodal fall detection", *Conference Proceedings - IEEE International Conference on Systems, Man and Cybernetics* 2019-October, Article number 8914429: 3422-3429. Conference Paper.

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FUZZY AGGREGATION OF SIMILARITY VALUES FOR ELECTRONIC HEALTH RECORD INTEROPERABILITY

ABSTRACT. Schema matching is used for data integration, mediation, and conversion between heterogeneous sources. Nevertheless, mappings identified with an automatic or semi-automatic process can never be completely certain. In a process of concept alignment, it is necessary to manage uncertainty. In this paper, we present a fuzzy-based process of concept alignment for uncertainty management in schema matching problem. The ultimate goal is to enable interoperability between different electronic health records. Data integration of health information is done through the mediation of our ubiquitous user model framework. Results look promising and fuzzy theory proved to be a good fit for modeling uncertain schema matching. Fuzzy combined similarities can handle uncertainty in the schema matching process to enable interoperability between electronic health records improving the quality of mappings and diminishing the human error to verify the mappings. © 2019 - IOS Press and the authors. All rights reserved.

Martinez-Villaseñor L., Ponce H., González-Mendoza M. (2019), "Fuzzy aggregation of similarity values for electronic health record interoperability", *Journal of Intelligent and Fuzzy Systems* 36(2): 1573-1585, doi: [10.3233/JIFS-18526](https://doi.org/10.3233/JIFS-18526). Article.

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UP-FALL DETECTION DATASET: A MULTIMODAL APPROACH

ABSTRACT. Falls, especially in elderly persons, are an important health problem worldwide. Reliable fall detection systems can mitigate negative consequences of falls. Among the important challenges and issues reported in literature is the difficulty of

fair comparison between fall detection systems and machine learning techniques for detection. In this paper, we present UP-Fall Detection Dataset. The dataset comprises raw and feature sets retrieved from 17 healthy young individuals without any impairment that performed 11 activities and falls, with three attempts each. The dataset also summarizes more than 850 GB of information from wearable sensors, ambient sensors and vision devices. Two experimental use cases were shown. The aim of our dataset is to help human activity recognition and machine learning research communities to fairly compare their fall detection solutions. It also provides many experimental possibilities for the signal recognition, vision, and machine learning community. © 2019 by the authors. Licensee MDPI, Basel, Switzerland.

Martínez-Villaseñor L., Ponce H., Brieva J., Moya-Albor E., Núñez-Martínez J., Peñafoort-Asturiano C. (2019), "UP-Fall Detection Dataset: A Multimodal Approach", *Sensors* (Basel, Switzerland) 19(9), doi: [10.3390/s19091988](https://doi.org/10.3390/s19091988). Article.

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COLLECTION OF SOLID WASTE IN MUNICIPAL AREAS: URBAN LOGISTICS

ABSTRACT. A sustainable process satisfies the current needs without compromising the ability of future generations to satisfy their own needs; that is, it must have a triple impact (sustainability): social, economic, and environmental. In México, there are several services that the government must provide to society for its proper development, for example, the collection of solid waste. Urban logistics include all the processes and operations that provide a service to the community, such as water, safety, health, waste collection, etc., providing the service with the lowest possible cost (economic, social, and environmental) that contributes to the sustainability of the city. Due to the accelerated growth of the world population, several environmental problems have arisen, among them, the generation of solid waste in important quantities; their proper management is relevant for adequate development of the population. The collection of solid waste in municipal areas aims to grant green spaces and recreation areas for the citizens. Although an outstanding effort has been made by the government to provide an adequate service, there are still gaps in the application of correct tools that guarantee efficiency in operations and continuity in services. This article presents a proposal to improve the planning of the design of territories for the cleaning, weeding, and collection of solid waste in municipal areas, using

two MILP (Mixed Integer Linear Programming) models. The main contribution of the adaptation of this model is the application to the weeding and waste collection service municipality of the Monterrey Metropolitan Area, which considers important factors among which are the amount of waste, frequency, and service coverage. © 2019 by the authors.

Martínez J. A. S., Mendoza A., Vázquez M. R. A. (2019), "Collection of solid waste in municipal areas: Urban logistics", *Sustainability* (Switzerland) 11(19), 5442, doi: [10.3390/su11195442](https://doi.org/10.3390/su11195442). Article.

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HYBRID METHODS TO QUANTIFY ICE FRONT MOVEMENT DURING FREEZE-CONCENTRATION PROCESS

ABSTRACT. Freeze concentration is an emerging separation method that can be implemented as part of a water purification system, however, its development is still at pilot plant scale. One of the useful parameters for design and control of this process is the growth velocity of the crystal, commonly known as the limit velocity. Above this limit, ice crystals will capture solids and separation will lose quality. Two-hybrid non-invasive methods to follow the displacement of the ice front during a freeze concentration (FC) procedure have been tested. The methods included image segmentation, string matching technique and a bio-inspired optical flow algorithm to calculate the ice front velocity. A thermal camera was used in the experiments in order to validate the estimated movement of the ice by the image analysis procedures. Both methods were successful to follow the movement of the ice front, and the estimated displacement was between 4 and 12 pixels in 15 minutes. © 2018 IEEE.

Moya-Albor E., Pardo J. M., Gregori A., Brieva J. (2019), "Hybrid Methods to Quantify Ice Front Movement during Freeze-concentration Process", *Proceedings-2018 Nanotechnology for Instrumentation and Measurement, NANOJIM 2018*, 8688615, doi: [10.1109/NANOJIM.2018.8688615](https://doi.org/10.1109/NANOJIM.2018.8688615). Conference Paper.

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AN OPTIMIZATION FRAMEWORK FOR THE DISTRIBUTION PROCESS OF A MANUFACTURING COMPANY BALANCING DELIVERYMEN WORKLOAD AND CUSTOMER'S WAITING TIMES

ABSTRACT. In this paper, we consider the distribution process of a manufacturing company that supplies products to the customers located in a service region. The company distributes its products partitioning the service region into delivery zones or districts that are served by a single deliveryman. Two objectives are considered when designing the delivery zones: balance the workload associated with each zone, and the minimization of the customers' waiting times (latency). The former objective concerns a districting decision, and the latter objective is related to a routing decision. To support these planning decisions, an optimization framework based on a novel bi-objective optimization model is proposed. To approximate the frontier of non-dominated solutions of the bi-objective problem, an efficient heuristic algorithm inspired in the ϵ -constraint method is developed. The proposed algorithm exploits the characteristics of the problem, and it is used to solve a real case study. Obtained results are compared with the current solution employed by the company. Both objective function values are improved by any of the solutions in the approximated Pareto front. To show the efficiency and robustness of the proposed algorithm, an additional set of instances derived from the case study is tested. The results indicate that the algorithm is able to approximate the Pareto fronts despite their shape. Hence, interesting managerial insights to improve the current decisions of the company are provided derived from the computational experiments. © 2019 Elsevier Ltd.

Camacho-Vallejo, J. F., Nucamendi-Guillén, S., González-Ramírez, R. G. (2019), "An optimization framework for the distribution process of a manufacturing company balancing deliverymen workload and customer's waiting times", *Computers and Industrial Engineering* 137, 106080, doi: [10.1016/j.cie.2019.106080](https://doi.org/10.1016/j.cie.2019.106080). Article.

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SNI Nivel I

MAXIMIZATION OF PROFIT FOR A PROBLEM OF LOCATION AND ROUTING, WITH PRICE-SENSITIVE DEMANDS

ABSTRACT. This article seeks to study and solve a problem of profit maximization of a company by defining the location of an optimal number of facilities, allocation and routing of vehicles, and costs for home delivery to meet the demand of its customers. This study is based on an article in which, for the first time, a problem of location and routing and maximization of utilities with price-sensitive demands is integrated. This problem, unlike other studies that only minimize other metrics such as waiting times, route distances, and transportation costs, seeks a greater benefit by increasing profits by discriminating prices depending on the customer's location or adding an additional cost to retail sales. This paper presents a model for small instances based on the model proposed in the aforementioned article. Next, a two-phase heuristic is proposed that solves larger instances with a result close to that obtained in the previous article where a branch-and-price heuristic was used. Copyright © 2019 by SCITEPRESS - Science and Technology Publications, Lda. All rights reserved.

Ibarra-Delgado N. E., Olivares-Benitez E., Nucamendi-Guillén S., Rojas O. G. (2019), "Maximization of profit for a problem of location and routing, with price-sensitive demands", *ICORES 2019 - Proceedings of the 8th International Conference on Operations Research and Enterprise Systems 2019*: 414-421. Conference Paper.

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SNI Nivel I

THE CAPACITATED LOT SIZING PROBLEM WITH BATCH ORDERING: A MILP AND HEURISTIC APPROACH

ABSTRACT. This article presents a mixed integer linear programming method and a heuristic algorithm to deal with the problem of multi-period, multiple-product batch purchases, with a finite time horizon, considering delivery times, order placement costs and independent batch size for each product. The objective of this problem is to minimize the costs of placing purchase orders and inventory. This problem is motivated by its application in a marketing company that handles the sale of fashion products (footwear and accessories) through catalogs and for which excess inventory represents a major problem given the short life cycle of its products. Experimental results show that the heuristic algorithm is able to obtain feasible solutions that improve in cost by up to 37% the best integer solutions reported by the model when it reaches the time limit. To validate the efficiency of the algorithm, a real scenario was solved for a trading company, obtaining results that improve by 28% compared to the current company's situation. These results show that the heuristic approach is promising in terms of the quality of the solution and the computational time required. Copyright © 2019 by SCITEPRESS - Science and Technology Publications, Lda. All rights reserved.

Macedo-Barragán G., Nucamendi-Guillén S., Olivares-Benitez E., Rojas O. G. (2019), "The capacitated lot sizing problem with batch ordering: A MILP and heuristic approach", *ICORES 2019 - Proceedings of the 8th International Conference on Operations Research and Enterprise Systems 2019*: 229-236. Conference Paper.

Eliás Olivares Benítez

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IMPLEMENTATION OF LEAN MANUFACTURING TO REDUCE THE DELIVERY TIME OF A REPLACEMENT PART TO DEALERS: A CASE STUDY

ABSTRACT. In today's automotive industry, Lean production systems are used successfully to reduce delivery times. The current case study addresses a problem that affects an automotive

company, which is the excessive delivery time of a spare part to its both national and international authorized dealers. In order to reduce the delivery time of this replacement part, the Lean Manufacturing methodology was used. For this purpose, the value stream mapping and the proposed A3 report are the tools used. With the use of these tools, activities that did not add any value are eliminated or modified; in addition, the logistical flow of the modules of the door-side trim panel delivery process is improved. As a result, added value is increased, the delivery time is reduced (for Mexico) and the number of product variants is reduced. Now, the painting process is done by the authorized dealers, and the number of pieces used for every spare part was estimated. The study demonstrates that the integration of value stream mapping administrative/productive in conjunction with the A3 report proposal allows to identify and eliminate waste in the delivery process.

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Francisco Alejandro Orozco Argote

SNI Nivel I

EVALUATION OF THE OCCUPATIONAL HAZARD PERCEPTION OF BUILDING CONSTRUCTION WORKERS FROM A PSYCHOMETRIC PARADIGM AND CONSIDERING SOCIODEMOGRAPHIC VARIABLES

ABSTRACT. Historically, the construction industry has presented high accident rates, and in order to get a deeper understanding and making right decisions, it is interesting to consider the risks from a worker's point of view. This research addresses the perception of risks by construction workers from a psychometric paradigm and considering some sociodemographic variables. The study considered a sample consisted of a group of workers who belong to the Chilean construction industry, particularly from the building construction sector. Relevant risks associated with a high accident rate were identified through an extensive literature review. In addition, the relative risk related to physical overexertion and that related to the exposure to physical and chemical agents are considered. Based on a psychometric approach for the evaluation of qualitative attributes, a measurement instrument was applied; results were then statistically analyzed. Additionally, the incidence of sociodemographic variables was evaluated:

age, profession, experience and educational level in relation to the perceived risk level. Statistically significant differences of the perceived risk associated to noise exposure, depending on the age of the workers were obtained. On the other hand, it was determined that workers with the most experience consider that those jobs that involve uncomfortable or forced postures constitute a relevant physical risk. Meanwhile, jobs such as: rebar workers, bricklayers and concrete workers, perceive the gravity and immediacy of the effect associated to risk significantly more in activities that involve repetitive movements. © 2018.

Forcael E., Risso L., Álvarez P., Gómez N., Orozco F. (2019), "Evaluation of the occupational hazard perception of building construction workers from a psychometric paradigm and considering sociodemographic variables". *Journal of Applied Pharmaceutical Science*, 9(2): 97-104, doi: [10.7324/JAPS.2019.90213](https://doi.org/10.7324/JAPS.2019.90213). Article.

Francisco Alejandro Orozco Argote

SNI Nivel I

ONTOLOGICAL MODELS FOR SIMULATION OF BUILDING CONSTRUCTION PROCESSES

ABSTRACT. The construction industry has a series of own practices and methods; which specifically depends on either the nature of construction works or the actions of the actors involved in construction activities. This makes evident the need of having tools that facilitate the construction management of projects, one of them: the simulation of construction processes. Thus, this paper presents a conceptualization of constructive operations, as a start-point for the development of a library of objects for the simulation of construction processes in buildings. To do it, fieldwork was conducted to gather information about processes and resources, which were then modeled by using Unified Modeling Language (UML). To validate the conceptualization made, some of the models created were simulated by using Discrete Event Simulation. © 2019 Latin American and Caribbean Consortium of Engineering Institutions. All rights reserved.

Forcael E., Salgado M., Ramis F., Orozco F., Rodríguez C. (2019), "Ontological models for simulation of building construction processes", *Proceedings of the LACCEI international Multi-conference for Engineering, Education and Technology 2019*, doi: [10.18687/LACCEI2019.1.1.456](https://doi.org/10.18687/LACCEI2019.1.1.456). Conference Paper.

Josué Ortiz Medina

SNI Nivel I

DEFECT ENGINEERING AND SURFACE FUNCTIONALIZATION OF NANOCARBONS FOR METAL-FREE CATALYSIS

ABSTRACT. With the advent of carbon nanotechnology, which initiated significant research efforts more than two decades ago, novel materials for energy harvesting and storage have emerged at an amazing pace. Nevertheless, some fundamental applications are still dominated by traditional materials, and it is especially evident in the case of catalysis, and environmental-related electrochemical reactions, where precious metals such as Pt and Ir are widely used. Several strategies are being explored for achieving competitive and feasible metal-free carbon nanomaterials, among which doping and defect engineering approaches within nanocarbons are recurrent and promising. Here, the most recent efforts regarding the control of doping and defects in carbon nanostructures for catalysis, and in particular for energy-related applications, are addressed. Finally, an overview of alternative proposals that can make a difference when enabling carbon nanomaterials as efficient and emerging catalysts is presented. © 2019 WILEY-VCH Verlag GmbH & Co. KGaA, Weinheim.

Ortiz-Medina J., Wang Z., Cruz-Silva R., Morelos-Gomez A., Wang F., Yao X., Terrones M., Endo M. (2019), "Defect Engineering and Surface Functionalization of Nanocarbons for Metal-Free Catalysis", *Advanced Materials* 31(13), 1805717, doi: [10.1002/adma.201805717](https://doi.org/10.1002/adma.201805717). Review.

Josué Ortiz Medina

SNI Nivel I

ENHANCED ANTIFOULING FEED SPACER MADE FROM A CARBON NANOTUBE-POLYPROPYLENE NANOCOMPOSITE

ABSTRACT. Spacers are widely used in membrane technologies to reduce fouling and concentration polarization. Fouling can start from the spacer surface and grow, thereby reducing flux, selectivity, and operation lifetime. Fluorescein isothiocyanate labeled bovine serum albumin was used for fouling studies and observed during cross-flow filtration operation for up to 144 h. Here, we mixed carbon nanotubes (CNTs) and polypropylene (PP) to make a spacer with better antifouling than plain PP spacers. The fouling process was observed by scanning electron microscopy and monitored in situ by fluorescence microscopy. Molecular dynamics simulations show that bovine serum

albumin has a lower interaction energy with the nanocomposite CNTs/PP spacer than with the plain PP. The findings are relevant for the development of spacers to improve the operation lifetime of membranes in filtration technologies. © 2019 American Chemical Society.

Kitano H., Takeuchi K., Ortiz-Medina J., Cruz-Silva R., Morelos-Gomez A., Fujii M., Obata M., Yamanaka A., Tejima S., Fujishige M., Akuzawa N., Yamaguchi A., Endo M. (2019), "Enhanced Antifouling Feed Spacer Made from a Carbon Nanotube-Polypropylene Nanocomposite", *ACS Omega* 4(13): 15496-15503, doi: [10.1021/acsomega.9b01757](https://doi.org/10.1021/acsomega.9b01757). Article.

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FREEZING FRONT VELOCITY ESTIMATION USING IMAGE PROCESSING TECHNIQUES

ABSTRACT. Freeze concentration is a promising water purification technology due to its low energy consumption when compared with traditional procedures such as evaporation. Crystal growth velocity is an important parameter for the design and control of this process. If crystal growth surpasses certain speed, known as limit velocity, the separation process will not be successful. In this work two different motion detection image analysis strategies were used as non invasive techniques to follow the crystal growth velocity in a unidirectional crystallizer. The first technique is based on matching primitives detected on the image and the second one on optical flow algorithms. A mid-level processing algorithm has been used to identify the freezing front position. It segments the images using thresholding limits based on CIELAB color space parameters L^*, a^*, b^* . Both methods were successfully used to estimate limit ice front velocity. Furthermore, the effect of initial solid concentration on limit ice front velocity has been modelled by an equation of the form $VI=K1C0^{-k2}$. © 2019 Elsevier Ltd.

Pardo J. M., Moya-Albor E., Ortega-Ibarra G., Brieva J. (2020), "Freezing front velocity estimation using image processing techniques", *Measurement: Journal of the International Measurement Confederation* 151, 107085, doi: [10.1016/j.measurement.2019.107085](https://doi.org/10.1016/j.measurement.2019.107085). Article.

León Felipe Palafox Novack

SNI Nivel I

GENTRIFICATION PREDICTION USING MACHINE LEARNING

ABSTRACT. Gentrification is a problem in big cities that confounds economic, political and population factors. Whenever it happens, people in the higher brackets of income replace people of low income. This replacement generates population displacement, which force people to change their lives radically. In this work, we use Classification Trees to generate an index, which will indicate the likelihood for a neighborhood to gentrify. This index uses many population variables that include things like age, education and transportation. This system can be used later to inform decisions regarding urban housing and transportation. We can prevent areas of the city of overflowing with private investment in lieu of public housing policy that allows people to stay in their places of living. We expect this work to be a stepping zone on working towards a generalization of gentrification effects in different cities in the world. © Springer Nature Switzerland AG 2019.

Alejandro, Y., Palafox, L. (2019), "Gentrification Prediction Using Machine Learning", *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* 11835 LNAI: 187-199, doi: [10.1007/978-3-030-33749-0_16](https://doi.org/10.1007/978-3-030-33749-0_16). Conference Paper.

León Felipe Palafox Novack

SNI Nivel I

PREDICTION OF STUDENT ATTRITION USING MACHINE LEARNING

ABSTRACT. Student attrition is one of the most important problems for any school, being it private or public. In public education, a high attrition rate reflects poorly in the school, as it is wasting public taxes on students that do not finish their majors. In private education, it means the school revenue decreases considerably. Much work has been done on predicting churn rates in the Telecommunication industry, in this work we use similar techniques to predict churn rates in education. We explore the data extensively and see the possible correlations between attrition and variables like entrance examination, place where the students are from and grades up to the point of abandonment of the major. © Springer Nature Switzerland AG 2019.

Aguilar-Gonzalez, S., Palafox, L. (2019), "Prediction of Student Attrition Using Machine Learning", *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* 11835 LNAI, 212-222, doi: [10.1007/978-3-030-33749-0_18](https://doi.org/10.1007/978-3-030-33749-0_18). Conference Paper.

Claudio de Jesús Pita Ruiz Velasco

SNI Nivel I

SOME FORMULAS FOR BELL NUMBERS

ABSTRACT. We give elementary proofs of three formulas involving Bell numbers, including a generalization of the Gould-Quaintance formula and a generalization of Spivey's formula. We find variants for two of our formulas which involve some well-known sequences, among them the Fibonacci, Bernoulli and Euler numbers. © 2018, University of Nis. All rights reserved.

Komatsu T., Pita-Ruiz C. (2018), "Some formulas for bell numbers", *Filomat* 32(11): 3881-3889, doi: [10.2298/FIL1811881K](https://doi.org/10.2298/FIL1811881K). Article.

Hiram Eredín Ponce Espinosa

SNI Nivel I

A CONCEPTUAL DESIGN OF A FIREFIGHTER DRONE

ABSTRACT. In this paper, a mechatronic design of a firefighter drone is presented. Unmanned aerial vehicles have been around for years, they present characteristics that allow them to be used for different purposes. Nowadays, these devices have become more popular and their application increases rapidly in various fields. This paper focuses on the implementation of a low cost device that can help to control a fire. By implementing a mechatronic device, it is possible to spot a fire on time, and extinguish it without risking humans lives. It is an emergency responder device that can assist firemen in fighting high rise fires. The description of the proposed mechatronic system is briefly described, as well as experiments that demonstrate its principal functionality. © 2018 IEEE.

Cervantes A., García P., Herrera C., Morales E., Tarriba F., Tena E., Ponce H. (2018), "A Conceptual Design of a Firefighter Drone", *2018 15th International Conference on Electrical Engineering, Computing Science and Automatic Control, CCE 2018*, 8533926, doi: [10.1109/ICEEE.2018.8533926](https://doi.org/10.1109/ICEEE.2018.8533926). Conference Paper.

Hiram Eredín Ponce Espinosa

SNI Nivel I

José Antonio Marmolejo Saucedo

SNI Nivel II

María de Lourdes Martínez Villaseñor

SNI Nivel I

A GENETIC ALGORITHM TO SOLVE POWER SYSTEM EXPANSION PLANNING WITH RENEWABLE ENERGY

ABSTRACT. In this paper, a deterministic dynamic mixed-integer programming model for solving the generation and transmission expansion-planning problem is addressed. The proposed model integrates conventional generation with renewable energy sources and it is based on a centralized planned transmission expansion. Due a growing demand over time, it is necessary to generate expansion plans that can meet the future requirements of energy systems. Nowadays, in most systems a public entity develops both the short and long of electricity-grid expansion planning and mainly deterministic methods are employed. In this study, an heuristic optimization approach based on genetic algorithms is presented. Numerical results show the performance of the proposed algorithm. © 2018, Springer Nature Switzerland AG.

Martínez-Villaseñor L., Ponce H., Marmolejo J. A., Ramírez J. M., Hernández A. (2018), "A genetic algorithm to solve power system expansion planning with renewable energy", *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* 11288 LNAI: 3-17, doi: [10.1007/978-3-030-04491-6_1](https://doi.org/10.1007/978-3-030-04491-6_1). Conference Paper.

Hiram Eredín Ponce Espinosa

SNI Nivel I

Mario Acevedo Alvarado

SNI Nivel Candidato

A HYBRID FUZZY-MOLECULAR CONTROLLER ENHANCED WITH EVOLUTIONARY ALGORITHMS: A CASE STUDY IN A ONE-LEG MECHANISM

ABSTRACT. Intelligent control systems are able to work well in uncertain nonlinear systems, mainly for: changes in the operating point, presence of environmental noise and disturbances, uncertainty in sensor measurements, miscalibration, uncertain model plant, and others. For instance, fuzzy controllers have been widely studied and applied. Recently, artificial organic controllers (AOC) have been proposed as an ensemble of fuzzy logic and

artificial hydrocarbon networks. However, a weakness in AOC is the lack of training methods for tuning parameters for desired output responses in control. In this regard, this paper aims to introduce an evolutionary optimization method, i.e. particle swarm optimization, for tuning artificial organic controllers. Three objectives are proposed for automatic tuning of AOC: overall error, steady-state error and settling time of output response. The proposed methodology is implemented in the well-known cart-pole system. Also, the proposed method is applied on a one-leg unstable mechanism as case study. Results validate that automatic tuning of AOC over simulation systems can achieve suitable output responses with minimal overall error, steady-state error and settling time. © 2019 The Franklin Institute.

Ponce, H., Acevedo, M., Esparza-Duran, N. (2019), "A hybrid fuzzy-molecular controller enhanced with evolutionary algorithms: A case study in a one-leg mechanism", *Journal of the Franklin Institute* 356(16): 9432-9450, doi: [10.1016/j.jfranklin.2019.09.001](https://doi.org/10.1016/j.jfranklin.2019.09.001). Article in Press.

Hiram Eredín Ponce Espinosa

SNI Nivel I

A NEW VISION-BASED METHOD USING DEEP LEARNING FOR DAMAGE INSPECTION IN WIND TURBINE BLADES

ABSTRACT. Wind turbines are having great impact in the field of clean energies. However, there is a need to improve these technologies in various aspects, such as: Maintenance, energy storage, cases of overload or mechanical failure. In maintenance, they constantly suffer of damage in blades typically to be in the open air and in constant operation. The most well-known damages in blades are identified as: Impact of rays, wearing, fractures by cutting forces, freezing, among others. Because of all these factors, it is necessary to develop a predictive technique to help us to do the inspections of the blades in a safer and more effective way than manual inspection. In that sense, this paper introduces a deep learning vision-based approach to automatically analyze each part of the face of the blade, capable of making the detection of certain faults (impact of rays, wear and fractures). In addition, we present a proof-of-concept using a robot to automatically detect failures in wind turbine blades. Experimental results validate our vision system. © 2018 IEEE.

Moreno S., Pena M., Toledo A., Trevino R., Ponce H. (2018), "A New Vision-Based Method Using Deep Learning for Damage Inspection in Wind Turbine Blades", *2018 15th International Conference on Electrical Engineering, Computing Science and Automatic Control, CCE 2018*, 8533924, doi: [10.1109/ICEEE.2018.8533924](https://doi.org/10.1109/ICEEE.2018.8533924). Conference Paper.

Hiram Eredín Ponce Espinosa

SNI Nivel I

A ROBUST CONTROL SCHEME FOR RENEWABLE-BASED DISTRIBUTED GENERATORS USING ARTIFICIAL HYDROCARBON NETWORKS

ABSTRACT. Distributed generators (DGs) based on renewable energy systems such as wind turbines, solar panels, and storage systems, are key in transforming the current electric grid into a green and sustainable network. These DGs are called inverter-interfaced systems because they are integrated into the grid through power converters. However, inverter-interfaced systems lack inertia, deteriorating the stability of the grid as frequency and voltage oscillations emerge. Additionally, when DGs are connected to the grid, its robustness against unbalanced conditions must to be ensured. This paper presents a robust control scheme for power regulation in DGs, which includes inertia and operates under unbalanced conditions. The proposed scheme integrates a robust control algorithm to ensured power regulation, despite unbalanced voltages. The control algorithm is an artificial hydrocarbon network controller, which is a chemically-inspired technique, based on carbon networks, that provides stability, robustness, and accuracy. The robustness and stability of the proposed control scheme are tested using Lyapunov techniques. Simulation, considering one- And three-phase voltage sags, is executed to validate the performance of the control scheme. © 2019 by the authors.

Rosales A., Ponce P., Ponce H., Molina A. (2019), "A robust control scheme for renewable-based distributed generators using artificial hydrocarbon networks", *Energies* 12(10), 12101896, doi: [10.3390/en12101896](https://doi.org/10.3390/en12101896). Article.

Hiram Eredín Ponce Espinosa

SNI Nivel I

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SNI Nivel I

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Profesor Investigador

A VISION-BASED APPROACH FOR FALL DETECTION USING MULTIPLE CAMERAS AND CONVOLUTIONAL NEURAL NETWORKS: A CASE STUDY USING THE UP-FALL DETECTION DATASET

ABSTRACT. The automatic recognition of human falls is currently an important topic of research for the computer vision and artificial intelligence communities. In image analysis, it is common to use a vision-based approach for fall detection and classification systems due to the recent exponential increase in the use of cameras. Moreover, deep learning techniques have revolutionized vision-based approaches. These techniques are considered robust and reliable solutions for detection and classification problems, mostly using convolutional neural networks (CNNs). Recently, our research group released a public multimodal dataset for fall detection called the UP-Fall Detection dataset, and studies on modality approaches for fall detection and classification are required. Focusing only on a vision-based approach, in this paper, we present a fall detection system based on a 2D CNN inference method and multiple cameras. This approach analyzes images in fixed time windows and extracts features using an optical flow method that obtains information on the relative motion between two consecutive images. We tested this approach on our public dataset, and the results showed that our proposed multi-vision-based approach detects human falls and achieves an accuracy of 95.64% compared to state-of-the-art methods with a simple CNN network architecture. © 2019 Elsevier Ltd

Espinosa, R., Ponce, H., Gutiérrez, S., Martínez-Villaseñor, L., Brieva, J., Moya-Albor, E. (2019), "A vision-based approach for fall detection using multiple cameras and convolutional neural networks: A case study using the UP-Fall detection dataset", *Computers in Biology and Medicine* 115, 103520, doi: [10.1016/j.compbiomed.2019.103520](https://doi.org/10.1016/j.compbiomed.2019.103520). Article.

Hiram Eredín Ponce Espinosa

SNI Nivel I

AN IMPLEMENTATION OF A MONOCULAR 360-DEGREE VISION SYSTEM FOR MOBILE ROBOT NAVIGATION

ABSTRACT. One of the problems facing autonomous navigation is obstacle sensing and dynamic surroundings. Multi-sensor systems and omni-directional vision systems have been implemented to increase the observability of robots. However, these approaches consider several drawbacks: the cost of processing multiple signals, synchronization of data collection, cost of materials and energy consumption, among others. Thus in this paper, we propose a new 360-degree vision system for mobile robot navigation using a static monocular camera. We demonstrate that using our system, it is possible to monitor the complete surroundings of the robot with a single sensor, i.e. the camera. Moreover, it can detect the position and orientation of an object from an egocentric point of view. We also present a low cost prototype of our proposal to validate it. © 2018 IEEE.

Acevedo E., Beltran A., Castellanos M., Chaverra L., Gonzalez G., Sarmiento M., Ponce H. (2018), "An Implementation of a Monocular 360-Degree Vision System for Mobile Robot Navigation", *Proceedings - 2018 International Conference on Mechatronics, Electronics and Automotive Engineering, ICMEAE 2018*, 8743104: 21-25, doi: [10.1109/ICMEAE.2018.00011](https://doi.org/10.1109/ICMEAE.2018.00011). Conference Paper.

Hiram Eredín Ponce Espinosa

SNI Nivel I

Mario Acevedo Alvarado

SNI Nivel Candidato

DESIGN AND EQUILIBRIUM CONTROL OF A FORCE-BALANCED ONE-LEG MECHANISM

ABSTRACT. The problem of equilibrium is critical for planning, control, and analysis of legged robot. Control algorithms for legged robots use the equilibrium criteria to avoid falls. The computational efficiency of the equilibrium tests is critical. To comply with this it is necessary to calculate the horizontal momentum rotation for every moment. For arbitrary contact geometries, more complex and computationally-expensive techniques are required. On the other hand designing equilibrium controllers for legged robots is a challenging problem. Nonlinear or more complex control systems have to be designed, complicating the computational cost and demanding robust actuators. In this paper, we propose a force-balanced mechanism as a building element for the syn-

thesis of legged robots that can be easily balance controlled. The mechanism has two degrees of freedom, in opposition to the more traditional one degree of freedom linkages generally used as legs in robotics. This facilitates the efficient use of the “projection of the center of mass” criterion with the aid of a counter rotating inertia, reducing the number of calculations required by the control algorithm. Different experiments to balance the mechanism and to track unstable set-point positions have been done. Proportional error controllers with different strategies as well as learning approaches, based on an artificial intelligence method namely artificial hydrocarbon networks, have been used. Dynamic simulations results are reported. Videos of experiments will be available at: <https://sites.google.com/up.edu.mx/smart-robotic-legs/>. © 2018, Springer Nature Switzerland AG.

Ponce H., Acevedo M. (2018), “Design and equilibrium control of a force-balanced one-leg mechanism”, Lecture Notes in Computer Science (including sub-series *Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics*) 11289 LNAI: 276-290, doi: [10.1007/978-3-030-04497-8_23](https://doi.org/10.1007/978-3-030-04497-8_23). Conference Paper.

Hiram Eredín Ponce Espinosa

SNI Nivel I

DESIGN OF AN AUTOMATED SWEEPER FOR PUBLIC PARKS

ABSTRACT. Some of the most serious problems in cities are soil pollution and littering in public places. The amount of litter piled up in the venues of public parks is so much that it indirectly causes different phenomena like insecurity, crime and promotes more pollution. In that sense, this paper presents the design of an autonomous robotic system for performing the tasks of collection, sweeping, vacuuming and cleaning at ground level. This work shows a proof-of-concept and a prototype in order to validate the proposed mechatronics system. Experimental results show that this machine is able to clean wide areas, promoting less pollution and litter in public spaces like parks. © 2018 IEEE.

Alan J., Jimenez G., Maldonado E., Silvestre A., Poza D., Vargas M., Ponce H. (2018), “Design of an Automated Sweeper for Public Parks”, *Proceedings - 2018 International Conference on Mechatronics, Electronics and Automotive Engineering, ICMEAE 2018*, 8743128: 114-117, doi: [10.1109/ICMEAE.2018.00028](https://doi.org/10.1109/ICMEAE.2018.00028). Conference Paper.

Hiram Eredín Ponce Espinosa

SNI Nivel I

DEVELOPMENT OF FAST AND RELIABLE NATURE-INSPIRED COMPUTING FOR SUPERVISED LEARNING IN HIGH-DIMENSIONAL DATA

ABSTRACT. Machine learning and data mining tasks in big data involve different nature of inputs that typically exhibit high dimensionality, e.g. more than 1,000 features, far from current acceptable scales computing in one machine. In many different domains, data have highly nonlinear representations that nature-inspired models can easily capture, outperforming simple models. But, the usage of these approaches in high-dimensional data are computationally costly. Recently, artificial hydrocarbon networks (AHN) —a supervised learning method inspired on organic chemical structures and mechanisms— have shown improvements in predictive power and interpretability in contrast with other well-known machine learning models, such as neural networks and random forests. However, AHN are very time-consuming that are not able to deal with big data until now. In this chapter, we present a fast and reliable nature-inspired training method for AHN, so they can handle high-dimensional data. This training method comprises a population-based meta-heuristic optimization with defined both individual encoding and objective function related to the AHN-model, and it is also implemented in parallel-computing. After benchmark performing of population-based optimization methods, grey wolf optimization (GWO) was selected. Our results demonstrate that the proposed hybrid GWO-based training method for AHN runs more than 1400x faster in high-dimensional data, without loss of predictability, yielding a fast and reliable nature-inspired machine learning model. We also present a use case in assisted living monitoring, i.e. human fall classification comprising 1,269 features from sensor signals and video recordings, with this proposed training algorithm to show its implementation and performance. We anticipate our new training algorithm to be useful in many applications like medical engineering, robotics, finance, aerospace, and others, in which big data is essential. © Springer Nature Switzerland AG 2020.

Ponce, H., González-Mora, G., Morales-Olvera, E., Souza, P. (2020), “Development of fast and reliable nature-inspired computing for supervised learning in high-dimensional data”. In *Studies in Computational Intelligence*, vol. SCI 871 (Cham: Springer), 109-138. Book Chapter.

Hiram Eredín Ponce Espinosa

SNI Nivel I

Maria de Lourdes Martínez Villaseñor

SNI Nivel I

FEATURE SELECTION METHODS EVALUATION FOR CTR ESTIMATION

ABSTRACT. The most widespread payment model in online advertising is Cost-per-click (CPC). In this model the advertisers pay each time that a user generates a click. In order to enhance the income of CPC Advertising Networks, it is necessary to give priority to the most profitable adverts. The most important factor in the profitability of an advert is Click-through-rate (CTR), which is the probability that a user generates a click in a given advert. In this paper we find which feature selection method between PCA, RFE, Gain ratio and NSGA-II is better suited, or if otherwise, the machine learning classification methods work best without any feature selection method.

Miralles-Pechuan, L., Ponce, H., Martínez-Villaseñor, L. (2016), "Feature Selection Methods Evaluation for CTR Estimation". *2016 Fifteenth Mexican International Conference on Artificial Intelligence (MICAI)*, 57-62, doi: [10.1109/MICAI-2016.2016.00017](https://doi.org/10.1109/MICAI-2016.2016.00017). Conference Paper.

Hiram Eredín Ponce Espinosa

SNI Nivel I

María de Lourdes Martínez Villaseñor

SNI Nivel I

HUMAN ACTIVITY RECOGNITION ON MOBILE DEVICES USING ARTIFICIAL HYDROCARBON NETWORKS

ABSTRACT. Human activity recognition (HAR) aims to classify and identify activities based on data-driven from different devices, such as sensors or cameras. Particularly, mobile devices have been used for this recognition task. However, versatility of users, location of smartphones, battery, processing and storage limitations, among other issues have been identified. In that sense, this paper presents a human activity recognition system based on artificial hydrocarbon networks. This technique have been proved to be very effective on HAR systems using wearable sensors, so the present work proposes to use this learning method with the information provided by the in-sensors of mobile devices. Preliminary results proved that artificial hydrocarbon networks might be used as an alternative for human activity recognition on mobile devices. In addition, a real dataset created for this work has been published. © Springer Nature Switzerland AG 2018.

Ponce H., González G., Miralles-Pechuán L., Martínez-Villaseñor M.L. (2018), "Human activity recognition on mobile devices using artificial hydrocarbon networks", *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* 10632 LNAI: 17-29, doi: [10.1007/978-3-030-02837-4_2](https://doi.org/10.1007/978-3-030-02837-4_2). Conference Paper.

Hiram Eredín Ponce Espinosa

SNI Nivel I

INTELLIGENT CONTROL NAVIGATION EMERGING ON MULTIPLE MOBILE ROBOTS APPLYING SOCIAL WOUND TREATMENT

ABSTRACT. In robotics, learning new tasks is a complex solving problem. This learning depends on the environment, the robot configuration, the difficulty of the problem task, even the prior knowledge. Reinforcement learning has been widely employed for learning from scratch and policy search; however, it is very time-consuming. Multi-robots, as collaborative learners, have been proposed to improve the speed of learning in robotics. In this paper, we propose a collaborative intelligent control navigation strategy in robots, including a social wound treatment approach, such that robots can jointly learn how to avoid obstacles and move freely around the environment. This collective learning about social treatment aims to detect unexpected or inefficient behaviors of the robots, allowing them to redirect the right tasks with more agility, as observed in some animals. Experimental results over a multiple homogeneous robot system simulation validated our proposal. © 2019 IEEE.

Ponce H., Souza P. V. C. (2019), "Intelligent control navigation emerging on multiple mobile robots applying social wound treatment", *Proceedings - 2019 IEEE 33rd International Parallel and Distributed Processing Symposium Workshops, IPDPSW 2019*, 8778312: 559-564, doi: [10.1109/IPDPSW.2019.00098](https://doi.org/10.1109/IPDPSW.2019.00098). Conference Paper.

Hiram Eredín Ponce Espinosa

SNI Nivel I

Mario Acevedo Alvarado

SNI Nivel Candidato

María de Lourdes Martínez Villaseñor

SNI Nivel I

MODELING AND CONTROL BALANCE DESIGN FOR A NEW BIO-INSPIRED FOUR-LEGGED ROBOT

ABSTRACT. Bio-inspired robots have chosen to propose novel developments aiming to inhabit and interact complex and dynamic environments. Bio-inspired four-legged robots, typically inspired on animal locomotion, provide advantages on mobility, obstacle avoidance, energy efficiency and others. Balancing is a major challenge when legged robots require to move over uncertain and sharp terrains. It becomes of particular importance to solve other locomotion tasks such as walking, running or jumping. In this paper, we present a preliminary study on the modeling and control balance design of a bio-inspired four-legged robot for standing on its aligned legs in a straight line. The proposed robot is loosely inspired on the bio-mechanics of the chameleon. Thus, a mathematical modeling, simulation, intelligent control strategy, prototype implementation and preliminary results of control balance in our robot are presented and discussed. © Springer Nature Switzerland AG 2019.

Ponce, H., Acevedo, M., Morales-Olvera, E., Martínez-Villaseñor, L., Díaz-Ramos, G., Mayorga-Acosta, C. (2019), "Modeling and Control Balance Design for a New Bio-inspired Four-Legged Robot", *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* 11835 LNAI: 728-739, doi: [10.1007/978-3-030-33749-0_58](https://doi.org/10.1007/978-3-030-33749-0_58). Conference Paper.

Hiram Eredín Ponce Espinosa

SNI Nivel I

NURSE-BOT: A ROBOT SYSTEM APPLIED TO MEDICAL ASSISTANCE

ABSTRACT. Caring for the elderly and sick people is one of the biggest concerns of families. Those who experience the responsibility and the enormous work involved in this care recognizes that all kind of help it's welcomed. The objective of this paper is to present Nurse-bot as a mechatronics system for taking care of the elderly and sick people. In particular, we refer this device not only as a tool, but with the time and development a

true support to the people. It is like-a nurse made robot that monitors vital signs and keeps the information, so that the attending physician has up-to-date parameters before the consultation that allows a better follow-up of the results of the prescribed treatment made by a specialist. A proof-of-concept and the first prototype is presented in this work. Experimental results shows insights that this robot can help people. © 2018 IEEE.

Alvarez J., Campos G., Enriquez V., Miranda A., Rodriguez F., Ponce H. (2018), "Nurse-Bot: A Robot System Applied to Medical Assistance", *Proceedings - 2018 International Conference on Mechatronics, Electronics and Automotive Engineering, ICMEAE 2018*, 8743137: 56-59, doi: [10.1109/ICMEAE.2018.00017](https://doi.org/10.1109/ICMEAE.2018.00017). Conference Paper.

Hiram Eredín Ponce Espinosa

SNI Nivel I

STOCHASTIC PARALLEL EXTREME ARTIFICIAL HYDROCARBON NETWORKS: AN IMPLEMENTATION FOR FAST AND ROBUST SUPERVISED MACHINE LEARNING IN HIGH-DIMENSIONAL DATA

ABSTRACT. Artificial hydrocarbon networks (AHN) – a supervised learning method inspired on organic chemical structures and mechanisms – have shown improvements in predictive power and interpretability in comparison with other well-known machine learning models. However, AHN are very time-consuming that are not able to deal with large data until now. In this paper, we introduce the stochastic parallel extreme artificial hydrocarbon networks (SPE-AHN), an algorithm for fast and robust training of supervised AHN models in high-dimensional data. This training method comprises a population-based meta-heuristic optimization with defined individual encoding and objective function related to the AHN-model, an implementation in parallel-computing, and a stochastic learning approach for consuming large data. We conducted three experiments with synthetic and real data sets to validate the training execution time and performance of the proposed algorithm. Experimental results demonstrated that the proposed SPE-AHN outperforms the original-AHN method, increasing the speed of training more than 10,000x times in the worst case scenario. Additionally, we present two case studies in real data sets for solar-panel deployment prediction (regression problem), and human falls and daily activities classification in healthcare monitoring systems (classification problem). These case studies showed that SPE-AHN improves the state-of-the-art machine learning models in both engineering problems.

We anticipate our new training algorithm to be useful in many applications of AHN like robotics, finance, medical engineering, aerospace, and others, in which large amounts of data (e.g. big data) is essential. © 2019 Elsevier Ltd.

Ponce, H., de Campos Souza, P. V., Guimarães, A. J., González-Mora, G. (2020). "Stochastic parallel extreme artificial hydrocarbon networks: An implementation for fast and robust supervised machine learning in high-dimensional data", *Engineering Applications of Artificial Intelligence* 89, Article number 103427. Article.

Hiram Eredín Ponce Espinosa

SNI Nivel I

José Antonio Marmolejo Saucedo

SNI Nivel II

María de Lourdes Martínez Villaseñor

SNI Nivel I

TOWARDS CONSTANT CALCULATION IN DISJUNCTIVE INEQUALITIES USING WOUND TREATMENT OPTIMIZATION

ABSTRACT. When using the mixed-integer programming to model situations where the limit of the variables follows a box constraint, we find nonlinear problems. To solve this, linearization techniques of these disjunctive inequality constraints are typically used, including constants associated to the variable bounds called M-constants or big-M. Calculation of these constants is an open problem since their values affect the reliability of the optimal solution and convergence of the optimization algorithm. To solve this problem, this work proposes a new population-based metaheuristic optimization method, namely wound treatment optimization (WTO) for calculating the M-constant in a typical domain known as the fixed-charge transportation problem. WTO is inspired on the social wound treatment present in ants after raids. This method allows population diversity that allows to find near-optimal solutions. Experiments of the WTO method on the fixed-charge transportation problem validated its performance and efficiency to find tighten solutions of the M-constant that minimizes the objective function of the problem. © Springer Nature Switzerland AG 2019.

Ponce, H., Marmolejo-Saucedo, J. A., Martínez-Villaseñor, L. (2019), "Towards Constant Calculation in Disjunctive Inequalities Using Wound Treatment Optimization", *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* 11835 LNAI: 305-316, doi: [10.1007/978-3-030-33749-0_25](https://doi.org/10.1007/978-3-030-33749-0_25). Conference Paper.

Hiram Eredín Ponce Espinosa

SNI Nivel I

María de Lourdes Martínez Villaseñor

SNI Nivel I

VERSATILITY OF ARTIFICIAL HYDROCARBON NETWORKS FOR SUPERVISED LEARNING

ABSTRACT. Surveys on supervised machine show that each technique has strengths and weaknesses that make each of them more suitable for a particular domain or learning task. No technique is capable to tackle every supervised learning task, and it is difficult to comply with all possible desirable features of each particular domain. However, it is important that a new technique comply with the most requirements and desirable features of as many domains and learning tasks as possible. In this paper, we presented artificial hydrocarbon networks (AHN) as versatile and efficient supervised learning method. We determined the ability of AHN to solve different problem domains, with different data-sources and to learn different tasks. The analysis considered six applications in which AHN was successfully applied. © Springer Nature Switzerland AG 2018.

Ponce H., Martínez-Villaseñor M. L. (2018), "Versatility of artificial hydrocarbon networks for supervised learning", *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)* 10632 LNAI: 3-16, doi: [10.1007/978-3-030-02837-4_1](https://doi.org/10.1007/978-3-030-02837-4_1). Conference Paper.

María José Quintana Hernández

SNI Nivel I

Roberto González Ojeda

Profesor Investigador

GRAIN SIZE DISTRIBUTION ON A FORGED NI-CR-MO LOW-ALLOY STEEL

ABSTRACT. Microalloyed Ni-Cr-Mo steel (8620) combines good characteristics of formability during forging at 1100°C with the capacity to transform into martensite, while distributing residual stresses and allowing surface treatments and modifications in mechanical parts such as gears and cams. The work presents grain size measurements at different locations of a hot forged gear analyzing it by quantitative metallography techniques and simulating deformation by finite element modeling to estimate local strain and strain rate. Dynamic recrystallization mathematical models for the austenitic initial grain size before forging were applied to calculate the-

oretical final grain size and correlate the results with microstructural observations, taking also into account the role of precipitation of Cr and Mo carbides. Copyright © 2018 MS&T18®.

Quintana M. J., Kenney M., Ales T. K., Collins P. C., Gonzalez R. (2019), "Grain size distribution on a forged Ni-Cr-Mo low-alloy steel". *Materials Science and Technology* 2018, MS and T 2018, 1208-1215, doi: [10.7449/2018/MST_2018_1208_1215](https://doi.org/10.7449/2018/MST_2018_1208_1215). Conference Paper.

Héctor Rogelio Robles Campos

Profesor Investigador

A COMPARATIVE EVALUATION OF MODULATION STRATEGIES FOR HEXVERTER-BASED MODULAR MULTILEVEL CONVERTERS

ABSTRACT. In this work two different modulation strategies termed: i) nearest level control, and ii) phase disposition- sinusoidal pulse width modulation, are described, simulated and compared when applied to a Hexverter-based modular multilevel converter. In addition, two different voltage balancing algorithms are implemented and evaluated. Furthermore, total harmonic distortion regarding three-phase system voltages are assessed. In the end, synthesized branch voltage spectrum for each modulation strategy is analyzed. © 2019 IEEE.

Robles-Campos, H. R., Mancilla-David, F. (2019), "A comparative evaluation of modulation strategies for hexverter-based modular multilevel converters", *Proceedings of the IEEE International Conference on Industrial Technology 2019*, 8755144: 1465-1470, doi: [10.1109/ICIT.2019.8755144](https://doi.org/10.1109/ICIT.2019.8755144). Conference Paper.

Héctor Rogelio Robles Campos

Profesor Investigador

DETAILED MODELING OF LARGE SCALE PHOTOVOLTAIC POWER PLANTS UNDER PARTIAL SHADING CONDITIONS

ABSTRACT. As the popularity of solar panels increases, significant research is being performed on maximizing the power extracted from photovoltaic systems. A phenomenon known as partial shading is a major source of power losses for photovoltaic plants. One way to reduce the effects of partial shading conditions is by using bypass-diodes. Typically any number of series and parallel-connected photovoltaic cells, known as photovoltaic cell arrays, are connected in anti-parallel with bypass-diodes. Due to this, it is advantageous to have an equivalent model for a photovoltaic cell array that is connected to bypass-diodes. In order

to accurately develop this model, it is necessary to consider both series and parallel configurations of bypass-diodes, as well as the thermal behavior of bypass-diodes. The bypass-diode's temperature model must be comprised of the constantly changing dissipated power, the effects of wind speed and the ambient temperature. This paper constructs an electro-thermal modular model for any size photovoltaic system and includes the effects of both the photovoltaic cells and bypass-diodes. A detailed analysis of the proposed model is performed and is then validated in both PSCAD/EMTDC and Matlab-Simscape. The proposed model is then further validated by the use of real measurements of ambient temperature, cell temperature, wind speed and then finally by a performance analysis of several maximum-power-point-tracking algorithms. © 2019 International Solar Energy Society.

Robles-Campos, H. R., Azuaje-Berbeci, B. J., Scheller, C. J., Angulo, A., Mancilla-David, F. (2019), "Detailed modeling of large scale photovoltaic power plants under partial shading conditions", *Solar Energy* 194: 485-498, doi: [10.1016/j.solener.2019.10.043](https://doi.org/10.1016/j.solener.2019.10.043). Article.

Pedro Manuel Rodrigo Cruz

SNI Nivel I

FEASIBILITY OF FLAT-PLATE HEAT-SINKS FOR ULTRA-HIGH CONCENTRATIONS (> 2000 SUNS) USING MICROSCALE SOLAR CELLS

ABSTRACT. Concentrator photovoltaic (CPV) systems replace semiconductor material by cost-efficient optical elements. The potential cost reduction of these systems is closely related to the concentration factor because higher light concentrations imply lower amount of semiconductor material required for the solar cells. Thus, one promising way for improving this technology is moving towards ultra-high concentration levels (>2000 suns). However, the thermal management at such ultra-high light fluxes is difficult. The use of small-sized solar cells is beneficial for improving the thermal management. Among the possible cooling strategies, the use of flat-plate heat-sinks for passive cooling, if feasible, would be the simplest way to dissipate heat and would accelerate the development of ultra-high CPV prototypes. In this work, a thermal 3D finite-element model is used to investigate the possibilities of flat-plate heat-sinks for passive cooling at concentration ratios not tested to date (2000-10000 suns). Results show that a micro solar cells of 0.5mm x 0.5mm area can be thermally handled with conventional Aluminium flat-plate heat-sinks up to 10000 suns. © 2018 IEEE.

Valera A., Fernández E. F., Almonacid F., Rodrigo P. M. (2018), "Feasibility of Flat-Plate Heat-Sinks for Ultra-High Concentrations (> 2000 Suns) Using Microscale Solar Cells", *Proceedings of the 2018 12th Spanish Conference on Electron Devices, CDE 2018*, 8596790, doi: [10.1109/CDE.2018.8596790](https://doi.org/10.1109/CDE.2018.8596790). Conference Paper.

Pedro Manuel Rodrigo Cruz

SNI Nivel I

FEASIBILITY OF FLAT-PLATE HEAT-SINKS USING MICROSCALE SOLAR CELLS UP TO 10,000 SUNS CONCENTRATIONS

ABSTRACT. Concentrator photovoltaic (CPV) systems replace semiconductor material by cost-efficient optical elements. The potential cost reduction of these systems is closely related to the concentration factor because higher light concentrations imply lower amount of semiconductor material required for the solar cells. Thus, one promising way for improving this technology is moving towards ultra-high (UH) concentration levels (>2000 suns). However, the thermal management at such extreme light fluxes is difficult. Using small-sized solar cells is beneficial for improving the thermal management. Among the possible cooling strategies, the use of flat-plate heat-sinks for passive cooling, if feasible, would be the simplest way to dissipate the heat and would accelerate the development of UHCPV prototypes. However, the feasibility of flat-plate heat-sinks using microscale solar cells for UHCPV applications has not been analysed in detail yet. In this work, a thermal 3D finite-element model is used to investigate the possibilities of flat-plate heat-sinks at concentration ratios not tested to date, i.e. 2000–10,000 suns. Critical parameters such as solar cell area and efficiency, substrate thickness, heat-sink area, and heat-sink material are evaluated and discussed. Results show that solar cells of 1 mm × 1 mm area or below can be thermally handled with conventional Aluminium flat heat-sinks up to 10,000 suns. © 2019 International Solar Energy Society.

Valera A., Fernández E.F., Rodrigo P.M., Almonacid F. (2019), "Feasibility of flat-plate heat-sinks using microscale solar cells up to 10,000 suns concentrations", *Solar Energy* 181: 361-371, doi: [10.1016/j.solener.2019.02.013](https://doi.org/10.1016/j.solener.2019.02.013). Article.

Pedro Manuel Rodrigo Cruz

SNI Nivel I

FINITE ELEMENT ANALYSIS OF COOLING MECHANISM BY FLAT HEAT-SINKS IN ULTRA-HIGH CPV SYSTEMS

ABSTRACT. The potential cost reduction of Concentrator photovoltaic (CPV) systems is closely related to the concentration factor because higher light concentrations imply lower amount of semiconductor material required for the solar cells. However, the thermal management at such ultra-high light fluxes is difficult. The use of small-sized solar cells is beneficial for improving the thermal management. Among the possible cooling strategies, the use of flat-plate heat-sinks for passive cooling, if feasible, would be the simplest way to dissipate heat and would accelerate the development of ultra-high CPV prototypes. In this work, a thermal 3D finite-element model is used to investigate the possibilities of flat-plate heat-sinks for passive cooling at concentration ratios within 2,000-10,000 suns. Results show that a micro solar cells of 1mm x 1mm area can be thermally handled with conventional Aluminium flat plate heat-sinks up to 10,000 suns. © 2019 American Institute of Physics Inc. All rights reserved.

Valera, Á., Fernández, E.F., Rodrigo, P. M., Ferrer-Rodríguez, J. P., Pérez-Higueras, P., Almonacid, F. (2019), "Finite element analysis of cooling mechanism by flat heat-sinks in ultra-high CPV systems", *AIP Conference Proceedings* 2149, 020006-1, doi: [10.1063/1.5124176](https://doi.org/10.1063/1.5124176). Conference Paper.

Pedro Manuel Rodrigo Cruz

SNI Nivel I

OPTIMUM ARRAY SPACING IN GRID-CONNECTED PHOTOVOLTAIC SYSTEMS CONSIDERING TECHNICAL AND ECONOMIC FACTORS

ABSTRACT. The performance and economics of grid-connected photovoltaic (PV) systems are affected by the array spacing. Increasing the array spacing implies reducing the impact of shading, but at the same time, it increases the land purchase/preparation costs and the wiring costs. A number of technical and economic factors are involved when selecting an optimum array spacing. Designers of PV plants often set the row-to-row spacing based on simplified rules, losing the opportunity of improving the profitability of their projects. In this paper, a comprehensive methodology for optimizing the array spacing is proposed. It is based on annual shading energy calculations and incorporates a PV energy yield

model together with an economic model focused on investment costs. The method is applied to the climatic conditions in Aguascalientes, Mexico, as a case study. A sensitivity analysis allowed the impact of the technical and economic parameters involved on the optimum interrow distance to be quantified. According to the results, the most relevant technical parameters are the module tilt (often considered by the PV designers), the ratio of plant width to plant length, and the module efficiency. The main economic parameters are the land-related costs and the costs per kWp. The comparison of this methodology to a conventional rule based on the winter solstice condition shows differences in the array spacing for the same location when the multiple technical and economic parameters are considered. Therefore, the proposed method will be useful for PV designers to improve the energetic and economic behavior of their systems. Copyright © 2019 S. Sánchez-Carbajal and P. M. Rodrigo.

Sánchez-Carbajal S., Rodrigo P. M. (2019), "Optimum Array Spacing in Grid-Connected Photovoltaic Systems considering Technical and Economic Factors", *International Journal of Photoenergy* 2019, 1486749, doi: [10.1155/2019/1486749](https://doi.org/10.1155/2019/1486749). Article.

Pedro Manuel Rodrigo Cruz

SNI Nivel I

OPTIMUM CAPACITY OF THE INVERTERS IN CONCENTRATOR PHOTOVOLTAIC POWER PLANTS WITH EMPHASIS ON SHADING IMPACT

ABSTRACT. Nowadays, there is wide experience on selecting an adequate ratio between the photovoltaic array peak power and the inverter capacity for conventional photovoltaic systems. However, when dealing with concentrator photovoltaic plants, the problem is more complex and the results obtained with conventional methods are not directly applicable. There are few studies regarding concentrator photovoltaic technology and all of them neglect the impact of shading. In this paper, based on the experimental characterisation of a typical concentrator photovoltaic module, a power plant model is developed, which takes into consideration shading, module misalignment, and different inverter configuration schemes for optimising the inverter capacity. The inverter size is analysed for different ground cover ratios (from 12% to 52%), inverter schemes (micro-, string-, and tracker-inverters), inverter efficiencies (low-, medium-, and high-efficiency), climatic conditions (Granada, Marrakech, and Frenchman Flat), and economic conditions (system cost excluding inverters from 850 to 1400

€/kWp). Results show values for the DC-to-AC sizing ratio ranging from 1.01 to 1.67 (maximum performance ratio), and from 1.53 to 1.79 (minimum levelised cost of energy). String-inverters exhibit the best behaviour in terms of levelised cost of energy, except in shadow-free systems, in which tracker-inverters behave better.

Rodrigo, P. M., Talavera, D. L., Fernandez, E. F., Almonacid, F. M., Perez-Higueras, P. J. (2019), "Optimum capacity of the inverters in concentrator photovoltaic power plants with emphasis on shading impact", *Energy* 187, 115967, doi: [10.1016/j.energy.2019.115964](https://doi.org/10.1016/j.energy.2019.115964). Article.

Pedro Manuel Rodrigo Cruz

SNI Nivel I

PERFORMANCE AND ECONOMIC LIMITS OF PASSIVELY COOLED HYBRID THERMOELECTRIC GENERATOR-CONCENTRATOR PHOTOVOLTAIC MODULES

ABSTRACT. Concentrator photovoltaic technology has doubled the efficiency of conventional non-concentrating photovoltaic systems. However, still ≈60% of the incident energy is dissipated as heat, and costs of concentrator photovoltaics need to be lowered for these systems to be competitive. One promising way for taking advantage of the heat generated in the solar cells is the hybridization with thermoelectric generators. The feasibility of hybrid concentrator photovoltaic-thermoelectric modules has been shown in recently published work for enhancing the efficiency and lowering the cost, with special emphasis on actively cooled designs. However, if feasible, the use of simple and reliable passive cooling would accelerate the development of new hybrid prototypes. The performance and cost reduction limits achievable with passively cooled designs have not yet been studied in detail. In this paper, an electric/thermal/economic model of concentrator photovoltaic-thermoelectric module is developed. As the main novelty, the model allows the thermoelectric generator area to be adjusted. Some optimisation problems are formulated and solved to evaluate the efficiency improvement and cost reduction of the hybrid system in comparison to a typical 800x light concentration factor and 36.4% efficiency concentrator photovoltaic-only module. The analysis showed that optimising the thermoelectric generator area is essential for the cell operating temperature limits not to be exceeded, and that conventional passive cooling is enough for achieving efficiency gains and cost reduction considering a state-of-the-art highly efficient 3 mm × 3 mm triple junction solar cell.

With advanced thermoelectric materials and cell temperature of 100 °C, a maximum efficiency of 39.2% for the hybrid system can be achieved at 800x concentration factor by using low thermal resistance heat sinks, and a maximum cost reduction of 46.0% can be achieved at the maximum analysed concentration factor (1900x) by using moderate thermal resistance heat sinks. A trade-off between enhancing the efficiency and lowering the cost was observed. The sensitivity analysis on the thermoelectric parameters showed that parameters other than thermoelectric generator area and ZT figure-of-merit barely influence the results. The existing experimental concentrator photovoltaic-thermoelectric prototypes are far from the efficiency and cost benefits predicted in this paper. Thus, the study can help in the development of future prototypes. © 2019 Elsevier Ltd.

Rodrigo P. M., Valera A., Fernández E. F., Almonacid F. M. (2019), "Performance and economic limits of passively cooled hybrid thermoelectric generator-concentrator photovoltaic modules", *Applied Energy* 238: 1150-1162, doi: [10.1016/j.apenergy.2019.01.132](https://doi.org/10.1016/j.apenergy.2019.01.132). Article.

Ernesto Leonides Rodríguez González

Profesor Investigador

APPLICATION OF THE SCORING METHOD FOR INTEGRAL CUSTOMER CLASSIFICATION [APLICACIÓN DEL MÉTODO SCORING PARA LA CLASIFICACIÓN INTEGRAL DE CLIENTES]

ABSTRACT. There are entities that provide on-site services, where the exchange of value occurs in the client's facilities, involving a greater number of resources. In the work, two entities are presented, an offer "turnkey" security system, executing projection, supplies, installation and commissioning, training the client and the subsequent maintenance service of the systems, the other distributes ice cream to different points of sale. In both entities the clients are classified considering only one criterion (installed technology and distance). Both entities have presented problems with the performance indicators, being necessary the redesign of their planning systems. The first step that is proposed for the conformation of the plan is to carry out the integral classification of the clients taking into account a set of criteria. It is shown how to obtain this classification using a multicriterial approach, specifically the Scoring method, which allowed to quickly and efficiently determine the integral classification of clients in the entities under study. Among the economic results can be mentioned: a saving in 11 760 liters of oil per year, which results in a savings of \$ 5 576, 64 USD for a turnkey service entity, while for the ice cream dis-

tribution entity increases the income at \$ 35,347, the utility at \$ 40,588.45 and the cost decreases at \$ 5,470 for one month of application of the procedure. © 2019, Universidad de Tarapaca. All rights reserved.

Ríos, R. C. G., Sánchez, C. N. G., González, E. L. R. (2019), "Application of the scoring method for integral customer classification [Aplicación del método scoring para la clasificación integral de clientes]", *Ingeniare* 27(3): 375-382, doi: [10.4067/S0718-33052019000300375](https://doi.org/10.4067/S0718-33052019000300375). Article.

Rodrigo Romero Silva

SNI Nivel I

Margarita Hurtado Hernández

SNI Nivel Candidato

A NOTE ON DEFINING ORGANISATIONAL SYSTEMS FOR CONTINGENCY THEORY IN OM

ABSTRACT. This paper aims to improve the applicability and relevance of contingency theory research in the field of Operations Management. Based on the results of previous studies, we have identified a systems-based single definition of organisation types that could describe the fit between organisational environment and organisational structure. This definition of organisation type, which we call an 'organisational system', regards the organisation as an integrated whole instead of as a sum of its parts and can help to better classify organisations in order to identify fits between organisation types and emerging practices in Operations Management. © 2019, © 2019 Informa UK Limited, trading as Taylor & Francis Group.

Romero-Silva R., Santos J., Hurtado M. (2018), "A note on defining organisational systems for contingency theory in OM", *Production Planning and Control* 29(16): 1343-1348, doi: [10.1080/09537287.2018.1535146](https://doi.org/10.1080/09537287.2018.1535146). Article.

Rodrigo Romero Silva

SNI Nivel I

Margarita Hurtado Hernández

SNI Nivel Candidato

REDUCING THE VARIABILITY OF INTER-DEPARTURE TIMES OF A SINGLE-SERVER QUEUEING SYSTEM – THE EFFECTS OF SKEWNESS

ABSTRACT. A critical performance measure in serial production lines is the variability of inter-departure times of a single-server queue. Increasing upstream inter-departure time variability gener-

ates greater downstream variability, diminishing overall line performance. Theory suggests that the variability of inter-departure times of a single-server queue is reduced by decreasing the variance of inter-arrival and service times. This study investigates the effects of the skewness of inter-arrival and service time distributions on the variability of inter-departure times. Contrary to previous results suggesting that mean waiting times of a GI/G/1 queue can be reduced by increasing inter-arrival time skewness, this experimental study of a GI/G/1 queue with triangular inter-arrival and service times shows that the inter-departure time coefficient of variation is reduced through a combination of negative inter-arrival time skewness and positive service time skewness. These results also suggest that the absolute value of the negative autocorrelation between consecutive departures is reduced by the same combination of negative inter-arrival time skewness and positive service time skewness for low values of server's utilization, while positive skewness for both inter-arrival and service times reduces this value for high values of server's utilization. Finally, it was found that queue capacity constraints increase the coefficient of variation of inter-departure times, as has been previously suggested, as well as the skewness and the absolute correlation values of the inter-departure time distribution. © 2019 Elsevier Ltd.

Romero-Silva R., Marsillac E., Shaaban S., Hurtado-Hernández M. (2019), "Reducing the variability of inter-departure times of a single-server queueing system – The effects of skewness", *Computers and Industrial Engineering* 135: 500-517, doi: [10.1016/j.cie.2019.06.030](https://doi.org/10.1016/j.cie.2019.06.030). Article.

Rodrigo Romero Silva

SNI Nivel I

Margarita Hurtado Hernández

SNI Nivel Candidato

SERIAL PRODUCTION LINE PERFORMANCE UNDER RANDOM VARIATION: DEALING WITH THE 'LAW OF VARIABILITY'

ABSTRACT. Many Queueing Theory and Production Management studies have investigated specific effects of variability on the performance of serial lines since variability has a significant impact on performance. To date, there has been no single summary source of the most relevant research results concerned with variability, particularly as they relate to the need to better understand the 'Law of Variability'. This paper fills this gap and provides readers the foundational knowledge needed to develop intuition and insights on

the complexities of stochastic simple serial lines, and serves as a guide to better understand and manage the effects of variability and design factors related to improving serial production line performance, i.e. throughput, inter-departure time and flow time, under random variation. © 2019 The Society of Manufacturing Engineers.

Romero-Silva R., Marsillac E., Shaaban S., Hurtado-Hernández M. (2019), "Serial production line performance under random variation: Dealing with the 'Law of Variability'", *Journal of Manufacturing Systems* 50: 278-289, doi: [10.1016/j.jmsys.2019.01.005](https://doi.org/10.1016/j.jmsys.2019.01.005). Article.

Rodrigo Romero Silva

SNI Nivel I

TRENDS AND TOPICS IN IJPR FROM 1961 TO 2017: A STATISTICAL HISTORY

ABSTRACT. This paper studies the history of the International Journal of Production Research (IJPR) by analysing the topics that have received the most attention in each of the journal's publication years. Text mining exposed for scrutiny the most frequently mentioned and cited terms contained in the titles, abstracts and keywords of IJPR papers. Analyses suggest that the triad of scheduling/optimisation/simulation and supply-chain-related topics have been IJPR's mainstays, but valuable opportunities remain for relevant topics that have not yet been concurrently and frequently studied. Results also show that terms related to sustainability and risk management topics have gained recent relevance. In addition, IJPR appears to complement its modeling technique focus with empirical methodological approaches to provide a well-balanced perspective, since the 'case study' term is common. Finally, a linear relationship is found between the number of papers that have covered certain topics and the number of citations those topics have received, highlighting which topics had fewer or more citations than expected, given the number of papers that covered those topics. IJPR stands as one of the most prestigious and established journals in its field and the results from this study indicate the evolving interests of the field for over half a century. © 2018, © 2018 Informa UK Limited, trading as Taylor & Francis Group.

Romero-Silva R., Marsillac E. (2019), "Trends and topics in IJPR from 1961 to 2017: a statistical history", *International Journal of Production Research* 57(15-16): 4692-4718, doi: [10.1080/00207543.2018.1551638](https://doi.org/10.1080/00207543.2018.1551638). Review.

Luis Alberto Rosa Sierra

SNI Nivel II

Fabiola Cortés Chávez

Profesor Investigador

DESIGN OF A WHEELCHAIR FOR LOW-INCOME COUNTRIES, THE SECOND STAGE OF A PROJECT

ABSTRACT. In the first phase of the project, it was reported in a previous conference communication, the manufacture of two low-cost wheelchairs developed under this platform, both proposals designed in European countries (Spain and Italy). Following the constructive drawings and instructions available on the open-source platforms, both chairs were manufactured as close as possible to reported instructions. In their manufacture process, both wheelchairs presented some problems, in the construction and during the user testing phase, we report these kinds of problems in the first stage of the project. In the present stage, we start from models manufactured and tested with users, with the aim of improving the product design, since, one of the characteristics of the products designed under the open-source scheme is its ability to be modified and adapted to local needs, materials and production processes. © Springer Nature Switzerland AG 2020.

Rossa-Sierra A., Cortes-Chavez F., Vidana-Zavala D., Munno M. G. T. (2020), "Design of a wheelchair for low-income countries, the second stage of a project", *Advances in Intelligent Systems and Computing* 954: 301-309, doi: [10.1007/978-3-030-20444-0_29](https://doi.org/10.1007/978-3-030-20444-0_29). Conference Paper.

Luis Alberto Rosa Sierra

SNI Nivel II

REDESIGNING THE COMMON NICU INCUBATOR: AN APPROACH THROUGH THE EMULATION OF FACTORS RESEMBLING THE MOTHER'S WOMB

ABSTRACT. Incubators are essential medical devices in Neonatal Intensive Care Units (NICU) with the purpose of regulating and maintaining the required humidity and temperature for neonates and preterm infants (PI): Basic survival functions. Nonetheless, their optimal development must consider other fundamental factors such as positioning of the body, orientation in space, and other stimuli. The aim of this study was to compare the emotional visual impact variation caused by the common NICU incubator and a redesign proposal that takes into account all the factors previously mentioned. The emotional impact caused by these two devices was measured through

a survey using PrEmo Tool©. The results showed that through the redesigned proposal, a higher positive response was achieved while decreasing its negative emotional impact. The proposal's aim for improvement was achieved through the emulation of the mother's womb both in form and function. © Springer Nature Switzerland AG 2020.

Chavez-Marón, D., Taylor-Arthur, A., Olivares-Jimenez, S., Durán-Aguilar, G., Rossa-Sierra, A. (2020), "Redesigning the Common NICU Incubator: An Approach Through the Emulation of Factors Resembling the Mother's Womb", *Advances in Intelligent Systems and Computing* 1026: 331-335, doi: [10.1007/978-3-030-27928-8_50](https://doi.org/10.1007/978-3-030-27928-8_50). Conference Paper.

Enrique Rosales Ruíz

Profesor Investigador

Arturo Jafet Rodríguez Muñoz

Profesor Investigador

SURFACEBRUSH: FROM VIRTUAL REALITY DRAWINGS TO MANIFOLD SURFACES

ABSTRACT. Popular Virtual Reality (VR) tools allow users to draw varying-width, ribbon-like 3D brush strokes by moving a hand-held controller in 3D space. Artists frequently use dense collections of such strokes to draw virtual 3D shapes. We propose SurfaceBrush, a surfacing method that converts such VR drawings into user-intended manifold free-form 3D surfaces, providing a novel approach for modeling 3D shapes. The inputs to our method consist of dense collections of artist-drawn stroke ribbons described by the positions and normals of their central polylines, and ribbon widths. These inputs are highly distinct from those handled by existing surfacing frameworks and exhibit different sparsity and error patterns, necessitating a novel surfacing approach. We surface the input stroke drawings by identifying and leveraging local coherence between nearby artist strokes. In particular, we observe that strokes intended to be adjacent on the artist imagined surface often have similar tangent directions along their respective polylines. We leverage this local stroke direction consistency by casting the computation of the user-intended manifold surface as a constrained matching problem on stroke polyline vertices and edges. We first detect and smoothly connect adjacent similarly-directed sequences of stroke edges producing one or more manifold partial surfaces. We then complete the surfacing process by identifying and connecting adjacent similarly directed edges along the borders of these partial surfaces. We confirm the usability of the SurfaceBrush interface and the validity of our drawing analysis via an observational study. We validate our stroke surfacing algorithm by demon-

strating an array of manifold surfaces computed by our framework starting from a range of inputs of varying complexity, and by comparing our outputs to reconstructions computed using alternative means. © 2019 Copyright held by the owner/author(s). Publication rights licensed to ACM.

Rosales E., Rodriguez J., Sheffer A. (2019), "Surface-brush: from virtual reality drawings to manifold surfaces", *ACM Transactions on Graphics* 38(4), 96, doi: [10.1145/3306346.3322970](https://doi.org/10.1145/3306346.3322970). Article.

Julio César Rosas Caro

SNI Nivel I

A NOVEL PEMFC POWER CONDITIONING SYSTEM BASED ON THE INTERLEAVED HIGH GAIN BOOST CONVERTER

ABSTRACT. Power converter units are crucial components in proton exchange membrane fuel cell (PEMFC) energy generation systems. For this reason, and also motivated by the demands in high quality power conditioning for PEMFC systems, we propose the application of an interleaved high gain boost converter topology with a diode clamped multilevel inverter as power interface. The main advantages of the proposed scheme encompass: high voltage conversion ratio, input current ripple mitigation, and voltage balancing across output capacitors. These characteristics make this converter ideal for grid-connection purposes, acting as an interface for renewable energy sources that provide low voltages and demand low current ripples. The underlying theoretical analysis as well as simulation and experimental validation are presented in this paper. © 2018 Hydrogen Energy Publications LLC.

Mayo-Maldonado J. C., Valdez-Resendiz J. E., Sanchez V. M., Rosas-Caro J. C., Claudio-Sanchez A., Chan Puc F. (2019), "A novel PEMFC power conditioning system based on the interleaved high gain boost converter", *International Journal of Hydrogen Energy* 44(24): 12508-12514, doi: [10.1016/j.ijhydene.2018.11.090](https://doi.org/10.1016/j.ijhydene.2018.11.090). Article.

Julio César Rosas Caro

SNI Nivel I

Antonio Valderrábano González

SNI Nivel I

ADAPTIVE NEURAL STRATEGIES FOR THE INTERACTIVE TRACKING FLIGHT OF TWO AERIAL VEHICLES

ABSTRACT. In this paper an adaptive algorithm for the interactive flight of two aerial vehicles

(Quadrotor) is introduced. The proposed scheme allows to a vehicle (follower) to track another (leader), without knowledge of the planned references for the secondly mentioned. The use of adaptive control parameters enhances the closed loop dynamic responses of the Quadrotor vehicles. Adaptive learning and adjusting for the tracking of the online computed references for the follower vehicle is achieved using Neural Networks of the B-spline type. Numeric simulations are presented showing the effectiveness of the proposed approach to deal with the task of tracking. © 25th International Congress on Sound and Vibration 2018, ICSV 2018: Hiroshima Calling. All rights reserved.

Yañez-Badillo H., Tapia-Olvera R., Beltran-Carbajal F., Valderrábano-Gonzalez A., Rosas-Caro J. C., Aguilar-Mejia O. (2018), "Adaptive neural strategies for the interactive tracking flight of two aerial vehicles", *25th International Congress on Sound and Vibration 2018, ICSV 2018: Hiroshima Calling* 2: 800-807. Conference Paper.

Julio César Rosas Caro

SNI Nivel I

Antonio Valderrábano González

SNI Nivel I

AN ACTIVE SUPPRESSION APPROACH OF HARMONIC FORCES IN A QUADROTOR

ABSTRACT. An active vibration control approach for suppression of exogenous harmonic excitations in a quadrotor helicopter is introduced. Harmonic forces are approximated by Taylor polynomial into a small window of time in order to improve the capability of forced vibration attenuation of the active control scheme. Underactuated dynamics of the aerial vehicle is properly regulated around a desired position by means of pitch and roll movement trajectories. The sliding mode control method is then applied to regulate angular movements in accordance with the desired position in horizontal plane for the four-rotor helicopter. Some computer simulation results are included to depict the satisfactory performance of the control approach proposed to regulate the position of a quad-rotor aerial vehicle in presence of possible undesirable harmonic excitation forces. © 25th International Congress on Sound and Vibration 2018, ICSV 2018: Hiroshima Calling. All rights reserved.

Yañez-Badillo H., Beltran-Carbajal F., Tapia-Olvera R., Valderrábano-Gonzalez A., Rosas-Caro J.C., Damián-Noriega Z. (2018), "An active suppression approach of harmonic forces in a quadrotor", *25th International Congress on Sound and Vibration 2018, ICSV 2018: Hiroshima Calling* 2: 777-784. Conference Paper.

Julio César Rosas Caro

SNI Nivel I

DATA-DRIVEN STABILIZING CONTROL OF DC-DC CONVERTERS WITH UNKNOWN ACTIVE LOADS

ABSTRACT. We address the issue of stabilizing control design of DC-DC power converters with active loads, e.g. distributed generation systems, cascade converters, converters feeding DC buses, etc. We test the results in the presence of potential destabilizers, such as constant power loads (CPLs). The proposed approach is particularly devised for those situations where a full network dynamic model is either not available or it has an unsuitable level of complexity—in terms of number of state—space variables and equations, e.g. multiple loads, DC distribution networks, micro grids, etc. This is due to its model-free approach based on a data-driven strategy, which is able to guarantee stability using a LMI-Lyapunov approach. Elements of behavioral system theory such as linear difference systems, quadratic difference forms and Lyapunov theory, are crucial for the development of the proposed stabilizing control schemes. We also provide simulation and experimental results to corroborate the practical advantages of the proposed framework.

Ruiz-Martinez, O. F., Mayo-Maldonado, J. C., Escobar, G., Valdez-Resendiz, J. E., Maupong, T. M., Rosas-Caro, J. C. (2020), "Data-driven stabilizing control of DC-DC converters with unknown active loads", *Control Engineering Practice* 95, 104266, doi: [10.1016/j.conengprac.2019.104266](https://doi.org/10.1016/j.conengprac.2019.104266). Article.

Julio César Rosas Caro

SNI Nivel I

Antonio Valderrábano González

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Carolina del Valle Soto

Investigador Titular D, SNI Nivel I

Leonardo Jesús Valdivia Parga

SNI Nivel Candidato

ENERGY RECYCLING LABORATORY EXPERIMENTAL TEST BENCH FOR THREE-PHASE FACTS DEVICES PROTOTYPES

ABSTRACT. Power electronics grid integrated devices such as Flexible Alternating Current Transmission Systems (FACTS) and Custom Power Devices are a very active research field. In most of the cases, research must be supported by experimental results. In that cases, a three phase programmable voltage source and a three-phase

programmable electronic load may be used to validate the device under test, but that equipment are relatively expensive for most laboratories. If a laboratory has only the programmable voltage source, non-energy-recycling experiments may be performed with a passive load, with the respective cost and environmental sacrifice (the energy will be dissipated in the load). This paper presents a design and a laboratory implementation of a three-phase energy recycling test bench for power flow experiments, the proposed design can be built with equipment available in most laboratories at low cost. © 2019 IEEE.

Valdez-Resendiz J. E., Mayo-Maldonado J. C., Rosas-Caro J. C., Alejo-Reyes A., Llamas-Terres A., Valderrábano-Gonzalez A., Del-Valle-Soto C., Valdivia L. J. (2019), "Energy recycling laboratory experimental test bench for three-phase FACTS devices prototypes", *CONIELECOMP 2019 - 2019 International Conference on Electronics, Communications and Computers*, 8673197: 134-140, doi: [10.1109/CONIELECOMP.2019.8673197](https://doi.org/10.1109/CONIELECOMP.2019.8673197). Conference Paper.

Julio César Rosas Caro

SNI Nivel I

Antonio Valderrábano González

SNI Nivel I

EXTENDED PI FEEDBACK TRACKING CONTROL FOR SYNCHRONOUS MOTORS

ABSTRACT. A new dynamic feedback tracking control method of desired velocity and current profiles for permanent magnet synchronous motors, without the additional synthesis of disturbance observers and parametric identification methods, is introduced. Proportional-Integral (PI) feedback is properly extended for both efficient planned motion tracking control and simultaneous fast disturbance estimation. In this fashion, design of additional high-gain disturbance observers becomes unnecessary. This is, on-line dynamic load uncertainty estimation is simultaneously achieved by proposed tracking control implementation. Analytical and numerical results prove the efficient and robust tracking performance of controlled system variables on planned smooth motion profiles and a high-accuracy estimation of unknown high-order variable disturbances. © 2019, ICROS, KIEE and Springer.

Beltran-Carbajal F., Tapia-Olvera R., Lopez-Garcia I., Valderrábano-Gonzalez A., Rosas-Caro J. C., Hernandez-Avila J. L. (2019), "Extended PI Feedback Tracking Control for Synchronous Motors", *International Journal of Control, Automation and Systems* 17(6): 1346-1358, doi: [10.1007/s12555-018-0312-6](https://doi.org/10.1007/s12555-018-0312-6). Article.

IMPLEMENTATION AND CONTROL OF AN INDUSTRIAL STATIC VAR COMPENSATOR

ABSTRACT. Static VAR compensators (SVC) are shunt connected power devices that modify the reactive power at the connection point. These devices are conformed by a source of lagging current like the thyristor controlled reactors and a leading current source such as the fixed capacitors, fixed harmonics filters and thyristor switched capacitors. Due to the increasing regulations over the reactive power, the industrial SVC have acquire the attention as a cost effective way to fulfill these regulations. In this paper we focus on the implementation and control of a thyristor controlled reactor working under sinusoidal and balanced conditions. The control algorithm of the industrial SVC is done following a time based approach and the stability proof is performed with the polynomial lyapunov equation. Finally, an implementation in a low voltage testbench is done. © 2018 IEEE.

Garcia-Rochin R., Mayo-Maldonado J. C., Rosas-Caro J. C., Valdez-Resendiz J. E. (2018), "Implementation and control of an industrial static VAR compensator", *International Power Electronics Congress - CIEP 2018-October*, 8573350: 37-43, doi: [10.1109/CIEP.2018.8573350](https://doi.org/10.1109/CIEP.2018.8573350). Conference Paper.

PASSIVITY-BASED STABILIZATION OF DC-DC CONVERTERS WITH CONSTANT POWER LOADS

ABSTRACT. In this paper, we propose a new mathematical framework that allows combining power converter models with impedance based models, this is performed by using high order terms. We also introduce a passivity analysis for power electronics converters with stability problems due to the connection of constant power loads. Finally, we introduce a solution of instability problems by designing lossless stabilizing filters using the concept of passivity. The paper includes both analytical and experimental results that corroborate the main theoretical achievements of the proposition. © 2019 IEEE.

Mayo-Maldonado J. C., Valdez-Resendiz J. E., Rosas-Caro J. C., Ruiz-Martinez O. F., Guillen-Aparicio D., Escobar-Valderrama G. (2019), "Passivity-based Stabilization of DC-DC converters with Constant Power Loads", *2019 IEEE Texas Power and Energy Conference, TPEC 2019*, 8662161, doi: [10.1109/TPEC.2019.8662161](https://doi.org/10.1109/TPEC.2019.8662161). Conference Paper.

POWER BALANCING APPROACH FOR MODELING AND STABILIZATION OF DC NETWORKS

ABSTRACT. We propose a set of theoretical and practical tools for the stabilization of dc networks. In order to do so, we propose a new framework to study the dynamics of dc grids - one that permits the combination of power converter models with those impedances - directly in higher-order terms. This mathematical setting includes a convenient modeling specification that allows one to analyze complex high-gain converter topologies and to develop an energy-based stability analysis for dc grids with potential destabilizers such as loads with negative impedance characteristics (e.g., constant power loads). We show that instability problems arise due to a power imbalance between passive and non-passive loads, hence power balancing is a suitable stabilizing mechanism. Moreover, a low-cost hardware solution that ensures stability is provided in the form of a lossless (H-bridge) stabilizing filter. The new theoretical results, combined with the proposed implementation, offer a low-cost alternative with respect to other (battery/super-capacitor) energy-storage-based existing strategies. Experimental results based on a high voltage gain quadratic converter feeding multiple non-passive loads are included. © 2010-2012 IEEE.

Mayo-Maldonado J. C., Valdez-Resendiz J. E., Rosas-Caro J. C. (2019), "Power Balancing Approach for Modeling and Stabilization of DC Networks", *IEEE Transactions on Smart Grid* 10(4): 4188-4200, doi: [10.1109/TSG.2018.2851589](https://doi.org/10.1109/TSG.2018.2851589). Article.

Antonio Valderrábano González

QUADRATIC BUCK-BOOST CONVERTER WITH REDUCED INPUT CURRENT RIPPLE AND WIDE CONVERSION RANGE

ABSTRACT. This study introduces an advanced DC-DC power converter with two main objectives, (i) to achieve a wide range of voltage gain, which means the converter may work over a wide range of input voltage for a fixed desired output voltage and (ii) to achieve a reduced input current ripple. Those features are highly desired in renewable energy applications, for example with photovoltaic panels and fuel cells. The proposed converter was designed in a structure in which the input voltage is composed by the difference of two

inductor currents, the currents through inductors are driven with transistors that may have different duty cycle, this allows the current ripple cancellation. In addition, the structure of the converter provides a quadratic type voltage gain, which leads to a wide range of operation voltage. The converter achieves both the wide range of voltage gain and current ripple cancellation, nonetheless, the buck-boost capability is also provided. The input current ripple reduction helps preserve the renewable energy sources since they suffer deterioration when current with considerable ripple is drawn from them. Dynamic and steady-state analysis are performed along with the components sizing. Simulation and experimental results are provided to demonstrate the principle of the proposition. © The Institution of Engineering and Technology 2019.

García-Vite, P. M., Rosas-Caro, J. C., Martínez-Salazar, A. L., De Jesus Chavez, J., Valderrábano-González, A., Sánchez-Huerta, V. M. (2019), "Quadratic buck-boost converter with reduced input current ripple and wide conversion range", *IET Power Electronics* 12(15): 3977-3986, doi: [10.1049/iet-pel.2018.5616](https://doi.org/10.1049/iet-pel.2018.5616). Article.

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Antonio Valderrábano González

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QUADRATIC BUCK-BOOST CONVERTER WITH ZERO OUTPUT VOLTAGE RIPPLE AT A SELECTABLE OPERATING POINT

ABSTRACT. We introduce a new dc-dc converter topology with the following features: first, quadratic voltage gain, which allows the converter to work over a wide voltage range with a minimal variation of duty cycle and without the use of extreme duty cycles; second, output voltage ripple mitigation, which can be accomplished with respect to a fixed but otherwise arbitrary duty cycle by proper selection of components and switching signals. Since the proposed converter can be designed to have zero output voltage ripple for the nominal gain (duty cycle), this allows the use of small values of capacitances. The underlying principles and steady-state equations in continuous conduction mode are presented in detail. Experimental tests are presented to validate the analysis. © 1972-2012 IEEE.

Mayo-Maldonado J. C., Valdez-Resendiz J. E., García-Vite P. M., Rosas-Caro J. C., Del Rosario Rivera-Espinosa M., Valderrábano-González A. (2019), "Quadratic Buck-Boost Converter with Zero Output Voltage Ripple at a Selectable Operating Point", *IEEE Transactions on Industry Applications* 55(3), 8586898: 2813-2822, doi: [10.1109/TIA.2018.2889421](https://doi.org/10.1109/TIA.2018.2889421). Conference Paper.

Julio César Rosas Caro

SNI Nivel I

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SNI Nivel I

VOLTAGE AND CURRENT SWITCHING-RIPPLE CANCELATION IN THE DOUBLE DUAL BOOST CONVERTER

ABSTRACT. The classical interleaving buck converter is able to cancel out a percentage of the inductor current ripple driven to the output capacitor, in the same way, the classical interleaving boost converter is able to cancel out a percentage of the input current ripple drained from the source, depending on the number of interleaving stages and the operation point (duty cycle), the ripple can be actually zero. This paper study the potential of the double dual boost converter to achieve zero ripple at an arbitrary duty cycle by implementing a new design methodology and a special PWM scheme. This paper introduces also a new characteristic that is achievable by the double dual boost converter, the capability of achieving zero output voltage ripple. A detailed theoretical analysis as well as experimental results are included to demonstrate the principles of the proposition. © 2018 IEEE.

Valdez-Resendiz J. E., Rosas-Caro J. C., Mayo-Maldonado J. C., Calderon-Zavala G., Valderrábano-González A., Escobar-Valderrama G. (2018), "Voltage and current switching-ripple cancellation in the double dual boost converter", *International Power Electronics Congress - CIEP 2018-October*, 8573323: 89-95, doi: [10.1109/CIEP2018.8573323](https://doi.org/10.1109/CIEP2018.8573323). Conference Paper.

Claudia Nallely Sánchez Gómez

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ANALYSIS OF WIND MISSING DATA FOR WIND FARMS IN ISTHMUS OF TEHUANTEPEC

ABSTRACT. The availability of reliable data related to the behavior of the wind in a wind farm is very useful to determinate with accuracy some aspects as power curve of a wind energy turbine and the wind's speed in an interval of times. The precision in the prediction process of wind behavior is useful for reducing structural efforts in the wind-turbine rotor system, and even in the tower section. In practice, sensors are used to acquire data for monitoring wind farms which occasionally may tend to fail causing an incomplete information from the sensor. This work is focused on the imputation of missing data based

on a combination of interpolation and regression models. Our experiments show that this approach is useful for correlated time series, considering the direction and speed wind for 20 and 40 meters of height in wind farms located in the Isthmus of Tehuantepec in Oaxaca state in Mexico. Finally, the approach of combination methods is effective to solve the problem of missing data in the database of wind in wind farms. © 2018 IEEE.

Sanchez C. N., Enriquez-Zarate J., Velazquez R., Graff M., Sassi S. (2019), "Analysis of wind missing data for wind farms in isthmus of tehuantepec", *2018 IEEE International Autumn Meeting on Power, Electronics and Computing, ROPEC 2018*, 8661457, doi: [10.1109/ROPEC.2018.8661457](https://doi.org/10.1109/ROPEC.2018.8661457). Conference Paper.

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José Sebastián Gutiérrez Calderón

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Julietta Domínguez Soberanes

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[Colaboración: Escuela de Dirección de Negocios Gastronómicos]

LANDSCAPE IMAGES DISTANCE USING KULLBACK LEIBLER DIVERGENCE

ABSTRACT. We present in this document a new proposal to measure distance for landscape images taking into consideration color, texture and, orientation. The hue, entropy and gradient field's magnitude and orientation are used to define features within the images. Distance measurement between images of different sizes were performed using histograms and the Kullback Leibler divergence. The results show that the proposed way to measure the distance performance can identify differences between the landscapes analyzed: forest, city and, dessert. © 2018 IEEE.

Sanchez C. N., Gutierrez S., Soberanes J. D., Graff M. (2018), "Landscape images distance using kullback leibler divergence", *Proceedings of the 2018 3rd IEEE International Conference on Research in Intelligent and Computing in Engineering, RICE 2018* 2018-January, 8627908, doi: [10.1109/RICE.2018.8627908](https://doi.org/10.1109/RICE.2018.8627908). Conference Paper.

Fidencio Tapia Rodríguez

Profesor Investigador

EXPERIMENTAL ANALYSIS OF A 3-DOF ARTICULATED FLAT EMPENNAGE

ABSTRACT. This paper presents the aerodynamic analysis of a bio-inspired empennage, which mimics the way that the tail of some birds moves. To avoid

a kinematic chain in the proposed design, the three axes of rotation intersect in a single point. To define the relationship between the attitude of the empennage and the aerodynamic coefficients, different tests were conducted in an open-circuit wind tunnel at low velocity, where the attitude of the empennage was changed, and the aerodynamic effects were measured by means of a force sensor and expressed with six dimensional wrenches, including forces and torques. Wrenches were transformed from the sensor's reference frame to a frame located at the aerodynamic center of the empennage to compute the aerodynamic coefficients. A multiple regression analysis revealed a coupling effect between the aerodynamic coefficients and the attitude of the proposed empennage, as changes in any of the three Euler angles modify the aerodynamic coefficients. Besides, it is shown that both the longitudinal and the translational motion of the vehicle can be controlled by the proposed bio-inspired empennage. © Springer International Publishing AG, part of Springer Nature 2018. All rights reserved.

García-Terán M. A., Olguín-Díaz E., Gamboa-Marrofo M., Flores-Abad A., Tapia-Rodríguez F. (2018), "Experimental analysis of a 3-DOF articulated flat empennage", *Advanced Topics on Computer Vision, Control and Robotics in Mechatronics*: 379-408, doi: [10.1007/978-3-319-77770-2_14](https://doi.org/10.1007/978-3-319-77770-2_14). Book Chapter.

Fidencio Tapia Rodríguez

Profesor Investigador

NUMERICAL AND EXPERIMENTAL CHARACTERISATION OF AN AERONAUTIC PITOT PROBE

ABSTRACT. Aeronautic Pitot probes (PPs) are extremely important for airspeed and altitude measurements in aviation. Failure of the instrument due to clogging caused by ice formation can lead to dangerous situations. In this work, a commercial aeronautic PP was characterised experimentally regarding its inner composition, material properties and its thermal performance in a climatic wind tunnel. Performance runs were taken out in order to analyse the thermal response of the PP under various operating conditions with a particular emphasis on the cooling process in the case of a heating element failure. Data for the thermal conductivity, diffusivity and specific heat for each material forming the PP were obtained. A numerical model to simulate the thermal behaviour of the PP was created using Comsol Multiphysics (CM). Experimental data were compared with their numerical counterparts for model validation purposes. After the model was validated, the operation of the PP in flight conditions was simulated. The failure of the conventional heating system was analysed to obtain the time until the PP

reaches a tip temperature where ice formation can be expected. The tip temperature undercut the zero degrees Celsius mark 165 seconds after the heating element was switched off. The data collected in this work can be used to implement and validate mathematical models in order to predict the thermal performance of Pitot probes in flight conditions. © 2019 Royal Aeronautical Society.

R. Jäckel, G. L. Gutiérrez Urueta, F. Tapia Rodríguez y C. Monreal Jiménez (2019), "Numerical and experimental characterisation of an aeronautic Pitot probe", *Aeronautical Journal* 123(1264): 890-911, doi: [10.1017/aer.2019.33](https://doi.org/10.1017/aer.2019.33). Article.

Antonio Valderrábano González

SNI Nivel I

AN ACTIVE VEHICLE SUSPENSION CONTROL APPROACH WITH ELECTROMAGNETIC AND HYDRAULIC ACTUATORS

ABSTRACT. An active vibration control approach from an online estimation perspective of unavailable feedback signals for a quarter-vehicle suspension system is introduced. The application of a new signal differentiation technique for the online estimation of disturbance trajectories due to irregular road surfaces and velocity state variables is described. It is assumed that position measurements are only available for active disturbance suppression control implementation. Real-time signal differentiation is independent of detailed mathematical models of specific dynamic systems and control force generation mechanisms. Active control forces can be supplied by electromagnetic or hydraulic actuators. Analytical and simulation results prove the effective and fast dynamic performance of the online signal estimation as well as a satisfactory active disturbance attenuation on a quarter-vehicle active suspension system. © 2019 by the authors.

Beltran-Carbajal F., Valderrabano-Gonzalez A., Favela-Contreras A., Hernandez-Avila J. L., Lopez-Garcia I., Tapia-Olvera R. (2019), "An active vehicle suspension control approach with electromagnetic and hydraulic actuators", *Actuators* 8(2), 35, doi: [10.3390/act8020035](https://doi.org/10.3390/act8020035). Article.

Antonio Valderrábano González

SNI Nivel I

HARMONIC OSCILLATION SUPPRESSION IN POSITION CONTROL OF INDUCTION MOTORS

ABSTRACT. An active vibration control approach for suppression of harmonic mechanical oscilla-

tions and, simultaneously, efficient tracking of angular position trajectories for induction motor is proposed. The introduced forced oscillation suppression scheme is based on virtual dynamic vibration absorbers. Numerical results are also presented to depict the capability of the original dynamic control approach for suppression of synchronous vibrations. A effective position trajectory tracking specified for an induction motor in presence of harmonic disturbing torque is shown as well. © 2018 IEEE.

Beltran-Carbajal F., Lopez-Garcia I., Valderrabano-Gonzalez A., Tapia-Olvera R. (2019), "Harmonic oscillation suppression in position control of induction motors", *2018 IEEE International Autumn Meeting on Power, Electronics and Computing, ROPEC 2018*, 8661442, doi: [10.1109/ROPEC.2018.8661442](https://doi.org/10.1109/ROPEC.2018.8661442). Conference Paper.

Antonio Valderrábano González

SNI Nivel I

INTEGRAL ACTION IN SLIDING MODE CONTROL FOR REDUCTION OF CHATTERING IN SPEED REGULATION OF A SYNCHRONOUS MOTOR

ABSTRACT. In this paper a sliding mode controller for speed regulation of a PMSM is evaluated. Here, the oscillation attenuation due to the non-linear discontinuous control action is addressed by means of low-pass filters based on iterated integrals, where the undesirable chattering problem is considered as high-frequency noise. © Published under licence by IOP Publishing Ltd.

Templos-Santos J. L., Aguilar-Mejia O., Beltran-Carbajal F., Valderrabano-Gonzalez A., Tapia-Olvera R. (2019), "Integral Action in Sliding Mode Control for Reduction of Chattering in Speed Regulation of a Synchronous Motor", *Journal of Physics: Conference Series* 1221(1), 12060, doi: [10.1088/1742-6596/1221/1/012060](https://doi.org/10.1088/1742-6596/1221/1/012060). Conference Paper.

Antonio Valderrábano González

SNI Nivel I

Julio César Rosas Caro

SNI Nivel I

LARGE INDUCTION MOTOR DRIVE PERFORMANCE COMPARISON

ABSTRACT. Comparative analysis of the performance of a motor drive with different controller strategies such as Volt-age/frequency (V/F), Proportional, Integral (PI), and Neural Network (NN) controllers to follow speed and torque variations is presented. Bézier profiles are used to reduce peaks in voltage and current when the motor conditions

change. Details on the construction of a S4 pulse Voltage Source Converter are provided to follow amplitude, phase and frequency required to drive a large motor. Very low total harmonic distortion is proved and harmonic spectrums illustrate the use of a power filter is evaded. © 2018 IEEE.

Valderrabano-Gonzalez A., Rosas-Caro J. C., Beltran-Carbajal F., Lopez-Garcia I., Tapia-Olvera R., Gabbar H. A. (2019), "Large induction motor drive performance comparison", *2018 IEEE International Autumn Meeting on Power, Electronics and Computing, ROPEC 2018*, 8661352, doi: [10.1109/ROPEC.2018.8661352](https://doi.org/10.1109/ROPEC.2018.8661352). Conference Paper.

Antonio Valderrábano González

SNI Nivel I

VIRTUAL VIBRATION ABSORBERS IN MOTION CONTROL OF A QUADROTOR AERIAL VEHICLE

ABSTRACT. Passive and active vibration absorbers have been widely used to suppress undesirable frequency harmonic excitations in flexible mechanical structures. This paper introduces a study on the application of virtual active vibration absorbers in the synthesis of motion control schemes for quadrotor aerial vehicles. A dynamic control approach for both stabilization at a desired position and forced vibration attenuation for a quadrotor helicopter is introduced. Virtual vibration absorbers are tuned at unwanted harmonic excitation frequencies and integrated into motion regulation controllers. Some computer simulation results are included to show a satisfactory performance of the proposed position control scheme to regulate the motion around an operation condition specified for a multiple-input multiple-output nonlinear aerial vehicle under external perturbations. © 25th International Congress on Sound and Vibration 2018, ICSV 2018: Hiroshima Calling. All rights reserved.

Beltran-Carbajal F., Silva-Navarro G., Yañez-Badillo H., Tapia-Olvera R., Valderrabano-Gonzalez A. (2018), "Virtual vibration absorbers in motion control of a quadrotor aerial vehicle", *25th International Congress on Sound and Vibration 2018, ICSV 2018: Hiroshima Calling 2*: 785-792. Conference Paper.

Leonardo Jesús Valdivia Parga

SNI Nivel Candidato

COEXISTENCE OF SAFETY AND SECURITY: SYNCHRONIZED REDUNDANT SYSTEM WITH SECURITY ENHANCEMENTS

ABSTRACT. A malicious attack on a safety-critical system can derive in an undesired behavior of the system that may result in a failure. In this case, the

reliability of the device is decreased, and it might affect directly to safety. Therefore, the security is also an essential issue to consider in the design of safety-critical systems. The main problem when safety and security are considered is to make them work together without interfering each other. A safety-critical device needs to be certified following standards like IEC-61508, and any security mechanisms must not affect this certification. This paper describes a system that integrates safety and security mechanisms to improve reliability without affecting safety certification. With the aim of reaching the required safety level, a redundant system is considered. This system is an n out of m distributed and synchronized voter. The synchronization method is based on the precision time protocol (IEEE-1588) allowing that all devices on a local network have the same time. © 2018 John Wiley & Sons, Ltd.

Valdivia L. J., Adin I., Añorga J., Arrizabalaga S., Mendizabal J. (2019), "Coexistence of safety and security: Synchronized redundant system with security enhancements", *Quality and Reliability Engineering International* 35(2): 561-571, doi: [10.1002/qre.2421](https://doi.org/10.1002/qre.2421). Article.

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COMPARISON BETWEEN REACTIVE AND PROACTIVE PROTOCOLS OF WIRELESS SENSOR NETWORKS: RAILWAY APPLICATION

ABSTRACT. Railway is a critical application; hence, all systems that compose the railway infrastructure must meet two conditions: Availability and safety. The availability ensures continuous operation of the system; on the other hand, safety is achieved when the device works properly regardless of the environmental or operating conditions. In addition, Wireless Sensor Networks (WSN) are used to perform tasks previously performed manually. However, it is necessary to analyse what protocol is appropriate for the railway industry, since availability and safety are the required attributes. In this work, a recently proposed routing protocol, the Multi-Parent Hierarchical (MPH), has been compared with a well-known protocol, the Ad-hoc On-Demand Distance Vector (AODV), in order to find the most suitable one for the railway applications. For this purpose, a simulator has been developed, which faithfully reifies the workings of a given protocol, considering a fixed, reconfig-

urable ad-hoc network given by the number and location of participants, and general network conditions. © 2019, Faculty of Transport and Traffic Engineering. All rights reserved.

Del-Valle-Soto C., Valdivia, L. J., Velázquez, R. (2019), "Comparison between reactive and proactive protocols of wireless sensor networks: Railway application", *Promet - Traffic - Traffico* 31(3): 311-319, doi: [10.7307/ptt.v31i3.3001](https://doi.org/10.7307/ptt.v31i3.3001). Article.

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Arturo Jafet Rodríguez Muñoz

Profesor Investigador

Miguel Alcaraz Rivera

Profesor Investigador

DECENTRALIZATION: THE FAILED PROMISE OF CRYPTOCURRENCIES

ABSTRACT. Cryptocurrencies promise to revolutionize the financial market due to two main features: security and decentralization. In this article, the authors analyze whether cryptocurrencies are fully decentralized-in other words, whether the transaction processing is distributed among different entities. In addition, they present the consequences that a possible centralization entails. © 1999-2012 IEEE.

Valdivia L. J., Del-Valle-Soto C., Rodríguez J., Alcaraz M. (2019), "Decentralization: The Failed Promise of Cryptocurrencies", *IT Professional* 21(2), 8676128: 33-40, doi: [10.1109/MITP.2018.2876932](https://doi.org/10.1109/MITP.2018.2876932). Article.

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SMART CAMPUS: AN EXPERIMENTAL PERFORMANCE COMPARISON OF COLLABORATIVE AND COOPERATIVE SCHEMES FOR WIRELESS SENSOR NETWORK

ABSTRACT. Presently, the Internet of Things (IoT) concept involves a scattered collection of different multipurpose sensor networks that capture information, which is further processed and used in applications such as smart cities. These networks can send large amounts of information in a fairly efficient but insecure wireless environment. Energy consumption is a key aspect of sensor networks since most of the time, they are battery powered and placed in not easily accessible locations. Therefore, and regardless of the final application, wireless sensor networks require a careful energy consumption analysis that allows selection of the best operating protocol and energy optimization scheme. In this paper, a set of performance metrics is defined to objectively compare different kinds of protocols. Four of the most popular IoT protocols are selected: Zigbee, LoRa, Bluetooth, and Wi-Fi. To test and compare their performance, multiple sensors are placed at different points of a university campus to create a network that can accurately simulate a smart city. Finally, the network is analyzed in detail using two different schemes: collaborative and cooperative. © 2019 by the authors.

Del-Valle-Soto, C., Valdivia, L. J., Velázquez, R., Rizo-Dominguez, L., López-Pimentel, J. C. (2019), "Smart campus: An experimental performance comparison of collaborative and cooperative schemes for wireless sensor network", *Energies* 12(16), 3135, doi: [10.3390/en12163135](https://doi.org/10.3390/en12163135). Article.

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WIRELESS COMMUNICATION FOR RAILWAY APPLICATIONS: REACTIVE AND PROACTIVE PROTOCOLS

ABSTRACT. Railway is a critical application; hence, all systems that composed the railway infrastructure must meet two conditions: Availability and safety. The availability ensures the continuous operation of the system; on the other hand, safety is achieved when the device works properly regardless the environmental or operating conditions. In addition, Wireless Sensor Networks (WSN) are used to perform tasks previously performed manually. However, it is necessary to analyse what protocol is appropriate for the railway industry, since availability and safety are required attributes. In this work, we compare a recently proposed routing protocol, the Multi-

Parent Hierarchical (MPH), with a well-known protocol, the Ad-hoc On-Demand Distance Vector (AODV), in order to find the most suitable for railway applications. For this purpose, we have developed a simulator, which faithfully reifies the workings of a given protocol, considering a fixed, reconfigurable ad-hoc network given by the number and location of participants, and general network conditions. © 2019 IEEE.

Valdivia L. J., Del-Valle-Soto C., Rosas-Caro J. C. (2019), "Wireless communication for railway applications: Reactive and proactive protocols", *CONIELECOMP 2019 - 2019 International Conference on Electronics, Communications and Computers*, 8673096: 21-26, doi: [10.1109/CONIELECOMP.2019.8673096](https://doi.org/10.1109/CONIELECOMP.2019.8673096). Conference Paper.

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ENERGY-EFFICIENT ANALYSIS IN WIRELESS SENSOR NETWORKS APPLIED TO ROUTING TECHNIQUES FOR INTERNET OF THINGS

ABSTRACT. Imagine being able to connect to the work network from a public park and then meet a friend for coffee or shopping. Imagine finding everything a tourist needs, such as bus schedules, nearby restaurants and other entertainment options in touch screen kiosks conveniently located throughout the city. Most applications of IoT depend on a battery for their operation and they are designed to reduce or even avoid the human intervention in the sensing process. Most IoT projects are motivated by a need to reduce operating energy costs or increase revenue. This paper presents and analyses the energy model of a wireless sensor using four different routing protocols: Multi-Parent Hierarchical (MPH), On Demand Distance Vector (AODV), Dynamic Source Routing (DSR) and ZigBee Tree Routing (ZTR). In these applications, the energy consumption is a key factor, sensors can be located in remote zones difficult to access, so it is not possible to replace the battery continuously. Due to the limitations of battery life, the nodes are designed to save as much energy as possible, and most of the time they are in sleep mode (low power consumption). Finding energy sources for difficult-to-connect device has become a priority for technology, in large part due to the rise of the IoT concept. This is why the network itself must provide energy saving mechanisms and a

good solution could be in charge of the packets administration in the network. required format. © Springer Nature Switzerland AG 2020.

Del-Valle-Soto C., Durán-Aguilar G., Cortes-Chavez F., Rossa-Sierra A. (2020), "Energy-efficient analysis in wireless sensor networks applied to routing techniques for internet of things", *Advances in Intelligent Systems and Computing* 953: 312-321, doi: [10.1007/978-3-030-20473-0_30](https://doi.org/10.1007/978-3-030-20473-0_30). Conference Paper.

Carolina del Valle Soto

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NEW DETECTION PARADIGMS TO IMPROVE WIRELESS SENSOR NETWORK PERFORMANCE UNDER JAMMING ATTACKS

ABSTRACT. In this work, two new self-tuning collaborative-based mechanisms for jamming detection are proposed. These techniques are named (i) Connected Mechanism and (ii) Extended Mechanism. The first one detects jamming by comparing the performance parameters with respect to directly connected neighbors by interchanging packets with performance metric information, whereas the latter, jamming detection relays comparing defined zones of nodes related with a collector node, and using information of this collector detects a possible affected zone. The effectiveness of these techniques were tested in simulated environment of a quadrangular grid of 7×7 , each node delivering 10 packets/sec, and defining as collector node, the one in the lower left corner of the grid. The jammer node is sending packets under reactive jamming. The mechanism was implemented and tested in AODV (Ad hoc On Demand Distance Vector), DSR (Dynamic Source Routing), and MPH (Multi-Parent Hierarchical), named AODV-M, DSR-M and MPH-M, respectively. Results reveal that the proposed techniques increase the accurate of the detected zone, reducing the detection of the affected zone up to 15% for AODV-M and DSR-M and up to 4% using the MPH-M protocol. © 2019, MDPI AG. All rights reserved.

Del-Valle-Soto C., Mex-Perera C., Aldaya I., Lezama F., Nolasco-Flores J. A., Monroy R. (2019), "New Detection Paradigms to Improve Wireless Sensor Network Performance under Jamming Attacks", *Sensors* (Basel, Switzerland) 19(11), 2489, doi: [10.3390/s19112489](https://doi.org/10.3390/s19112489). Article.

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SNI Nivel I

NOVEL DETECTION METHODS FOR SECURING WIRELESS SENSOR NETWORK PERFORMANCE UNDER INTRUSION JAMMING

ABSTRACT. Nowadays, the Internet of Things concept is composed of a scattered collection of different networks with different purposes that has nodes that capture information to be processed and, subsequently, used for purposes such as Smart Cities. These devices, called sensors, have the ability to send large amounts of information in a fairly efficient, but insecure, wireless environment. Intentional interference, named jamming, has emerged as a source of growing concern in recent years. Since no or little network information is required, this type of attack is extremely easy to implement but has become difficult to detect because of its variations in interference frequency. In this document, we propose two new jamming detection mechanisms that can identify reactive jamming without any free jam operation information, called Connected Mechanism and Extended Mechanism. The first one is based on the information of the performance metrics collected from the directly connected nodes. In the second approach, a collector node knows the performance parameters of all nodes in the network and can make comparisons between them. Through extensive simulations, we demonstrate that the first mechanism has an improved performance of 78% and the second has an improved 86% performance in detecting the area affected by an interference node with a proactive protocol such as MPH (Multi-Parent Hierarchical) compared to well-known reactive protocols: AODV (ad hoc distance distance vector) and DSR (dynamic origin routing). © 2019 IEEE.

Del-Valle-Soto C., Valdivia L. J., Rosas-Caro J. C. (2019), "Novel detection methods for securing wireless sensor network performance under intrusion jamming", *CONIELECOMP 2019 - 2019 International Conference on Electronics, Communications and Computers*, 8673079: 1-8, doi: [10.1109/CONIELECOMP.2019.8673079](https://doi.org/10.1109/CONIELECOMP.2019.8673079). Conference Paper.

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PREDICTIVE TOOL FOR PLANNING THE SCALING AND INTERFERENCE OF WIRELESS SENSOR NETWORKS

ABSTRACT. The Internet of Things has introduced a new era of devices capable of sensing different parameters from an environment. Unfortunately, these sensors use multiple standards and are not always designed to work together in a Wireless Body Area Network (WBAN). We studied various applications of the combination of these devices to try and establish an ideal environment which reduces interference and improves data delivery reliability. In this paper we propose a graphical network simulator capable of scaling multiple scenarios, which was tested with a real environment, simulating a WBAN, using five nodes in a ZigBee network where one of them acted as the coordinator and with an approximate overall error rate of $\pm 13.5\%$ in performance metrics such as Packet Delivery Ratio, Link Quality Indicator and Received Signal Strength Indication. Finally, we were able to extrapolate the number of nodes to predict the scalability and the interference influence on a network. © 2018 IEEE.

Rodríguez, J., Del-Valle-Soto, C. (2019), "Predictive Tool for Planning the Scaling and Interference of Wireless Sensor Networks", *Proceedings - 2018 10th IEEE Latin-American Conference on Communications, LATINCOM 2018*, 8613246, doi: [10.1109/LATINCOM.2018.8613246](https://doi.org/10.1109/LATINCOM.2018.8613246). Conference Paper.

Ramiro Velázquez Guerrero

SNI Nivel I

A MONTE CARLO SIMULATOR OF NON-WSSUS RAYLEIGH FADING CHANNELS FOR VEHICULAR COMMUNICATIONS

ABSTRACT. This paper presents a new simulator of non-wide-sense-stationary uncorrelated scattering (non-WSSUS) multipath Rayleigh fading channels for the performance analysis of vehicular communication systems. The proposed simulator is based on the Montecarlo method and the sum-of-cisoids principle. It provides an accurate and flexible solution to reproduce the time and frequency correlation properties of non-WSSUS vehicular channels under arbitrary isotropic and non-isotropic scattering conditions. A performance analysis of two channel estimation techniques, namely the least-squares (LS) and the spectral-temporal-averaging (STA) estimators, is presented to demonstrate the

practical value of the proposed simulator. The results show that the vehicular channel's non-stationary characteristics are transparent to the LS estimator, but they significantly degrade the performance of the STA estimator. A variation of the original STA technique is introduced seeking a performance improvement in non-WSSUS channels. © 2018 IEEE.

Jaime-Rodríguez J. J., Gómez-Vega C. A., Gutiérrez C. A., Luna-Rivera J. M., Campos-Delgado D. U., Velázquez R. (2018), "A Monte carlo simulator of non-WSSUS Rayleigh fading channels for vehicular communications", *Proceedings of the 2018 IEEE 38th Central America and Panama Convention, CONCAPAN 2018*, 8596375, doi: [10.1109/CONCAPAN.2018.8596375](https://doi.org/10.1109/CONCAPAN.2018.8596375). Conference Paper.

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José Sebastián Gutiérrez Calderón

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SNI Nivel I

ACTIVE AND PASSIVE HAPTIC PERCEPTION OF SHAPE: PASSIVE HAPTICS CAN SUPPORT NAVIGATION

ABSTRACT. Real-time haptic interactions occur under two exploration modes: active and passive. In this paper, we present a series of experiments that evaluate the main perceptual characteristics of both exploration modes. In particular, we focus on haptic shape recognition as it represents a fundamental task in many applications using haptic environments. The results of four experiments conducted with a group of 10 voluntary subjects show that the differences in motor activity between active and passive haptics ease the perception of surfaces for the first case and the perception of pathways for the latter. In addition, the guidance nature of passive haptics makes the pathway direction easy to recognize. This work shows that this last observation could find application in more challenging tasks such as navigation in space. © 2019 by the authors. Licensee MDPI, Basel, Switzerland.

Rodríguez J. L., Velázquez R., Del-Valle-Soto C., Gutiérrez S., Varona J., Enríquez-Zarate J. (2019), "Active and passive haptic perception of shape: Passive haptics can support navigation", *Electronics* (Switzerland) 8(3), 355, doi: [10.3390/electronics8030355](https://doi.org/10.3390/electronics8030355). Article.

Ramiro Velázquez Guerrero

SNI Nivel I

DESIGN AND CONSTRUCTION OF A NEW DOOR DRIVING MECHANISM FOR MEXICO'S CITY METRO

ABSTRACT. Mexico's city Metro is the most important public transportation system in Latin America since it serves 5 million users daily. Some important subsystems, such as the mechanism for driving the wagons doors, have been kept the same since its inauguration in 1969 and register high maintenance occurrence. To improve the quality of the service, they urgently need to be modernized. This paper presents a new concept of door opening/closing mechanism based on synchronous bands which aim is to be a safe, reliable, and low-cost replacement option to the mechanism that operates today. An analysis with the finite element method is shown to validate the design. A first prototype has been developed and preliminary tests on cyclic operation suggest a robust concept suitable for the application. © 2018 IEEE.

Magos-Rivera M., Velázquez R., Gómez A. S., Gutiérrez C. A. (2018), "Design and construction of a new door driving mechanism for Mexico's city metro", *Proceedings of the 2018 IEEE 38th Central America and Panama Convention, CONCAPAN 2018*, 8596428, doi: [10.1109/CONCAPAN.2018.8596428](https://doi.org/10.1109/CONCAPAN.2018.8596428). Conference Paper.

Ramiro Velázquez Guerrero

SNI Nivel I

DESIGN OF HIGH EFFICIENCY POLYMER PROBE FOR GEOTHERMAL ENERGY TRANSMISSION AND MEASUREMENT

ABSTRACT. In the effort to reduce emissions, in particular those due to energy conversion and transformation, renewal energies can give a substantial contribution in this field. For house heating, direct exploitation of subsoil energy is a matter of great interest. To extract subsoil energy for house utilization, a plant is needed. Among different parts and devices included in the plant dedicated to conversion and transmission, geothermal probe plays an important role. It is a special device allowing conversion from thermal energy to thermal energy with different enthalpy. It operates as a sensing system without changing the type of energy. In general, there are two types of probe: vertical and horizontal probes. The article illustrates the design, construction and testing of a high efficiency vertical polymer geothermal probe. A verification of flow/fluid measurement has been carried out. © 2019 Elsevier Ltd.

Lay-Ekuakille, A., Blois, L., Velazquez, R. "Design of high efficiency polymer probe for geothermal energy transmission and measurement", *Measurement: Journal of the International Measurement Confederation* 152, Article number 107329. Article.

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