



# INFORME DE PRODUCCIÓN CIENTÍFICA 20 22



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## CALIDAD 2021 VS 2022

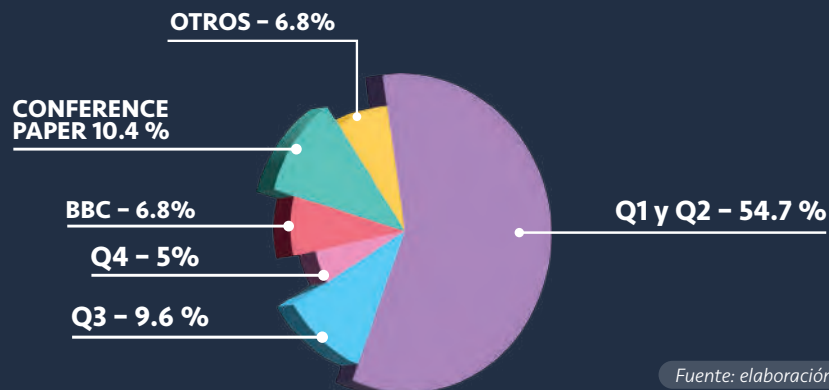
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- JOURNAL Q2
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- CONFERENCE PAPER
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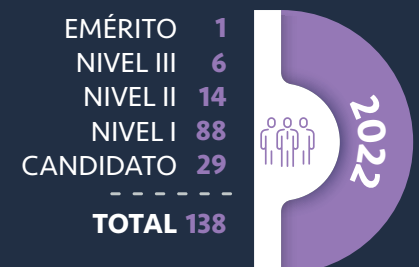
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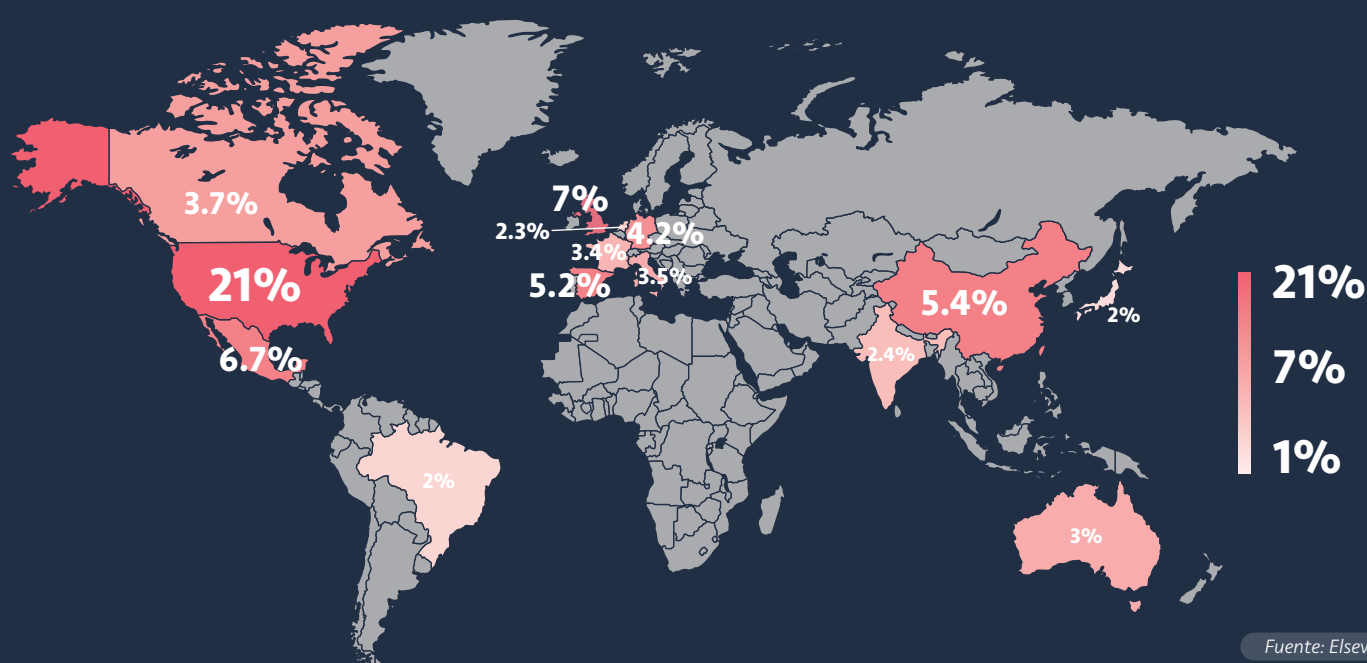
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# INFORME DE PRODUCCIÓN CIENTÍFICA 20 22



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## INFORME DE PRODUCCIÓN CIENTÍFICA 2022

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# PRESENTACIÓN

Como todos los años, nos complace presentar el Informe de Producción Científica 2022 y uno de los logros más importantes, que destaca en este Informe, fue la publicación del 56 % de nuestra producción científica en revistas de alta calidad (Q1 y Q2). Adicionalmente, los resultados en la materia nos han ayudado a reforzar el posicionamiento de nuestra institución en algunos rankings:

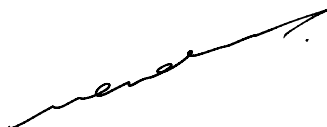
- En el Ranking Mundial de QS (*Quacquarelli Symonds*) y *Times Higher Education* (primera inclusión en la historia de nuestra universidad) obtuvimos el segundo lugar entre las universidades privadas y el quinto lugar a nivel nacional.
- Con respecto a *Green Metric University Rankings*, obtuvimos el mejor resultado histórico subiendo 35 posiciones con respecto al año anterior. Lo que nos posiciona como la tercera mejor universidad privada mexicana y la séptima mejor a nivel nacional.

Cabe destacar que, atendiendo la planeación estratégica en el rubro de consecución de fondos para la investigación, la Panamericana ha dirigido esfuerzos para detectar y gestionar oportunidades de financiamiento. Resultado de lo anterior ha sido la materialización de múltiples proyectos nacionales e internacionales donde destacan organismos como Conacyt, 100,000 Strong in the Americas, Templeton World Charity Foundation y Erasmus+.

También hemos dado pasos importantes en la construcción de un Ecosistema de Innovación y Transferencia, que tiene el propósito de conectar la generación de nuevo conocimiento con la creación de soluciones económicamente viables. Ejemplo de esto es el crecimiento en la solicitud de patentes, creaciones intelectuales protegidas y proyectos de investigación con estudios de vigilancia tecnológica e inteligencia competitiva.

Al igual que en años anteriores, estos significativos logros han sido posibles fundamentalmente gracias al empeño de nuestros profesores por alcanzar sus metas y objetivos. El trabajo continuo a lo largo de estos últimos años ha aumentado nuestra visibilidad y, por ende, el prestigio institucional, reafirmando nuestro compromiso con la sociedad y poniendo como prioridad el ejercer una positiva influencia que repercuta en el beneficio social.

Desde la Panamericana, seguiremos esforzándonos por divulgar los logros de nuestro claustro de investigadores en materia de producción científica. Extiendiendo una felicitación a todos aquellos que forman parte de este ecosistema y colaboran al crecimiento y consolidación de nuestra institución.



**Dr. Abraham Mendoza Andrade**  
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# INFORME DE PRODUCCIÓN CIENTÍFICA

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22

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## ELBA DÍAZ CERVERÓ

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### CAUGHT IN THE MIDDLE: INTERNAL AND EXTERNAL PRESSURES ON THE COVERAGE OF ORGANIZED CRIME IN MEXICO

**ABSTRACT.** With 33 journalists killed since the beginning of Andrés Manuel López Obrador's presidential term in December 2018, Mexico heads the list of the most violent countries for journalists in Latin America—and that of countries not at war. While journalist organizations demand a meaningful protection apparatus to safeguard their physical safety, official corruption, and criminal impunity continue to escalate the pressures to which media staff are exposed, especially in Mexican states where cartels and criminal groups have the largest footprint. This study aims to precisely identify the pressures, both internal and external, facing journalists who report on organized crime in Mexico. To do this, we drew from the Hierarchy of Influences Model, and interviewed 22 Mexican journalists who work on the organized crime beat in the country's capital and in the most violent states in the Republic. The results suggest that the most influential forces they face are associated with the organizational level (such as editorial line or institutional censorship), and the extramedia level (e.g., anti-press violence from cartels/authorities, and government advertising contracts). © The Author(s) 2022.

Díaz-Cerveró, E., Barredo-Ibáñez, D. & González Macías, R. A. (2022). Caught in the Middle: Internal and External Pressures on the Coverage of Organized Crime in Mexico. *SAGE Open*, 12(2). doi: 10.1177/21582440221094610. Article.

## ÍÑIGO FERNÁNDEZ FERNÁNDEZ

Investigador Titular B, SNI Nivel I

### AN IRISHMAN IN MEXICO: BERNARD SHAW IN THE MEXICAN PRESS (1900-1960)

**ABSTRACT.** The study and reception of the work and ideas of Bernard Shaw in the Mexican press during the first half of the twentieth century is a theme that has not been broached, and thus could well be seen as a fertile field for the study of the history of the Mexican press and literature. What is certain is that, in the specific case of Mexico, this reception process was marked by conjunc-

tures and structural changes that represented the end of one regime—the Porfiriato—and the rise and consolidation of another—the revolutionary. On the one hand, during the former, the sense of Francization reigned in the breast of a small but powerful urban elite. On the other hand, the governors who emerged from the Revolution were, initially, inclined to foment a nationalism in which the resurgence of the arts in the country was based on the revival of the pre-Hispanic world. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

Fernández F, Í. (2022). An Irishman in Mexico: Bernard Shaw in the Mexican Press (1900-1960). In Nelson, P. G. (Ed.), *Bernard Shaw and His Contemporaries* (pp. 143-163). Palgrave Macmillan. doi: 10.1007/978-3-030-97423-7\_8. Book Chapter.

## PAULA GÁRGOLES SAEs

Profesora investigadora

### STUDY OF SPANISH BRANDS ON SUSTAINABILITY AND REPUTATION IN THE FASHION SECTOR

**ABSTRACT.** A company's reputation is heavily influenced by sustainability. Furthermore, the recent pandemic has made us more aware of the social dimension of sustainability. Herein, fashion brands also have a role in collaborating and generating a positive impact on society. Hence, the focus of this paper is to examine if sustainability is associated with a company's corporate reputation among real customers. An analysis of 10 Spanish fashion brands has been conducted, measuring the impact of sustainability on their corporate reputation. Data for this study was collected by surveying 500 Spanish consumers online and quantitative analysis was performed with Partial Least Squares (PLS) v.3.2.7 software. The empirical study does not validate that sustainability positively affects the reputation of Spanish fashion brands, while companies were evaluated negatively when it came to social responsibility or enhancing society. Nevertheless, the company received positive feedback on its environmental stewardship. The other results show that reputation does have a positive effect on trust. It is the most significant direct effect that occurs in the present study. Also, trust has a positive impact on loyalty in Spanish fashion brands. © 2022 idd3. All right reserved.

Gárgoles Saes, P., Grilec, A., & Sejdini, M. (2022). Study of Spanish Brands on Sustainability and Reputation in the Fashion Sector. *Textile and Leather Review*, 5, 31-52. doi: 10.31881/TLR.2021.33. Article.

## MARÍA DE LOURDES LÓPEZ GUTIÉRREZ

SNI Nivel Candidato

### THE CONCEPT OF POWER AND ITS REPRESENTATION IN TELEVISION SERIALITY. THE CASE OF «HOUSE OF CARDS»

### [EL CONCEPTO DE PODER Y SU REPRESENTACIÓN EN LA SERIALIDAD TELEVISIVA. EL CASO DE HOUSE OF CARDS]

**ABSTRACT.** To study how power is configured, this article analyzes the first and second seasons of the TV Series House of Cards. The behavior patterns of the main character, Frank Underwood, were tracked to analyze his foundations, the means used, the scope and the type of power he wields. The theoretical approaches of Dahl (1957) and French and Bertram (1959) were used for constructing a group of categories that served as a guide in the search for index units. Therefore, the methodology is based on units (Barthes, 1970) identified within the dialogues, the iconic composition, and the actions of the character. The results obtained reveal that in the first season argumentation as a means to exercise power predominates, and manipulation predominates in the second season. Also, the media repertoire is much broader in the first season when the main character builds the scenarios to achieve his goals. These findings contribute to the construction of a broader understanding of power and its exercise. © The Authors.

Gutiérrez L., M. L. & Flores-Ivich, L. G. (2022). The concept of power and its representation in television seriality. The case of «House of Cards» [El concepto de poder y su representación en la serialidad televisiva. El caso de House of Cards]. *Communication and Society*, 35(4), 101-115. doi: 10.15581/003.35.4.101-115. Article.

## MARIANO EMMANUEL NAVARRO ARROYO

Investigador Titular A, SNI Nivel Candidato

## MINDAUGAS BRIEDIS

Profesor investigador

### THE BODY IN RELIGIOUS MEDIA ECOLOGIES: THE CASE OF SUBALTERN LATINO COUNTERPUBLICS

[KŪNIŠKUMAS RELIGINIŲ MEDIJŲ EKOLOGIJOSE: SUBALTERNATYVIOS OPOZICIJOS LOTYNŲ AMERIKOJE ATVEJIS]

**ABSTRACT.** This paper explores the body-schematic and body-imaginative processes that underlie individuals' participation in the public sphere via religious media ecologies. Utilising embodied cognition and social critique, the authors outline how subaltern counterpublics make use of the body to enact micro-oppositions to mainstream discourses. The paper also discloses the origins of higher objectivities (identity, sense of togetherness, justice, plausibility, opposition and openness) in embodiment. Discussing counterpublics through the prism of embodied cognition, as found in Latin religious media ecologies, constitutes a valuable alternative to the logocentric understanding of public consent. While the dominant discourse privileges abstract formal cognition, Latino subalterns use bodily, affective and enactive affordances given by religious media ecologies. The latter offer affordances and alternative strategies for enacting social imagination, bridging the personal and the public in physically choreographed joint intentions. Embodied participation suggests a constitutive process of public meaning that makes use of the body as the most fundamental medium of communication. © Lietuvos mokslų akademija, 2022.

Navarro, M. & Briedis, M. (2022). The Body in Religious Media Ecologies: The Case of Subaltern Latino Counterpublics [Kūniškumas religinių medijų ekologijose: subalternatyvios opozicijos Lotynų Amerikoje atvejis]. *Filosofija, Sociologija*, 33(3), 226-234. doi: 10.6001/fil-soc.v33i3.4768. Article.

## MARÍA TERESA NICOLÁS GAVILÁN

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Investigador Titular D, SNI Nivel I

### APPLYING THE CONTEMPLATIVE TECHNOPEDEAGOGY FRAMEWORK: INSIGHTS FOR TEACHING ETHICS USING TV SERIES

**ABSTRACT.** With 33 journalists killed since the beginning of Andrés Manuel López Obrador's presidential term in December 2018, Mexico heads the list of the most violent countries for journalists in Latin America—and that of countries not at war. While journalist organizations demand a meaningful protection apparatus to safeguard their physical safety, official corruption, and criminal impunity continue to escalate the pressures to which media staff are exposed, especially in Mexican states where cartels and criminal groups have the largest footprint. This study aims to precisely identify the pressures, both internal and external, facing journalists who report on organized crime in Mexico. To do this, we drew from the Hierarchy of Influences Model, and interviewed 22 Mexican journalists who work on the organized crime beat in the country's capital and in the most violent states in the Republic. The results suggest that the most influential forces they face are associated with the organizational level (such as editorial line or institutional censorship), and the extramedia level (e.g., anti-press violence from cartels/authorities, and government advertising contracts). © The Author(s) 2022.

Shanks, J. D., Scalzo, G., & Nicolás-Gavilán, M. T. (2022). Applying the Contemplative Technopedagogy Framework: Insights for Teaching Ethics Using TV Series. *Journal of Business Ethics Education*, 18, 143-158. doi: 10.5840/jbee2021188. Article.

# ESCUELA DE DIRECCIÓN DE NEGOCIOS ALIMENTARIOS



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<sup>1</sup> Colaboración en cuatro artículos en Facultad de Ingeniería (pp. 65, 85 y 92).

<sup>2</sup> Colaboración en un artículo en Facultad de Ingeniería (p. 65).

<sup>3</sup> Colaboración en un artículo en Facultad de Ingeniería (p. 65).

**JULIETA DOMÍNGUEZ SOBERANES***Investigadora Titular A, SNI Nivel I***CHARACTERIZATION OF COOKED MEAT MODELS USING GRASSHOPPER (*SPHENARIUM PURPURASCENS*) SOLUBLE PROTEIN EXTRACTED BY ALKALISATION AND ULTRASOUND AS MEAT-EXTENDER**

**ABSTRACT.** The most abundant Orthoptera in Mexico is a small grasshopper (*Sphenarium purpurascens*) which is considered a food source with increased nutritional value due to its high protein content. Insect proteins have gained relevance because of their high potential as gelling, texturing, and extender agents in the food industry. The objective of this study was to evaluate the effect of substituting meat with a soluble protein extract from grasshopper obtained by alkalisation or alkalisation-piezoelectric ultrasound, on the techno-functional, physicochemical, and sensory characteristics of cooked meat models (sausages). The soluble protein was extracted in  $\text{NaHCO}_3$  pH 8 and a piezoelectric ultrasound 5-mm sonotrode at 20 kHz with 99% amplitude. Different formulations with meat substitution: 0%, 5%, 10%, and 15% were prepared and characterised for their rheological behaviour, emulsion stability, weight loss by cooking, total protein content, colour, and texture. Sensory evaluation was conducted with consumers using a test involving check-all-that-apply and overall liking. The alkalisation-piezoelectric ultrasound method improved the solubility and the techno-functional properties of the soluble grasshopper protein when applied in sausages at maximum levels of 10% meat substitution. The sensory evaluation indicated that the formulation with 5% meat substitution exhibited the same acceptability as the control sample. Given these results, the soluble protein treated with alkalisation and piezoelectric ultrasound could be used as an extender in meat products.

Cruz-Lopez, S. O., Escalona-Buendía, H. B., Roman-Guerrero, A., Domínguez-Soberanes, J., & Álvarez-Cisneros, Y. M. (2022). Characterization of Cooked Meat Models using Grasshopper (*Sphenarium purpurascens*) Soluble Protein Extracted by Alkalisation and Ultrasound as Meat-Extender. *Food Sci Anim Resour*, 42(3), 536-555. doi: 10.5851/kosfa.2022.e22. Article.

**JULIETA DOMÍNGUEZ SOBERANES***Investigadora Titular A, SNI Nivel I***CLAUDIA NALLELY SÁNCHEZ GÓMEZ***Investigadora Titular B, SNI Nivel Candidato***PHYSICOCHEMICAL AND SENSORY CHARACTERISTICS OF SAUSAGES MADE WITH GRASSHOPPER (*SPHENARIUM PURPURASCENS*) FLOUR**

**ABSTRACT.** Insects are currently of interest due to their high nutritional value, in particular for the high concentration of quality protein. Moreover, it can also be used as an extender or binder in meat products. The objective was to evaluate grasshopper flour (GF) as a partial or total replacement for potato starch to increase the protein content of sausages and achieve good acceptability by consumers. GF has 48% moisture, 6.7% fat and 45% total protein. Sausages were analyzed by NIR and formulations with GF in all concentrations (10, 7, 5 and 3%) combined with starch (3, 5 and 7%) increased protein content. Results obtained for the sausages formulations with grasshoppers showed an increase in hardness, springiness, gumminess and chewiness through a Texture-Profile-Analysis. Moreover,  $a^*$  and  $b^*$  are similar to the control, but  $L^*$  decreased. The check-all-that-apply test showed the attributes highlighted for sausages with GF possessed herbal flavor, brown color, and granular texture. The liking-product-landscape map showed that the incorporation of 7 and 10% of GF had an overall liking of 3.2 and 3.3, respectively, considered as "do not like much". GF can be used as a binder in meat products up to 10% substitution. However, it is important to improve the overall liking of the sausage. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

Cruz-López, S. O., Álvarez-Cisneros, Y. M., Domínguez-Soberanes, J., Escalona-Buendía, H. B., & Sánchez, C. N. (2022). Physicochemical and Sensory Characteristics of Sausages Made with Grasshopper (*Sphenarium purpurascens*) Flour. *Foods*, 11(5). doi: 10.3390/foods11050704. Article.



# ESCUELA DE GOBIERNO Y ECONOMÍA



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## ESTEBAN COLLA DE ROBERTIS

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### LAND TENURE SECURITY AND AGRARIAN INVESTMENTS IN THE PERUVIAN HIGHLANDS

**ABSTRACT.** The abundant empirical studies on the relationship between land tenure security and investment remain inconclusive. This work sheds light on this issue, estimating a simultaneous equation model of 9 different types of land investments and land tenure security using data from the Peruvian agrarian census. This study analyzed the case of the Peruvian highlands, which could be a suitable case study for discussing the importance of land tenure security and land titling programs on rural development in developing countries due to its agrarian-based economic characteristics and for having an official land-titling program (the PETT). We found that tenure security was significantly and positively related to five land investments among the nine analyzed; however, the size of these effects is small, so its importance is lower than what it is a

priori expected on institutional grounds. The effects were also negative for two investments for which customs seemed to be a good way of land management. Land-titling programs in developing countries seem to be a necessary but not sufficient policy approach to promote rural development. Our results indicate that where customs are functioning well, land-titling programs can be complement to but not a substitute for these customary institutions. The impacts of other socio-economic variables suggest that public programs promoting education and training as well as gender equality are important for the promotion of rural development. © 2021 The Authors.

Navarro-Catañeda S., Arranz J. M., Burguillo M., & Colla De Robertis E. (2021). Land tenure security and agrarian investments in the Peruvian Highlands. *Land Use Policy*, 109. doi: 10.1016/j.landusepol.2021.105651. Article.

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**EXPERIENCES OF UNIVERSITY PROFESSORS  
STUDYING FOR A DOCTORAL DEGREE IN  
THE MEXICAN CONTEXT**

**ABSTRACT.** Aim/Purpose To understand the experiences of full-time university professors at a Mexican university who are pursuing a doctoral degree, this study seeks to describe the experiences of doctoral students who are also university professors. The study focuses on the intentions, experiences, and prospects regarding the decision to study for a doctorate as a university professor. Background This research has a dual background. On the one hand, there is the institutional interest in establishing an academic and professional profile of university professors studying for a doctorate in decision-making. On the other hand, the researchers who conducted this study maintain an interest in deepening knowledge of the doctoral process and researcher training. In the field of educational research, this article seeks to strengthen the almost nil research carried out specifically in Mexico on university professors who study for a doc-

torate, particularly in private institutions. Methodology The research design is based on the interpretive paradigm, with a qualitative approach and a phenomenological perspective. A semi-structured interview was used to explore the individual experiences of 17 university professors who are studying for a doctorate. Contribution This study is unique in that it explores the personal and professional views of university professors studying for a doctoral degree, providing further insight into academic and professional profiles. © 2022 Informing Science Institute. All rights reserved.

Galbán-Lozano, S. E. & García-Bejar, L. (2022). Experiences of University Professors Studying for a Doctoral Degree in the Mexican Context. *International Journal of Doctoral Studies*, 17, 459-477. doi: 10.28945/5028. Article.

**LIGIA GARCÍA BÉJAR**

*Profesora investigadora*

**PARENTS' LITERACY ON MOBILE ADVERTISING  
AIMED AT CHILDREN: A CROSS-CULTURAL  
APPROACH**

**ABSTRACT.** Purpose: The use of mobile devices by children and adolescents is increasing significantly; therefore, it is relevant to research the level of advertising literacy (AL) of parents who act as mediators

between children and mobile advertising. This study aims to explore the conceptual, moral and attitudinal dimensions of AL and its relationship with different styles of parental control. Design/methodology/approach: A cross-sectional survey was applied simultaneously to a sample of parents with children between 5 and 16 years old in three Spanish-speaking countries: Mexico, Spain and Colombia. Participants from the three countries were recruited via online social media networks and were asked to fill in an online survey. A questionnaire, which has been adapted from previous literature to suit the mobile advertising context and the population of interest, was designed. Cross-country samples of varying sizes, with a predetermined quota of 200 participants for each country, were used. The total sample consisted of 1,454 participants. Findings: Four factors of mobile AL were found, which, to a greater extent, correspond to the dimensions of AL proposed in the literature. The following are the dimensions that were identified: cognitive, moral, attitudinal and an emerging factor is known as "children's perceived mobile AL." Differences in parents' perceived knowledge of mobile advertising, parental control styles and AL levels in the three countries were identified. Parents with an authoritative style were identified to have more knowledge than those with an indul-

gent style. Differences were also identified between countries concerning the amount of exposure that children have to mobile advertising, while no significant differences were found in the moral dimension. Practical implications: Marketing practitioners and public policymakers must consider that parents differ in some dimensions of AL. Parents also seem to lack adequate knowledge about the advertising tools available to announcers that affect children and adolescents in a mobile communication environment. Therefore, government agencies should consider developing mobile digital media literacy programs for parents. Originality/value: This paper explores the dimensions of AL applied to the mobile context and identifies the level of parental mobile AL in three Spanish-speaking countries, as well as the differences between these sub-samples concerning parental mobile AL profiles and parental control styles, thus expanding the literature on AL with a cross-cultural approach. © 2021, Emerald Publishing Limited.

Robayo-Pinzon, O., Rojas-Berrio, S., Núñez-Gómez, P., Miguélez-Juan, B., & García-Béjar, L. (2021). Parents' literacy on mobile advertising aimed at children: a cross-cultural approach. *Young Consumers*, 23(2), 255-281. doi: 10.1108/YC-05-2021-1331. Article.

### MARÍA TERESA HERNÁNDEZ HERRERA

Profesora investigadora

### GUSTAVO ADOLFO ESPARZA URZÚA

SNI Nivel I

#### THE QUALITY OF EDUCATION IN RURAL AREAS FROM THE PERSPECTIVE OF PUBLIC POLICIES

#### [LA CALIDAD DE LA EDUCACIÓN EN TERRITORIOS RURALES DESDE LAS POLÍTICAS PÚBLICAS]

**ABSTRACT.** The objective of this article is to deepen the concept of educational quality in the reality of the Mexican Educational System. As a problem, it assumes the asymmetry of results and realities experienced in the rural and urban context to question whether there is a common criterion on 'educational quality'. The concept of educational quality is explored in the face of the federal norms that protect the right to education. On the other hand, it explains the conceptual change that has occurred in the conception of rurality, becoming increas-

ingly diverse. A specific section describes the Community School Model, which educationally serves dispersed and underpopulated communities in Mexico. Methodologically, a hermeneutic reflection of three sources is proposed: the concept of education, the wording of Article 3 of the Mexican Constitution with its various changes and description of the rural educational environment in that period, and the Multigrade Schools promoted by CONAFE as the system that reaches those territories. It is concluded that educational quality is delimited by the Political Constitution of the United Mexican States and the conditions in which it is developed, the above framed by the following factors: (i) the dignification of the person, (ii) the legal terms described in Art. 3, (iii) contextualized in the geographical reality of the student. © Universidad Politécnica Salesiana del Ecuador.

Herrera H., M. T. & Urzúa E., G. A. (2022). The quality of education in rural areas from the perspective of public policies [La calidad de la educación en territorios rurales desde las políticas públicas]. *Sophia*, 32, 171-193. doi: 10.17163/soph.n32.2022.05. Article.

### FERNANDA LLERGO BAY

Rectora General UP-IPADE, Profesora investigadora

#### KOSSELCK'S VIEW OF THE CRISIS CONCEPT

**ABSTRACT.** The phenomenon of crisis —of all kinds and at all levels— provides abundant material for study in disciplines centered on the human being. The twentieth century's complex landscape provides valuable elements for developing a "morphology of crisis," where crises of all types can be identified, including personal, family, social, economic, ethical, scientific, philosophical, and historical ones. The broad range of crises that exists today requires further study to better understand the concept, and Reinhart Koselleck offered perhaps the most significant interpretative keys for such a task. In his work, *Critique and Crisis* (1954), Koselleck developed a particularly lucid theory of crisis. His vast historical erudition, steeped in a philosophical quest, offers contemporary readers an approach to the issue of crisis, elucidating its most relevant requirements and challenges. This chapter studies the historical use of the word crisis, aiming to better understand both the term and whether or not it preserves the con-

cept's invariable foundation and transversal elements, namely the experience of time as a turning point between the past and future, the need for judgment to guide the development of a particular situation, and a decision that gives shape to a new state of affairs. This analysis is not just limited to understanding Koselleck's account of the crisis concept; it also tests and addresses its internal structure. The description of the diversity of crisis phenomena at the beginning supports assessment of the illuminating power of Koselleck's concept of crisis. © 2020 Emerald Publishing Limited.

Llergo-Bay, F. (2020). Koselleck's View of the Crisis Concept. In García-Álvarez, S. & Atristain-Suárez, C. (Eds.), *Strategy, Power and CSR: Practices and Challenges in Organizational Management* (pp. 187-201). Emerald Publishing. doi: 10.1108/978-1-83867-973-620201011. Book Chapter.

### HUMBERTO MARTÍNEZ CAMACHO

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### MARÍA ALEJANDRA CALDERÓN SWAIN

Profesora investigadora

#### TECHNOLOGICAL SCENARIOS FOR THE NEW NORMALITY IN LATIN AMERICAN ACADEMIC LIBRARIES

**ABSTRACT.** The technological scenarios that have arisen in Latin American universities have been substantially changing in recent months as a result of the international health emergency caused by COVID-19. The lockdown policy revealed the need to develop digital and informational skills to adapt to the environment and the demands of distance learning required for integral online education. In order to observe and systematize the transformation of the technological environment in academic libraries during these months, the recent situation was identified based on data analysis obtained from a questionnaire applied in Latin American countries. The results reported significant changes in the use of digital applications, services, user assistance and librarian training during the pandemic, as well as the libraries' mid-term commitments. © The Author(s) 2022.

Basurto, L. F., Martínez-Camacho, H. & Calderón-Swain, A. (2022). Technological scenarios for the new normality in Latin American academic libraries. *IFLA Journal*, 48(4), 538-547. doi: 10.1177/03400352211035412. Article.

## MÓNICA DEL CARMEN MEZA MEJÍA

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SNI Nivel I

### THE MEANING OF THE MANAGEMENT FUNCTION: DISCOURSE FROM EDUCATIONAL INSTITUTION DIRECTORS

**ABSTRACT.** This qualitative research articulates the perspective that educational institution directors have on the meaning of management action and the need for training in this area. Significant research findings include the importance of training in three specific aspects: technical knowledge, virtues, and managerial competencies. Study participants emphasized that experience alone is insufficient to run a school, which is an important job not only for educating students, but also for the impact it has on the entire educational community (i.e., managers, administrative and service staff, teachers, and parents). © 2020 Emerald Publishing Limited.

Meza-Mejía, M. D. C., García-Casas, C. M., Ortega-Barba, C. F., & Galbán-Lozano, S. E. (2020). The Meaning of the Management Function: Discourse from Educational Institution Directors. In García-Álvarez, S. & Atristain-Suárez, C. (Eds.), *Strategy, Power and CSR: Practices and Challenges in Organizational Management* (pp. 11-30). Emerald Publishing. doi: 10.1108/978-1-83867-973-620201002. Book Chapter.

just that question. During the last several decades, said approach has been progressing and has started to be recognized as a paradigm shift, superseding certain canonical notions in mainstream behavior analysis, cognitive psychology, and even neuroscience. In this paper, we describe the main features of feedback control theory and its associated techniques, concentrating on its critiques of behavior analysis, as well as the commonalities they share. While some of feedback control theory's major critiques of behavior analysis arise from the fact that they focus on different levels of organization, we believe that some are legitimate and meaningful. Moreover, feedback control theory seems to blend with neurobiology more smoothly as compared to canonical behavior analysis, which only subsists in a scattered handful of fields. If this paradigm shift truly takes place, behavior analysts—whether they accept or reject this new currency—should be mindful of the basics of the feedback control approach. © 2022 Society for the Experimental Analysis of Behavior.

Sosa, R. & Alcalá, E. (2022). The nervous system as a solution for implementing closed negative feedback control loops. *Journal of the Experimental Analysis of Behavior*, 117(3), 279-300. doi: 10.1002/jeab.736. Article.

## RODRIGO SOSA SÁNCHEZ

SNI Nivel I

### THE NERVOUS SYSTEM AS A SOLUTION FOR IMPLEMENTING CLOSED NEGATIVE FEEDBACK CONTROL LOOPS

**ABSTRACT.** Behavior can be regarded as the output of a system (action), as a function linking stimulus to response (reaction), or as an abstraction of the bidirectional relationship between the environment and the organism (interaction). When considering the latter possibility, a relevant question arises concerning how an organism can materially and continuously implement such a relationship during its lifetime in order to perpetuate itself. The feedback control approach has taken up the task of answering

# ESCUELA SUPERIOR DE ADMINISTRACIÓN DE INSTITUCIONES (ESDAI)



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### **HOSPITALITY: AN INNOVATIVE APPROACH TO MANAGING CONTEMPORARY ORGANIZATIONS**

**ABSTRACT.** Organizations are typically diverse, and differences among team members may present challenges. Considering the values of humanism presents an opportunity for organizational leaders to address concerns related to diversity. Effective and respectable leadership involves innovation and it is within this context that hospitality offers a new approach. Hospitality has the potential to provide a conducive and suitable environment for developing members' talents and potential to contribute to the organization. This chapter aims to analyze the role of hospitality in the management of modern-day organizations. Hospitality is considered an essential and important factor that guarantees an atmosphere of harmony. It is a binding force that supports the complexities of managerial work. © 2020 Emerald Publishing Limited.

Tercero, S. R. (2020). Hospitality: An Innovative Approach to Managing Contemporary Organizations. In García-Álvarez, S. & Atristain-Suárez, C. (Eds.), *Strategy, Power and CSR: Practices and Challenges in Organizational Management* (pp. 31-46). Emerald Publishing. doi:10.1108/978-1-83867-973-620201003. Book Chapter.

## **FRINÉ VELÁZQUEZ CONTRERAS**

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### **CYCLODEXTRINS IN POLYMER-BASED ACTIVE FOOD PACKAGING: A FRESH LOOK AT NONTOXIC, BIODEGRADABLE, AND SUSTAINABLE TECHNOLOGY TRENDS**

**ABSTRACT.** Organizations are typically diverse, and differences among team members may present challenges. Considering the values of humanism presents an opportunity for organizational leaders to address concerns related to diversity. Effective and respectable leadership involves innovation and it is within this context that hospitality offers a new approach. Hospitality has the potential to provide a conducive and suitable environment for developing members' talents and potential to contribute to the organization. This chapter aims to analyze the role of hospitality in the management of modern-day organizations. Hospitality is considered an essential and important factor that guarantees an atmosphere of harmony. It is a binding force that supports the complexities of managerial work. © 2020 Emerald Publishing Limited.

Velázquez-Contreras, F., Zamora-Ledezma, C., López-González, I., Meseguer-Olmo, L., Núñez-Delgado, E., & Gabaldón, J. A. (2022). Cyclodextrins in polymer-based active food packaging: A fresh look at nontoxic, biodegradable, and sustainable technology trends. *Polymers*, 14(1). doi:10.3390/polym14010104. Article.



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## EVANDRO AGAZZI

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### THE PROBLEMS OF SCIENTIFIC REALISM TODAY

**ABSTRACT.** The article describes scientific realism and the debate around this position. It shows that initially (in the scholastic tradition) the debate between realists and antirealists was purely ontological, since it was accepted that when we know, we know the real – knowledge cannot be anything other than knowledge of the real. The question about the reality of the object of our knowledge, about whether the world beyond our representations is equal to the world we represent to ourselves, distinguishes modern philosophy from classical philosophy and arises from the claim that we know our representations and not the real. A twofold problem is formed: first, to demonstrate the existence of the world beyond our representations, and second, to demonstrate that the knowledge we have constitutes precisely the knowledge of the world in which we live and is, in fact, actual knowledge, not chimer. Thus the problem of realism takes on an almost exclusively epistemological meaning. Nevertheless, contemporary realistic positions often confuse ontological and epistemological theses, which leads to internal contradictions. The same is true of the proponents of anti-realist views. The question of the causes of the anti-realistic tendency in the philosophy of science is raised and it is shown that the initial attitude of the modern science was realistic. It was undermined, on the one hand, by anti-realistic interpretations of the cognitive process (starting from Kant), on the other hand, by difficulties of theoretical order arisen in physics, and the main thing was that science began to deal with the unobservable, undermining the cognitive basis of radical empiricism. However, the new cognitive situation does not necessarily lead to anti-realism, another way of development relies on an understanding of the complexity and problematic relationship between theory and experience. A number of reasons in favor of scientific realism are concluded. © The Authors.

Agazzi, E. (2022). The problems of scientific realism today. *Filosofiya Nauki i Tehniki*, 27(2), 20-30. doi: 10.21146/2413-9084-2022-27-2-20-30. Article.

## VANIA ROCÍO ALDRETE CORTEZ

SNI Nivel I

### DIFFERENTIAL FETAL GROWTH RATES MEDIATED BY SOCIODEMOGRAPHIC FACTORS IN YUCATAN, MEXICO: AN EPIDEMIOLOGICAL STUDY

**ABSTRACT.** Background: Fetal growth restriction (FGR) may be related to ethnicity. Additionally, ethnic groups experience adverse socioeconomic circumstances that increase FGR risk. However, the dearth of evidence of the interaction between socioeconomic factors and FGR highlights the need for additional research. Objective: To analyze the association between socioeconomic factors and FGR in Maya and non-Maya populations in Yucatan, Mexico. Methods: A total of 21,320 singleton births in 2017 in Yucatan were analyzed. The student's t-test and the chi-square test were used to compare the means and proportions of maternal and perinatal variables between the FGR group and the birth-weight appropriate for gestational age (AGA) group. Path analysis was performed to identify the direct and indirect effects of socioeconomic factors on FGR and mediators between predictors and FGR. Results: The prevalence of FGR at birth was 9.06%; this rate was higher in the Maya population (12.4, 95% CI 11.3–13.5), without differences between socioeconomic levels. Path analysis revealed sociostructural variables (ethnicity and poverty) are reliable predictors of FGR at birth mediated by maternal education ( $\beta = -.152$ ,  $p < .001$ ) and teenage pregnancy ( $\beta = .065$ ,  $p = .037$ ). The proposal path model had a good fit index CFI = .968, TLI = .920, RMSEA = .046. Conclusion: The prevalence of FGR was higher among Maya women than non-Maya women. The socioeconomic conditions associated with FGR at birth were ethnicity, poverty, maternal education, and teenage pregnancy. Maternal education and teenage pregnancy act as mediators between sociostructural variables and FGR at birth. © 2022 Informa UK Limited, trading as Taylor & Francis Group.

Aldrete-Cortez, V., Rendón-Macías, M. E., Azcorra, H., & Salvador-Ginez, O. (2022). Differential fetal growth rates mediated by sociodemographic factors in Yucatan, Mexico: an epidemiological study. *Journal of Maternal-Fetal and Neonatal Medicine*, 35(25), 9884-9492. doi: 10.1080/14767058.2022.2066992. Article.

## VANIA ROCÍO ALDRETE CORTEZ

SNI Nivel I

### INFANTS PRENATALLY EXPOSED TO SARS-COV-2 SHOW THE ABSENCE OF FIDGETY MOVEMENTS AND ARE AT HIGHER RISK FOR NEUROLOGICAL DISORDERS: A COMPARATIVE STUDY

**ABSTRACT.** Congenital viral infections are believed to damage the developing neonatal brain. However, whether neonates exposed to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) show manifestations of such damage remains unclear. For neurodevelopment evaluation, general movement assessments have been shown to be effective in identifying early indicators of neurological dysfunction, including the absence of fidgety movements. This study compared the early motor repertoire by general movement assessment at three to five months of age in neonates who were or were not prenatally exposed to SARS-CoV-2 to determine whether infants prenatally exposed to SARS-CoV-2 are at risk of developing neurological disorders. Fifty-six infants, including 28 in the exposed group of mothers without vaccination who had no need for intensive care and likely had SARS-CoV-2 infection close to the time of pregnancy resolution and 28 infants in the nonexposed group, were videotaped to compare their detailed early motor repertoires, in which a motor optimality score-revised (MOS-R) was calculated using Prechtl's method by using the chi-square or Mann-Whitney U tests. In the exposed group, 3 (11%) infants showed the absence of fidgety movements with a total MOS-R < 14 points, and 3 (11%) other infants showed abnormal fidgety movements. Between groups, atypical body symmetry ( $p = 0.009$ ) and MOS-R values were significantly lower ( $Z = -3.08$ ,  $p = 0.002$ ), with a large size effect (Cohen's  $d = 0.97$ ). The consequences of this new virus go beyond the health of the pregnant mother, and these consequences in some of the infants in the exposed group are likely not transitory because of the absence of fidgety movements between 3–5 months; thus, these babies are at increased risk of developing a serious neurological disorder. © 2022 Aldrete-Cortez et al. This is an open access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution,

and reproduction in any medium, provided the original author and source are credited.

Aldrete-Cortez, V., Bobadilla, L., Tafoya, S. A., Gonzalez-Carpintero, A., Nava, F., Viñals, C., Alvarado, E., Mendizabal-Espinosa, R., Gómez-López, M. E., Ramirez-García, L. A., & Perez-Miguel, A. (2022). Infants prenatally exposed to SARS-CoV-2 show the absence of fidgety movements and are at higher risk for neurological disorders: A comparative study. *PLoS ONE*, 17(5). doi: 10.1371/journal.pone.0267575. Article.

## GUILLERMO RAFAEL CANTÚ QUINTANILLA

Profesor investigador

A.L.L. Y.O.U. N.E.E.D. I.S. L.O.V.E. MANUAL ON HEALTH SELF-MANAGEMENT AND PATIENT-REPORTED OUTCOMES AMONG LOW-INCOME YOUNG ADULT MEXICANS ON CHRONIC DIALYSIS: FEASIBILITY STUDY

**ABSTRACT.** Purpose: We evaluated disease knowledge/self-management skills among low-income Mexican young adults maintained on dialysis and to test the effectiveness of the A.L.L. Y.O.U. N.E.E.D. I.S. L.O.V.E (AYNIL) Manual – Spanish Version on patient-reported outcomes. This is a low literacy teaching tool designed with patients and educators' input. Design and methods: A quasi-experimental study was conducted in 17 chronic dialysis patients at Mexico City's Hospital General de México, Dr. Eduardo Liceaga. Ages 18–30-year-old completed disease knowledge/self-management and quality of life measures before the intervention and 6 weeks later. Results: Significant increases were observed on disease knowledge/self-management scores in the STARx questionnaire from 47 (IQ: 40,51) to 50 (IQ: 48,54)  $p = 0.04$ . The UNC-TRxANSITION Index increased significantly from 4.8 (IQ: 3.9,5.7) to 7.7 (IQ: 7.5,8.2)  $p \leq 0.001$ . Significant increases in scores were detected in the "Burden of kidney disease" ( $p = 0.008$ ), "Effects of kidney disease" ( $p = 0.03$ ) and "Dialysis staff encouragement" ( $p = 0.027$ ) based on the KDQoL survey. Conclusions: In this vulnerable population, the Spanish version of the A.L.L. Y.O.U. N.E.E.D. I.S. L.O.V.E. - AYNIL Manual improved CKD/ESRD disease knowledge/self-management skills and HRQoL. This study highlighted the need for low-literacy educational tools to improve patient-reported outcomes. Practice implications: Young adults with CKD/ESRD can benefit from patient-centered educational

interventions to enhance their autonomy and the development of self-management behaviors that improve patient-reported outcomes and potential complications of the disease. Special attention is needed in low-income patients with low rates of adherence to treatments and poor self-management skills. © 2021 Elsevier Inc.

Brító-Suárez, J. M., Medina-Hernández, E., Medeiros, M., Cantú-Quintanilla, G., Morales-Buenrostro, L. E., Díaz-González de Ferris, M. E., & Valdez-Ortiz, R. (2021). A.L.L. Y.O.U. N.E.E.D. I.S. L.O.V.E. Manual on health self-management and patient-reported outcomes among low-income young adult Mexicans on chronic dialysis: Feasibility study. *Journal of Pediatric Nursing*, 62(1), 129-135. doi: 10.1016/j.pedn.2021.10.020. Article.

## GUILLERMO RAFAEL CANTÚ QUINTANILLA

Profesor investigador

EFFECT OF INTRADIALYTIC ORAL NUTRITIONAL SUPPLEMENTATION WITH OR WITHOUT EXERCISE IMPROVES MUSCLE MASS QUALITY AND PHYSICAL FUNCTION IN HEMODIALYSIS PATIENTS: A PILOT STUDY

**ABSTRACT.** Background: Oral nutritional supplementation (ONS) with or without exercise (EX) could improve muscle mass (MM) in chronic kidney disease. Methods: Patients were randomized into two groups: (1) ONS and (2) ONS + EX. Thigh muscle area (cm<sup>2</sup>) and intramuscular lipid content via attenuation were evaluated at baseline and 6 months with computed tomography (CT) to measure MM quantity and quality. Physical function was measured by six-minute walk test (6 MWT), gait speed, handgrip strength (HGS), and Time Up and Go test (TUG) at baseline and 3 and 6 months. Results: The ONS group ( $n = 14$ ) showed statistically significant improvement in gait speed and HGS; ONS + EX group ( $n = 10$ ) showed differences in gait speed, in 6 MWT, and HGS. In the ANOVA (3 times  $\times$  2 groups), no differences were observed between groups. Greater effect sizes in favor to ONS + EX group were observed in the 6 MWT ( $d = 1.02$ ) and TUG test ( $d = 0.63$ ). Muscle quality at six months revealed a significant trend in favor of the EX-group ( $p = 0.054$ ). Conclusions: Both groups had improved physical function, and greater effect sizes were seen in the ONS + EX group for the 6 MWT and TUG test. Neither MM quantity or quality was improved in either group. © 2022 by the authors.

Martin-Alemañy, G., Perez-Navarro, M., Wilund, K. R., García-Villalobos, G., Gómez-Guerrero, I., Cantú-Quintanilla, G., Reyes-Caldelas, M. A., Espinosa-Cuevas, A., Escobedo, G., Medeiros, M., Bennett, P. N., & Valdez-Ortiz, R. (2022). Effect of Intradialytic Oral Nutritional Supplementation with or without Exercise Improves Muscle Mass Quality and Physical Function in Hemodialysis Patients: A Pilot Study. *Nutrients*, 14(14). doi: 10.3390/nu14142946. Article.

## FRANCISCO JAVIER ESTRADA MENA

SNI Nivel II

PHARMACOGENETICS OF TAXANE-INDUCED NEUROTOXICITY IN BREAST CANCER: SYSTEMATIC REVIEW AND META-ANALYSIS

**ABSTRACT.** Taxane-based chemotherapy regimens are used as first-line treatment for breast cancer. Neurotoxicity, mainly taxane-induced peripheral neuropathy (TIPN), remains the most important dose-limiting adverse event. Multiple genes may be associated with TIPN; however, the strength and direction of the association remain unclear. For this reason, we systematically reviewed observational studies of TIPN pharmacogenetic markers in breast cancer treatment. We conducted a systematic search of terms alluding to breast cancer, genetic markers, taxanes, and neurotoxicity in Ovid, ProQuest, PubMed, Scopus, Virtual Health, and Web of Science. We assessed the quality of evidence and bias profile. We extracted relevant variables and effect measures. Whenever possible, we performed random-effects gene meta-analyses and examined inter-study heterogeneity with meta-regression models and subgroup analyses. This study follows the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) and STrengthening the REporting of Genetic Association Studies (STREGA) reporting guidance. A total of 42 studies with 19,431 participants were included. These evaluated 262 single-nucleotide polymorphisms (SNPs) across 121 genes. We conducted meta-analyses on 23 genes with 60 SNPs (19 studies and 6246 participants). Thirteen individual SNPs (ABCB1-rs2032582, ABCB1-rs3213619, BCL6/-rs1903216, /CAND1-rs17781082, CYP1B1-rs1056836, CYP2C8-rs10509681, CYP2C8-rs11572080, EPHA5-rs7349683, EPHA6-rs301927, FZD3-rs7001034, GSTP1-rs1138272, TUBB2A-rs9501929, and XKR4-rs4737264) and the overall SNPs' effect in four genes (CYP3A4, EphA5, GSTP1,

and SLC01B1) were statistically significantly associated with TIPN through meta-analysis. In conclusion, through systematic review and meta-analysis, we found that polymorphisms, and particularly 13 SNPs, are associated with TIPN, suggesting that genetics does play a role in interindividual predisposition. Further studies could potentially use these findings to develop individual risk profiles and guide decision making. © 2022 The Authors. Clinical and Translational Science published by Wiley Periodicals LLC on behalf of American Society for Clinical Pharmacology and Therapeutics.

Gujosa, A., Freyria, A., Espinosa-Fernandez, J. R., Estrada-Mena, F. J., Armenta-Quiroga, A. S., Ortega-Treviño, M. F., Catalán, R., Antonio-Aguirre, B., Villarreal-Garza, C., & Perez-Ortiz, A. C. (2022). Pharmacogenetics of taxane-induced neurotoxicity in breast cancer: Systematic review and meta-analysis. *Clinical and Translational Science*, 15(10), 2403-2436. doi: 10.1111/cts.13370. Article.

**VÍCTOR HUGO GÁLVEZ ZÚÑIGA**  
SNI Nivel I

**MONTREAL COGNITIVE ASSESSMENT (MOCA) PERFORMANCE IN HUNTINGTON'S DISEASE PATIENTS CORRELATES WITH CORTICAL AND CAUDATE ATROPHY**

**ABSTRACT.** Huntington's Disease (HD) is an autosomal neurodegenerative disease characterized by motor, cognitive, and psychiatric symptoms. Cognitive impairment develops gradually in HD patients, progressing later into a severe cognitive dysfunction. The Montreal Cognitive Assessment (MoCA) is a brief screening test commonly employed to detect mild cognitive impairment, which has also been useful to assess cognitive decline in HD patients. However, the relationship between MoCA performance and brain structural integrity in HD patients remains unclear. Therefore, to explore this relationship we analyzed if cortical thinning and subcortical nuclei volume differences correlated with HD patients' MoCA performance. Twenty-two HD patients and twenty-two healthy subjects participated in this study. T1-weighted images were acquired to analyze cortical thickness and subcortical nuclei volumes. Group comparison analysis showed a significantly lower score in the MoCA global performance of HD patients.

Also, the MoCA total score correlated with cortical thinning of fronto-parietal and temporo-occipital cortices, as well as with bilateral caudate volume differences in HD patients. These results provide new insights into the effectiveness of using the MoCA test to detect cognitive impairment and the brain atrophy pattern associated with the cognitive status of prodromal/early HD patients. Copyright 2022 Ramirez-Garcia et al.

Ramirez-Garcia, G., Galvez, V., Diaz, R., Campos-Romo, A., & Fernandez-Ruiz, J. (2022). Montreal Cognitive Assessment (MoCA) performance in Huntington's disease patients correlates with cortical and caudate atrophy. *PeerJ*, 10. doi:10.7717/peerj.12917. Article.

**DESIDERIO SALOMÓN HERNÁNDEZ GUTIÉRREZ**

SNI Nivel I

**FARID ANDRÉS TEJEDA DOMÍNGUEZ**

SNI Nivel Candidato

**MARÍA LILIA LOREDO MENDOZA**

Profesora investigadora

**VÍCTOR MANUEL ARENAS LUNA**

Profesor Investigador

**STANDARDIZED PHYTOPREPARATIONS AND CUCURBITACIN IIB FROM IBERVILLEA SONORAE (S. WATSON) GREENE INDUCE APOPTOSIS IN CERVICAL CANCER CELLS BY NRF2 INHIBITION**

**ABSTRACT.** Ethnopharmacology relevance: Ibervillea sonorae (S. Watson) Greene is a plant from northwestern Mexico, known as "Wereke" or "Guareque", used by the Mayo ethnic group to treat diabetes and cancer. Cucurbitacin IIB (CIIB), isolated from I. sonorae has apoptotic and antitumor activity in a model of cervical cancer with the HeLa cell line. One pathway affected by cucurbitacins is Nrf2, a glutathione transferase (GST) transcription factor, important in the regulation of mitochondrial oxidative stress (MOS). A signal of MOS is the change in the mitochondrial membrane potential ( $\Delta\Psi_m$ ), which has been detected in HeLa in the presence of CIIB. Fito-Ison-EtOH (Etanison) and Fito-Ison-EtOAc (Acetison) are phytopreparations from I. sonorae standardized according to their CIIB content (6.7 mg/g and 18.4 mg/g of CIIB, respectively). Etanison and Acetison have been reported to induce morphological changes in HeLa like those induced by CIIB. Aim of the study: To evaluate the apoptotic and Nrf2 inhibition activity of the

phytopreparations Acetison and Etanison from Ibervillea Sonorae in the HeLa cervical cancer cell line. Materials and methods: Antiproliferative activity was evaluated by the MTT method at 24, 48, and 72 h. For Acetison and Etanison, serial concentrations from 6.25 µg/mL to 100 µg/mL were tested, and for CIIB from 1.56 µg/mL to 50 µg/mL. The expression of Nrf2, caspase 3, and caspase 9 was evaluated by western blot, using concentrations of 30 µg/mL for Acetison, 50 µg/mL for Etanison, and 15 µg/mL for CIIB. Cisplatin was used as a positive control. Results and conclusions: Apoptotic activity of Etanison and Acetison was demonstrated in HeLa, due to the presence of caspase-9 and caspase-3 in western blot assays. Likewise, both the phytopreparations and CIIB showed inhibition of Nrf2, associating apoptotic activity with the inhibition of the GST transcription factor. In this sense, the phytopreparations of I. sonorae, as well as their derivatives, have the potential to obtain and develop anticancer products. © 2022 Elsevier B.V.

Vidal-Gutiérrez, M., Torres-Moreno, H., Arenas-Luna, V., Loreda-Mendoza, M. L., Tejeda-Dominguez, F., Velazquez, C., Vilegas, W., Hernández-Gutiérrez, S., & Robles-Zepeda, R. E. (2022). Standardized phytopreparations and cucurbitacin IIB from Ibervillea sonorae (S. Watson) greene induce apoptosis in cervical cancer cells by Nrf2 inhibition. *Journal of Ethnopharmacology*, 298. doi: 10.1016/j.jep.2022.115606. Article.

**GREGORIO TOMÁS OBRADOR VERA**  
SNI Nivel III

**EFFICACY AND SAFETY OF DAPRODUSTAT FOR TREATMENT OF ANEMIA OF CHRONIC KIDNEY DISEASE IN INCIDENT DIALYSIS PATIENTS: A RANDOMIZED CLINICAL TRIAL**

**ABSTRACT.** Importance: Daprodustat, a hypoxia-inducible factor prolyl hydroxylase inhibitor, is being evaluated as an oral alternative to conventional erythropoiesis-stimulating agent (ESA) therapy. Few studies of anemia treatment in an incident dialysis (ID) population have been reported. Objective: To evaluate the efficacy and safety of daprodustat vs darbepoetin alfa in treating anemia of chronic kidney disease in ID patients. Design, Setting, and Participants: This prospective, randomized, open-label clinical trial was conducted from May 11, 2017, through September 24, 2020,

in 90 centers across 14 countries. Patients with advanced CKD were eligible if they planned to start dialysis within 6 weeks from screening or had started and received hemodialysis (HD) or peritoneal dialysis (PD) within 90 days before randomization, had a screening hemoglobin (Hb) concentration of 8.0 to 10.5 g/dL (to convert to grams per liter, multiply by 10) and a randomization Hb of 8.0 to 11.0 g/dL, were ESA-naïve or had received limited ESA treatment, and were iron-replete. Interventions: Randomized 1:1 to daprodustat or darbepoetin alfa. Main Outcomes and Measures: The primary analysis in the intent-to-treat population evaluated the mean change in Hb concentration from baseline to evaluation period (weeks 28-52) to assess noninferiority of daprodustat vs darbepoetin alfa (noninferiority margin, -0.75 g/dL). The mean monthly intravenous (IV) iron dose from baseline to week 52 was the principal secondary end point. Rates of treatment-emergent and serious adverse events (AEs) were also compared between treatment groups to assess safety and tolerability. Results: A total of 312 patients (median [IQR] age, 55 [45-65] years; 194 [62%] male) were randomized to either daprodustat (157 patients; median [IQR] age, 52.0 [45-63] years; 96 [61%] male) or darbepoetin alfa (155 patients; median [IQR] age, 56.0 [45-67] years; 98 [63%] male); 306 patients (98%) completed the trial. The mean (SD) Hb concentration during the evaluation period was 10.5 (1.0) g/dL for the daprodustat and 10.6 (0.9) g/dL for the darbepoetin alfa group, with an adjusted mean treatment difference of -0.10 g/dL (95% CI, -0.34 to 0.14 g/dL), indicating noninferiority. There was a reduction in mean monthly IV iron use from baseline to week 52 in both treatment groups; however, daprodustat was not superior compared with darbepoetin alfa in reducing monthly IV iron use (adjusted mean treatment difference, 19.4 mg [95% CI, -11.0 to 49.9 mg]). Adverse event rates were 76% for daprodustat vs 72% for darbepoetin alfa. Conclusions and Relevance: This randomized clinical trial found that daprodustat was noninferior to darbepoetin alfa in treating anemia of CKD and may represent a potential oral alternative to a conventional ESA in the ID population. Trial Registration: ClinicalTrials.gov Identifier: NCT03029208. © 2022 American Medical Association. All rights reserved.

Singh, A. K., Cizman, B., Carroll, K., McMurray, J. J. V., Perkovic, V., Jha, V., Johansen, K. L., Lopes, R. D., Macdougall, I. C., Obrador, G. T., Waikar, S. S., Wanner, C., Wheeler, D. C., Wiecek, A., Stankus, N., Strutz, F., Blackorby, A., Cobitz, A. R., Meadowcroft, A. M., Paul, G., Ranganathan, P., Sedani, S., & Solomon, S. (2022). Efficacy and Safety of Daprodustat for Treatment of Anemia of Chronic Kidney Disease in Incident Dialysis Patients: A Randomized Clinical Trial. *JAMA Internal Medicine*, 182(6), 592-602. doi: 10.1001/jamainternmed.2022.0605. Article.

## GREGORIO TOMÁS OBRADOR VERA

SNI Nivel III

### EVANDRO AGAZZI

Profesor Emérito

#### FACTORS ASSOCIATED WITH THE QUALITY OF THE PATIENT-DOCTOR RELATIONSHIP: A CROSS-SECTIONAL STUDY OF AMBULATORY MEXICAN PATIENTS WITH RHEUMATIC DISEASES

**ABSTRACT.** BACKGROUND: The patient-doctor relationship (PDR) is a complex phenomenon with strong cultural determinants, which impacts health-related outcomes and, accordingly, does have ethical implications. The study objective was to describe the PDR from medical encounters between 600 Mexican outpatients with rheumatic diseases and their attending rheumatologists, and to identify factors associated with a good PDR. METHODS: A cross-sectional study was performed. Patients completed the PDRQ-9 (Patient-Doctor Relationship Questionnaire, 9 items), the HAQ-DI (Health Assessment Questionnaire Disability Index), the Short-Form 36 items (SF-36), a pain-visual analog scale, and the Ideal Patient Autonomy Scale. Relevant sociodemographic, disease-related, and treatment-related variables were obtained. Patients assigned a PDRQ-9 score to each patient-doctor encounter. Regression analysis was used to identify factors associated with a good PDR, which was defined based on a cutoff point established using the borderline performance method. RESULTS: Patients were primarily middle-aged female subjects (86%), with substantial disease duration (median, 11.1 years), without disability (HAQ-DI within reference range, 55.3%), and with deteriorated quality of life (SF-36 out of reference range, 73.7%-78.6%). Among them, 36.5% had systemic lupus erythematosus and 31.8% had rheumatoid arthritis. There were 422 patients (70.3%) with a good PDR and 523 medical

encounters (87.2%) involved certified rheumatologists. Patient paternalistic ideal of autonomy (odds ratio [OR], 3.029; 95% confidence interval [CI], 1.793-5.113), SF-36 score (OR, 1.014; 95% CI, 1.003-1.025), female sex (OR, 0.460; 95% CI, 0.233-0.910), and being certified rheumatologist (OR, 1.526; 95% CI, 1.059-2.200) were associated with a good PDR. CONCLUSIONS: Patient-related factors and the degree of experience of the attending physician impact the quality of the PDR, in Mexican outpatients with rheumatic diseases. Copyright © 2021 The Author(s). Published by Wolters Kluwer Health, Inc.

Pascual-Ramos, V., Contreras-Yáñez, I., Ortiz-Haro, A. B., Molewijk, A. C., Obrador, G. T., & Agazzi, E. (2022). Factors Associated With the Quality of the Patient-Doctor Relationship: A Cross-Sectional Study of Ambulatory Mexican Patients With Rheumatic Diseases. *Journal of Clinical Rheumatology: Practical Reports on Rheumatic & Musculoskeletal Diseases*, 28(4), 183-189. doi: 10.1097/RHU.0000000000001816. Article.

## GREGORIO TOMÁS OBRADOR VERA

SNI Nivel III

#### THE ASCEND-ND TRIAL: STUDY DESIGN AND PARTICIPANT CHARACTERISTICS

**ABSTRACT.** BACKGROUND: Anaemia is common in chronic kidney disease (CKD) and assessment of the risks and benefits of new therapies is important. METHODS: The Anaemia Study in CKD: Erythropoiesis via a Novel prolyl hydroxylase inhibitor Daprodustat-Non-Dialysis (ASCEND-ND) trial includes adult patients with CKD Stages 3-5, not using erythropoiesis-stimulating agents (ESAs) with screening haemoglobin (Hb) 8-10 g/dL or receiving ESAs with screening Hb of 8-12 g/dL. Participants were randomized to daprodustat or darbepoetin alfa (1:1 in an open-label trial (steering committee- and sponsor-blinded), with blinded end-point assessment. The co-primary endpoints are mean change in Hb between baseline and evaluation period (average over Weeks 28-52) and time to first adjudicated major adverse cardiovascular (CV) event. Baseline characteristics were compared with those of participants in similar anaemia trials. RESULTS: Overall, 3872 patients were randomized from 39 countries (median age 67 years, 56% female, 56% White, 27% Asian and 10% Black). The median baseline Hb was 9.9 g/dL, blood pressure was 135/74 mmHg



and estimated glomerular filtration rate was 18 mL/min/1.73 m<sup>2</sup>. Among randomized patients, 53% were ESA non-users, 57% had diabetes and 37% had a history of CV disease. At baseline, 61% of participants were using renin-angiotensin system blockers, 55% were taking statins and 49% were taking oral iron. Baseline demographics were similar to those in other large non-dialysis anaemia trials. **CONCLUSION:** ASCEND-ND will define the efficacy and safety of daprodustat compared with darbepoetin alfa in the treatment of patients with anaemia associated with CKD not on dialysis. © The Author(s) 2021. Published by Oxford University Press on behalf of the ERA.

Perkovic, V., Blackorby, A., Cizman, B., Carroll, K., Cobitz, A. R., Davies, R., DiMino, T. L., Jha, V., Johansen, K. L., Lopes, R. D., Kler, L., Macdougall, I. C., McMurray, J. J. V., Meadowcroft, A. M., Obrador, G. T., Solomon, S., Taft, L., Wanner, C., Waikar, S. S., Wheeler, D. C., Wiecek, A., & Singh, A. K. (2022). The ASCEND-ND trial: study design and participant characteristics. *Nephrology Dialysis Transplantation*, 37(11), 2157-2170. doi: 10.1093/ndt/gfab318. Article.

## GREGORIO TOMÁS OBRADOR VERA

SNI Nivel III

### THE ENVIRONMENT AND KIDNEY HEALTH: CHALLENGES AND OPPORTUNITIES

**ABSTRACT.** The accelerating environmental degradation as a result of modernisation and climate change is an urgent threat to human health. Environment change can impact kidney health in a variety of ways such as water scarcity, global heating and changing biodiversity. Ever increasing industrialization of health care has a large carbon footprint, with dialysis being a major contributor. There have been calls for all stakeholders to adopt a 'one health approach' and develop mitigation and adaptation strategies to combat this challenge. Because of its exquisite sensitivity to various elements of environment change, kidney health can be a risk marker and a therapeutic target for such interventions. In this narrative review, we discuss the various mechanisms through which environmental change is linked to kidney health and the ways that the global kidney health communities can respond to environmental change. © 2022. Salud Publica de Mexico. All Rights Reserved.

Bharati, J., Zavaleta-Cortijo, C., Bressan, T., Shingada, A., Obrador, G., Sola, L., Peiris, D., Miranda, J. J., & Jha, V. (2022). The environment and kidney health: challenges and opportunities. *Salud Pública de México*, 64, 46-55. doi: 10.21149/12799. Article.

## GREGORIO TOMÁS OBRADOR VERA

SNI Nivel III

### STUDY DESIGN AND BASELINE CHARACTERISTICS OF PATIENTS ON DIALYSIS IN THE ASCEND-D TRIAL

**ABSTRACT.** Background: The Anemia Studies in chronic kidney disease (CKD): Erythropoiesis via a Novel prolyl hydroxylase inhibitor Daprodustat-Dialysis (ASCEND-D) trial will test the hypothesis that daprodustat is non-inferior to comparator epoetin alfa or darbepoetin alfa for two co-primary endpoints: hemoglobin (Hb) efficacy and cardiovascular (CV) safety. Methods: We report the trial design, key demographic, clinical and laboratory findings, and baseline therapies of 2964 patients randomized in the open-label (sponsor-blinded) active-controlled, parallel-group, randomized ASCEND-D clinical trial. We also compare baseline characteristics of ASCEND-D patients with patients who are on dialysis (CKD G5D) enrolled in other large CV outcome trials (CVOTs) and in the most relevant registries. Results: The median age of patients was 58 years, 43% were female; 67% were White and 16% were Black. The median Hb at baseline was 10.4 g/dL. Among randomized patients, 89% were receiving hemodialysis and 11% peritoneal dialysis. Among key comorbidities, 42% reported a history of diabetes mellitus and 45% a history of CV disease. Median blood pressure was 134/74 mmHg. The median weekly dose of epoetin was 5751 units. Intravenous and oral iron uses were noted in 64 and 11% of patients, respectively. Baseline demographics were similar to patients with CKD G5D enrolled in other CVOTs and renal patient registries. Conclusions: ASCEND-D will evaluate the efficacy and safety of daprodustat compared with epoetin alfa or darbepoetin alfa in the treatment of patients with anemia with CKD G5D. This trial is registered with ClinicalTrials.gov: NCT02879305. EudraCT Number: 2016-000541-31; Sponsor Protocol Number: 200807. © 2021 The Author(s) 2021. Published by Oxford University Press on behalf of the ERA-EDTA.

Singh, A. K., Blackorby, A., Cizman, B., Carroll, K., Cobitz, A. R., Davies, R., Jha, V., Johansen, K. L., Lopes, R. D., Kler, L., Macdougall, I. C., McMurray, J., Meadowcroft, A. M., Obrador, G. T., Perkovic, V., Solomon, S., Wanner, C., Waikar, S. S., Wheeler, D. C., & Wiecek, A. (2022). Study design and baseline characteristics of patients on dialysis in the ASCEND-D trial. *Nephrology Dialysis Transplantation*, 37(5), 960-972. doi: 10.1093/ndt/gfab065. Article.

## DIANA PACHECO ÁLVAREZ

SNI Nivel II

### THE EUROPEAN AND JAPANESE EEL NaCl COTRANSPORTERS B EXHIBIT CHLORIDE CURRENTS AND ARE RESISTANT TO THIAZIDE TYPE DIURETICS

**ABSTRACT.** The thiazide-sensitive Na<sup>+</sup>-Cl<sup>-</sup> cotransporter (NCC) is the major pathway for salt reabsorption in the mammalian distal convoluted tubule, and the inhibition of its function with thiazides is widely used for the treatment of arterial hypertension. In mammals and teleosts, NCC is present as one ortholog that is mainly expressed in the kidney. One exception, however, is the eel, which has two genes encoding NCC. The eNCCα is located in the kidney and eNCCβ, which is present in the apical membrane of the rectum. Interestingly, the European eNCCβ functions as a Na<sup>+</sup>-Cl<sup>-</sup> cotransporter that is nevertheless resistant to thiazides and is not activated by low-chloride hypotonic stress. However, in the Japanese eel rectal sac, a thiazide-sensitive NaCl transport mechanism has been described. The protein sequences between eNCCβ and jNCCβ are 98% identical. Here, by site-directed mutagenesis, we transformed eNCCβ into jNCCβ. Our data showed that jNCCβ, similar to eNCCβ, is resistant to thiazides. In addition, both NCCβ proteins have high transport capacity with respect to their renal NCC orthologs and, in contrast to known NCCs, exhibit electrogenic properties that are reduced when residue I172 is substituted by A, G, or M. This is considered a key residue for the chloride ion-binding sites of NKCC and KCC. We conclude that NCCβ proteins are not sensitive to thiazides and have electrogenic properties dependent on Cl<sup>-</sup>, and site I172 is important for the function of NCCβ.

Moreno, E., Plata, C., Vázquez, N., Oropeza-Viveros, D. M., Pacheco-Alvarez, D., Rojas-Vega, L., Olin-Sandoval, V., & Gamba, G. (2022). The European and Japanese eel NaCl cotransporters β exhibit chloride currents and are resistant to thiazide type diuretics. *American Journal of Physiology*, 323(2), C385-C399. doi: 10.1152/ajpcell.00213.2022. Article.

## FARID ANDRÉS TEJEDA DOMÍNGUEZ

SNI Nivel Candidato

### GALECTIN-3 AS A POTENTIAL PROGNOSTIC BIOMARKER OF SEVERE COVID-19 IN SARS-COV-2 INFECTED PATIENTS

**ABSTRACT.** Severe COVID-19 is associated with a systemic hyperinflammatory response leading to acute respiratory distress syndrome (ARDS), multi-organ failure, and death. Galectin-3 is a  $\beta$ -galactoside binding lectin known to drive neutrophil infiltration and the release of pro-inflammatory cytokines contributing to airway inflammation. Thus, we aimed to investigate the potential of galectin-3 as a biomarker of severe COVID-19 outcomes. We prospectively included 156 patients with RT-PCR confirmed COVID-19. A severe outcome was defined as the requirement of invasive mechanical ventilation (IMV) and/or in-hospital death. A non-severe outcome was defined as discharge without IMV requirement. We used receiver operating characteristic (ROC) and multivariable logistic regression analysis to determine the prognostic ability of serum galectin-3 for a severe outcome. Galectin-3 levels discriminated well between severe and non-severe outcomes and correlated with markers of COVID-19 severity, (CRP, NLR, D-dimer, and neutrophil count). Using a forward-stepwise logistic regression analysis we identified galectin-3 [odds ratio (OR) 3.68 (95% CI 1.47–9.20),  $p < 0.01$ ] to be an independent predictor of severe outcome. Furthermore, galectin-3 in combination with CRP, albumin and CT pulmonary affection  $> 50\%$ , had significantly improved ability to predict severe outcomes [AUC 0.85 (95% CI 0.79–0.91,  $p < 0.0001$ )]. Based on the evidence presented here, we recommend clinicians measure galectin-3 levels upon admission to facilitate allocation of appropriate resources in a timely manner to COVID-19 patients at highest risk of severe outcome. © 2022, The Author(s).

Cervantes-Alvarez, E., La Rosa N. L. -D., La Mora, M. S. -D., Valdez-Sandoval, P., Palacios-Jimenez, M., Rodriguez-Alvarez, F., Vera-Maldonado, B. I., Aguirre-Aguilar, E., Escobar-Valderrama, J. M., Alanis-Mendizabal, J., Méndez-Guerrero, O., Tejeda-Dominguez, F., Torres-Ruiz, J., Gómez-Martin, D., Colborn, K. L., Kershonobich, D., Huang, C. A., & Navarro-Alvarez, N. (2022). Galectin-3 as a potential prognostic biomarker of severe COVID-19 in SARS-CoV-2 infected patients. *Scientific Reports*, 12(1). doi: 10.1038/s41598-022-05968-4. Article.

## FARID ANDRÉS TEJEDA DOMÍNGUEZ

SNI Nivel Candidato

### GALECTIN-3 IS OVEREXPRESSED IN ADVANCED CIRRHOSIS AND PREDICTS POST-LIVER TRANSPLANT INFECTIOUS COMPLICATIONS

**ABSTRACT.** Background & Aims: Patients with advanced cirrhosis often have immune dysfunction and are more susceptible to infections. Galectin-3 is a  $\beta$ -galactoside-binding lectin implicated in inflammation, immune regulation and liver fibrosis. We aim to investigate galectin-3 expression in advanced cirrhosis and its ability to predict post-transplant infectious complications. Methods: We collected sera and liver samples from 129 cirrhotic patients at the time of liver transplantation and from an external cohort of 37 patients with alcoholic liver disease including alcoholic hepatitis (AH) at the time of diagnosis. Galectin-3 was assessed by ELISA, real-time PCR, immunohistochemistry and RNA-seq. Receiver operating characteristic curves and Cox proportional-hazards regression analysis were performed to assess the predictive power of galectin-3 for disease severity and post-transplant infections. Results: Increased galectin-3 levels were found in advanced cirrhosis. Galectin-3 significantly correlated with disease severity parameters and inflammatory markers. Galectin-3 had significant discriminating power for compensated and advanced cirrhosis (AUC = 0.78/0.84, circulating/liver galectin-3;  $p < .01$ ), and was even higher to discriminate severe AH (AUC = 0.95,  $p < .0001$ ). Cox Proportional-hazard model showed that galectin-3, MELD-Na and the presence of SIRS predict the development of post-transplant infectious complications. Patients with circulating galectin-3 ( $> 16.58$  ng/ml) were at 2.19-fold 95% CI (1.12–4.29) increased risk, but when combined with MELD-Na  $> 20.0$  and SIRS, the risk to develop post-transplant infectious complications, increased to 4.60, 95% CI (2.38–8.90). Conclusion: Galectin-3 is a novel biological marker of active inflammation and disease severity that could be clinically useful alone or in combination with other scores to discriminate advanced cirrhosis and predict post-transplant infectious complications. © 2022 John Wiley & Sons A/S. Published by John Wiley & Sons Ltd.

Cervantes-Alvarez, E., Limon-de la Rosa, N., Vilatoba, M., Pérez-Monter, C., Hurtado-Gomez, S., Martinez-Cabrera, C., Argemi, J., Alatorre-Arenas, E., Yarza-Regalado, S., Tejeda-Dominguez, F., Lizardo-Thiebaud, M. J., Mendez-Guerrero, O., Gamboa-Dominguez, A., Aguilar-Salinas, C. A., Huang, C. A., Kershonobich, D., Bataller, R., Torre, A., & Navarro-Alvarez, N. (2022). Galectin-3 is overexpressed in advanced cirrhosis and predicts post-liver transplant infectious complications. *Liver International*, 42(10), 2260–2273. doi: 10.1111/liv.15326. Article.

## LOURDES VELÁZQUEZ GONZÁLEZ

SNI Nivel II

### PERSONAL ATTITUDES AND DENIALIST VIEWS ABOUT THE COVID-19 PANDEMIC IN ITALY: A NATIONAL SURVEY

**ABSTRACT.** Since COVID-19 began to spread, hypotheses about the possible causes of the disease and its treatment have increased worldwide, engendering fears and concerns. This context of uncertainty, as well as the great changes that people were forced to accept in their daily lives, have challenged the general population, affecting public opinion and collective imagination inevitably, with also a negative impact on compliance with public health policies. This study explored the personal attitudes towards the COVID-19 pandemic and their association with denial stances in the Italian context. The aim was to address the relevance of these phenomena and in what guise they are present in relation to the grounds supporting them, as an avenue to be more effective in public health under different domains. An online questionnaire was set out to survey the general population over 18 throughout the Italian country, including students and health professionals, to offer geographic and professional diversity. General population was also stratified based on their direct or indirect experience of COVID-19, whilst health participants were recruited with regard to their involvement in a COVID centre. A total of 2110 questionnaire were filled out between December 2020 and April 2021. Of the participants, 85.45% completely disagree with the possibility that COVID-19 is not real and that the cultural, social and economic system wanted us to believe otherwise, whereas 69% had doubts about what has been claimed to date about the existence of COVID-19. Trust in institutions and types of COVID-19 experience affected these beliefs. The results

also show that stress, anxiety, sadness, and vulnerability increased as compared to the pre-COVID-19 pandemic timeframe. The findings of this national survey revealed how much behaviors based on social responsibility and rational prudence are important for defending human life. © AUDT 2022.

Sisto, A., Quintiliani, L., Vicinanza, F., Fabris, S., Campanozzi, L. L., Curcio, G., Michilli, M., Molina, A., Ghilardi, G., Manazza, A., Lauri, G., Gentile, R., Perciaccante, A., De Micco, F., Navarini, L., Velázquez, L., Picozzi, M., Ricci, G., Piacquadio, F., Maioni, M., Ermili, F., Tambone, M., Chelucci, G. L., Ciccozzi, M., & Tambone, V. (2022). Personal attitudes and denialist views about the COVID-19 pandemic in Italy: a national survey. *Medicina e Morale*, 71(2), 143-156. doi: 10.4081/mem.2022.1204. Article.

## CLAUDIA DEL SOCORRO VILLANUEVA SÁENZ

Profesora investigadora

### COVID-19 AND FONTAN: BIOETHICAL ANALYSIS DERIVED FROM THE NEED FOR HOSPITAL RECONVERSION

[COVID-19 Y FONTAN: ANÁLISIS BIOÉTICO DERIVADO DE LA NECESIDAD DE RECONVERSIÓN HOSPITALARIA]

**ABSTRACT.** Background: Among congenital heart diseases, those with univentricular physiology are the most severe with the lowest survival. Fontan surgery (FS) is the procedure of choice, as it bypasses the flow from the caval veins to the pulmonary circulation but requires close monitoring for late complications. The SARS-CoV-2 (severe acute respiratory syndrome coronavirus 2) pandemic caused nations to prioritize the availability of human and material health resources to benefit those infected. This study aimed to evaluate the clinical consequences of hospital reconversion due to the COVID-19 pandemic in a univentricular heart clinic for patients with FS from the bioethical perspective. Methods: We conducted an analytical cross-sectional study in a captive cohort of patients with FS treated in a tertiary hospital with conversion to COVID-19 patient care. The consequences of discontinuation of follow-up were recorded. Qualitative variables were expressed as frequencies and percentages, and quantitative variables as medians and interquartile ranges (p25-p75). Comparison between the two groups was performed with the  $\chi^2$  test. Results: We included 51 patients with a median age of 13 years and a follow-up of 5 years. The

male: female ratio was 0.88:1.12, and 41% (21) presented failures. More than 90% of the patients presented needs for medications and imaging studies. The two patients cared for in palliative care discontinued their care. Conclusions: Continuity of care must be guaranteed for all patients who require it, so health policies are needed to ensure compliance with vulnerable groups. © 2022, Permanyer Publications. All rights reserved.

Gómezchico-Velasco, R., Villanueva-Sáenz, C. S., Salazar-Lizárraga, D., Yáñez-Gutiérrez, L., & Márquez-González, H. (2022). COVID-19 and Fontan: bioethical analysis derived from the need for hospital reconversion [COVID-19 y Fontan: análisis bioético derivado de la necesidad de reconversión hospitalaria]. *Boletín Médico del Hospital Infantil de México*, 79(1), 44-50. doi: 10.24875/BMHIM.21000058. Article.

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<sup>1</sup> Colaboración en un artículo en Facultad de Ingeniería (p. 88).





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**SANTIAGO GARCÍA ÁLVAREZ**

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**NARRATIVE AND FAMILY BUSINESS FIRMS:  
A DISCOURSE FRAMEWORK TOWARD  
CONTINUITY AND COMPETITIVENESS**

**ABSTRACT.** Family business firms (FBFs) constantly struggle with the challenge of successfully reaching and surviving beyond the third generation. Narrative or storytelling is frequently used in business to transmit knowledge, achieve goals, create and maintain a connection with stakeholders, and achieve sustained growth. Most FBFs consciously or unconsciously use narrative and possess their own discourse, which is unique to every family and family business and which may aid FBFs in achieving continuity. FBFs must have an adequate atmosphere of collaboration and cooperation so that group members can transform acquired tacit knowledge through storytelling into explicit action. FBFs should be prepared to help collaborators and other stakeholders build competencies since tacit knowledge transfer, through narrative, can aid in the solving of problems, enhance innovativeness, and improve strategic decision-making. Therefore, narrative may well

aid FBFs in fulfilling their ultimate goal of continuity. The purpose of this chapter is to evaluate the potential influence of narrative on FBFs' continuity and prevention of their precipitous expiration. This chapter contributes to previous literature that sheds light on the narrative implications of FBFs, and depicts FBFs' narratives and the dynamics of their business objectives, as well as touches on the heterogeneous nature of each family business' storyline. There are various advantages to FBFs' storytelling; perhaps the most noteworthy is the achievement of sustained business growth and continuity. © 2020 Emerald Publishing Limited.

Atristain-Suárez, C. & García-Álvarez, S. (2020). Narrative and Family Business Firms: A Discourse Framework Toward Continuity and Competitiveness. In García-Álvarez, S. & Atristain-Suárez, C. (Eds.), *Strategy, Power and CSR: Practices and Challenges in Organizational Management* (pp.101-118). Emerald Publishing. doi:10.1108/978-1-83867-973-620201005. Book Chapter.

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**HUGO BRISEÑO RAMÍREZ**

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**ANALYZING THE CHARGING CAPACITY  
OF ELECTRIC VEHICLES FOR INTERURBAN  
TRAVEL USING SIMULATION**

**ABSTRACT.** The adoption of electric vehicles (EVs) has been increasing around the world in recent years. EVs present many advan-

tages for sustainability. However, they have some drawbacks, including the high upfront cost, low range of some models and the availability of chargers. Hence, traveling long distances might be compromising for EVs. In this paper, we present a simulation-based study to analyze the charging capacity between two main cities in Mexico. Although the sales of EVs in Mexico are increasing, the number of this type of vehicles in the roads is relatively very low. In consequence, the charging infrastructure might not be sufficient to complete long trips given the large extension of the country. The modeling approach proposed in this paper helps identifying areas where new charging stations are needed to complete long trips. Furthermore, the results reveal a high correlation in the congestion of neighboring charging stations. © 2021 IEEE.

Ramirez-Nafarrate, A., Grayeb Pereira, J. C., Briseno, H., Ruiz, F., & Araz, O. M. (2021). Analyzing the Charging Capacity of Electric Vehicles for Interurban Travel Using Simulation. 2021 Winter Simulation Conference, WSC 2021, Phoenix, United States, 12 December 2021 through 15 December 2021, Category number CFP21WSC-ART, Code 177415. WSC, *Proceedings-Winter Simulation Conference*, 2021. doi: 10.1109/WSC52266.2021.9715333. Conference Paper.

## FERNANDA CANALE SEGOVIA

Profesora investigadora

### GREEN INNOVATION IN THE LATIN AMERICAN AGRI-FOOD INDUSTRY: UNDERSTANDING THE INFLUENCE OF FAMILY INVOLVEMENT AND BUSINESS PRACTICES

**ABSTRACT.** Purpose: Over the past few years, several scholars have focused on green innovation in the agri-food industry. In line with this research stream, the purpose of this paper is to cover some unexplored areas regarding if stakeholder pressures have a positive influence on family engagement to implement green innovation practices and socially responsible practices. Design/methodology/approach: By adopting a qualitative research methodology, mainly based on a multiple case study, this paper seeks to cover some unexplored areas regarding the understanding the relationship between stakeholders, family involvement and business practices in green innovation. The authors analyze eight cases from five Latin American countries selected, all are family firms focused on agricultural production. Findings: Latin American family firms from agri-food industry, have a positive influence from internal/external stakeholder to implement green innovation initiatives and socially responsible practices, that result in short/long term business practices. Originality/value: The originality of the proposed conceptual model stems from the need to overcome the previous theoretical models based on the stakeholder theory, which deals separately with internal/external influence over the firm. © 2022, Emerald Publishing Limited.

Muller, C. G., Canale, F., & Discua Cruz, A. (2022). Green innovation in the Latin American agri-food industry: understanding the influence of family involvement and business practices. *British Food Journal*, 124(7), 2209-2238. doi: 10.1108/BFJ-09-2021-0994. Article.

## ALBA VIOLETA CORONA CABRERA

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### OMAR GUILLERMO ROJAS ALTAMIRANO

Investigador Titular D, SNI Nivel I

### SENSORY EXPECTATIONS FROM AESTHETIC PERCEPTIONS OF COFFEE BEVERAGES PRESENTED IN DIFFERENT MUGS

**ABSTRACT.** The present work examined how the esthetic impression caused by a specific mug selection seems to influence the expected

flavor elicited by a coffee beverage. Participants from Mexico viewed online photographs of espresso, Americano, latte and cappuccino presented in two different mugs, including a transparent glass mug and a white ceramic mug. The type of mug influenced participants' subjective ratings of the drinks. Espresso and Americano were expected to be more aromatic, bitter, hotter and more intense when served in a transparent glass mug rather than in a white ceramic mug. Results extend the knowledge of consumer preferences and bring an idea for the best way to better fulfill customer's sensory expectations. © 2020 Taylor & Francis.

Corona, V., Vargas de la Cruz, I., Lujan-Moreno, G. A., Albors-Garrigos, J., García Segovia, P., & Rojas, O. G. (2022). Sensory expectations from aesthetic perceptions of coffee beverages presented in different mugs. *Journal of Culinary Science and Technology*, 20(3), 213-238. doi: 10.1080/15428052.2020.1824834. Article.

## CLARA CRISTINA CATARINA ECCIUS WELLMANN

SNI Nivel I

### ELECTROPHYSIOLOGICAL BRAIN RESPONSE TO ERROR IN SOLVING MATHEMATICAL TASKS

**ABSTRACT.** Objective: to identify energy patterns in the electrophysiological bands of the brain as possible indicators of overconfidence in students when they receive feedback indicating they have erred while solving a mathematical task. Methodology: EEG were recorded from 20 subjects while they performed mathematical exercises. Energy changes in the delta and theta bands before, during, and after solving the task were analyzed. Results: when the answers to the exercises were shown, an increase of energy in the delta band was observed in participants with correct answers but a reduction in that band in those who answered incorrectly. Subjects with incorrect answers received feedback and then attempted to solve a second, similar, exercise. Subjects who answered correctly showed an increase of energy theta, while those with incorrect answers showed a decrease. Conclusions: the energy changes when subjects erred while solving a mathematical task could serve as a quantitative indicator for characterizing overconfidence. © 2022 by the authors.

Alvarado-Rodríguez, F. J., Ibarra-González, K. P., Eccius-Wellmann, C., Vélez-Pérez, H., & Romo-Vázquez, R. (2022). Electrophysiological Brain Response to Error in Solving Mathematical Tasks. *Mathematics*, 10(18). doi: 10.3390/math10183294. Article.

## SANTIAGO GARCÍA ÁLVAREZ

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### MARÍA CONCEPCIÓN ATRISTAIN SUÁREZ

Profesora investigadora

### STRATEGY, POWER AND CSR: PRACTICES AND CHALLENGES IN ORGANIZATIONAL MANAGEMENT

**ABSTRACT.** In today's global and complex environment, traditional views towards organizational management are not enough for businesses to thrive. It's only by bringing together different approaches can management styles develop fast enough to keep pace with the ever-changing big picture. © 2020 Emerald Publishing Limited.

García-Álvarez, S. & Atristain-Suárez, C. (2020). *Strategy, Power and CSR: Practices and Challenges in Organizational Management*. Emerald Publishing. doi: 10.1108/9781838679736. Book.

## EUGENIO GÓMEZ ALATORRE

Profesor investigador

### HOW TO EFFECTIVELY COMMUNICATE YOUR CODE OF ETHICS: AN EMPIRICAL STUDY USING A CLUSTER RANDOMIZED CONTROL TRIAL EXPERIMENT

**ABSTRACT.** This paper proposes a method to measure the effectiveness of an ethics program at one of the most prominent pawnshop chains in Mexico, surveying a sample of 519 workers. This research presents a novel approach to the investigation of business ethics by conducting a cluster randomized control trial experiment to assess effectiveness. No evidence of an enhanced understanding of the existing code of ethics from the communication and explanation of the code was apparent. This could indicate an example of a failed ethics program, suggesting the possibility of additional ineffective ethics programs and companies could be wasting resources on them. We demonstrate that it is possible to implement a cluster randomized control trial, which is considered to be the gold standard in impact evaluation. This should lead to the application of more effective methodologies in the field of business ethics, offering a more comprehensive understanding of the effectiveness of ethics programs. © 2022 W. Michael Hoffman Center for Business Ethics at Bentley University.



Gómez-Alatorre, E., Cuñado, J., & Ferrero, I. (2022). How to effectively communicate your code of ethics: An empirical study using a cluster randomized control trial experiment. *Business and Society Review*, 127(1), 69-96. doi: 10.1111/basr.12255. Article.

## JORGE ARTURO LEÓN Y VÉLEZ AVELAR

Profesor investigador

### COMMUNICATING WITH STAKEHOLDERS VIA TWITTER: FROM CSR TO COVID-19

**ABSTRACT.** Communication efforts made in terms of Corporate Social Responsibility (CSR) are a task companies must carry out if they want stakeholders to recognize the work they are doing on the topic. This communication has become relevant, particularly during the last year, considering that stakeholders, especially customers, have increased their interest in sustainability, and communication impacts their perception. The most used communication tools for these topics are annual reports and web pages, but numerous companies tend to use social networks as an extra tool to communicate actions, considering the construction of dialog with stakeholders who can respond and interact. In an exploratory and descriptive way, through a sample of company tweets recognized as socially responsible from the last two years, this study shows that companies communicated more through Twitter during the pandemic and indicates the main words used for their communication during 2020. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

León y Vélez Avelar, J. A. (2022). Communicating with Stakeholders via Twitter: From CSR to COVID-19. In López-Fernández, A. M., & Terán-Bustamante, A. (Eds.), *Business Recovery in Emerging Markets. Global Perspectives from Various Sectors*, series *Palgrave Studies in Democracy, Innovation and Entrepreneurship for Growth* (pp. 181-200). Palgrave Macmillan. doi: 10.1007/978-3-030-91532-2\_10. Book Chapter.

## ANDRÉE MARIE LÓPEZ FERNÁNDEZ

SNI Nivel I

### A NATIONWIDE STRIKE UNCOVERS UNETHICAL PRACTICES: CONSULTING ON SOCIALLY RESPONSIBLE COLLABORATOR MANAGEMENT IN MEXICO

**ABSTRACT.** Learning outcomes: It is expected that students enhance their awareness of

businesses' role in human rights protection as a key factor in their corporate social responsibility (CSR) engagement and core objective achievement, as well as understand the effects of gender-based violence on organizational performance and identify and develop policies for a socially responsible strategic plan for effective communication with current and potential stakeholders. Case overview/synopsis: The case of AFF Consulting Group in Mexico illustrates the challenges that firms face when doing business in an environment riddled with inequality and gender-based violence. The firm is challenged with developing a socially responsible strategic plan to ensure effective communication with stakeholders. The case has been developed as a narrative to demonstrate the intricacies of internal dynamics and discussions, which lead to strategic planning and decision-making. Complexity academic level: The case study illustrates the challenges of business dynamics in an emerging market. It is applicable, especially, for undergraduate and graduate students in management studies related to CSR, ethics, human resources, collaborator management and human rights. Supplementary materials: Teaching notes are available for educators only. Subject code: CSS 11: Strategy. © 2022, Emerald Publishing Limited.

López-Fernández, A. M. (2022). A nationwide strike uncovers unethical practices: consulting on socially responsible collaborator management in Mexico. *Emerald Emerging Markets Case Studies*, 12(2), 1-23. doi: 10.1108/EEMCS-04-2021-0105. Article.

## ANDRÉE MARIE LÓPEZ FERNÁNDEZ

SNI Nivel I

### "CHECK YOUR COGNITIVE DISSONANCE AT THE DOOR": CORPORATE SOCIAL RESPONSIBILITY DRIVING ANTI-ISM POLICIES FOR INCLUSIVE GROWTH

**ABSTRACT.** Organizations that align corporate social responsibility (CSR) with their corporate philosophy and governance achieve business and social growth and development by maintaining a successful stakeholder relationship. However, too many demonstrate cognitive dissonance in relation to their CSR engagement; that is, they state to be socially responsible yet participate in unethical and questionable practices. Isms are the clearest form of

firms' cognitive dissonance; the question is how can firms achieve inclusive growth while tolerating and/or enabling isms? The objective of this conceptual study is to understand the effects of cognitive dissonance related to CSR engagement on the lack of social and business growth and development. The study contributes to existing literature related to corporate social responsibility and business ethics and understanding of how firms can achieve inclusive growth by tackling CSR-related cognitive dissonance. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

López-Fernández, A. M. (2022). "Check Your Cognitive Dissonance at the Door": Corporate Social Responsibility Driving Anti-Isms Policies for Inclusive Growth. In López-Fernández, A. M., & Terán-Bustamante, A. (Eds.), *Business Recovery in Emerging Markets. Global Perspectives from Various Sectors*, series *Palgrave Studies in Democracy, Innovation and Entrepreneurship for Growth* (pp. 29-46). Palgrave Macmillan. doi: 10.1007/978-3-031-12217-0\_2. Book Chapter.

## ANDRÉE MARIE LÓPEZ FERNÁNDEZ

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### CONSUMER PARADOX: A MANIFESTATION OF SELF-CONCEPT IN ACTIVISM IN RESPONSE TO SUPPLY CHAIN PRACTICES

**ABSTRACT.** The effects of unethical and non-socially responsible organizational practices across supply chains have been hyper-normalized. For instance, the involvement of the private sector in modern day slavery, however alarming and unacceptable, is commonplace. Interestingly, consumers hold significant power to drive change. The question is, does consumer self-concept relate to consumer activism, and why is some consumers' awareness of unethical practices insufficient to sway their purchase decision-making? A set of propositions were framed, and conceptual model was developed to analyze the relation among self-concept, consumer types as to social responsibility, and organizational practices across supply chains. The study contributes to the understanding of consumer behavior, particularly activism and conformism, regarding firm's ethical behavior, social responsibility, and sustainability for purchase decision-making. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

López-Fernández, A. M. (2022). Consumer Paradox: A Manifestation of Self-Concept in Activism in Response to Supply Chain Practices. In López-Fernández, A. M., & Terán-Bustamante, A. (Eds.), *Business Recovery in Emerging Markets. Global Perspectives from Various Sectors*, series *Palgrave Studies in Democracy, Innovation and Entrepreneurship for Growth* (pp. 165-185). Palgrave Macmillan. doi: 10.1007/978-3-030-79709-6\_9. Book Chapter.

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### INTRODUCTION. PALGRAVE STUDIES IN DEMOCRACY, INNOVATION AND ENTREPRENEURSHIP FOR GROWTH

**ABSTRACT.** COVID-19 has significantly impacted just about every sector around the world. The incomparable effects have posed important challenges to understand the virus, comprehend the widespread consequences and their implications, as well as survive. While we are still learning about the pandemic's effects, we are tasked with the imperative need to devise strategic plans to recover. This chapter describes the content of the collaborative work which analyzes how various sectors are recovering from the pandemic and its collateral crises. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

López-Fernández, A. M. (2022). Introduction. In López-Fernández, A. M., & Terán-Bustamante, A. (Eds.), *Business Recovery in Emerging Markets. Global Perspectives from Various Sectors*, series *Palgrave Studies in Democracy, Innovation and Entrepreneurship for Growth* (pp. 1-6). Palgrave Macmillan. doi: 10.1007/978-3-030-91532-2\_1. Book Chapter.

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### MACHINE LEARNING SUSTAINABLE COMPETITIVENESS FOR GLOBAL RECOVERY

**ABSTRACT.** The unexpected appearance and expansion of the pandemic caused by COVID-19 have shown that both developed and less developed countries need strategic, scientific-technological capacities and an innovation ecosystem to respond quickly to these challenges. The objective of

this research is to analyze the potential correlation between competitiveness and sustainable development for a global recovery. To carry out the study, five global indexes were considered: competitiveness, sustainability, innovation, impunity, and human development which were analyzed with a mixed-method approach, quantitative and qualitative analysis. Organizational and government leaders are facing significant collateral effects of the health pandemic including economic recession and social development regression; therefore, the road to recovery requires they work toward sustainable development to reach desired competitiveness. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

López-Fernández, A. M., Terán-Bustamante, A., & Martínez-Velasco, A. (2022). Machine Learning Sustainable Competitiveness for Global Recovery. In López-Fernández, A. M., & Terán-Bustamante, A. (Eds.), *Business Recovery in Emerging Markets. Global Perspectives from Various Sectors*, series *Palgrave Studies in Democracy, Innovation and Entrepreneurship for Growth* (pp. 241-267). Palgrave Macmillan. doi: 10.1007/978-3-030-91532-2\_13. Book Chapter.

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### REDESIGNING CORPORATE SOCIAL RESPONSIBILITY FOR THE GLOBAL AGENDA: A STAKEHOLDER CENTRIC APPROACH FOR BUSINESS SURVIVAL

**ABSTRACT.** This chapter argues that most organizations, institutions and business, regardless of size and line of business deliver corporate social responsibility. It is fair to say that what organizational leaders mostly get wrong is the notion that corporate social responsibility is all about giving back; that is, either to the community, environment and, sometimes, both. Discussions in this chapter put together various concepts on redesigning corporate social responsibility in context of global agenda. A stakeholder-based approach for business survival is delineated in this chapter. © 2019 by Nova Science Publishers, Inc.

López-Fernández, A. M. (2019). Redesigning Corporate Social Responsibility for the Global Agenda: A Stakeholder Centric Approach for Business Survival. In Rajagopal & Divya Kirti Gupta (Eds.), *Strategic Rethinking: Connecting Local-Global Business Models* (pp. 35-55). Nova Science Publishers. Book Chapter.

## ANDRÉE MARIE LÓPEZ FERNÁNDEZ

SNI Nivel I

### UNETHICAL SUPPLY CHAINS DELAYING RECOVERY: ANALYZING PRE AND MID COVID-19 CONDITIONS

**ABSTRACT.** Entire industries have been negatively impacted by the COVID-19 crisis. As a result, global supply chains, along with their collaborators, have been severely affected. The slow pace of recovery has raised many questions as it is not only a matter of vaccination and employment. Other issues that preceded the pandemic are pushing recovery further; inequality is at the center of these issues. If unequal conditions and practices do not change, is recovery even possible? Another issue that arises is the illustrious need to get back to normal, which leads to the questions: should we be striving for normal? Is it the ideal state? The study contributes to the understanding of recovery's slow pace and proposes a conceptual model to foster socially responsible supply chain governance by means of individual and organizational resilience to close the inequality gap and recover. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

López-Fernández, A. M. (2022). Unethical Supply Chains Delaying Recovery: Analyzing Pre and Mid COVID-19 Conditions. In López-Fernández, A. M., & Terán-Bustamante, A. (Eds.), *Business Recovery in Emerging Markets. Global Perspectives from Various Sectors*, series *Palgrave Studies in Democracy, Innovation and Entrepreneurship for Growth* (pp. 201-222). Palgrave Macmillan. doi: 10.1007/978-3-030-91532-2\_11. Book Chapter.

## DOLORES LUQUÍN GARCÍA

Profesora investigadora

### CLUSTER IDENTIFICATION IN GUADALAJARA METROPOLITAN AREA: RESTAURANTS

**ABSTRACT.** The aim of this article is to identify the most convenient clustering methodology to be applied in the restaurants' sector in the Guadalajara Metropolitan Area (ZMG). An analysis of different clustering techniques was carried out, and as a result, the Kulldorff technique was selected to determine where the existing restaurant clusters are. The results show ten restaurant clusters in the ZMG, seven of them with a high concentration of economic units.

The present study is innovative concerning the detection of clusters in the restaurant industry in the ZMG. © 2022 Colegio de Mexico, A.C., Departamento de Publicaciones. All rights reserved.

Luquín-García, D. & Reynoso C. F. (2022). Cluster identification in Guadalajara Metropolitan Area: Restaurants. *Estudios Demográficos y Urbanos*, 37(3), 1063-1104. doi: 10.24201/edu.v37i3.2077. Article.

## JAVIER MORENO ESPINOSA

SNI Nivel Candidato

### PERSPECTIVES FOR RECOVERY OF VAT COLLECTION DERIVED FROM IMPORTS OF GOODS

**ABSTRACT.** In this chapter, the elasticity of the collection of value-added tax resulting from foreign trade operations was estimated based on imports' transactions by type of good to determine the group's sensitivity to imports' behavior. Results show that final consumer goods show the most significant effect of all, followed by intermediate and capital goods. Furthermore, there is an average decrease in the corresponding elasticities of 14.13%, attributable to COVID-19, during 2020. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

Espinosa, J. M. & Mata, L. M. (2022). Perspectives for Recovery of VAT Collection Derived from Imports of Goods. In López-Fernández, A. M., & Terán-Bustamante, A. (Eds.), *Business Recovery in Emerging Markets. Global Perspectives from Various Sectors*, series Palgrave Studies in Democracy, Innovation and Entrepreneurship for Growth (pp. 23-44). Palgrave Macmillan. doi: 10.1007/978-3-030-91532-2\_3. Book Chapter.

## PAOLO RICCARDO MORGANTI

Profesor investigador

### EXISTENCE AND UNIQUENESS OF PRICE EQUILIBRIA IN LOCATION-BASED MODELS OF DIFFERENTIATION WITH FULL COVERAGE

**ABSTRACT.** In location-based models of price competition, traditional sufficient conditions for existence and uniqueness of an equilibrium (Caplin and Nalebuff in *Econometrica* 59(1): 25-59) are not robust for the firm that serves the right-tail of the consumers' distribution. Interestingly, as we relax these conditions, we observe only two new alternative cases. Moreover, we

identify a novel, easily testable condition for uniqueness that is weaker than log-concavity and that can also apply to Mechanism Design. Thanks to this general framework, we can solve the equilibrium of general vertical differentiation models numerically and show that inequality has a U-shaped effect on profits and prices of a high-quality firm. Moreover, we prove that extreme levels of concentration can dissolve natural monopolies and restore competition, contrary to the Uniform case. © 2021, The Author(s), under exclusive licence to Springer-Verlag GmbH Austria, part of Springer Nature.

Cortés, J. H. & Morganti, P. (2022). Existence and uniqueness of price equilibria in location-based models of differentiation with full coverage. *Journal of Economics/Zeitschrift für Nationalökonomie*, 136(2), 115-148. doi: 10.1007/s00712-021-00770-8. Article.

## PAOLO RICCARDO MORGANTI

Profesor investigador

## ENRIQUE MARTÍN MURILLO OTHÓN

Investigador Titular C, SNI Nivel I

## ANTONIA TERÁN BUSTAMANTE

Investigadora Titular A, Profesora investigadora

### FINALLY BACK TO CAMPUS? MOTIVATIONS FOR FACEMASK ADOPTION IN THE HIGHER EDUCATION SECTOR

**ABSTRACT.** The COVID-19 pandemic caused an unprecedented crisis in the higher education sector through campuses closing worldwide. To contain the disease, authorities required their citizens to wear facemasks in public spaces. As universities return to in-person instruction, they will probably require all students to wear facemasks while on-campus. This study examined antecedents of voluntary adoption of facemasks through a survey of students enrolled in Mexico City universities in the Fall of 2020. It was hypothesized that Social Value Orientation (SVO) and Trust would be positively related to facemask adoption. Findings revealed that among students, wearing a facemask reflects distinct conducts depending on the social context. Regression results show that SVO and Trust significantly predict facemask use but only in some contexts, giving partial support to hypotheses. A key implication is that public health communications should avoid general messages recommending facemasks, and craft more nuanced appeals targeting specific social con-

texts. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

Morganti, P., Terán-Bustamante, A., & Murillo, E. (2022). Finally Back to Campus? Motivations for Facemask Adoption in the Higher Education Sector. In López-Fernández, A. M., & Terán-Bustamante, A. (Eds.), *Business Recovery in Emerging Markets. Global Perspectives from Various Sectors*, series Palgrave Studies in Democracy, Innovation and Entrepreneurship for Growth (pp. 85-107). Palgrave Macmillan. doi: 10.1007/978-3-030-91532-2\_6. Book Chapter.

## ENRIQUE MARTÍN MURILLO OTHÓN

Investigador Titular C, SNI Nivel I

### ENHANCING BRAND UNDERSTANDING THROUGH BRAND TRAINING: A CONDITIONAL PROCESS ANALYSIS OF RECENT HIRES AT AN AIRLINE

**ABSTRACT.** Purpose – Within internal branding research, the positive association between employee brand training and brand understanding is well established. However, the boundary conditions of this focal relationship have not been researched to date, and insights about the effect of individual differences would be of significant practical value to service organizations. Accordingly, the purpose of this study is to test the moderating effect on the focal relationship of three key individual differences: age, gender, and customer-contact position. Rationale – The study is grounded on established constructs and relationships from the internal branding literature. Design/methodology/approach – Data were collected at a Latin American airline using a web-based survey. The sample included 225 recently hired employees. The analysis was performed through conditional process models estimated with the PROCESS macro for SPSS. Findings – Age moderates the focal relationship, with older employees displaying a weaker impact of brand training on brand understanding, which becomes non-significant after the age of 50. For gender, the moderating effect was not significant. Contact position had a significant negative effect on the focal relationship, i.e. brand training had a weaker impact on brand understanding for contact employees compared to non-contact employees. This is attributed to contact employees' involvement in service encounters, which provides real-world opportunities to learn about the brand above and beyond formal brand



training, opportunities which non-contact employees lack. Practical & social implications of research – Training managers in service organizations can use the study results to achieve a greater impact from scarce brand training resources. For gender differences, the findings support a uniform allocation of training resources. For age differences, a differential allocation is advised, with more resources for younger employees, who have lower brand understanding scores and derive a greater impact from brand training. The finding of a diminishing impact of brand training suggests devising alternative means/ opportunities for older employees to enhance their brand understanding. Lastly, the results support allocating more training resources to non-contact employees who, when compared to contact employees, have lower brand understanding scores, exhibit a higher impact of brand training, and have fewer non-training opportunities to learn about the brand. The result generalizability is limited by the sample coming from a single organization. Originality/value – Within the internal branding research there is little examination of moderating effects for established relationships. This study makes an incremental contribution by testing the effect of three relevant individual differences on the relationship between brand training and brand understanding. The results have practical managerial applications. © FECAP.

Murillo, E. (2022). Enhancing Brand Understanding Through Brand Training: a Conditional Process Analysis of Recent Hires at an Airline. *Revista Brasileira de Gestao de Negocios*, 24(2), 312-331. doi: 10.7819/rbgn.v24i2.4170. Article.

### JUAN ENRIQUE NÚÑEZ RÍOS

Investigador Titular B, SNI Nivel Candidato

### JACQUELINE YVETTE SÁNCHEZ GARCÍA

Investigadora Titular B, SNI Nivel Candidato

### CARLOS EDUARDO LÓPEZ HERNÁNDEZ

Investigador Titular B, SNI Nivel I

### MANUEL SOTO PÉREZ

SNI Nivel Candidato

**A SYSTEMS SCIENCE APPROACH TO ORGANIZATIONAL INTEGRITY. CASE: SERVICES SMALL AND MEDIUM ENTERPRISES**

**ABSTRACT.** This study developed a model oriented to organizational integrity in services

small and medium-sized enterprises (SMEs). A systemic approach was adopted to articulate methodologies as follows: A) We used the soft systems methodology to frame the problem and formulate a conceptual model. B) Partial least squares path modeling was applied to validate the construct statistically. C) The viable system model was used to realign interactions within SMEs to foster organizational integrity. The results suggest that the relationships proposed in the construct may promote organizational integrity. The ideas developed are constrained to the organizational domain, and although the results apply to the Mexican context, this study provides an opportunity to discuss methods for improving the analysis of and viewpoints for rethinking viability in these organizations; while suggesting an analytic protocol to support academics and managers for addressing the study of integrity. © 2021 Taylor & Francis Group, LLC.

Núñez-Ríos, J. E., Sánchez-García, J. Y., López-Hernández, C., Soto-Pérez, M., & Cardoso-Castro P. P. (2021). A Systems Science Approach to Organizational Integrity. Case: Services Small and Medium Enterprises. *Cybernetics and Systems*, 53(2), 238-255. doi:10.1080/01969722.2021.1983698. Article.

### JUAN ENRIQUE NÚÑEZ RÍOS

Investigador Titular B, SNI Nivel Candidato

### JACQUELINE YVETTE SÁNCHEZ GARCÍA

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### MANUEL SOTO PÉREZ

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### ELÍAS OLIVARES BENÍTEZ

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### OMAR GUILLERMO ROJAS ALTAMIRANO

Investigador Titular D, SNI Nivel I

**COMPONENTS TO FOSTER ORGANIZATIONAL RESILIENCE IN TOURISM SMES**

**ABSTRACT.** Purpose: Small- and medium-sized enterprises (SMEs) mainly rely on their structure and internal networks to achieve their goals and remain competitive. However, their limited internal capabilities and complex environments can hinder their stability. Thus, this study evaluated the relationships among specific factors toward fostering organizational resilience (OR) in tourism SMEs. Design/methodology/approach: A multi-methodological approach was adopted to address this

research study, including (1) social network analysis (SNA) to formulate the conceptual model and (2) construct validation through partial least squares path modeling (PLS-PM). Findings: The six proposed hypotheses were supported. These results suggest that addressing these variables and relationships after considering management style and people development as critical factors can foster OR in tourism SMEs. Research limitations/implications: The ideas that were developed were constrained to the organizational domain. Although the results apply to the Mexican context, this limitation can be offset by extending the proposal to other emergent regions or organizations. This can also increase the generalization of the results and foster improvements in the approaches applied. Practical implications: Academics and managers must rethink resilience as the final state generated by multiple factors. This requires reconfiguring inner organizational interactions, providing more autonomy to operative units, reinforcing business intelligence and improving feedback mechanisms. Originality/value: This research study contrasts previous studies because it proposes that SNA be exploited to avail of the advantages it confers in designing the conceptual model. In this regard, we present new relationships to promote OR and provide new avenues in order to improve the analysis of adaptation processes. © 2021, Emerald Publishing Limited.

Núñez-Ríos, J. E., Sánchez-García, J. Y., Soto-Pérez, M., Olivares-Benítez, E., & Rojas, O. G. (2021). Components to foster organizational resilience in tourism SMEs. *Business Process Management Journal*, 28(1), 208-235. doi: 10.1108/BPMJ-12-2020-0580. Article.

### JUAN PABLO PATIÑO KARAM

SNI Nivel Candidato

**KEY FAIL FACTORS AS INNOVATION STRATEGIES TO BE AVOIDED: A COMPARATIVE STUDY BETWEEN MEXICAN AND AMERICAN SOCIAL IMPACT STARTUP UNDER COVID-19 PANDEMIC TIMES**

**[FACTORES CLAVE DE FRACASO COMO ESTRATEGIAS DE INNOVACIÓN QUE DEBEN EVITARSE: UN ESTUDIO COMPARATIVO ENTRE STARTUPS DE IMPACTO SOCIAL MEXICANAS Y ESTADOUNIDENSES DURANTE LA PANDEMIA COVID-19]**

**ABSTRACT.** Purpose: This study determines the different combinations and levels of

key fail factors (KFF) as the opposite as key success factors (KSF), between Mexican and American social impact startups (SIS) in COVID-19 pandemic times, as the source of innovation strategies. Methodology: It is based on the KSF-SIS framework, an academic and empirical scale previously probed in 2021. The survey data was on 100 Mexican/300 American CEOs-SIS in Jan-Jun-2021. Covariance-Based Structural Equation Modeling (CB-SEM) determined the model's reliability/validity to confirm the KSF, and Fuzzy set Qualitative Comparative (fsQCA) to get the KFF. Results: According to the 6 factors implied in the KSF-SIS framework, such as Entrepreneur Profile (EPR); Market Knowledge (MKK); Strategic Analysis (STA); Key Performance Indicators (KPI); Business Plan (BPL); Value Proposition (VPN). The results showed 5 combinations of such factors that produce KFF for Mexican SIS and 2 combinations for American SIS as innovation strategies to be avoided. Originality: CB-SEM is used as a reliability and validity tool to confirm the KSF framework to achieve several opposite conditions as KFF through fsQCA, determining necessary, sufficiency, coverage, and consistency of such a framework for Mexican/American SIS. © 2022. Norteamérica. All Rights Reserved.

Mejía-Trejo, J., Gutiérrez, J. S., & Patiño-Karam, J. P. (2022). Key Fail Factors as Innovation Strategies to be avoided: a comparative study between Mexican and American Social Impact Startup under COVID-19 pandemic times [Factores clave de fracaso como estrategias de innovación que deben evitarse: Un estudio comparativo entre startups de impacto social mexicanas y estadounidenses durante la pandemia COVID-19]. *Norteamérica*, 17(1). doi: 10.22201/cisan.24487228e.2022.1.512. Article.

## HÉCTOR XAVIER RAMÍREZ PÉREZ

SNI Nivel Candidato

### PRINCIPALS AND STUDENT ACHIEVEMENT: A COMPARATIVE STUDY OF EIGHT COUNTRIES

**ABSTRACT.** Connections between principal leadership activities, school context, and student achievement are examined within this paper. Data for this quantitative study are from the 2013 Teaching and Learning International Survey (TALIS) and the 2012 Programme for International Student Assessment (PISA). The eight countries of examination participated in both the TALIS and PISA and the researchers merged datasets, yielding a

study sample of 1,301 schools. This paper supports a context-specific view of instructional leadership. When looking across countries, the researchers found different practices were more strongly associated with the academic achievement of students, and suggest that school leaders have a meaningful overall relationship with academic achievement, both directly and indirectly. This study therefore supports prior research about the direct and indirect effects of instructional leadership. Further study, which accounts for differences in family academic resources and school-level opportunities to learn, will better illuminate the connection between instructional leadership practices and academic achievement. © 2021, IGI Global.

Perry, S. M., Sealy, K. M., Ramírez-Pérez, H. X., DeNicola, T. C., & Cohen, Y. (2020). Principals and student achievement: A comparative study of eight countries. In *Research Anthology on Preparing School Administrators to Lead Quality Education Programs*, 3 vols. (pp. 1378-1404). IGI Global. doi: 10.4018/978-1-7998-3438-0.ch061. Book Chapter.

## SALVADOR RIVAS ACEVES

SNI Nivel I

### SUSTAINABLE GARDENING FOR ECONOMIC INCLUSION, POVERTY REDUCTION, AND CULTURE PRESERVATION

**ABSTRACT.** Sustainable gardening activities can be the basis to reduce poverty while preserving culture. By generating economic inclusion, gardening can provide the entry point into society for vulnerable communities. Community stakeholders in Mexico City and Northeast Ohio were studied to analyze whether sustainable gardening can generate economic inclusion while preserving culture. Through in-depth interviews, the relationship between these three components is analyzed. In particular, topics such as gardening experience, family traditions, institutional support, economic barriers, use of technology, cropping methods, and social integration were explored. From conception to implementation and analysis, the goal of agency building reinforced social sustainability. In addition to interpretive qualitative interviews, experiential research was conducted through a "working-with" model where the communities in reference contributed intellectual resources to the project-based research design. Primary results fall into three primary categories including gardening methods, cultural preservation,

and economic factors. In each analyzed case, implications of cultural preservation emerge as a foundational motivation to maintain the particular agricultural practice. Despite significant economic barriers, including high poverty rates, the cases in reference nonetheless maintain traditions, thus highlighting the importance of culture. Negative economic implications suggest an absence of institutional support, which contribute to issues of poverty and low quality of life. Social implications indicate a level of marginalization that contributes to the aforementioned economic and institutional barriers. © 2022 by the authors.

Rivas-Aceves S. & Schmidt S. (2022). Sustainable Gardening for Economic Inclusion, Poverty Reduction, and Culture Preservation. *Sustainability*, 14(23). doi: 10.3390/su142315743. Article.

## SALVADOR RIVAS ACEVES

SNI Nivel I

### THE K-SHAPE ECONOMIC RECOVERY AND A NEW COMPANY CLASSIFICATION

**ABSTRACT.** One of the main consequences the pandemic has brought is the economic recession since economic activities have been affected and, as a final result, companies have gone bankrupt and unemployment has increased. Specific negative impacts occur according to the economic activity type a company carries out, mainly due to face-to-face interaction intensity with economic agents. Companies that were able to innovate their production and distribution processes not only endured the pandemic but also grew. Companies that were not able to innovate stopped growing or, even worse, shrunk or went bankrupt. The research objective is to show that both economic recession and recovery alike are creating a broader two-sector classification based on the physical interaction intensity among economic activities. In order to do so, the link between economic recovery and business bankruptcy is performed by considering the economy sectors for European and North American regions; in particular, 14 European countries, Canada, the United States and Mexico were the studied economies. Findings show that face-to-face interaction is a main factor for some economic activities to decline; hence, business bankruptcy is related to that interaction so the K-shape economic recovery is created. Consequently, the pandemic has

brought a new classification for companies. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

Rivas-Aceves, S. & Morales, M. M. (2022). The K-shape Economic Recovery and a New Company Classification. In López-Fernández, A. M., & Terán-Bustamante, A. (Eds.), *Business Recovery in Emerging Markets. Global Perspectives from Various Sectors*, series *Palgrave Studies in Democracy, Innovation and Entrepreneurship for Growth* (pp. 109-127). Palgrave Macmillan. doi: 10.1007/978-3-030-91532-2\_7. Book Chapter.

## ROMÁN RODRÍGUEZ AGUILAR

SNI Nivel II

### A BRIEF LITERATURE REVIEW OF QUANTITATIVE MODELS FOR SUSTAINABLE SUPPLY CHAIN MANAGEMENT

**ABSTRACT.** Supply chain management is the basis for the execution of operations, being considered as the core of the business function in the 21st century. On the other hand, at present, factors such as the reduction of natural resources, the search for competitive advantages, government laws, and global agreements have generated a greater interest in the sustainable development, which, in order to achieve it, industries need to rethink and plan their supply chain considering a path of sustainability. So sustainable supply chain management emerges as a means to integrate stakeholders' concern for profit and cost reduction with environmental and social requirements, attracting significant interest among managers, researchers, and practitioners. The main objective of this study is to provide a synthesis of the key elements of the quantitative model offerings that use sustainability indicators in the design and management of forward supply chains. To achieve this objective, we developed a systematic literature review that includes 80 articles published during the last decade in peer-reviewed journals in English language. In addition, a 4W's analysis (when, who, what, and where) is applied and three structural dimensions are defined and grouped by categories: supply chain management, modeling, and sustainability. As part of the results, we evidenced a continuous growth in the scientific production of this type of articles, with a predominance of deterministic mathematical programming models with an environmental economic perspective. Finally, we identified research gaps, highlighting the lack of inte-

gral inclusion of a life cycle analysis in the design of supply chain networks. © 2022 Elsevier Inc. All rights reserved.

Flores-Sigüenza, P., Marmolejo-Saucedo, J. A., & Rodríguez Aguilar, R. (2022). A brief literature review of quantitative models for sustainable supply chain management. In Vasant, P., Thomas, J., Munapo, E., & Weber, G. (Eds.), *Advances of Artificial Intelligence in a Green Energy Environment* (pp. 301-329). Academic Press. doi: 10.1016/B978-0-323-89785-3.00005-0. Book Chapter.

## ROMÁN RODRÍGUEZ AGUILAR

SNI Nivel II

### DIGITAL TWINS AND BLOCKCHAIN: EMPOWERING THE SUPPLY CHAIN

**ABSTRACT.** Industry 4.0 is here, and it arrived with very promising new technologies that can foster the supply chain management across industries. In this paper we review multiple sources to identify the main characteristics of Digital Twins and Blockchain technologies and how they can work together to fulfill the needs of the supply chain. We identify some advantages and disadvantages that must be properly analyzed before adopting this approach into any business. Many applications behind these new benefits are still in development, but we believe these two technologies have great potential. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

Aguilar-Ramirez, J. E., Marmolejo-Saucedo, J. A., & Rodríguez-Aguilar, R. (2022). Digital Twins and Blockchain: Empowering the Supply Chain. 4th International Conference on Intelligent Computing and Optimization, ICO 2021, Virtual, Online, 30 December 2021 through 31 December 2021, Code 270349. *Lecture Notes in Networks and Systems*, 371, 450-456. doi: 10.1007/978-3-030-93247-3\_44. Conference Paper.

## ROMÁN RODRÍGUEZ AGUILAR

SNI Nivel II

### ELECTRIC VEHICLES AS DISTRIBUTED MICRO GENERATION USING SMART GRID FOR DECISION MAKING: BRIEF LITERATURE REVIEW

**ABSTRACT.** This article deals with a brief review of the literature about the potential use of renewable energies through the integration of smart grids and the use of electric vehicles as micro generators that allow energy exchange with the grid. The main technical aspects are addressed, as well as potential benefits and requirements necessary for said integration. Highlighting key

aspects in the integration of smart grids, energy storage systems, prosumers and their interaction with electrical vehicles on the grid. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

Sanchez-García, J., Rodríguez-Aguilar, R., & Marmolejo-Saucedo, J. A. (2022). Electric Vehicles as Distributed Micro Generation Using Smart Grid for Decision Making: Brief Literature Review. 4th International Conference on Intelligent Computing and Optimization, ICO 2021, Virtual, Online, 30 December 2021 through 31 December 2021, Code 270349. *Lecture Notes in Networks and Systems*, 371, 981-991. doi: 10.1007/978-3-030-93247-3\_93. Conference Paper.

## ROMÁN RODRÍGUEZ AGUILAR

SNI Nivel II

### KEY FACTORS IN THE SUCCESSFUL INTEGRATION OF THE CIRCULAR ECONOMY APPROACH IN THE INDUSTRY OF NON-DURABLE GOODS: A LITERATURE REVIEW

**ABSTRACT.** Nowadays consumers are more informed about the characteristics of the products they are buying and the services they are using as well as their respective environmental impacts. The nondurable goods industry is the closest to consumers in everyday life, therefore awareness of the environmental impacts of these products has gained greater attention from consumers. In response to increased consumer demand for environmental attributes, the nondurable goods industry has begun to apply circular economy guidelines in its supply chain, in addition to complying with new environmental regulations in various countries. This research addresses a literature review to identify the key factors that allow the correct implementation of the circular economy approach in the non-durable goods industry. Among the main factors identified are the voice of the customer, the traceability and collection of empty containers, as well as and efficient international environmental regulation. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

Jacinto-Cruz, M., Rodríguez-Aguilar, R., & Marmolejo-Saucedo, J. A. (2022). Key Factors in the Successful Integration of the Circular Economy Approach in the Industry of Non-durable Goods: A Literature Review. 4th International Conference on Intelligent Computing and Optimization, ICO 2021, Virtual, Online, 30 December 2021 through 31 December 2021, Code 270349. *Lecture Notes in Networks and Systems*, 371, 812-819. doi: 10.1007/978-3-030-93247-3\_77. Conference Paper.

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## ROMÁN RODRÍGUEZ AGUILAR

SNI Nivel II

### MICRODATA ANALYTICS OF OUT-OF-POCKET AND CATASTROPHIC HEALTH SPENDING IN MEXICO: AN ANALYSIS BY QUANTILES

**ABSTRACT.** Out-of-pocket and catastrophic health spending are key indicators for assessing the financial coverage of a health system. Out-of-pocket spending represents expenditures related to the health care of a household member, while catastrophic spending represents expenditures that constitute more than 30 % of the household's ability to pay. Measurements in Mexico of out-of-pocket household spending show that it is an item that has not decreased from 2016 to 2018, the out-of-pocket household spending increased by 4 % real representing in 2018, 109 billion of Mexican pesos. Analysis of out-of-pocket spending by quintile shows that average monthly household spending on health is in the range of Q1-\$17 to Q5-\$1,900 pesos with high dispersion in the data (SD=1,446). The quantile regression shows that there are significant differences between the factors associated to out-of-pocket spending among the quintiles, especially due to the presence of chronic diseases in the household, belonging to the rural environment, the age of the head of the household and the total number of household members. The incidence of catastrophic spending represented 2.19 % [2.18-2.19, N=760,3030] of total households. According to the results of the logistic model, the incidence of catastrophic spending is mainly influenced by households that had hospital spending (OR=20.13) and maternity spending (OR=20.77). Affiliation with a health institution decreases the probability of incurring catastrophic spending (OR=0.93), and when households are segmented by income quintile, the incidence is higher in Q2 and Q4. Mainly affected by spending on hospitalization and maternal care. © 2021, The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature.

Rodríguez-Aguilar, R. (2022). Microdata Analytics of Out-of-pocket and Catastrophic Health Spending in Mexico: an Analysis by Quantiles. *Mobile Networks and Applications*, 27(5), 2182-2197. doi: 10.1007/s11036-021-01855-w. Article.

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## ROMÁN RODRÍGUEZ AGUILAR

SNI Nivel II

### PROFILE OF THE BUSINESS SCIENCE PROFESSIONAL FOR THE INDUSTRY 4.0

**ABSTRACT.** The development of the fourth industrial revolution called Industry 4.0 has generated a significant boost in areas related to information technology. However, this development has permeated into other areas such as business sciences. Based on a systematic literature review, the main areas of development of business sciences were identified within the framework of industry 4.0, this, in turn, generates the need to update profiles and capacities for professionals. The large areas identified are auditing, finance, accounting, and planning, among others. The need for the comprehensive development of all areas of knowledge in the digital age is evident. Changes in the mode of production, trade, and interaction between individuals have permeated all areas and business science is no exception. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

Salgado-Reyes, A. P. & Rodríguez-Aguilar, R. (2022). Profile of the Business Science Professional for the Industry 4.0. 4th International Conference on Intelligent Computing and Optimization, ICO 2021, Virtual, Online, 30 December 2021 through 31 December 2021, Code 270349. *Lecture Notes in Networks and Systems*, 371, 820-831. doi: 10.1007/978-3-030-93247-3\_78. Conference Paper.

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## OMAR GUILLERMO ROJAS ALTAMIRANO

Investigador Titular D, SNI Nivel I

### AN EMPIRICAL INVESTIGATION BETWEEN FDI, TOURISM, AND TRADE ON CO<sub>2</sub> EMISSION IN ASIA: TESTING ENVIRONMENTAL KUZNET CURVE AND POLLUTION HAVEN HYPOTHESIS

**ABSTRACT.** This study aims to analyze the influence of foreign direct investment (FDI), tourism, exports, and imports on carbon dioxide (CO<sub>2</sub>) emissions in the High-Income State, Upper-Middle Income, and Lower-Middle-Middle Income in Asia during the period of 2010-2019. This study uses the Poisson Pseudo-Maximum Likelihood method. The results of this study indicate that Environmental Kuznets Curve Hypothesis is valid in the country of High Income and Upper-Middle Income. In addition, there is a nonlinear relationship between FDI, tourism, Export, and imports on carbon dioxide (CO<sub>2</sub>)

emissions. The interaction variables, which are a FDI with tourism and FDI with Export. Each of them is reducing carbon dioxide emissions only in high-income countries. Meanwhile, the interaction variables between FDI and imports reduce carbon dioxide emissions in high-income countries. However, it increases the carbon dioxide emissions in the upper-middle-income country. © 2022, Econjournals. All rights reserved.

Handoyo, R. D., Rahmawati, Y., Altamirano, O. G. R., Ahsani, S. F., Hudang, A. K., & Haryanto, T. (2022). An Empirical Investigation between FDI, Tourism, and Trade on CO<sub>2</sub> Emission in Asia: Testing Environmental Kuznet Curve and Pollution Haven Hypothesis. *International Journal of Energy Economics and Policy*, 12(4), 385-393. doi: 10.32479/ijeep.13242. Article.

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## OMAR GUILLERMO ROJAS ALTAMIRANO

Investigador Titular D, SNI Nivel I

### CRUDE OIL AND BIOFUEL AGRICULTURAL COMMODITY PRICES

**ABSTRACT.** Crop prices in the United States (USA), and especially corn prices, have been displaying important changes in the last 10 years, after the ethanol mandate in 2005. Motivated by these significant price changes, there has been a growing interest in the study of price transmission from oil prices to agricultural commodity prices. In this contribution, we concentrate on the relationship between the price of oil and the prices of three agricultural commodities that are used for biofuels production: corn, soybeans, and sugar. In doing so, we apply linear Granger causality tests, the nonlinear causality test of Diks and Panchenko (J Econ Dyn Control 30:1647-1669, 2006), and the Brooks and Hinich (J Empir Financ 6:385-404) cross-bicorrelation test to daily data over the period from 1990 to 2016. Coherent with the previous studies, we find weak linear Granger causality, but strong bidirectional nonlinear causality, especially for the period from 2006 to 2016. Using the Brooks and Hinich test, we also identify the number of epochs (nonoverlapped windows) where there is nonlinear dependence between each pair of series. We find that most cross-bicorrelation windows coincide from 2006 to 2016, indicating that the nonlinear dynamics between the series studied have changed in recent years in the aftermath of the ethanol mandate. Our results provide hints in order to improve our understanding of the effects



of the implemented policies in the energy sector on agricultural commodities. © 2018, Springer Nature Switzerland AG.

Coronado, S., Rojas, O., Romero-Meza, R., Serletis, A., & Chiu L. V. (2018). Crude Oil and Biofuel Agricultural Commodity Prices. In Mitnik, S., & Semmler, W. (Eds.), *Dynamic Modeling and Econometrics in Economics and Finance*, vol. 24 (pp. 107-123). Springer. doi: 10.1007/978-3-319-98714-9\_5. Book Chapter.

## OMAR GUILLERMO ROJAS ALTAMIRANO

Investigador Titular D, SNI Nivel I

## GUILLERMO SOSA GÓMEZ

SNI Nivel I

### LOCAL SEARCH TRAJECTORIES OVER S-BOX SPACE

**ABSTRACT.** A local search method is developed and applied to create trajectories over S-box spaces in this work. These trajectories show a strong linear correlation between confusion coefficient variance, transparency order, modified transparency order, and revised transparency order under the Hamming weight model. When the confusion coefficient variance values increase, the values of transparency order, modified transparency order beta zero, and revised transparency order beta zero decrease, reflecting the same theoretical resistance against side-channel attacks by power consumption. From the best of our knowledge, it is the first time that Local Search trajectories are used to discover relations between cryptography properties. The experimental results and comparisons provide evidence of the capabilities of the proposal to handle the cryptography problems. © 2022 Elsevier Ltd.

Martínez-Díaz, I., Legón-Pérez, C. M., Rojas, O., Sosa-Gómez, G., & Oliva, D. (2022). Local Search trajectories over S-box space. *Journal of Information Security and Applications*, 69. doi: 10.1016/j.jisa.2022.1032722. Article.

## OMAR GUILLERMO ROJAS ALTAMIRANO

Investigador Titular D, SNI Nivel I

### NEXUS BETWEEN TECHNOLOGICAL INNOVATION, RENEWABLE ENERGY, AND HUMAN CAPITAL ON THE ENVIRONMENTAL SUSTAINABILITY IN EMERGING ASIAN ECONOMIES: A PANEL QUANTILE REGRESSION APPROACH

**ABSTRACT.** The goal of this study was to examine the interlinkage of renewable

energy, technology innovation, human capital, and governance on environment quality by using a panel quantile regression in Asian emerging economies over the period of 1990-2019. The results indicated that higher economic growth, population density, technological innovation in renewable energy, and exploitation of natural resources have significantly raised CO<sub>2</sub> emissions in emerging Asia. Furthermore, larger capital, more use of renewable energy, green technology, and human capital development can improve environmental sustainability in Asia. As for governance, proxied by corruption rates, no evidence indicated that it has resulted in more damage, unlike earlier studies have suggested. The findings indicated that the three channels exposed in the Kuznets hypothesis can serve as a reference for proposals for environmental policies (scale of consumption, energy composition, and choice of technologies). There are opportunities to reduce CO<sub>2</sub> emissions through investments in human development, investing in new technologies to increase efficiency in energy (generation and consumption), increasing working capital (GCF), and migrating to more environmentally friendly energy. The negative link between carbon dioxide emissions and economic growth, increases in population density, and exploitation of natural resources can compromise the achievement of sustainable environmental goals. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

Esquivias, M. A., Sugiharti, L., Rohmawati, H., Rojas, O., & Sethi, N. (2022). Nexus between Technological Innovation, Renewable Energy, and Human Capital on the Environmental Sustainability in Emerging Asian Economies: A Panel Quantile Regression Approach. *Energies*, 15(7). doi: 10.3390/en15072451. Article.

## OMAR GUILLERMO ROJAS ALTAMIRANO

Investigador Titular D, SNI Nivel I

### TRANSFER ENTROPY GRANGER CAUSALITY BETWEEN NEWS INDICES AND STOCK MARKETS IN U.S. AND LATIN AMERICA DURING THE COVID-19 PANDEMIC

**ABSTRACT.** The relationship between three different groups of COVID-19 news series and stock market volatility for several Latin American countries and the U.S. are analyzed. To confirm the relationship between these series, a maximal overlap

discrete wavelet transform (MODWT) was applied to determine the specific periods wherein each pair of series is significantly correlated. To determine if the news series cause Latin American stock markets' volatility, a one-sided Granger causality test based on transfer entropy (GC-TE) was applied. The results confirm that the U.S. and Latin American stock markets react differently to COVID-19 news. Some of the most statistically significant results were obtained from the reporting case index (RCI), A-COVID index, and uncertainty index, in that order, which are statistically significant for the majority of Latin American stock markets. Altogether, the results suggest these COVID-19 news indices could be used to forecast stock market volatility in the U.S. and Latin America. © 2022 by the authors.

Coronado, S., Martínez, J. N., Gualajara, V., & Rojas, O. (2022). Transfer Entropy Granger Causality between News Indices and Stock Markets in U.S. and Latin America during the COVID-19 Pandemic. *Entropy*, 24(10). doi: 10.3390/e24101420. Article.

## JACQUELINE YVETTE SÁNCHEZ GARCÍA

Investigadora Titular B, SNI Nivel Candidato

## CARLOS EDUARDO LÓPEZ HERNÁNDEZ

Investigador Titular B, SNI Nivel I

### APPLYING SYSTEM DYNAMICS TO A NEGOTIATION DIAGRAM

**ABSTRACT.** This chapter introduces the negotiagram as a tool that contributes to the study of the negotiation process. The negotiagram is a construct that facilitates an understanding of interactions between negotiators and their temporal context. Given that the negotiation process can be seen as a system, system dynamics (SD) are used to explore the interactions and complexities in the proposed construct, especially when it comes to circumstances with a high degree of uncertainty, such as an economic crisis or disruptive innovation in the industry. The results suggest that the causal configurations that SD establish lead to non-linear relationships and feedback loops that direct behavior within negotiation, an understanding that further leads stakeholders to a holistic vision and the opportunity to change, manage, and control a negotiation as a system. © 2020 Emerald Publishing Limited.

Sánchez-García, J. Y., & López-Hernández, C. (2020). Applying System Dynamics to a Negotiation Diagram. In García-Álvarez, S. & Atristain-Suárez, C. (Eds.), *Strategy, Power and CSR: Practices and Challenges in Organizational Management* (pp. 85-99). Emerald Publishing. doi: 10.1108/978-1-83867-973-620201004. Book Chapter.

## GERMÁN ROBERTO SCALZO MOLINA

Investigador Titular D, SNI Nivel I

## MARÍA TERESA NICOLÁS GAVILÁN

SNI Nivel I

### APPLYING THE CONTEMPLATIVE TECHNOPELAGOGY FRAMEWORK: INSIGHTS FOR TEACHING ETHICS USING TV SERIES

**ABSTRACT.** Digital media and technology are nearly ubiquitous in contemporary higher education. As such, researchers and educators are keen to identify best practices and understand impacts. Digital media and technology present opportunities to cultivate interactive, creative teaching-learning communities. However, inclusion of digital media and technology in a course does not necessarily cultivate creative engagement or deep reflection among students. This manuscript studies how a contemplative approach to teaching with digital media, specifically TV series, can lead to more effective and engaging in the process of teaching professional ethics. This research explores how the Contemplative Technopedagogy Framework can enrich the use of TV series for teaching professional ethics and positively influence the effective integration of ethical behavior into university students' future professional lives. © 2021, NeilsonJournals Publishing. All rights reserved.

Shanks, J. D., Scalzo, G., & Nicolás-Gavilán, M. T. (2021). Transfer Entropy Granger Causality between News Indices and Stock Markets in U.S. and Latin America during the COVID-19 Pandemic. *Journal of Business Ethics Education*, 18, 143-158. doi: 10.5840/jbee2021188. Article.

## GERMÁN ROBERTO SCALZO MOLINA

Investigador Titular D, SNI Nivel I

### MANAGEMENT EDUCATION AND INTERPERSONAL GROWTH: A HUMANIST TRANSCENDENTAL-PERSONALIST PERSPECTIVE

**ABSTRACT.** This chapter critically addresses the direction toward which management education (ME) should evolve in the future.

Drawing from transcendental personalist anthropology, it explores what constitutes us as human beings and argues that future ME should address students' moral selfhood and their disposition toward interpersonal growth to construct a better future with others. After a critical exploration of current humanist proposals in ME and their philosophical bases, we argue for a renewal of anthropological foundations of humanistic ME in light of three personalist principles: (1) the person's intimacy and dignity, (2) the transcendence of human beings, who grow as persons through free and caring interpersonal relations, and (3) a view of human action as the manifestation of the person's intimacy and transcendence, and as her arena for interpersonal, virtuous development. The last section explains how these three personal dimensions could be addressed in future ME, namely by fostering future managers' moral selfhood through self-reflection, by proposing an interpersonal pedagogy of the gift, and by promoting personalist practical wisdom. These practices constitute possible paths toward renewed ethical management education that goes beyond traditional "know-what" and "know-how" content to include ethically informed "know-why" and "know-for-whom" knowledge. Ultimately, they facilitate future managers' disposition for interpersonal growth. © Chinnapong and 2022 selection and editorial matter, Martin R. Fellenz, Sabine Hoidn, and Mairead Brady; individual chapters, the contributors.

Akrivou, K., Fernandez Gonzalez, M. J., Scalzo, G., & Rodriguez, R. M. (2020). Management Education and Interpersonal Growth: A Humanist Transcendental-Personalist Perspective. In Fellenz, M. R., Hoidn, S. & Brady, M. (Eds.), *The Future of Management Education* (pp. 89-107). Taylor and Francis. doi: 10.4324/9781003095903-8. Book Chapter.

## GERMÁN ROBERTO SCALZO MOLINA

Investigador Titular D, SNI Nivel I

### MELÉ CARNÉ, D. (2020). VALOR HUMANO Y CRISTIANO DEL TRABAJO. ENSEÑANZAS DE S. JUAN PABLO II. EUNSA. COLECCIÓN ASTROLABIO ECONOMÍA Y EMPRESA. 384 PP.

**ABSTRACT.** La reflexión sobre el trabajo ha estado presente en la filosofía desde sus orígenes, aunque no ha estado exenta de limitaciones, reduccionismos y prejuicios que no hacen justicia a esta realidad tan impor-

tante para la vida del hombre. En efecto, como ha señalado la Doctrina Social de la Iglesia (DSI) desde sus inicios, el trabajo ocupa una posición central en la cuestión social y se fundamenta en la verdad sobre el hombre. A pesar del esfuerzo moderno de la teoría económica por basar la reflexión sobre la actividad económica en un agente universal y abstracto —que, aunque con variantes, podría resumirse en el paradigma del *homo oeconomicus*—, en los últimos años se ha puesto de manifiesto que dicha reflexión es estéril si no se fundamenta en una concepción antropológica realista y verdadera. Este ha sido precisamente el objetivo fundacional de la DSI: profundizar en la verdad sobre el hombre para ofrecer elementos de reflexión, criterios de juicio y directrices de acción que puedan guiar a la razón práctica para contribuir al bien común. En lo que respecta específicamente al trabajo, la aportación de san Juan Pablo II (JP II) ha sido fundamental, y el libro que aquí se reseña es fruto de varias décadas de reflexión sobre este tema que ha captado la atención del autor —profesor emérito del IESE Business School— de manera singular desde el inicio de su fructífera carrera en el ámbito académico de la ética empresarial.

Scalzo, G. (2022). Melé Carné, D. (2020). Valor humano y cristiano del trabajo. Enseñanzas de S. Juan Pablo II. EUNSA. Colección Astrolabio Economía y Empresa. 384 pp. *Tópicos*, 64, 477-480. doi: 10.21555/top.v640.2450. Review.

## GERMÁN ROBERTO SCALZO MOLINA

Investigador Titular D, SNI Nivel I

### THE INTERPROCESSIONAL-SELF THEORY IN SUPPORT OF HUMAN NEUROSCIENCE STUDIES

**ABSTRACT.** Rather than occurring abstractly (autonomously), ethical growth occurs in interpersonal relationships (IRs). It requires optimally functioning cognitive processes [attention, working memory (WM), episodic/autobiographical memory (AM), inhibition, flexibility, among others], emotional processes (physical contact, motivation, and empathy), processes surrounding ethical, intimacy, and identity issues, and other psychological processes (self-knowledge, integration, and the capacity for agency). Without intending to be reductionist, we believe that these aspects are essential for optimally engaging in IRs



and for the personal constitution. While they are all integrated into our daily life, in research and academic work, it is hard to see how they are integrated. Thus, we need better theoretical frameworks for studying them. That study and integration thereof are undertaken differently depending on different views of what it means to live as a human being. We rely on neuroscientific data to support the chosen theory to offer knowledge to understand human beings and interpersonal relational growth. We should of course note that to describe what makes up the uniqueness of being, acting, and growing as a human person involves something much more profound which requires too, a methodology that opens the way for a theory of the person that responds to the concerns of philosophy and philosophical anthropology from many disciplines and methods (Orón Semper, 2015; Polo, 2015), but this is outside the scope of this study. With these in mind, this article aims to introduce a new explanatory framework, called the Interprocessual-self (IPS), for the neuroscientific findings that allow for a holistic consideration of the previously mentioned processes. Contributing to the knowledge of personal growth and avoiding a reductionist view, we first offer a general description of the research that supports the interrelation between personal virtue in IRs and relevant cognitive, emotional, and ethic-moral processes. This reveals how relationships allow people to relate ethically and grow as persons. We include conceptualizations and descriptions of their neural bases. Secondly, with the IPS model, we explore neuroscientific findings regarding self-knowledge, integration, and agency, all psychological processes that stimulate inner exploration of the self concerning the other. We find that these fundamental conditions can be understood from IPS theory. Finally, we explore situations that involve the integration of two levels, namely the interpersonal one and the social contexts of relationships. Copyright © 2022 Luis, Akrivou, Bermejo-Martins, Scalzo and Orón.

Luis, E. O., Akrivou, K., Bermejo-Martins, E., Scalzo, G., & Orón, J. V. (2022). The Interprocessual-Self Theory in Support of Human Neuroscience Studies. *Frontiers in Psychology*, 12. doi: 10.3389/fpsyg.2021.686928. Article.

## GERMÁN ROBERTO SCALZO MOLINA

Investigador Titular D, SNI Nivel I

### THE LOGIC OF GIFT IN HUMAN RELATIONSHIPS: ECONOMY AND RECIPROCITY IN LIGHT OF THE RADICAL NOTIONS OF LEONARDO POLO

[LA LÓGICA DEL DON EN LAS RELACIONES HUMANAS: ECONOMÍA Y RECIPROCIDAD A LA LUZ DE LOS RADICALES POLIANOS]

**ABSTRACT.** Aimed at questioning the primacy of the contract over the logic of the gift in modernity, this paper compares and contrasts three archetypes of social relationships in light of the Polian radicals, as well as the types of reciprocity that derive from each of them. Modern, closed-dual reciprocity is opposed to open-triadic reciprocity, which characterizes gift-based relationships, both in their classical and Christian versions. This paper concludes that only the Christian radical, that of the person, can integrate the logic of the gift with a radical sense of freedom. Said radical starts with an anthropology that complements the practice of virtues as a way of moral perfection with an openness to transcendence and to aiding the neediest among us. © 2022 Servicio de Publicaciones de la Universidad de Navarra. All rights reserved.

Scalzo G., & Almarcegui A. M. (2022). The Logic of Gift in Human Relationships: Economy and Reciprocity in Light of the Radical Notions of Leonardo Polo [La lógica del don en las relaciones humanas: Economía y reciprocidad a la luz de los radicales polianos]. *Studia Poliana*, 24, 133-158. doi: 10.15581/013.24.133-158. Article.

## GERMÁN ROBERTO SCALZO MOLINA

Investigador Titular D, SNI Nivel I

### THE NARRATIVE DIMENSION OF PRODUCTIVE WORK: CRAFTSMANSHIP AND COLLEGIALLY IN THE QUEST FOR EXCELLENCE IN MODERN PRODUCTIVITY

**ABSTRACT.** Alasdair MacIntyre's criticism of Modernity essentially refers to the problem of compartmentalization, which restricts the possibility of achieving excellence in an integral lifestyle. Among other reasons, compartmentalization is especially derived from an insular valorization of the workplace based on a reductionist understanding of productivity in terms of mere efficiency. Aimed at overcoming the moral confusion derived from the overestimation of technical, skilled productivity and individualistic cooperation in private corpo-

rations, this article offers a thicker explanation of MacIntyre's theory of productive work in light of a narrative approach that opens up the possibility of achieving standards of excellence in modern production. To do so, it follows MacIntyre's understanding of productivity in terms of craftsmanship by explaining what excellence in production is and the role it plays in achieving unity of life and excellence in modern corporations based on two criteria derived from a historical definition of production, namely, craftsmanship and collegiality. © 2021, The Author(s), under exclusive licence to Springer Nature Switzerland AG.

Pinto-Garay, J., Scalzo, G., & Llesma, C. R. (2021). The Narrative Dimension of Productive Work: Craftsmanship and Collegiality in the Quest for Excellence in Modern Productivity. *Philosophy of Management*, 21(2), 245-264. doi: 10.1007/s40926-021-00188-8. Article.

## GERMÁN ROBERTO SCALZO MOLINA

Investigador Titular D, SNI Nivel I

### HÉCTOR XAVIER RAMÍREZ PÉREZ

SNI Nivel Candidato

### VIRTUE ETHICS: A CONTRIBUTION TO FAMILY FIRMS

**ABSTRACT.** This chapter is an exploratory study of business ethics as it relates to family firms; it primarily aims to explore virtue ethics as an alternative proposal for the ethical concerns that family firms face in their management, thus overcoming the limitations of relevant business ethics approaches and integrating them into an overarching paradigm. Ethics can be classified into three main streams: (1) deontology, (2) utilitarianism, and (3) virtue ethics. The former two approaches have been widely used in the realm of business and family firms for many years and they tend to instrumentalize ethics for business purposes. Yet, they are mostly powerless to explain and promote the ethical concerns surrounding the family firm's culture. Virtue ethics regained philosophical interest in the second half of the twentieth century, shifting the focus of morality from "the right thing to do" to the "best way to live." By bringing together two consolidated research fields, family firms and virtue ethics, this chapter contributes a rich perspective to current research in both fields and opens up new ways of answering many of the cultural questions that family firms bring to the table. © 2020 Emerald Publishing Limited.

Scalzo, G., & Ramírez-Pérez, H. X. (2020). Virtue Ethics: A Contribution to Family Firms. In García-Álvarez, S. & Atristain-Suárez, C. (Eds.), *Strategy, Power and CSR: Practices and Challenges in Organizational Management* (pp. 279-294). Emerald Publishing. doi: 10.1108/978-1-83867-973-620201015. Book Chapter.

## GUILLERMO SOSA GÓMEZ

SNI Nivel I

### OMAR GUILLERMO ROJAS ALTAMIRANO

Investigador Titular D, SNI Nivel I

#### A PARTIAL EVALUATION APPROACH FOR THE SCHOOL BUS ROUTING PROBLEM

**ABSTRACT.** Several real-life optimization problems, such as the case of several instances of the School Bus Routing Problem (SBRP), are very complex and expensive to solve with exact algorithms. Metaheuristics are a good alternative in these situations because they are capable of generating good quality solutions to these problems in a reasonable time. Metaheuristics iterate thousands of times by introducing changes concerning the previous solutions. Each new solution must be evaluated, and sometimes, the new solutions have elements unchanged that are unnecessarily re-evaluated. However, an approach avoids repeatedly evaluating parts of different solutions known as partial evaluation. This work applies this technique to the SBRP to reduce its execution time. To apply the partial evaluation approach in this problem, each solution contains the information of the change that was made concerning the solution from which it originates. With this information, when evaluating the objective function, it will be only necessary to analyze the routes that changed. In the literature reviewed, no previous work was found in which the partial evaluation approach has been applied in the context of SBRP. In this paper we apply it in order to reduce the computational cost of SBRP solutions based on metaheuristics. The results show that it is possible to decrease the execution time in 80% of the instances, reducing the execution time on average by 73.6%. © 2022 The Authors.

Pérez, A. C., Sánchez-Ansola, E., Rosete, A., Rojas, O., & Sosa-Gómez, G. (2022). A partial evaluation approach for the School Bus Routing Problem. *Heliyon*, 8(4). doi: 10.1016/j.heliyon.2022.e09291. Article.

## GUILLERMO SOSA GÓMEZ

SNI Nivel I

### OMAR GUILLERMO ROJAS ALTAMIRANO

Investigador Titular D, SNI Nivel I

#### CONSCIOUS EXPLORATION OF ALPHA-CUTS IN THE PARAMETRIC SOLUTION OF THE SCHOOL BUS ROUTING PROBLEM WITH FUZZY WALKING DISTANCE

**ABSTRACT.** Combinatorial optimization problems allow for modeling multiple situations in which proper allocation of resources is needed. For some real-world problems, the use of fuzzy elements in the models allows for incorporating certain levels of uncertainty to better approximate such real-world situations. One way to solve combinatorial optimization problems with fuzzy elements is the parametric approach, where it is necessary to define how to explore different relaxation levels using alpha-cuts. Researchers tend to select such alpha-cuts uniformly. The current investigation proposes a novel strategy for selecting alpha-cuts in the School Bus Routing Problem with fuzzy students' maximum walking distance. This proposal bases its foundations on the number of student-bus stop pairs available according to the different levels of relaxations allowed. Results demonstrate how the proposed strategy gives attractive solutions with more diverse trade-offs, contrasted with other methods in the literature. Furthermore, it decreases the computational cost for those instances where the maximum relaxation does not provide new pairs of students-bus stops. © 2022 Eduardo Sánchez-Ansola et al.

Sánchez-Ansola, E., Pérez-Pérez, A. C., Rosete, A., Torres-Pérez, I., Rojas, O., & Sosa-Gómez, G. (2022). Conscious Exploration of Alpha-Cuts in the Parametric Solution of the School Bus Routing Problem with Fuzzy Walking Distance. *Computational Intelligence and Neuroscience*, 2022. doi: 10.1155/2022/4821927. Article.

## GUILLERMO SOSA GÓMEZ

SNI Nivel I

### OMAR GUILLERMO ROJAS ALTAMIRANO

Investigador Titular D, SNI Nivel I

#### CONSTRUCTION OF BOOLEAN FUNCTIONS FROM HERMITIAN CODES

**ABSTRACT.** In 2005, Guillot published a method for the construction of Boolean

functions using linear codes through the Maiorana-McFarland construction of Boolean functions. In this work, we present a construction using Hermitian codes, starting from the classic Maiorana-McFarland construction. This new construction describes how the set of variables is divided into two complementary subspaces, one of these subspaces being a Hermitian Code. The ideal theoretical parameters of the Hermitian code are proposed to reach desirable values of the cryptographic properties of the constructed Boolean functions such as nonlinearity, resiliency order, and order of propagation. An extension of Guillot's work is also made regarding parameters selection using algebraic geometric tools, including explicit examples. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

Sosa-Gómez, G., Paez-Osuna, O., Rojas, O., Rodríguez, P. L. A., Kanarek, H., & Madarro-Capó, E. J. (2022). Construction of Boolean Functions from Hermitian Codes. *Mathematics*, 10(6). doi: 10.3390/math10060899. Article.

## GUILLERMO SOSA GÓMEZ

SNI Nivel I

### OMAR GUILLERMO ROJAS ALTAMIRANO

Investigador Titular D, SNI Nivel I

#### DETECTION OF DIAG AND LINE PATTERNS IN PASSPOINTS GRAPHICAL PASSWORDS BASED ON THE MAXIMUM ANGLES OF THEIR DELAUNAY TRIANGLES

**ABSTRACT.** An alternative authentication method to traditional alphanumeric passwords is graphical password authentication, also known as graphical authentication, for which one of the most valuable cue-recall techniques is PassPoints. This technique stands out for its security and usability. However, it can be violated if the user follows a predefined pattern when selecting the five points in an image as their passwords, such as the DIAG and LINE patterns. Dictionary attacks can be built using these two patterns to compromise graphical passwords. So far, no reports have been found in the state of the art about any test capable of detecting graphical passwords with DIAG or LINE patterns in PassPoints. Studies carried out in other scenarios have shown the effectiveness of the characteristics of Delaunay triangulations in extracting information about the dependence between the points. In this

work, graphical passwords formed by five randomly selected points on an image are compared with passwords whose points contain patterns of the DIAG or LINE type. The comparison is based on building for each password its Delaunay triangulation and calculating the mean value of the maximum angles of the triangles obtained; such a mean value is denoted by  $\text{amad}_t$ . It is experimentally shown that in passwords containing DIAG and LINE patterns, the value of  $\text{amad}_t$  is higher than the one obtained in passwords formed by random dots. From this result, it is proposed to use this  $\text{amad}_t$  value as a statistic to build a test of means. This result constitutes the work's main contribution: The proposal of a spatial randomness test to detect weak graphical passwords that contain DIAG and LINE type patterns. The importance and novelty of this result become evident when two aspects are taken into account: First, these weak passwords can be exploited by attackers to improve the effectiveness of their attacks; second, there are no prior criteria to detect this type of weak password. The practical application of said test contributes to increasing PassPoints security without substantially affecting its efficiency. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

Suárez-Plasencia, L., Herrera-Macías, J. A., Legón-Pérez, C. M., Sosa-Gómez, G., Rojas, O. (2022). Detection of DIAG and LINE Patterns in PassPoints Graphical Passwords Based on the Maximum Angles of Their Delaunay Triangles. *Sensors*, 22(5). doi: 10.3390/s22051987. Article.

## GUILLERMO SOSA GÓMEZ

SNI Nivel I

## OMAR GUILLERMO ROJAS ALTAMIRANO

Investigador Titular D, SNI Nivel I

### ELECTRONIC VOTING SYSTEM USING AN ENTERPRISE BLOCKCHAIN

**ABSTRACT.** Conventional electronic voting systems use a centralized scheme. A central administration of these systems manages the entire voting process and has partial or total control over the database and the system itself. This creates some problems, accidental or intentional, such as possible manipulation of the database and double voting. Many of these problems have been solved thanks to permissionless blockchain

technologies in new voting systems; however, the classic consensus method of such blockchains requires specific computing power during each voting operation. This has a significant impact on power consumption, compromises the efficiency and increases the system latency. However, using a permissioned blockchain improves efficiency and reduces system energy consumption, mainly due to the elimination of the typical consensus protocols used by public blockchains. The use of smart contracts provides a secure mechanism to guarantee the accuracy of the voting result and make the counting procedure public and protected against fraudulent actions, and contributes to preserving the anonymity of the votes. Its adoption in electronic voting systems can help mitigate part of these problems. Therefore, this paper proposes a system that ensures high reliability by applying enterprise blockchain technology to electronic voting, securing the secret ballot. In addition, a flexible network configuration is presented, discussing how the solution addresses some of the security and reliability issues commonly faced by electronic voting system solutions. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

González, C. D., Mena, D. F., Muñoz, A. M., Rojas, O., & Sosa-Gómez, G. (2022). Electronic Voting System Using an Enterprise Blockchain. *Applied Sciences*, 12(2). doi: 10.3390/app12020531. Article.

## GUILLERMO SOSA GÓMEZ

SNI Nivel I

### GENERATION OF THE SYMMETRIC GROUP $S_n$ 2

**ABSTRACT.** In various scenarios today, the generation of random permutations has become an indispensable tool. Since random permutation of dimension  $n$  is a random element of the symmetric group  $S_n$ , it is necessary to have algorithms capable of generating any permutation. This work demonstrates that it is possible to generate the symmetric group  $S_{n2}$  by shifting the components of a particular matrix representation of each permutation. © 2022 World Scientific Publishing Company.

Sánchez, C. Z., Madarro Capó, E. J., & Sosa-Gómez, G. (2022). Generation of the symmetric group  $S_n$  2. *Discrete Mathematics, Algorithms and Applications*, 14(2). doi: 10.3390/app12020531. Article.

## GUILLERMO SOSA GÓMEZ

SNI Nivel I

## OMAR GUILLERMO ROJAS ALTAMIRANO

Investigador Titular D, SNI Nivel I

### IMPROVED OBJECTIVE FUNCTIONS TO SEARCH FOR $8 \times 8$ BIJECTIVE S-BOXES WITH THEORETICAL RESISTANCE AGAINST POWER ATTACKS UNDER HAMMING LEAKAGE MODELS

**ABSTRACT.** Many research focuses on finding S-boxes with good cryptographic properties applying a heuristic method and a balanced, objective function. The design of S-boxes with theoretical resistance against Side-Channel Attacks by power consumption is addressed with properties defined under one of these two models: the Hamming Distance leakage model and the Hamming Weight leakage model. As far as we know, a balanced search criterion that considers properties under both, at the same time, remains an open problem. We define two new optimal objective functions that can be used to obtain S-boxes with good cryptographic properties values, keeping high theoretical resistance for the two leakage models; we encourage using at least one of our objective functions. We apply a Hill Climbing heuristic method over the S-box's space to measure which objective function is better and to compare the obtained S-boxes with the S-boxes in the actual literature. We also confirm some key relationships between the properties and which property is more suitable to be used. © 2013 IEEE.

Martínez-Díaz, I., Freyre-Echevarría, A., Rojas, O., Sosa-Gómez, G., & Legón-Pérez, C. M. (2022). Improved Objective Functions to Search for  $8 \times 8$  Bijective S-Boxes with Theoretical Resistance Against Power Attacks under Hamming Leakage Models. *IEEE Access*, 10, 11886-11891. doi: 10.1109/ACCESS.2022.3145990. Article.

## GUILLERMO SOSA GÓMEZ

SNI Nivel I

## OMAR GUILLERMO ROJAS ALTAMIRANO

Investigador Titular D, SNI Nivel I

### IMPROVEMENTS IN THE COMPUTING EFFICIENCY OF THE PROBABILITIES OF THE LIL TEST FOR THE PRNG EVALUATION

**ABSTRACT.** The evaluation of randomness in pseudorandom numbers generators is of great importance in cryptography. For such an endeavor, there are numerous ran-

domness testing tests. Many have been designed based on important laws of randomness, such as the central limit theorem and the law of large numbers. Recently, a novel test with three variants was proposed by Yongee Wang, based on the law of the iterated logarithm for the evaluation of pseudorandom numbers generators. Wang found severe vulnerabilities in known PRNG utilizing this test's application, which can be of great importance in evaluating cryptographic algorithms and random numbers generators. In this work, a simplification of the expressions given by Wang is presented to calculate the theoretical probabilities applied in the test to allow more efficient implementations for its three variants. © 2021 Elsevier B.V.

Matos-Rodríguez, Y., Madarro-Capó, E. J., Legón-Pérez, C. M., Rojas, O., & Sosa-Gómez, G. (2021). Improvements in the computing efficiency of the probabilities of the LIL test for the PRNG evaluation. *Theoretical Computer Science*, 902, 29-40. doi: 10.1016/j.tcs.2021.12.006. Article.

## GUILLERMO SOSA GÓMEZ

SNI Nivel I

## OMAR GUILLERMO ROJAS ALTAMIRANO

Investigador Titular D, SNI Nivel I

### NEW HEURISTICS FOR ASSIGNING IN THE MULTI-DEPOT VEHICLE ROUTING PROBLEM

**ABSTRACT.** The paper addresses the Multi-Depot Vehicle Routing Problem (MDVRP) motivated by its practical relevance and considerable difficulty. Specifically, the work focuses on the assignment of customers to depots, one of the phases carried out to solve the MDVRP. Many authors have tackled this problem, and there are different heuristics to perform this task. This paper presents two new heuristics for this important phase of the MDVRP. Both heuristics are simple to implement and are fast in their execution. Furthermore, experimental results showed that the achieved solutions are comparable to those of some of the most important heuristics for this task.

Torres-Perez, I., Rosete, A., Sosa-Gomez, G., & Rojas, O. (2022). New heuristics for assigning in the Multi-Depot Vehicle Routing Problem. *IFAC-PapersOnLine*, 55(10), 2228-2233. doi: 10.1016/j.ifacol.2022.10.039. Conference Paper.

## GUILLERMO SOSA GÓMEZ

SNI Nivel I

## OMAR GUILLERMO ROJAS ALTAMIRANO

Investigador Titular D, SNI Nivel I

### PROBABILISTIC EVALUATION OF THE EXPLORATION-EXPLOITATION BALANCE DURING THE SEARCH, USING THE SWAP OPERATOR, FOR NONLINEAR BIJECTIVE S-BOXES, RESISTANT TO POWER ATTACKS

**ABSTRACT.** During the search for S-boxes resistant to Power Attacks, the S-box space has recently been divided into Hamming Weight classes, according to its theoretical resistance to these attacks using the metric variance of the confusion coefficient. This partition allows for reducing the size of the search space. The swap operator is frequently used when searching with a random selection of items to be exchanged. In this work, the theoretical probability of changing Hamming Weight class of the S-box is calculated when the swap operator is applied randomly in a permutation. The precision of these probabilities is confirmed experimentally. Its limit and a recursive formula are theoretically proved. It is shown that this operator changes classes with high probability, which favors the exploration of the Hamming Weight class of S-boxes space but dramatically reduces the exploitation within classes. These results are generalized, showing that the probability of moving within the same class is substantially reduced by applying two swaps. Based on these results, it is proposed to modify/improve the use of the swap operator, replacing its random application with the appropriate selection of the elements to be exchanged, which allows taking control of the balance between exploration and exploitation. The calculated probabilities show that the random application of the swap operator is inappropriate during the search for nonlinear S-boxes resistant to Power Attacks since the exploration may be inappropriate when the class is resistant to Differential Power Attack. It would be more convenient to search for nonlinear S-boxes within the class. This result provides new knowledge about the influence of this operator in the balance exploration-exploitation. It constitutes a valuable tool to improve the design of future algorithms for searching S-boxes with good cryptography properties. In a probabilistic way, our main theoretical result characterizes the influence of the swap operator in the

exploration-exploitation balance during the search for S-boxes resistant to Power Attacks in the Hamming Weight class space. The main practical contribution consists of proposing modifications to the swap operator to control this balance better. © 2021 by the authors. Licensee MDPI, Basel, Switzerland.

Legón-Pérez, C. M., Menéndez-Verdecía, J. A., Martínez-Díaz, I., Sosa-Gómez, G., Rojas, O., & Veloz-Remache, G. R. (2021). Probabilistic Evaluation of the Exploration-Exploitation Balance during the Search, Using the Swap Operator, for Nonlinear Bijective S-Boxes, Resistant to Power Attacks. *Information*, 12(12). doi: 10.3390/info12120509. Article.

## GUILLERMO SOSA GÓMEZ

SNI Nivel I

## OMAR GUILLERMO ROJAS ALTAMIRANO

Investigador Titular D, SNI Nivel I

### WEAK PASSPOINT PASSWORDS DETECTED BY THE PERIMETER OF DELAUNAY TRIANGLES

**ABSTRACT.** PassPoint is a graphical authentication technique that is based on the selection of five points in an image. A detected vulnerability lies in the possible existence of a pattern in the points that make up the password. The objective of this work is to detect nonrandom graphical passwords in the PassPoint scenario. A spatial randomness test based on the average of Delaunay triangles' perimeter is proposed, given the ineffectiveness of the classic tests in this scenario, which only consists of five points. A state-of-the-art of various applications of Voronoi polygons and Delaunay triangulations are presented to detect clustered and regular patterns. The distributions of the averages of the triangles' perimeters in the PassPoint scenario for various sizes of images are disclosed, which were unknown. The test's decision criterion was constructed from one of the best distributions to which the data were adjusted. Type I and type II errors were estimated, and it was concluded that the proposed test could detect clustered and regular graphical passwords in PassPoint, therefore being more effective in detecting clustering than regularity. © 2022 Lisset Suárez-Plasencia et al.

Suárez-Plasencia, L., Legón-Pérez, C. M., Herrera-Macías, J. A., Socorro-Llanes, R., Rojas, O., & Sosa-Gómez, G. (2021). Weak PassPoint Passwords Detected by the Perimeter of Delaunay Triangles. *Security and Communication Networks*, 2022. doi: 10.1155/2022/3624587. Article.



## MANUEL SOTO PÉREZ

SNI Nivel Candidato

## JUAN ENRIQUE NÚÑEZ RÍOS

Investigador Titular B, SNI Nivel Candidato

## JOSÉ ENRIQUE ÁVILA PALET

Investigador Titular B, SNI Nivel I

### JUSTICE, DEONTOLOGY AND MORAL MEANINGFULNESS AS FACTORS TO IMPROVE STUDENT PERFORMANCE AND ACADEMIC ACHIEVEMENT

**ABSTRACT.** The relationship between ethics and performance has previously been addressed in the literature, although there are still some gaps, for example, the relationship of ethical ideologies to student performance. This work aims to contribute to the literature with a statistical evaluation using partial least squares path modelling (PLS-PM) regarding whether university students' ethical ideologies and moral meaningfulness influence their level of student performance and academic achievement. Results indicate that the ideologies of justice and deontology increase moral meaningfulness, moral meaningfulness in turn increase student's citizenship behaviours and student's in-role performance, and finally, student's in-role performance positively influences academic achievement. This research provides resources applicable to the fields of pedagogy and ethics to encourage performance during the study and highlight the value of the ideologies of justice and deontology. © 2021, The Author(s), under exclusive licence to Springer Nature B.V.

Soto-Pérez, M., Ávila-Palet, J.-E. y Núñez-Ríos, J. E. (2022). Justice, Deontology and Moral Meaningfulness as Factors to Improve Student Performance and Academic Achievement. *Journal of Academic Ethics*, 20(3), 375-397. doi: 10.1007/s10805-021-09423-3. Article.

## MANUEL SOTO PÉREZ

SNI Nivel Candidato

## HUGO BRISEÑO RAMÍREZ

Investigador Titular A, SNI Nivel I

## ALEJANDRA NÚÑEZ ACOSTA

Profesora investigadora

### URBAN RISKS AND THEIR INFLUENCE ON SUBJECTIVE WELL-BEING AROUND THE WORLD

**ABSTRACT.** The present research aims to provide evidence that the risks to which individ-

uals are exposed when living in a given city are negatively associated with subjective well-being. The literature is systematically reviewed to highlight factors that affect both positively and negatively subjective well-being. It is noted that there are no studies that address how the risks of living in a city influence the happiness of its inhabitants. Several ordinary least squares models were carried out looking for the best fit that fulfilled the assumptions of normality, correct specification, homoscedasticity and non-multicollinearity. Data from 186 cities around the world were used, although the models incorporated from 120 to 125 due to the availability of information on the variables. These models show that there is a significant negative relationship between urban risks and subjective well-being. Evidence is also generated that social support, income and access to drinking water (public services) have a significant positive influence on subjective well-being. It is concluded that helping citizens mitigate risks in the face of possible threats can improve their self-perception of happiness. It is suggested to have a preventive rather than reactive approach to the possible problems faced by the population. © 2021, The Author(s), under exclusive licence to Springer Nature B.V.

Briseño H., Estefani G., Núñez-Acosta A., Soto-Pérez M. (2022). Urban Risks and Their Influence on Subjective Well-being Around the World. *Journal of Happiness Studies*, 23(4), 1617-1636. doi: 10.1007/s10902-021-00465-3. Article.

## ANTONIA TERÁN BUSTAMANTE

Investigadora Titular A, Profesora investigadora

## ANTONIETA TEODORA MARTÍNEZ VELASCO

Profesora investigadora

### BUSINESS MODEL INNOVATION AND DECISION-MAKING FOR THE PRODUCTIVE SECTOR IN TIMES OF CRISIS

**ABSTRACT.** The pandemic caused by COVID-19 has affected all companies and their business models. For this reason, firms have needed to redesign these models, focusing on customer value proposition. The purpose of this research is to analyze Business Model Innovation (BMI) for decision-making. The methodological strategy is carried out through Bayesian networks. A model is made in which the main ele-

ments that make up a BMI are identified and quantified, which impact better decision-making to properly manage the proposal value for customers, technology, and achieve innovation. Evidence shows that the construction of BMI requires a model that mainly considers the relationships between variables such as knowledge architecture, implementation operation, change and evolution, and agile response. BMI will apply to organizations to the extent that it contemplates variables related to customer service and attention, as well as those related to innovation in organizations, attention, and those related to innovation in organizations. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

Martínez-Velasco A., & Terán-Bustamante A. (2022). Business Model Innovation and Decision-Making for the Productive Sector in Times of Crisis. In López-Fernández, A. M., & Terán-Bustamante, A. (Eds.), *Business Recovery in Emerging Markets. Global Perspectives from Various Sectors*, series *Palgrave Studies in Democracy, Innovation and Entrepreneurship for Growth* (pp. 129-156). Palgrave Macmillan. doi: 10.1007/978-3-030-91532-2\_8. Book Chapter.

## ANTONIA TERÁN BUSTAMANTE

Investigadora Titular A, Profesora investigadora

## ANTONIETA TEODORA MARTÍNEZ VELASCO

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### INNOVATION AND TECHNOLOGICAL MANAGEMENT MODEL IN THE TEQUILA SECTOR IN MEXICO

**ABSTRACT.** Creativity, ideas, and an entrepreneurial attitude are needed to innovate. However, it is also necessary to have practical instruments that allow innovations to be reflected in the company. One of those tools is technology. This research aims to analyze innovation and technology in the tequila industry through Bayesian networks with machine learning techniques. Likewise, an innovation and technology management model will be developed to make better decisions, which will allow the company to innovate to generate competitive advantages in a mature low-tech industry. A model is made in which the critical factors that influence management innovation and technology optimally to generate value translate into competitive advantages. The evidence shows that the optimal or non-optimal management of knowledge management and its various fac-

tors, through the causality of the variables, allow the interrelation to be more adequately captured to manage it. The results show that the most relevant factors for adequate management of innovation and technology are knowledge management, sales and marketing, organizational and technological architecture, national and international markets, cultivation of raw materials, agave, and management, use of waste, and not research and development. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

Terán-Bustamante, A., Martínez-Velasco, A., Castillo-Girón, V. M., & Ayala-Ramírez, S. (2022). Innovation and Technological Management Model in the Tequila Sector in Mexico. *Sustainability*, 14(12). doi: 10.3390/su14127450. Article.

### ANTONIA TERÁN BUSTAMANTE

*Investigadora Titular A, Profesora investigadora*

#### UNIVERSITY SOCIAL RESPONSIBILITY (USR) AND ITS MISSION: THE CASE OF THE UNIVERSIDAD PANAMERICANA IN MEXICO

**ABSTRACT.** At present, Higher Education Institutions around the world are developing and implementing university social responsibility (USR) as part of their strategy. They do so because they seek to assure the quality of higher education systems, as well as to positively impact their surrounding environment. This chapter aims to analyze the university's role in the process of building social responsibility in line with efforts to adequately fulfill its three missions of teaching, research, and linking with society. The case study herein refers to the Universidad Panamericana (UP), a private university in Mexico with humanistic and Christian roots, which recently celebrated its 50th year. The analysis demonstrates the UP's significant efforts to build a social responsibility system and its achievement of significant social impact through programs that support the community, healthcare, and people with disabilities. However, management of USR should be done at an institutional level and across the board. © 2020 Emerald Publishing Limited.

Terán-Bustamante A., & Torres-Vargas A. (2020). University Social Responsibility (USR) and Its Mission: The Case of the Universidad Panamericana in Mexico. In García-Álvarez, S. & Atristain-Suárez, C. (Eds.), *Strategy, Power and CSR: Practices and Challenges in Organizational Management* (pp. 235-257). Emerald Publishing. doi: 10.1108/978-1-83867-973-620201013. Book Chapter.

### EDGAR DEMETRIO TOVAR GARCÍA

*Investigador Titular D, SNI Nivel II*

#### RELIGIOSITY AND ENTREPRENEURSHIP IN POST-SOVIET RUSSIA

**ABSTRACT.** This article empirically studies the associations between religion (Orthodox Christianity, Islam, and non-religion), religiosity (to be a believer or not, and to what extent), religious participation (attending divine services, meetings or other religious events) and the probabilities of being an entrepreneur in post-Soviet Russia. Using logistic regressions and data from the Russian Longitudinal Monitoring Survey, the findings suggest lower likelihoods of being an entrepreneur in the case of Orthodox Christians, religiosity shows mixed results, and religious participation presents positive links (increasing the probabilities of becoming an entrepreneur). Nevertheless, the negative association between Orthodoxy and entrepreneurship lacks statistical significance in several specifications. Indeed, only religious participation shows robust results, particularly for men. Note that religious participation is linked to social capital, namely, networking, facilitating resources for entrepreneurship. Therefore, in Russia, the religion-entrepreneurship nexus is associated with participation, and not precisely with religious affiliations or beliefs. © Equinox Publishing Ltd 2022.

Tovar-García, E. D. (2022). Religiosity and Entrepreneurship in Post-Soviet Russia. *Journal for the Academic Study of Religion*, 35(3), 271-297. doi: 10.1558/jasr.22397. Article.



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<sup>1</sup> Colaboración en un artículo en Instituto de Humanidades (p. 99).



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### JORGE CARLOS ADAME GODDARD

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DOMINGO, RAFAEL, ROMAN LAW. AN INTRODUCTION (LONDON AND NEW YORK, ROTULEDGE, 2018) 238 PP. [ISBN-10: 0815362773; ISBN-13: 987-0815362777]

**ABSTRACT.** Se trata de una pequeña y gran obra. Pequeña por la cantidad de páginas; grande por su amplia y profunda comprensión de la historia y del contenido del derecho romano. Está estructurada en dos partes, de similar extensión. La primera ofrece una visión histórica del derecho romano, y la segunda una exposición de las instituciones jurídicas romanas y su funcionamiento.

Goddard, J. A. (2022). Domingo, Rafael, Roman Law. An introduction (London and New York, Rotuledge, 2018) 238 pp. [ISBN-10: 0815362773; ISBN-13: 987-0815362777]. *Revista de Estudios Histórico-Jurídicos*, 44, 925-929. doi: 10.4067/S0716-54552022000100925. Review.

### FERNANDO BATISTA JIMÉNEZ

*Profesor investigador*

DOES MARIHUANA CONSUMPTION CONTRIBUTE TO OUR PERSONALITY DEVELOPMENT?

[CONSUMIR MARIHUANA ¿CONTRIBUYE AL DESARROLLO DE NUESTRA PERSONALIDAD?]

**ABSTRACT.** Through the ruling of the appeal 237/2014, the National Supreme Court of Justice has established that the consumption of

marihuana is determined *prima facie* by the right to free development of personality, which is founded in human dignity. However, despite interpreting the aforementioned notion by its ontological meaning -determining it as the foundation of all human rights-, when defining the limits of this right, more than placing the emphasis on the ontological interpretation of dignity, it is equated to the exercise of individual freedom. This broad view affects the interpretation of the right to free development of personality as well as fundamental rights as a whole, which, in turn, influences its exegesis and validity. © 2022 Universidad Nacional Autónoma de México. All rights reserved.

Batista Jiménez, F. (2022). Does marihuana consumption contribute to our personality development? [Consumir marihuana ¿contribuye al desarrollo de nuestra personalidad?]. *Cuestiones Constitucionales*, 46, 319-335. doi: 10.22201/ij.24484881e.2022.46.17058. Article.

### JUAN FRANCISCO DÍEZ SPELZ

*Investigador Asociado, Profesor investigador*

THE ANIMAL QUESTION, LAW, AND HUMAN RIGHTS. ANALYSIS OF LAW 17/2021 ON THE LEGAL REGIME OF ANIMALS IN SPAIN

[LA CUESTIÓN ANIMAL, EL DERECHO Y LOS DERECHOS HUMANOS. ANÁLISIS DE LA LEY 17/2021 SOBRE EL RÉGIMEN JURÍDICO DE LOS ANIMALES EN ESPAÑA]

**ABSTRACT.** The restlessness of the human and his position in front of other living

beings were always present in many of the western philosophical currents. Today, the legal debate on the dignity, morality, sensitivity and even personality of these beings is in force in many countries that seek to modify and create laws, such as Law 17/2021 in Spain, which by changing the legal status of animals to "sentient beings" achieves that protection is extended to them, establishing new responsibilities and duties. This article comments on this legislative change and explores the possibility of attributing rights to animals. © 2022 Universidad Nacional Autónoma de México. All rights reserved.

Díez Spelz, J. F. (2022). The animal question, law, and human rights. Analysis of Law 17/2021 on the legal regime of animals in Spain [La cuestión animal, el derecho y los derechos humanos. Análisis de la Ley 17/2021 sobre el régimen jurídico de los animales en España]. *Cuestiones Constitucionales*, 46, 353-372. doi: 10.22201/ij.24484881e.2022.46.17060. Article.

### JOSÉ ANTONIO LOZANO DÍEZ

*SNI Nivel I*

ASSESSING THE INTERDEPENDENCE AMONG RENEWABLE AND NON-RENEWABLE ENERGIES, ECONOMIC GROWTH, AND CO<sub>2</sub> EMISSIONS IN MEXICO

**ABSTRACT.** This paper is aimed at examining the short- and long-run relationships among consumption of renewable and non-renew-

able energies, economic growth, and CO<sub>2</sub> emissions in Mexico during the period 1973–2018. Data were obtained from the World Bank and the British Oil Company BP. A cointegration model together with a fully modified ordinary least squares (FMOLS) is used to estimate possible associations among all variables. Subsequently, the Granger causality test is applied to empirically verify the environmental Kuznets curve (EKC) hypothesis. The main empirical results are that the variables under study explain CO<sub>2</sub> emissions in the short and long run, with economic growth having the greatest influence on CO<sub>2</sub> emissions, which provides empirical evidence of an EKC for Mexico. Moreover, consumption of renewable and non-renewable energies and economic growth causes in the Granger sense the current levels of CO<sub>2</sub> emissions. Moreover, lagged GDP and lagged non-renewable energy consumption do influence (Granger cause) current CO<sub>2</sub> emissions. Long-term policies should encourage the use of renewable energies in the electricity, transport, manufacture, and construction sectors. © 2021, The Author(s), under exclusive licence to Springer Nature B.V.

Salazar-Núñez, H.F., Venegas-Martínez, F., & Lozano-Díez, J. A. (2021). Assessing the interdependence among renewable and non-renewable energies, economic growth, and CO<sub>2</sub> emissions in Mexico. *Environment, Development and Sustainability*, 24(11), 12850–12866. doi: 10.1007/s10668-021-01968-y. Article.

## JOSÉ MANUEL MAGAÑA RUFINO

SNI Nivel I

### COVID 19 AND ACCESS TO HEALTH: A PANDEMIC REFLECTION OF INTELLECTUAL PROPERTY

[EL COVID 19 Y EL ACCESO A LA SALUD: UNA REFLEXIÓN PANDÉMICA DE PROPIEDAD INTELECTUAL]

**ABSTRACT.** Objectives: The study is structured around three different themes that reveal its objectives: the first aims to address the figure of the pandemic from a framework of solidarity; the second presents observations from a Human Rights point of view in its balance with Intellectual Property as well as the behavior of the government agenda and of the countries in their international commitment; the third part describes an approach to the legal figure of licenses as flexibility in the face of monopoly, analyzing interpretations as well as sensitivities in its application in the Mexican case, without neglecting to mention the general vision of the other participating

countries of the WTO, with their disparate realities. Methodology: The method used is deductive and the bibliographic research technique. It is structured in introduction, development, conclusions and bibliography. Results: The article evidences the viability of invoking a compulsory license in the face of the COVID 19 pandemic, provided it has an adequate legislative and regulatory technique and be respectful to social paradigms. Contributions: Within a global pandemic scenario that has occurred since the arrival of the COVID-19 disease, different social and legal reflections are taking place in countries that participate in the WTO and in the multiple existing international agreements in relation to Intellectual Property law, with different interpretative dyes in terms of foreseen legal flexibilities versus current protectionist tendencies in a comparative law approach, which calls us to analyze the reality of a possible application of compulsory licenses from the patent point of view and as an ideal tool for accessing data. medicines. © 2021, Centro Universitario Curitiba - UNICURITIBA. All rights reserved.

Giménez Pereira, M. C. & Magaña Rufino, J. M. (2021). COVID 19 and Access to Health: a Pandemic Reflection of Intellectual Property [El COVID 19 y el acceso a la salud: una reflexión pandémica de propiedad intelectual]. *Revista Jurídica*, 3(6), 548-572. Note.

## JORGE EDUARDO MEDINA VILLANUEVA

SNI Nivel I

### DAMAGES DERIVED FROM SPOUSAL INFIDELITY. ANALYSIS OF THE ISSUE IN THE LIGHT OF THE RIGHT TO FREE DEVELOPMENT OF PERSONALITY AND THE INOBSERVANCE OF MARRIAGE DUTIES

[DAÑOS DERIVADOS DE LA INFIDELIDAD CONYUGAL. ANÁLISIS DEL TEMA A LA LUZ DEL DERECHO AL LIBRE DESARROLLO DE LA PERSONALIDAD Y DE LA INOBSERVANCIA DE LOS DEBERES MATRIMONIALES]

**ABSTRACT.** Among the issues related to the law of torts, without a doubt one of the most controversial is the referring to the claim for compensation for the consequences derived from marital infidelity. The Supreme Court of Justice of the Nation recently issued an interesting precedent in the sense of denying the origin of the compensation for damages derived from this assumption, attentive, in general terms, to the right to free development of the personality and that fidelity

sexuality is a moral duty, so the spouses cannot be coerced. The issue raised by the Supreme Court is analyzed from precisely these two aspects: the limits to the right to free development of the personality and the consequences of the non-observance of these moral duties. We conclude that the arguments of the sentence analyzed are not convincing and we propose new lines of analysis of the problem. © 2021, Universidad Nacional Autónoma de México. All rights reserved.

Medina Villanueva, J. E. (2021). Damages derived from spousal infidelity. Analysis of the issue in the light of the right to free development of personality and the inobservance of marriage duties [Daños derivados de la infidelidad conyugal. Análisis del tema a la luz del derecho al libre desarrollo de la personalidad y de la inobservancia de los deberes matrimoniales]. *Boletín Mexicano de Derecho Comparado*, 54(161), 671-703. doi: 10.22201/ij.24484873e.2021.161.16488. Article.

## PEDRO DE JESÚS PALLARES YABUR

SNI Nivel I

### CHARLES MALIK, HIS IDEA OF 'REASON' AND THE FORMULA 'BEING ENDOWED WITH REASON' FROM THE UNIVERSAL DECLARATION OF HUMAN RIGHTS'S ARTICLE 1

[CHARLES MALIK, SU IDEA DE 'RAZÓN' Y LA FÓRMULA 'DOTADOS COMO ESTÁN DE RAZÓN' DEL ARTÍCULO 1 DE LA DECLARACIÓN UNIVERSAL DE DERECHOS HUMANOS]

**ABSTRACT.** The original (drafted) meaning of the word conscience in Article 1 of UDHR has particular attention toward developing an interpretative frame of the Document. However, the preceding phrase of the formula -"being endowed with reason"- has not attracted consideration, if any. Maybe because there is no direct source as clear as conscience, this article intends to fill that void. For that intent, it will review the available sources of Charles Malik's academic years as a professor of philosophy at the American University of Beirut, which are storage at Library of Congress in Washington, DC. © 2022 Ediciones Universitarias de Valparaíso. All rights reserved.

Pallares-Yabu, P. (2022). Charles Malik, his idea of 'reason' and the formula 'being endowed with reason' from the Universal Declaration of Human Rights's Article 1 [Charles Malik, su idea de 'razón' y la fórmula 'dotados como están de razón' del artículo 1 de la Declaración Universal de Derechos Humanos]. *Revista de Estudios Histórico-Jurídicos*, 44, 179-204. doi: 10.4067/S0716-54552022000100179. Review.

## HUGO SAÚL RAMÍREZ GARCÍA

SNI Nivel II

### CONSTITUTIONALIZING THE PERSON: A FRAMEWORK FOR THE RULE OF LAW AND HUMAN RIGHTS CONNECTION

[LA CONSTITUCIONALIZACIÓN DE LA  
PERSONA: UN MARCO DE LA RELACIÓN  
ENTRE EL ESTADO DE DERECHO Y LOS  
DERECHOS HUMANOS]

**ABSTRACT.** What happens when the rule of law meets the practice of human rights? One notion expresses it synthetically: constitutionalizing the person. This article delves into its implications; that is, the full alignment of all the State activities towards the achievement of the fundamental interests of every human being. It will do so by focusing on the characteristics that identify human rights: universality, indivisibility, interdependency inalienability, progressiveness, imprescriptibility, indefeasibility. It also describes the trends that are currently strengthening the Rule of Law and Human Rights relationship. © 2022 Universidad Nacional Autónoma de México. All rights reserved.

Ramírez-García, H. S. (2022). Constitutionalizing the person: a framework for the rule of law and human rights connection [La constitucionalización de la persona: un marco de la relación entre el Estado de derecho y los derechos humanos]. *Cuestiones Constitucionales*, 47, 367-395. doi: 10.22201/ijj.24484881e.2022.47.17533. Article.

## HUGO SAÚL RAMÍREZ GARCÍA

SNI Nivel II

### JUAN FRANCISCO DÍEZ SPELZ

Investigador Asociado, Profesor investigador

### CORPORATE SOCIAL RESPONSIBILITY AND HUMAN RIGHTS: CHALLENGES IN A GLOBALIZED CONTEXT

**ABSTRACT.** This chapter aims to reflect upon the relationship between corporate social responsibility (CSR) and human rights. We argue that although CSR is a good attempt to propose better practices for managerial decisions, a human rights perspective enriches this vision. Therefore, the authors will define the meaning of a human rights perspective for business activities and, specifically, for CSR. The authors apply the idea of *res extra commercium* to human rights and CSR. As a first step, both factors need to

be identified as moral absolutes. Essentially, businesses should start by identifying areas of human activity that are off limits. © 2020 Emerald Publishing Limited.

Ramírez-García, H. S. & Díez Spelz, J. F. (2020). Corporate Social Responsibility and Human Rights: Challenges in a Globalized Context. In García-Álvarez, S. & Atristain-Suárez, C. (Eds.), *Strategy, Power and CSR: Practices and Challenges in Organizational Management* (pp. 311-327). Emerald Publishing. doi: 10.1108/978-1-83867-973-620201017. Book Chapter.

## HUGO SAÚL RAMÍREZ GARCÍA

SNI Nivel II

### JAIME OLAIZ GONZÁLEZ

SNI Nivel I

### POLITICAL TRANSFORMATIONS IN MEXICO. A DIALOGUE WITH VIRGINIA ASPE

[TRANSFORMACIONES POLÍTICAS EN MÉXICO.  
UN DIÁLOGO CON VIRGINIA ASPE]

**ABSTRACT.** In "The Political Dilemmas of Mexico's Transformations: A Philosophical Approach" (Tópicos, Revista de Filosofía 58), Virginia Aspe explores the character of political transformations in Mexico addressing the following questions: a) What does the notion "political transformation of Mexico" entail? b) What are the philosophical arguments behind the three political transformations that Mexico has experienced since the 19th century? c) What are the political arguments with which the so-called "fourth political transformation" of Mexico is being promoted? Our article offers a series of arguments to begin a conversation on some of the most salient contentions of professor Aspe regarding the phenomenon of political transformation *latu sensu* and the political transformations that Mexico has undergone, asking ourselves, specifically, if the rise of Obradorism to power can really be incorporated into that theoretical field with which Mexican political history has been articulated. © 2022 Universidad Panamericana. All rights reserved.

Ramírez-García, H. S. & Olaiz-González J. (2022). Political Transformations in Mexico. A Dialogue with Virginia Aspe [Transformaciones políticas en México. Un diálogo con Virginia Aspe]. *Tópicos*, 64, 459-474. doi: 10.21555/top.v640.2142. Article.

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## FERNANDO CANO JORGE

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### MORTENSEN LOGICS

**ABSTRACT.** In [23], Mortensen introduced a connexive logic commonly known as 'M3V'. M3V is obtained by adding a special conditional to LP. Among its most notable features, besides its being connexive, M3V is negation-inconsistent and it validates the negation of every conditional. But Mortensen has also studied and applied extensively other non-connexive logics, for example, closed set logic, CSL, and a variant of Sette's logic, identified and called 'P2' by Marcos in [17]. In this paper, we analyze and compare systematically the connexive variants of CSL and P2, obtained by adding the M3V conditional to them. Our main observations are two. First, that the inconsistency of M3V is exacerbated in the connexive variant of closed set logic, while it is attenuated in the connexive variant of the Sette-like P2. Second, that the M3V conditional is, unlike other conditionals, connexively stable, meaning that it remains connexive when combined with the main paraconsistent negations. © L. Estrada-González & F. Cano-Jorge.

Estrada-González, L. & Cano-Jorge, F. (2021). Mortensen Logics. 10th International Conference on Non-Classical Logics. Theory and Applications, NCL 2022, Lodz, Poland, 14 March 2022 through 18 March 2022, Code 178811. *NCL, Electronic Proceedings in Theoretical Computer Science, EPTCS*, 358, 189-201. doi: 10.4204/EPTCS.358.14. Conference Paper.

## FERNANDO CANO JORGE

Profesor Investigador

### REVISITING REICHENBACH'S LOGIC

**ABSTRACT.** In this paper we show that, when analyzed with contemporary tools in logic—such as Dunn-style semantics, Reichenbach's three-valued logic exhibits many interesting features, and even new responses to some of the old objections to it can be attempted. Also, we establish some connections between Reichenbach's three-valued logic and some contra-classical logics. © 2021, The Author(s), under exclusive licence to Springer Nature B.V.

Estrada-Gonzalez, L. & Cano-Jorge, F. (2021). Revisiting Reichenbach's logic. *Synthese*, 199(5-6), 11821-11845. doi: 10.1007/s11229-021-03313-2. Article.

## MAURICIO LECÓN ROSALES

SNI Nivel I

### ARE WE RESPONSIBLE FOR LAUGHING? SUÁREZ ON LAUGHTER'S VOLUNTARINESS

**ABSTRACT.** In his Commentary on Aristotle's *De Anima*, Francisco suárez offers a rich account of the psychology and physiology of laughter. Among other claims, he asserts that laughter is a voluntary act, without giving any further explanation. The aim of this paper is to glean from his texts a philosophically compelling argument for this claim. I will claim that for suárez laughter is a commanded act of the will, since it somehow needs the will's consent to be elicited. This kind of voluntariness is enough to make laughter morally relevant. © 2021 Philosophy Documentation Center. All rights reserved.

Lecón, M. (2021). Are We Responsible for laughing? Suárez on laughter's Voluntariness. *Studia Neoscholastica*, 18(1), 99-116. doi: 10.5840/studneor20211814. Article.

## LUIS XAVIER LÓPEZ FARJEAT

Investigador Titular D, SNI Nivel III

### CLASSICAL ISLAMIC PHILOSOPHY: A THEMATIC INTRODUCTION

**ABSTRACT.** This thematic introduction to classical Islamic philosophy focuses on the most prevalent philosophical debates of the medieval Islamic world and their importance within the history of philosophy. Approaching the topics in a comprehensive and accessible way in this new volume, Luis Xavier Lopez-Farjeat, one of the co-editors of *The Routledge Companion to Islamic Philosophy*, makes classical Islamic philosophy approachable for both the new and returning student of the history of philosophy, medieval philosophy, the history of ideas, classical Islamic intellectual history, and the history of religion. Providing readers with a complete view of the most hotly contested debates in the Islamic philosophical tradition, Lopez-Farjeat discusses the development of theology (kalam) and philosophy (falsafa) during the Abbasid period, including the translation of Aristotle into Arabic, the philosophy and theology of Islamic revelation, logic and philosophy of language, philosophy of natural science, metaphysics, psychology and cognition, and

ethics and political philosophy. This volume serves as an indispensable tool for teachers, students, and independent learners aiming to discover the philosophical problems and ideas that defined the classical Islamic world. © 2022 Taylor and Francis.

López-Farjeat, L. X. (2022). *Classical islamic philosophy: A thematic introduction*. Taylor and Francis. doi: 10.5840/studneor20211814. Book.

## EDUARDO ÓSCAR CHARPENEL ELORDUY

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### KANTIAN REPUBLICANISM AND LEGAL NORMATIVITY

#### [EL REPUBLICANISMO KANTIANO Y LA NORMATIVIDAD LEGAL]

**ABSTRACT.** En este artículo defiendiendo la postura según la cual el republicanismo -en comparación con otras nociones o motivos centrales- no se ha interpretado como uno de los rasgos que caracteriza a la filosofía jurídica y política de Kant como un todo. Una posible razón es que el republicanismo kantiano no ha ocupado un lugar destacado dentro de las narrativas republicanas, ya sea históricas o sistemáticas, que son más dominantes en las discusiones contemporáneas. A mi parecer, esto es así porque hay características innovadoras en la empresa republicana kantiana que se encuentran en tensión con otros proyectos republicanos de otra índole. Aquí discuto algunos de los rasgos distintivos del proyecto de Kant en lo que atañe a concepciones suyas sobre el estado de derecho, la ciudadanía, la autoridad política, la libertad de expresión y el derecho internacional, con el fin de señalar que estas son parte integral de una teoría política y legal que todavía es atractiva y sugerente. © 2020 Universidad del Norte. All rights reserved.

Charpenel, E. (2020). Kantian Republicanism and Legal Normativity. *Eidos*, 32, 135-164. doi: 10.14482/EIDOS.32.193.01. Article.



## ANDRÉ LAKS

Investigador Titular D, SNI Nivel III

**OBJECT-SUBJECT. PRELIMINARY OBSERVATIONS ON THE REASONINGS OF JEAN BOLLACK AND PETER SZONDI-INTRODUCED BY FRANZ KALTENBECK**

**ABSTRACT.** Jean Bollack (1923-2012), a specialist in ancient Greek literature and modern lyric poetry (especially that of Paul Celan) and Peter Szondi (1929-1971), a specialist in German literature, are linked by their thoughts on the status and the resources of philology. For both scholars, the aim was to restore the link between "criticism" and "hermeneutics," which has been endangered by a strong tendency, since the nineteenth century, to reduce philology to textual criticism and, more recently, by the illegitimate absorption of hermeneutics by the so-called "philosophical hermeneutics" derived from Heidegger and prominently represented by Gadamer. This article schematically confronts the intellectual trajectories of the two scholars in order to clarify Bollack's concepts of "critical hermeneutics" and of "radical historicization" by which he ended up characterizing his own approach.

Laks, A. (2017). Object-subject. Preliminary observations on the reasonings of Jean Bollack and Peter Szondi-Introduced by Franz Kaltenbeck. *Savoirs et Clinique*, 23(2), 90-100. doi: 10.3917/sc.023.0090. Article.

## LEONARDO RUIZ GÓMEZ

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**IMAGINATION AS AN EXPRESSIVE STRUCTURE OF APPERCEPTION IN G. W. LEIBNIZ**

[LA IMAGINACIÓN COMO MODELO EXPRESIVO DE LA APPERCEPCIÓN EN G. W. LEIBNIZ]

**ABSTRACT.** It is difficult to frame Leibniz's treatment of imagination in his broader gnosological theory. On the one hand, some of his texts seem to relate imagination with a poor display of cognitive faculties; on the other hand, there is textual evidence that the imagination plays a major role on his gnosological theory, as presented in the New Essays. The aim of this paper is to analyze this role in connection with Leibniz's theory of expression and apperception. To do so, I will present first a brief outline of these two latter notions; second, I will relate them to the concept of imagination. Finally, I will give some guidelines to explain the apparent contradictions in Leibniz's writings on imagination, in order to show its epistemological role. © 2019 Universidad Autónoma Metropolitana, Department of Philosophy. All rights reserved.

Ruiz-Gómez, L. (2019). Imagination as an expressive structure of apperception in G. W. Leibniz. *Signos Filosóficos*, 21(41), 36-69. Article.

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<sup>2</sup> Colaboración en un artículo en Facultad de Ciencias Económicas y Empresariales (p. 40).





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**VÍCTOR MANUEL ÁLVAREZ PATO***Profesor Investigador***JULIETA DOMÍNGUEZ SOBERANES***Investigadora Titular A, SNI Nivel I***CLAUDIA NALLELY SÁNCHEZ GÓMEZ***Investigador Titular B, SNI Nivel Candidato***DAVID EDUARDO MENDOZA PÉREZ***Profesor investigador***RAMIRO VELÁZQUEZ GUERRERO***SNI Nivel I***DOCUMENT DETAILS-DETERMINING FOOD ACCEPTANCE WITH CONSUMER PHYSIOLOGICAL REACTIONS: A MACHINE LEARNING APPROACH****[DETERMINACIÓN DE LA ACEPTACIÓN DE ALIMENTOS MEDIANTE REACCIONES FISIOLÓGICAS DEL CONSUMIDOR: UN ENFOQUE BASADO EN APRENDIZAJE AUTOMÁTICO]**

**ABSTRACT.** Food products elicit both psychological and physiological reactions in consumers that influence their liking and buying decisions. In particular, the physiological reactions toward food products have recently become of interest to better understand consumer behavior. To increase the chances of success in the market, pre-sale food product assessments must incorporate the consumers' physiological responses. This paper presents a novel sensory analysis system encompassing the measurement of several physiological parameters such as facial emotion recognition, galvanic skin response (GSR), and heart rate or pulse. Data fusion and machine learning methods allow predicting consumer acceptance of food samples. Experiments conducted with a large cohort of participants (120) suggest that facial expressions alone are not sufficient to determine consumer acceptance. However, when GSR and pulse signals are also considered, acceptance prediction is significantly improved. This work aims to contribute to the understanding of the human physiological reactions when interacting with food and to apply this knowledge to the food industry. © 2021, Associacao Iberica de Sistemas e Tecnologias de Informacao. All rights reserved.

Domínguez-Soberanes, J., Álvarez-Pato, V. M., Sánchez, C. N., Mendoza-Pérez, D. E., Visconti, P., & Velázquez, R. (2021). Document details-Determining food acceptance with consumer physiological reactions: A machine learning approach [Determinación de la aceptación de alimentos mediante reacciones fisiológicas del

consumidor: Un enfoque basado en aprendizaje automático]. *RISTI-Revista Iberica de Sistemas e Tecnologias de Informacao*, 2021(E43), 418-434. Article.

**LUIS ÁNGEL AMEZCUA ECCIUS***Profesor Investigador***HÉCTOR GABRIEL DÁVALOS ALEJO***SNI Nivel Candidato***ESTIMATION OF AVERAGE SPECTRAL ACCELERATION DURING SUBDUCTION INTERFACE EARTHQUAKES**

**ABSTRACT.** This paper presents a ground motion prediction model that estimates the median and the logarithmic standard deviation of average spectral acceleration for subduction interface earthquakes. The strong-motion database includes acceleration records from Chile, Japan, and New Zealand from earthquakes with moment magnitudes between 5 and 9 and epicentral distances ranging between 5 and 600 km. The study was developed for NEHRP site class D. The RotD50 horizontal component was used. Results show that the model predicts median values and logarithmic standard deviation for Saavg at distances between 1 to 400 km for magnitudes between 5 and 8, and at distances between 100 and 400 km for larger magnitudes (MW > 8). © 2022 12th National Conference on Earthquake Engineering, NCEE 2022 All rights reserved.

Amezcu, L., Dávalos, H., Heresi, P., & Miranda, E. (2022). Estimation of Average Spectral Acceleration during Subduction Interface Earthquakes. 12th National Conference on Earthquake Engineering, NCEE 2022, Salt Lake City, United States, 27 June 2022 through 1 July 2022, Code 182374. 12th National Conference on Earthquake Engineering, NCEE 2022, 2022. Conference Paper.

**CLAUDIA YOHANA ARIAS PORTELA***Profesora Investigadora***FLEXIBLE MANUFACTURING SYSTEMS: A METHODS ENGINEERING AND OPERATIONS MANAGEMENT APPROACH**

**ABSTRACT.** This paper covers a significant extent of the literature published in the field of operations and production research related with Flexible Manufacturing Systems (FMS). There is currently limited knowledge published for the implementation of FMS for mixed-models assembly; which can

present a relevant and critical analysis of the effects such a system has in terms of productivity, supply chain, and operation process, as well as the effects on human factors and methods engineering within the operation. Findings include advantages for the FMS effectiveness, management process, productivity, process analysis and technological advancement, while contrasting them against disadvantages on efficiency, learning curve, Kaizen principles and investment risks. Culminating on the importance of integrating intercommunicated systems throughout the company beyond the manufacturing system in order to control and profit from such implementation. The paper illustrates recommended measures to utilize the advantages mentioned while reducing the possible negative aspects. Finally, proposing some outlooks on future research.

Herrera-Garcia, M. C. & Arias-Portela, C. Y. (2021). Flexible Manufacturing Systems: A Methods Engineering and Operations Management Approach. In Russo, D., Ahram, T., Karwowski, W., Di Bucchianico, G., & Taiar, R. (Eds.), *Intelligent Human Systems Integration 2021. IHSI 2021*, vol. 1322, *Advances in Intelligent Systems and Computing Series*. doi: 10.1007/978-3-030-68017-6\_113. Conference Paper.

**PIA BERGER***Profesora investigadora***JULIETA DOMÍNGUEZ SOBERANES***Investigadora Titular A, SNI Nivel I***LINDA CAROLINA HERNÁNDEZ LOZANO***Profesora investigadora***CRISDALITH CACHUTT ALVARADO***Profesora investigadora***BIOPLASTIC MADE OF ORANGE PEELS****[BIOPLÁSTICO ELABORADO DE CÁSCARAS DE NARANJA]**

**ABSTRACT.** Plastics have prohibited its use in certain applications because of environmental issues. Therefore, a more eco-friendly option is needed for food packaging and containers. This study uses the waste of orange peel to create a biopolymer that can be used for these purposes. Orange peel of 100 and 250 micrometers, starch, from two sources: Corn and potato (7.5%), glycerol (6.0%) and water (71.5%) are the main materials used in these formulations. In addition, two technological procedures were evaluated: The cooling gel method (room temperatures,

refrigeration (4 C) freezing (-18 C) and the way in which water was eliminated: Solar, oven (120 C) and dehydration (42 C). In order to obtain the best results, 54 experiments were carried out in triplicate and the parameters were evaluated: Flexibility, porosity, water absorption, fracture force and biodegradability. Best results were obtained when utilizing orange powder of 250 micrometers, the bioplastic showed a better texture than the one utilizing powder of 100 micrometers. Different ratios of corn and potato starch hardly reveal any differences in the final biopolymer properties, however, from an economical point of view; corn starch is the best option. The best cooling methods of the gel are both refrigeration and room temperature; whereas the latter implies less energetic consumption and therefore it is suggested. The biopolymer made with 100% corn starch and using solar drying showed to be the most flexible one, as well presented less porosity, which is translated into less water absorption; exhibiting a biodegradability of 63% in 21 days. In future studies. © 2022 Publicaciones Dyna Sl. All rights reserved.

Domínguez-Soberanes, J., Berger, P., Hernández-Lozano, L. C., Ortega-Fraustro, D., Macías-Ochoa, M. F., & Cachutt-Alvarado, C. (2022). Bioplastic made of orange peels [Bioplástico elaborado de cáscaras de naranja]. *Dyna*, 97(23), 203-209. doi: 10.6036/10212. Article.

## PIA BERGER

Profesora investigadora

### INTERNATIONAL CIRCULAR ECONOMY STRATEGIES AND THEIR IMPACTS ON AGRICULTURAL WATER USE

**ABSTRACT.** The concept of Circular Economy (CE) is becoming increasingly important in the pursuit of more sustainable societies. CE strategies are being applied in the sustainable management of a plethora of areas, such as energy, water, food and eco-industrial parks. The present paper focuses on the question of how CE principles can support the sustainable management of water in the agricultural sector around the world, considering different legislative environments, water resources management guidelines, environmental stressors, and CE practices. Considering these practices and circumstances, seven countries were

compared: Brazil, Germany, Japan, Mexico, Morocco, Portugal, and Taiwan. Together, CE experts in the seven countries developed a set of 44 criteria to assess each of these areas. Broader establishment and respect of water resources legislation was found to be strongly correlated with lower agricultural water use. While the application of CE practices was found to not be correlated with lower consumption, this is still novel in most countries. Based on the studied countries, it can be concluded that a global CE agenda has not been reached for water resources. Further application and variety of practices is required to better represent the impact of CE on a national scale, but local success stories could support the wider application of CE in agriculture. The findings and the framework of the study can be applied to other countries in directing CE strategies for more sustainable water use in agriculture. Increasing CE implementation, motivated by legislation and better management can help ensure water security throughout nations. © 2022 The Authors.

Dziedzic, M., Gomes, P. R., Angilella, M., Asli, A. E., Berger, P., Charmier, A. J., Chen, Y. C., Dasanayake, R., Dziedzic, R., Ferro, F., Huising, D., Knaus, M., Mahichi, F., Rachidi, F., Rocha, C., Smith, K., & Tsukada S. (2022). International circular economy strategies and their impacts on agricultural water use. *Cleaner Engineering and Technology*, 8. doi: 10.1016/j.clet.2022.100504. Article.

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### A NON-CONTACT SPO2 ESTIMATION USING A VIDEO MAGNIFICATION TECHNIQUE

**ABSTRACT.** In this paper, we present a new non-contact strategy to estimate the Peripheral Oxygen Saturation (SpO2) based on the Eulerian motion video magnification technique and a signal processing technique. The magnification procedure was carried out using two approaches: the Hermite decomposition and the Gaussian decomposition. The SpO2 is estimated from the signals extracted after magnification process using the red and the blue channel of the image frame. We have tested the method on five healthy sub-

jects using videos obtained from the google-meet video conference platform. Each video includes the subject and the data of the contact pulse oximeter device. To compare the performance of the methods, we compute the mean average error and metrics issues from the Bland and Altman analysis to investigate the agreement of the methods with respect to a contact pulse oximeter device as reference. The proposed solution shows an agreement with respect to the reference of most of 98%. These preliminary results are promising for the implementation in a remote medical consultation setting. © 2021 SPIE.

Brieva, J., Moya-Albor, E., & Ponce, H. (2021). A Non-Contact SpO2 estimation using a Video Magnification Technique. 17th International Symposium on Medical Information Processing and Analysis, Campinas, Brazil, 17 November 2021 through 19 November 2021, Code 176104. *Proceedings of SPIE-The International Society for Optical Engineering*, 12088. doi: 10.1117/12.2606145. Conference Paper.

## JORGE EDUARDO BRIEVA RICO

Investigador Titular D, SNI Nivel I

## ERNESTO MOYA ALBOR

Investigador Titular D, SNI Nivel I

## HIRAM EREDÍN PONCE ESPINOSA

Investigador Titular D, SNI Nivel I

### DOCUMENT DETAILS-SCOMA HAND PROSTHETIC

**ABSTRACT.** SCOMA Prosthetic Hand is a robotic hand that can give to the patient the ability to resume a good part of their daily activities. It is not only designed to resume daily activities, but also to improve the mental health of the patient. Worldwide, each year the number of amputees increases from 150,000 to 200,000 in which 30% of these amputees have suffered an upper limb amputation but only between 27% and 44% of them use arm prostheses. There are many reasons behind this, but some aspects to consider about existing prostheses are: uncomfortable, very expensive, have a robotic appearance, or need invasive procedures to fit patients. In our proposal we used the mechatronic design methodology and the data from the Amputee Coalition to create a new hand prosthesis. We analyzed it through different studies such as SWOT diagrams, quality matrix, goal tree and pairwise comparison matrix and simulation tests. In addition, we tested a 3D printing to

find a suitable design and the most assertive components. By building the robotic hand with cheaper, more common components and limited functions, we can offer to the patients a comfortable prosthesis and a new more realistic option than those offer on the market. This prosthesis have limited functions but can be accessible to many people and the design could be improved in the future easily. © 2021 IEEE.

Garcia, C., Reyes, A., Canul, M., Gurza, O., Cruzado, S., Diaz, J., Brieva, J., Moya-Albor, E., & Ponce, H. (2021). Document details-SCOMA hand prosthetic. 2021 International Conference on Mechatronics, Electronics and Automotive Engineering, ICMEAE 2021, Virtual, Online, Mexico, 22 November 2021 through 26 November 2021, Category numberCF-P2190W-ART, Code 183273. *Proceedings-2021 International Conference on Mechatronics, Electronics and Automotive Engineering, ICMEAE 2021*, 2021, 232-328. doi: 10.1117/12.2606145. Conference Paper.

### KARINA CORONA GUTIÉRREZ

Profesora investigadora

### SAMUEL MOISÉS NUCAMENDI GUILLÉN

Investigador Titular D, SNI Nivel I

#### VEHICLE ROUTING WITH CUMULATIVE OBJECTIVES: A STATE OF THE ART AND ANALYSIS

**ABSTRACT.** In the past decades, there has been an increasing body of research in vehicle routing problems involving cumulative costs. These problems consider cumulative objective functions such as the sum of arrival times to customers or the cumulative costs based on the vehicles' load throughout the routes. This paper reviews this type of routing problem by means of the cumulative vehicle routing problem (Cum-VRP) and cumulative capacitated vehicle routing problem (CCVRP). In doing so, we present and discuss all related problem variants with regard to the different problem features proposed over time. Moreover, we provide an analysis of related papers concerning solution algorithms and used benchmark instances. Finally, an overview of the trends and promising areas for further research are also provided. © 2022 The Authors.

Corona-Gutiérrez, K., Nucamendi-Guillén, S., Lalla-Ruiz, E. (2022). Vehicle routing with cumulative objectives: A state of the art and analysis. *Computers and Industrial Engineering*, 169. doi: 10.1016/j.cie.2022.108054. Review.

### MARÍA LUISA CRUZ LÓPEZ

SNI Nivel I

#### ENHANCEMENT OF GRAYSCALE IMAGE DISPLAY WITH AMPLITUDE FOURIER HOLOGRAMS, EMPLOYING A LIMITED BANDWIDTH PHASE

**ABSTRACT.** An alternative method is proposed to generate a modified random phase that is able to concentrate the light around a given direction, produces well-contrasted Fourier amplitude holograms, reduces the quantity and the randomness of the speckle noise in the image, and decreases the amount of data necessary for the phase definition. This modified limited bandwidth random phase uses structured random phase patterns to control the object dispersion. The resulting hologram displays an image with structured speckle noise (SSN), exhibiting similar metrics as the iterative method for hologram generation. A filtering process eliminates the SSN; the speckle contrast in the final image is reduced from 0.66 to 0.07; and the peak SNR increases from 7.21 dB to 12.62 dB. This method enhances the fine details and grayscale tone perception in the final image. © 2022 Optica Publishing Group.

Cruz, M. L. (2022). Enhancement of grayscale image display with amplitude Fourier holograms, employing a limited bandwidth phase. *Applied Optics*, 61(19), 5657-5665. doi: 10.1364/AO.459507. Article.

### HÉCTOR GABRIEL DÁVALOS ALEJO

SNI Nivel Candidato

#### DAMPING MODIFICATION FACTORS FOR STRUCTURES BUILT ON SOFT SOILS

**ABSTRACT.** This study investigates how for soft soil sites, Damping Modification Factors (DMF's) differ significantly from those computed from ground motions recorded on rock or firm soils. A database of 100 ground motions recorded on soft soil deposits in Mexico City is used. It is shown that DMF's exhibit a stronger variation with changes in period of vibration and that the effect of damping is particularly large for structures whose period coincides with the first or second mode of vibration of the soil deposit where the effect of damping is significantly larger than the one that occurs for structures built on rock or firm soils. A nonlinear regression analysis was performed to develop an equation as a function of the

normalized period of vibration and damping ratio to provide estimates of mean DMF's for damping ratios between 1% and 30%. These DMF's provide a practical tool to estimate seismic demands of structures built on soft soil sites whose damping ratio is smaller or larger than the reference damping ratio of 5% typically used in ground motion prediction models, probabilistic seismic hazard analyses, and design spectra. It is shown that the proposed equation provides an excellent approximation to the statistical results. © 2022 12th National Conference on Earthquake Engineering, NCEE 2022 All rights reserved.

Bantis, J., Davalos, H., Miranda, E., & Cruz, C. (2022). Damping Modification Factors for Structures Built on Soft Soils. 12th National Conference on Earthquake Engineering, NCEE 2022, Salt Lake City, United States, 27 June 2022 through 1 July 2022, Code 182374. *12th National Conference on Earthquake Engineering, NCEE 2022*, 2022. Conference Paper.

### HÉCTOR GABRIEL DÁVALOS ALEJO

SNI Nivel Candidato

#### RESPONSE SPECTRAL DAMPING MODIFICATION FACTORS FOR STRUCTURES BUILT ON SOFT SOILS

**ABSTRACT.** The seismic hazard intensity at a site is usually defined in terms of 5% pseudo-acceleration spectral ordinates. However, as structures can have damping ratios different from 5%, it is necessary to apply damping modification factors to adjust spectral ordinates. This study examines damping modification factors corresponding to damping ratios ranging from 1% to 30% for structures built on soft soils. A statistical study is presented based on 90,000 ratios computed using a database of 100 ground motions recorded in the soft soils of Mexico City. It is shown that damping modification factors are very sensitive to changes in the period of vibration of the system, with the largest sensitivity occurring for periods close to the predominant period of the site. A simplified equation to estimate mean damping modification factors is proposed as a function of the level of damping and of the period of vibration normalized by the predominant site period. © 2022 Elsevier Ltd.

Dávalos, H., Miranda, E., Bantis, J., & Cruz, C. (2022). Response spectral damping modification factors for structures built on soft soils. *Soil Dynamics and Earthquake Engineering*, 154. doi: 10.1016/j.soildyn.2022.107153. Article.



**FERNANDO DÁVALOS HERNÁNDEZ***Profesor investigador***A DUAL-INPUT HIGH-GAIN BIDIRECTIONAL DC/DC CONVERTER FOR HYBRID ENERGY STORAGE SYSTEMS IN DC GRID APPLICATIONS**

**ABSTRACT.** This paper presents a dual input-port bidirectional DC/DC converter for a Hybrid Energy Storage System (HESS). The converter is non-coupled, non-isolated and it has high-gain. Thus, it does not have transformer or coupling inductances, so voltage spikes or circulating currents are not present which is reflected in its high efficiency. In addition, the DC/DC converter is totally bidirectional, so the sources can transfer the energy between them and to the load. The converter has six switches but only three of them work in each mode, so the control is relatively simple. The main applications of the proposed converter are HESS for DC microgrid applications or small electric vehicles, particularly in which the storage system is small, hence the voltage is low, but the 'load' works at a much higher voltage. The article analyses the converter in steady-state and presents the small-signal model, based on that, the control loop is designed. Simulations and experimental results validate the converter. © 2021 IEEE.

Davalos, F., Samanbakhsh, R., Mohammadi, P., & Ibanez, F. (2021). A Dual-Input High-Gain Bidirectional DC/DC Converter for Hybrid Energy Storage Systems in DC Grid Applications. *IEEE Access*, 9, 164006-164016. doi: 10.1109/ACCESS.2021.3132896. Article.

**FERNANDO DÁVALOS HERNÁNDEZ***Profesor investigador***SELF-BALANCING SUPERCAPACITOR ENERGY STORAGE SYSTEM BASED ON A MODULAR MULTILEVEL CONVERTER**

**ABSTRACT.** Energy Storage Systems (ESS) are an attractive solution in environments with a high amount of renewable energy sources, as they can improve the power quality in such places and if required, can extend the integration of more renewable sources of energy. If a large amount of power is needed, then supercapacitors are viable energy storage devices due to their specific power, allowing response times that are in the range of milliseconds to seconds. This paper details the design of an ESS that is based on a modular multilevel converter (MMC) with bidirectional power flow, which reduces the number of cas-

caded stages and allows the supercapacitors SCs to be connected to the grid to perform high-power transfers. A traditional ESS has four main stages or sub-systems: the energy storage device, the balancing system, and the DC/DC and DC/AC converters. The proposed ESS can perform all of those functions in a single circuit by adopting an MMC topology, as each submodule (SM) can self-balance during energy injection or grid absorption. This article analyses the structure in both power flow directions and in the control loops and presents a prototype that is used to validate the design. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

Davalos, F. D., Samanbakhsh, R., Ibanez, F. M., & Martin, F. (2022). Self-Balancing Supercapacitor Energy Storage System Based on a Modular Multilevel Converter. *Energies*, 15(1). doi: 10.3390/en15010338. Article.

**DAVID ESCOBAR CASTILLEJOS***Profesor investigador***LEARNING ANALYTICS TO DETERMINE PROFILE DIMENSIONS OF STUDENTS ASSOCIATED WITH THEIR ACADEMIC PERFORMANCE**

**ABSTRACT.** With the recent advancements of learning analytics techniques, it is possible to build predictive models of student academic performance at an early stage of a course, using student's self-regulation learning and affective strategies (SRLAS), and their multiple intelligences (MI). This process can be conducted to determine the most important factors that lead to good academic performance. A quasi-experimental study on 618 undergraduate students was performed to determine student profiles based on these two constructs: MI and SRLAS. After calibrating the students' profiles, learning analytics techniques were used to study the relationships among the dimensions defined by these constructs and student academic performance using principal component analysis, clustering patterns, and regression and correlation analyses. The results indicate that the logical-mathematical intelligence, intrinsic motivation, and self-regulation have a positive impact on academic performance. In contrast, anxiety and dependence on external motivation have a negative effect on academic performance. A priori knowledge of the characteristics of a student sample and its likely behavior predicted by the models may provide both students and teachers with an early-awareness alert that can help

the teachers in designing enhanced proactive and strategic decisions aimed to improve academic performance and reduce dropout rates. From the student side, knowledge about their main academic profile will sharpen their metacognition, which may improve their academic performance. © 2022 by the authors.

Gonzalez-Nucamendi, A., Noguez, J., Neri, L., Robledo-Rella, V., García-Castelán, R.M.G., & Escobar-Castillejos, D. (2022). Learning Analytics to Determine Profile Dimensions of Students Associated with Their Academic Performance. *Applied Sciences*, 12(20). doi: 10.3390/app122010560. Article.

**RICARDO ABEL ESPINOSA LOERA***Profesor investigador***A NOVEL HYBRID ENDOSCOPIC DATASET FOR EVALUATING MACHINE LEARNING-BASED PHOTOMETRIC IMAGE ENHANCEMENT MODELS**

**ABSTRACT.** Endoscopy is the most widely used medical technique for cancer and polyp detection inside hollow organs. However, images acquired by an endoscope are frequently affected by illumination artefacts due to the enlightenment source orientation. There exist two major issues when the endoscope's light source pose suddenly changes: overexposed and underexposed tissue areas are produced. These two scenarios can result in misdiagnosis due to the lack of information in the affected zones or hamper the performance of various computer vision methods (e.g., SLAM, structure from motion, optical flow) used during the non invasive examination. The aim of this work is two-fold: i) to introduce a new synthetically generated data-set generated by a generative adversarial techniques and ii) and to explore both shallow based and deep learning-based image-enhancement methods in overexposed and underexposed lighting conditions. Best quantitative results (i.e., metric based results), were obtained by the deep learning-based LMSPEC method, besides a running time around 7.6 fps. Data available at: <https://data.mendeley.com/datasets/3j3tmghw33/1>. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

García-Vega, A., Espinosa, R., Ochoa-Ruiz, G., Bazin, T., Falcón-Morales, L., Lamarque, D., & Daul, C. (2022). A Novel Hybrid Endoscopic Dataset for Evaluating Machine Learning-Based Photometric Image Enhancement Models. 21st Mexican International Conference on Artificial Intelligence, MICAI 2022, Monterrey, Mexico, 24 October 2022 through 29 October 2022, Code 285899. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial In-*



## HÉCTOR EDUARDO GILARDI VELÁZQUEZ

SNI Nivel Candidato

### DETERMINISTIC COHERENCE RESONANCE ANALYSIS OF COUPLED CHAOTIC OSCILLATORS: FRACTIONAL APPROACH

**ABSTRACT.** Recently, the stabilization of chaos by chaos has attracted the attention of researchers. A small deviation between the natural frequencies of unidirectionally coupled chaotic oscillators can cause the emerge of a coherence resonance in the slave oscillator for a given coupling strength. In this work, we investigate the phenomenon of coherence resonance for a coupled Rössler system under the influence of fractional operators in the frequency response of the slave oscillator. Based on the analysis of the fractional Rössler system, we determine a range of fractional orders in which the system retains its instability, and an analysis of the frequency response of the system to changes in natural frequency is developed. Finally, the frequency response of the slave system to changes in the fractional derivative order, the natural frequency of the master system, and the coupling strength is analyzed, and how these changes promote the occurrence of coherence resonance is examined. © 2022 Elsevier Ltd.

Gilardi-Velázquez, H. E., Echenausía-Monroy, J. L., Jaimes-Reátegui, R., García-López, J. H., Campos, E., Huerta-Cuellar, G. (2022). Deterministic coherence resonance analysis of coupled chaotic oscillators: fractional approach. *Chaos, Solitons and Fractals*, 157. doi: 10.1016/j.chaos.2022.111919. Article.

## HÉCTOR EDUARDO GILARDI VELÁZQUEZ

SNI Nivel Candidato

### MULTISTABILITY ROUTE IN A PWL MULTI-SCROLL SYSTEM THROUGH FRACTIONAL-ORDER DERIVATIVES

**ABSTRACT.** Recently, the stabilization of chaos by chaos has attracted the attention of researchers. A small deviation between the natural frequencies of unidirectionally coupled chaotic oscillators can cause the emerge of a coherence resonance in the

slave oscillator for a given coupling strength. In this work, we investigate the phenomenon of coherence resonance for a coupled Rössler system under the influence of fractional operators in the frequency response of the slave oscillator. Based on the analysis of the fractional Rössler system, we determine a range of fractional orders in which the system retains its instability, and an analysis of the frequency response of the system to changes in natural frequency is developed. Finally, the frequency response of the slave system to changes in the fractional derivative order, the natural frequency of the master system, and the coupling strength is analyzed, and how these changes promote the occurrence of coherence resonance is examined. © 2022 Elsevier Ltd.

Echenausía-Monroy, J. L., Gilardi-Velázquez, H. E., Wang, N., Jaimes-Reátegui, R., García-López, J. H., & Huerta-Cuellar, G. (2022). Multistability route in a PWL multi-scroll system through fractional-order derivatives. *Chaos, Solitons and Fractals*, 161. doi: 10.1016/j.chaos.2022.112355. Article.

## HÉCTOR EDUARDO GILARDI VELÁZQUEZ

SNI Nivel Candidato

### ON THE BEHAVIOR OF BIDIRECTIONALLY COUPLED MULTISTABLE SYSTEMS

**ABSTRACT.** In this work, we study the synchronization states for a specific pair of mutually coupled multistable scroll systems. First, we determine conditions in the coupling scheme, to achieve partial or complete synchronization, under a uniform-coupling strength. Second, it is analyzed how the changes in the coupling strength modify the synchronous state. Our main results show that the nature of the coupling scheme determines the obtained synchronization type, while the coupling strength allows us to have various synchronized state attractors that differ from initial attractors. The analysis of the emergence of stable collective behavior is presented using Lyapunov functions of the different couplings and illustrated by numerical simulations. © 2022, The Author(s), under exclusive licence to EDP Sciences, Springer-Verlag GmbH Germany, part of Springer Nature.

Ruiz-Silva, A., Cassal-Quiroga, B. B., Huerta-Cuellar, G., & Gilardi-Velázquez, H. E. (2022). On the behavior of bidirectionally coupled multistable systems. *European Physical Journal: Special Topics*, 231(3), 369-379. doi: 10.1140/epjs/s11734-021-00406-4. Article.

## HÉCTOR EDUARDO GILARDI VELÁZQUEZ

SNI Nivel Candidato

### PREDICTING THE EMERGENCE OF MULTISTABILITY IN A MONOPARAMETRIC PWL SYSTEM

**ABSTRACT.** One of the main problems in the study of dynamical systems is to explore the asymptotic behavior of the model when a parameter varies continuously. When these variations lead to the appearance of coexisting states, the study of the global properties of the system becomes an even more complex task, since it is almost impossible to predict the stability change. In this paper, we present a simple method for characterizing qualitative changes in the dynamics of a family of Piece-Wise Linear (PWL) chaotic systems, that transit from monostable to multistable behavior by a single bifurcation parameter. By characterizing the magnitude of the stable and unstable manifolds associated with the eigendirections, it is possible to analytically find tipping points in the linear model that are consistent with the occurrence of coexisting states in the dynamics. The results show agreement between the bifurcation diagrams of the linear operator, the bifurcation diagrams of the PWL system, and the multistability phenomenon validation in analog electronics. The presented work makes it possible to know the mechanism by which the system exhibits the break of its stability and the corresponding basin of attraction. This introduces a new methodology for the analysis of dynamical systems in search of dynamical changes such as coexisting attractors. © 2022 World Scientific Publishing Company.

Echenausía-Monroy, J. L., Jafari, S., Huerta-Cuellar, G., & Gilardi-Velázquez, H. E. (2022). Predicting the Emergence of Multistability in a Monoparametric PWL System. *International Journal of Bifurcation and Chaos*, 32(14). doi: 10.1142/S0218127422502066. Article.

## CARLOS ALBERTO GONZÁLEZ PÉREZ

SNI Nivel I

### DETERMINATION OF MASS PROPERTIES IN FLOOR SLABS FROM THE DYNAMIC RESPONSE USING ARTIFICIAL NEURAL NETWORKS

**ABSTRACT.** Most of the research on accidental eccentricity is directed at both the evaluation of accidental eccentricity design code recommendations and the study of

building torsional response. In contrast, this paper addresses how the mass properties of each of the levels of a building could be determined from the dynamic response of a building. Using the dynamic response of buildings, this paper presents the application of multilayer feed forward artificial neural networks (ANNs) to determine the magnitude, the radial distance, and the polar moment of inertia of the mass for each level of reinforced concrete (RC) buildings. Analytical models were developed for three regular buildings. Live-load magnitude and mass position are considered as random variables. Seven load cases were generated for the 1, 2 and 4-story models using two excitations. As for the input parameters of the ANNs, three different choices of input data to the network were used. The developed ANN models are able to predict with adequate accuracy the radial position, magnitude, and polar moment of inertia of masses of each level. The implementation of this method based on ANNs would allow the monitoring, either permanently or temporarily, of changes in mass properties at each building floor slab. © 2022 by the authors.

González-Pérez C. A., & De-La-Colina, J. (2022). Determination of Mass Properties in Floor Slabs from the Dynamic Response Using Artificial Neural Networks. *Civil Engineering Journal*, 8(8), 1549-1564. doi: 10.28991/CEJ-2022-08-08-01. Article.

## CARLOS ALBERTO GONZÁLEZ PÉREZ

SNI Nivel I

### PROPOSAL TO COMPUTE HYDRODYNAMIC PRESSURES AND SLOSHING HEIGHTS IN GROUND-SUPPORTED RECTANGULAR TANKS SUBJECTED TO EARTHQUAKES

**ABSTRACT.** A proposal to estimate both the hydrodynamic pressures and the maximum wave height of liquids contained in rectangular tanks subjected to earthquake ground motions is presented. The computation procedure, based on the Rayleigh-Ritz method, assumes the fluid as a continuum and it does not use concentrated masses or springs. The solution is achieved by equating the seismic input energy of the system with the total kinetic energy of the fluid assuming liquid velocity fields. The resulting design formulas are simple and they are intended to simplify the seismic design of tanks. Numerical results lead to both the liquid maximum

sloshing height and hydrodynamic pressure distributions that are similar to those obtained with other simplified methods and those estimated with the finite element method. Preliminary estimations of shear forces and bending moments for a numerical example resulted 13% and 6% larger (respectively) than the corresponding values obtained with the finite element method. © 2022, Scipedia S.L. All rights reserved.

González-Pérez C. A., & De-La-Colina, J. (2022). Proposal to compute hydrodynamic pressures and sloshing heights in ground-supported rectangular tanks subjected to earthquakes. *Revista Internacional de Métodos Numéricos para Cálculo y Diseño en Ingeniería*, 38(3). doi: 10.23967/j.rimni.2022.07.001. Article.

## CARLOS DANIEL LAGUNA JUÁREZ

Profesor investigador

### AUGMENTED REALITY (AR) AS A COMMUNICATION TOOL IN SPACE OUTREACH: A CASE OF STUDY IN A MEXICAN CUBESAT MISSION

**ABSTRACT.** The new space ecosystem has allowed new actors to access space: from private companies to universities. Likewise, the development of emerging technologies, such as interactive virtual tools, has broadened the possibilities of bringing space science closer to massive audiences. This paper offers an example by presenting an analysis of how Augmented Reality (AR) has helped an undergraduate CubeSat project, "Colibri Mission", communicate technical content in a user-friendly and interactive way to its diverse stakeholders: sponsors, young students, and the general public. Colibri Mission's transmedia communication strategy, designed for generating public outreach, includes the implementation of an AR mobile app that enables the interaction with the CubeSat structure, and an AR brochure. Three surveys were performed inquiring on the impact of AR content in the accomplishment of the following objectives: the comprehension of what is a cubesat among the public, evaluating the effectiveness of using AR inside a pitch presentation and evaluating the impact of translating complex concepts into visual experiences among Colibri Mission's students. The insights provided aim to guide and give a valuable overview of AR's practical and affordable usage in space outreach, especially in a country with a nascent space industry like Mexico.

The topics reviewed in this paper include the relationship between AR and branding-transmedia storytelling of a project; the potential benefits of including AR in public relations and fundraising activities; the learning advantages of communicating small satellite concepts through AR; and the availability of resources for designing AR content. The implementation of AR content makes it easier for Mexican people to believe in a space project, as it offers them a close interactive experience and shows them visual evidence of what is being worked on. This virtual technology represents the opportunity to bring the public closer to space science from the proximity of their devices. Copyright © 2021 by the International Astronautical Federation (IAF). All rights reserved.

Mendoza-Rodríguez, M. I., Salazar-Salinas, G., Albert-Flamand, E. S., de Jesús Denetro-Fragoso, J., Vega-Hernández, J. M., Rodríguez-Martínez, D., Laguna, C., & Oviedo-Villasana, A. (2021). Augmented Reality (AR) as a communication tool in space outreach: a case of study in a Mexican CubeSat mission. IAF Space Education and Outreach Symposium 2021 at the 72nd International Astronautical Congress, IAC 2021, Dubai, United Arab Emirates, 25 October 2021 through 29 October 2021, Code 177597. *Proceedings of the International Astronautical Congress, IAC*, E1. Conference Paper.

## CARLOS DANIEL LAGUNA JUÁREZ

Profesor investigador

### HIRAM EREDÍN PONCE ESPINOSA

Investigador Titular D, SNI Nivel I

### CONTROL DESIGN FOR AN ELECTRICAL PROPULSION SYSTEM IN A DRAG-FREE CUBESAT

**ABSTRACT.** Drag-free satellites such as TRIAD I, Gravity Probe B, GOCE and LISA-Pathfinder have demonstrated the use of a freefloating test mass as a gravitational reference to the satellite's feedback control system. In drag-free motion, gravity is the only disturbing force and therefore the satellite is not affected by the nonconservative atmospheric drag which dissipates most of the orbital energy in satellites on a geodesic orbit. A drag-free 3U CubeSat equipped with Ionic-Electrospray Thrusters and an off-the-shelf Attitude Control and Determination System (ADCS) has been in development to make atmospheric measurements in a Low Earth Orbit. Ionic-Electrospray thrusters are emitter arrays featuring a highly dense concentration of porous glass

emitter tips from which ions are expelled with an applied voltage between two electrodes, controlled with current or voltage. A propulsion and an attitude control are required for countering the drag force at a micro-Newton scale as well as other internal disturbances. In this work, we first achieve an optimal propulsion control using linear quadratic regulation and then analyse the non-linear dynamics of the controlled satellite, determined from the test mass' motion. Changes in air density, environmental noise from the gravity gradient and aerodynamic torques, noise from the thruster arrays (from electrical current and alignment errors), and a pointing error from the ADCS are all considered in the design process. Finally, the propulsion control performance and power consumption have been traded off in radial-transverse coordinate system and Clohessy-Wiltshire-Hill formulation. © 2021 International Astronautical Federation, IAF. All rights reserved.

Núñez, J. P., Zavala, A., Rib, M. D. C., Blanco, F. D., Aparicio, J. P., Hernández, A., Laguna, C., Ponce, H., & Zárate, A. M. (2021). Control Design for an Electrical Propulsion System in a Drag-Free CubeSat. IAF Astrodynamics Symposium 2021 at the 72nd International Astronautical Congress, IAC 2021, Dubai, United Arab Emirates, 25 October 2021 through 29 October 2021, Code 177585. *Proceedings of the International Astronautical Congress, IAC, C1*. Conference Paper.

## CARLOS DANIEL LAGUNA JUÁREZ

Profesor investigador

## HÉCTOR EDUARDO GILARDI VELÁZQUEZ

SNi Nivel Candidato

### INTEGRATION OF QUALITY TOOLS TO DEFINE THE SCOPE OF A CUBESAT SCIENTIFIC/ TECHNOLOGY DEMONSTRATION MISSION

**ABSTRACT.** Tailoring requirements based on the expectations of stakeholders is a complex task for any space mission. The typical stakeholder expectation definition process relies heavily on the stakeholders' clear understanding of the necessity and impact of the potential design solution. Contrary to commercial missions, in which the customer has a better understanding of the requirements needed to satisfy their goals, in science and technology demonstration missions stakeholders only have a vague idea of the expected capabilities of the technology being developed. In fact, many of these missions are a pathfinder

for the expected performance of future missions. This issue leads to uncertainty in the design, difficulty in establishing precise requirements and, consequently to unsatisfied stakeholders and failed objectives in the end. In this paper a method to coincide stakeholders expectations with the development of a science and technology mission from an early stage is presented. The method consists of the creation of a task force focused on understanding the problem presented by the stakeholders at greater depth. Afterwards, this task force works with the systems engineering team in the following analyses. First, a quality function deployment has been developed to determine the importance of certain features and requirements in the design in regards to that problem. Also, a Pareto diagram has been created to focus the design effort into the issues that have greater significance to the stakeholders. The feedback from this task force has enabled the systems engineering team to assess the risks in a better informed way. These changes have helped the team to agillize the decision making process and added certainty about the direction of the design alignment so it can fulfill stakeholders' expectations. Moreover, it ensures that the mission has the maximum possible value for the stakeholder's objectives, due to the fact the task force's main objective is to study in greater depth the problem presented by them. This method has been tested within the development of a 3U Cubesat for the study of atmospheric density using electric propulsion designed and built by undergraduate students. The method proposed provides value in two of the most important aspects in spacecraft development: it ensures that the spacecraft is developed according to stakeholders' expectations and reduces the time consumed in the process of capturing these expectations by all the technical team, which can be significant when these are not absolutely clear. Copyright 2021 by Universidad Panamericana de Ciudad de México.

Zarate-Villazon, A. M., Espinosa, E., Savage-Briz, A., Sánchez-Henkel Moreno, J. P., Laguna-Juarez, C., & Velázquez, H. G. (2021). Integration of quality tools to define the scope of a Cubesat scientific/technology demonstration mission. IAF Space Systems Symposium 2021 at the 72nd International Astronautical Congress, IAC 2021, Dubai, United Arab Emirates, 25 October 2021 through 29 October 2021, Code 177591. *Proceedings of the International Astronautical Congress, IAC, D1*. Conference Paper.

## CÉSAR LERMA TIRADO

Profesor investigador

### EFFECT OF CONSOLIDATION ON THE RESILIENT RESPONSE OF SOFT SOILS IN MEXICO CITY

**ABSTRACT.** A methodology used to determine the resilient modulus of the foundation soil that comprises the area of lacustrine soils in Mexico City is presented, and the effect of a ground improvement procedure conducted using preload and prefabricated vertical drains is described. To achieve the objectives of the study, it was necessary to develop new criteria to determine the resilient modulus of such soft soil, which led to results with no precedent in the literature. © 2022 The Authors.

Ossa, A., Lerma, C., Flores, M., & Gaxiola, A. (2022). Effect of consolidation on the resilient response of soft soils in Mexico City. *Case Studies in Construction Materials*, 16. doi: 10.1016/j.cscm.2022.e00888. Article.

## JUAN CARLOS LÓPEZ PIMENTEL

Profesor investigador

### A CLOUD MICROSERVICES ARCHITECTURE FOR DATA INTEGRITY VERIFIABILITY BASED ON BLOCKCHAIN

**ABSTRACT.** The current digital age, mainly characterized by an economy based upon information technology, demands a data integrity service, even more so because organizations and companies are migrating their services over the cloud. This is not a simple task; it is cumbersome since traditional schemes in databases could be subject to modifications. However, it can be solved using blockchain technology. This paper provides a data integrity verifiability architecture for cloud systems based on blockchain. The architecture provides a mechanism to store events (as logs) within a blockchain platform from any cloud system. Users can then consult data integrity through a microservice, acting as an intermediate server that carries out a set of verification steps within the blockchain, which confirms the integrity of a previously stored log. Our architecture takes advantage of the blockchain strength concerning integrity, providing a traceability track of the stored logs. A prototype system and a case study were implemented based on the proposed architecture. Our experimental results show that the proposed decentralized

architecture can be adapted to cloud existing systems that were born without blockchain technology and require a modular and scalable audit characteristic. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

López-Pimentel, J. C., Morales-Rosales, L. A., & Algreto-Badillo, I. (2022). A Cloud Microservices Architecture for Data Integrity Verifiability Based on Blockchain. *Applied Sciences*, 12(5). doi: 10.3390/app12052754. Article.

## JUAN CARLOS LÓPEZ PIMENTEL

Profesor investigador

### AN SHA-3 HARDWARE ARCHITECTURE AGAINST FAILURES BASED ON HAMMING CODES AND TRIPLE MODULAR REDUNDANCY

**ABSTRACT.** Cryptography has become one of the vital disciplines for information technology such as IoT (Internet Of Things), IIoT (Industrial Internet Of Things), I4.0 (Industry 4.0), and automotive applications. Some fundamental characteristics required for these applications are confidentiality, authentication, integrity, and nonrepudiation, which can be achieved using hash functions. A cryptographic hash function that provides a higher level of security is SHA-3. However, in real and modern applications, hardware implementations based on FPGA for hash functions are prone to errors due to noise and radiation since a change in the state of a bit can trigger a completely different hash output than the expected one, due to the avalanche effect or diffusion, meaning that modifying a single bit changes most of the desired bits of the hash; thus, it is vital to detect and correct any error during the algorithm execution. Current hardware solutions mainly seek to detect errors but not correct them (e.g., using parity checking or scrambling). To the best of our knowledge, there are no solutions that detect and correct errors for SHA-3 hardware implementations. This article presents the design and a comparative analysis of four FPGA architectures: two without fault tolerance and two with fault tolerance, which employ Hamming Codes to detect and correct faults for SHA-3 using an Encoder and a Decoder at the step-mapping functions level. Results show that the two hardware architectures with fault tolerance can detect up to a maximum of 120 and 240 errors, respectively, for every run of KECCAK-p, which is consid-

ered the worst case. Additionally, the paper provides a comparative analysis of these architectures with other works in the literature in terms of experimental results such as frequency, resources, throughput, and efficiency. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

Torres-Alvarado, A., Morales-Rosales, L. A., Algreto-Badillo, I., López-Huerta, F., Lobato-Báez, M., & López-Pimentel, J. C. (2022). An SHA-3 Hardware Architecture against Failures Based on Hamming Codes and Triple Modular Redundancy. *Sensors*, 22(8). doi: 10.3390/s22082985. Article.

## JUAN CARLOS LÓPEZ PIMENTEL

Profesor investigador

### TRADE-OFF ANALYSIS OF HARDWARE ARCHITECTURES FOR CHANNEL-QUALITY CLASSIFICATION MODELS

**ABSTRACT.** The latest generation of communication networks, such as SDVN (Software-defined vehicular network) and VANETs (Vehicular ad-hoc networks), should evaluate their communication channels to adapt their behavior. The quality of the communication in data networks depends on the behavior of the transmission channel selected to send the information. Transmission channels can be affected by diverse problems ranging from physical phenomena (e.g., weather, cosmic rays) to interference or faults inherent to data spectra. In particular, if the channel has a good transmission quality, we might maximize the bandwidth use. Otherwise, although fault-tolerant schemes degrade the transmission speed by solving errors or failures should be included, these schemes spend more energy and are slower due to requesting lost packets (recovery). In this sense, one of the open problems in communications is how to design and implement an efficient and low-power-consumption mechanism capable of sensing the quality of the channel and automatically making the adjustments to select the channel over which transmit. In this work, we present a trade-off analysis based on hardware implementation to identify if a channel has a low or high quality, implementing four machine learning algorithms: Decision Trees, Multi-Layer Perceptron, Logistic Regression, and Support Vector Machines. We obtained the best trade-off with an accuracy of 95.01% and efficiency of 9.83 Mbps/LUT(LookUp Table) with a hardware implementation of a Decision Tree

algorithm with a depth of five. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

Torres-Alvarado, A., Morales-Rosales, L. A., Algreto-Badillo, I., López-Huerta, F., Lobato-Báez, M., & López-Pimentel, J. C. (2022). Trade-Off Analysis of Hardware Architectures for Channel-Quality Classification Models. *Sensors*, 22(7). doi: 10.3390/s22072497. Article.

## OCTAVIO LOZADA FLORES

Profesor investigador

### CRYSTALLIZATION KINETICS OF HYPO, HYPER AND EUTECTIC NI-NB GLASSY ALLOYS

**ABSTRACT.** This study presents the thermal and kinetic behavior of Ni58.5 Nb41.5, Ni59.5 Nb40.5, and Ni60.5 Nb39.5 binary glassy alloys. The alloys ingots were obtained through an electric arc furnace and the ribbons using the melt-spinning technique at two different wheel speeds, 8 and 25 m/s. The non-isothermal study was carried out by means of Differential Scanning Calorimetry (DSC) at five different heating rates: 12.5, 15, 17.5, 20, and 22.5 K/min. X-ray Diffraction (XRD) analysis showed a fully glassy phase for all ribbons for all compositions. For both wheel speeds, the ribbons with higher Nb content were significantly thinner than those with less content. The activation energies were calculated from the Kissinger method, showing the tendency  $E_{p1} > E_{x1} > E_g$ , where  $E_{p1}$ ,  $E_x$  and  $E_g$  denote the activation energies of first peak temperature, the first crystallization onset and glass transition, respectively. The Flynn-Wall-Ozawa model displayed a close correlation with heating rates, ribbon thicknesses, and composition. The Nb content enhanced the glassy stability since the activation energy required for crystallization increased at higher Nb concentrations. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

Mendoza, L. E., Hernández, J. M., González, J. G., Orgaz, E., Lozada, O., & Figueroa, I. A. (2022). Crystallization Kinetics of Hypo, Hyper and Eutectic Ni-Nb Glassy Alloys. *Metals*, 12(5). doi: 10.3390/met12050808. Article.

## FÉLIX ORLANDO MARTÍNEZ RÍOS

Investigador Titular C, SNI Nivel I

### A NEW PROTOCOL BASED ON BLOCKCHAIN TECHNOLOGY FOR TRANSPARENT OPERATION OF CORPORATE SOCIAL RESPONSIBILITY

**ABSTRACT.** This chapter proposes a protocol based on blockchain technology applied to



corporate social responsibility (CSR). The first part discusses the characteristics associated with CSR actions and the main difficulties its development faces, such as transparency, security, fault tolerance, among others. Subsequently, the authors describe the characteristics and concepts related to blockchain-based developments to later describe our framework for the control and development of CSR actions based on blockchain. Herein, the authors also describe how to publicly and privately identify the participating elements of CSR and the operations and resources necessary for the implementation and operation of the proposed protocol. © 2020 Emerald Publishing Limited.

Martínez-Ríos, F. O., Marmolejo-Saucedo, J. A., & Abascal-Olascoaga, G. (2020). A New Protocol Based on Blockchain Technology for Transparent Operation of Corporate Social Responsibility. In García-Álvarez, S. & Atristain-Suárez, C. (Eds.), *Strategy, Power and CSR: Practices and Challenges in Organizational Management* (pp. 205-233). Emerald Publishing. doi: 10.1108/978-1-83867-973-620201012. Book Chapter.

## FÉLIX ORLANDO MARTÍNEZ RÍOS

Investigador Titular C, SNI Nivel I

### A NOVEL NETWORK SCIENCE AND SIMILARITY-SEARCHING-BASED APPROACH FOR DISCOVERING POTENTIAL TUMOR-HOMING PEPTIDES FROM ANTIMICROBIALS

**ABSTRACT.** Peptide-based drugs are promising anticancer candidates due to their biocompatibility and low toxicity. In particular, tumor-homing peptides (THPs) have the ability to bind specifically to cancer cell receptors and tumor vasculature. Despite their potential to develop antitumor drugs, there are few available prediction tools to assist the discovery of new THPs. Two web-servers based on machine learning models are currently active, the TumorHPD and the THPep, and more recently the SCMTHP. Herein, a novel method based on network science and similarity searching implemented in the starPep toolbox is presented for THP discovery. The approach leverages from exploring the structural space of THPs with Chemical Space Networks (CSNs) and from applying centrality measures to identify the most relevant and non-redundant THP sequences within the CSN. Such THPs were considered as queries (Qs) for multi-query similarity searches that apply a group fusion (MAXSIM rule) model. The resulting

multi-query similarity searching models (SSMs) were validated with three benchmarking datasets of THPs/non-THPs. The predictions achieved accuracies that ranged from 92.64 to 99.18% and Matthews Correlation Coefficients between 0.894–0.98, outperforming state-of-the-art predictors. The best model was applied to repurpose AMPs from the starPep database as THPs, which were subsequently optimized for the TH activity. Finally, 54 promising THP leads were discovered, and their sequences were analyzed to encounter novel motifs. These results demonstrate the potential of CSNs and multi-query similarity searching for the rapid and accurate identification of THPs. © 2022 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

Romero, M., Marrero-Ponce, Y., Rodríguez, H., Agüero-Chapin, G., Antunes, A., Aguilera-Mendoza, L., & Martínez-Ríos, F. (2022). A Novel Network Science and Similarity-Searching-Based Approach for Discovering Potential Tumor-Homing Peptides from Antimicrobials. *Antibiotics*, 11(3). doi: 10.3390/antibiotics11030401. Article.

## FÉLIX ORLANDO MARTÍNEZ RÍOS

Investigador Titular C, SNI Nivel I

### HANDCRAFTED VERSUS NON-HANDCRAFTED (SELF-SUPERVISED) FEATURES FOR THE CLASSIFICATION OF ANTIMICROBIAL PEPTIDES: COMPLEMENTARY OR REDUNDANT?

**ABSTRACT.** Antimicrobial peptides (AMPs) have received a great deal of attention given their potential to become a plausible option to fight multi-drug resistant bacteria as well as other pathogens. Quantitative sequence-activity models (QSAMs) have been helpful to discover new AMPs because they allow to explore a large universe of peptide sequences and help reduce the number of wet lab experiments. A main aspect in the building of QSAMs based on shallow learning is to determine an optimal set of protein descriptors (features) required to discriminate between sequences with different antimicrobial activities. These features are generally handcrafted from peptide sequence datasets that are labeled with specific antimicrobial activities. However, recent developments have shown that unsupervised

approaches can be used to determine features that outperform human-engineered (handcrafted) features. Thus, knowing which of these two approaches contribute to a better classification of AMPs, it is a fundamental question in order to design more accurate models. Here, we present a systematic and rigorous study to compare both types of features. Experimental outcomes show that non-handcrafted features lead to achieve better performances than handcrafted features. However, the experiments also prove that an improvement in performance is achieved when both types of features are merged. A relevance analysis reveals that non-handcrafted features have higher information content than handcrafted features, while an interaction-based importance analysis reveals that handcrafted features are more important. These findings suggest that there is complementarity between both types of features. Comparisons regarding state-of-the-art deep models show that shallow models yield better performances both when fed with non-handcrafted features alone and when fed with non-handcrafted and handcrafted features together. © The Author(s) 2022. Published by Oxford University Press. All rights reserved. For Permissions, please email: [journals.permissions@oup.com](mailto:journals.permissions@oup.com).

García-Jacas, C. R., García-González, L. A., Martínez-Ríos, F., Tapia-Contreras, I. P., & Brizuela, C. A. (2022). Handcrafted versus non-handcrafted (self-supervised) features for the classification of antimicrobial peptides: complementary or redundant? *Briefings in bioinformatics*, 23(6). doi: 10.1093/bib/bbac428. Article.

## MARÍA DE LOURDES MARTÍNEZ VILLASEÑOR

SNI Nivel I

### HIRAM EREDÍN PONCE ESPINOSA

Investigador Titular D, SNI Nivel I

### ANTONIETA TEODORA MARTÍNEZ VELASCO

Profesora investigadora

### AN EXPLAINABLE TOOL TO SUPPORT AGE-RELATED MACULAR DEGENERATION DIAGNOSIS

**ABSTRACT.** Artificial intelligence and deep learning, in particular, have gained large attention in the ophthalmology community due to the possibility of processing large amounts of data and digitized ocular images. Intelligent systems are developed to support the diagnosis and treatment of a number



of ophthalmic diseases such as age-related macular degeneration (AMD), glaucoma and retinopathy of prematurity. Hence, explainability is necessary to gain trust and therefore the adoption of these critical decision support systems. Visual explanations have been proposed for AMD diagnosis only when optical coherence tomography (OCT) images are used, but interpretability using other inputs (i.e. data point-based features) for AMD diagnosis is rather limited. In this paper, we propose a practical tool to support AMD diagnosis based on Artificial Hydrocarbon Networks (AHN) with different kinds of input data such as demographic characteristics, features known as risk factors for AMD, and genetic variants obtained from DNA genotyping. The proposed explainer, namely eXplainable Artificial Hydrocarbon Networks (XAHN) is able to get global and local interpretations of the AHN model. An explainability assessment of the XAHN explainer was applied to clinicians for getting feedback from the tool. We consider the XAHN explainer tool will be beneficial to support expert clinicians in AMD diagnosis, especially where input data are not visual. © 2022 IEEE.

Martinez-Villasenor, L., Ponce, H., Martinez-Velasco, A., & Miralles-Pechuan, L. (2022). An Explainable Tool to Support Age-related Macular Degeneration Diagnosis. 2022 International Joint Conference on Neural Networks, IJCNN 2022, Padua, Italy, 18 July 2022 through 23 July 2022, Category number CFP22IJS-ART, Code 183333. *Proceedings of the International Astronautical Congress, IAC, 2022*. doi: 10.1109/IJCNN55064.2022.9892895. Conference Paper.

## ABRAHAM MENDOZA ANDRADE

Investigador Titular D, SNI Nivel I

### A MULTI-PRODUCT DYNAMIC SUPPLY CHAIN INVENTORY MODEL WITH SUPPLIER SELECTION, JOINT REPLENISHMENT, AND TRANSPORTATION COST

**ABSTRACT.** The aim of this paper is to solve a multi-period supplier selection and inventory lot-sizing problem with multiple products in a serial supply chain. Compared to previous models proposed in the literature, our research incorporates a richer cost structure involving joint replenishment costs for raw material replenishment and production, and a more realistic description of the transportation costs represented as a vector of full-truck load costs for different

size trucks. This problem can be displayed graphically as a time-expanded transshipment network defined by nodes and arcs that can be reached by feasible material flows. First, we propose an integrated mixed integer linear programming model that minimizes the cost over the entire supply chain for a given planning horizon. The model determines the optimal dynamic supplier selection, inventory lot-sizing, and production schedule simultaneously. Second, a sequential approach is proposed to solve the same problem. That is, a production schedule is determined first, and then a supplier selection and replenishment strategy is obtained according to that predetermined schedule. Sensitivity analysis comparing the two approaches is performed. Results show that, even though the integrated approach achieves the minimum cost, the sequential approach may be suitable for solving large-scale instances of the problem as it requires less information sharing and generates a near-optimal solution with shorter implementation time and computational effort. © 2022, The Author(s), under exclusive licence to Springer Science+Business Media, LLC, part of Springer Nature.

Ventura, J. A., Golany, B., Mendoza, A., & Li, C. (2022). A multi-product dynamic supply chain inventory model with supplier selection, joint replenishment, and transportation cost. *Annals of Operations Research*, 316(2), 729-762. doi: 10.1007/s10479-021-04508-z. Article.

## ABRAHAM MENDOZA ANDRADE

Investigador Titular D, SNI Nivel I

### AN APPLICATION OF INTERACTIVE FUZZY OPTIMIZATION MODEL FOR REDESIGNING SUPPLY CHAIN FOR RESILIENCE

**ABSTRACT.** Supply chain disruptions compel professionals all over the world to consider alternate strategies for addressing these issues and remaining profitable in the future. In this study, we considered a four-stage global supply chain and designed the network with the objectives of maximizing profit and minimizing disruption risk. We quantified and modeled disruption risk as a function of the geographic diversification of facilities called supply density (evaluated based on the interstage distance between nodes) to mitigate the risk caused by disruptions. Furthermore, we developed

a bi-criteria mixed-integer linear programming model for designing the supply chain in order to maximize profit and supply density. We propose an interactive fuzzy optimization algorithm that generates efficient frontiers by systematically taking decision-maker inputs and solves the bi-criteria model problem in the context of a realistic example. We also conducted disruption analysis using a discrete set of disruption scenarios to determine the advantages of the network design from the bi-criteria model over the traditional profit maximization model. Our study demonstrates that the network design from the bi-criteria model has a 2% higher expected profit and a 2.2% lower profit variance under disruption solution. We envisage that this model will help firms evaluate the trade-offs between mitigation benefits and mitigation costs. © 2022, The Author(s).

Kungwalsong, K., Mendoza, A., Kamath, V., Pazhani, S., & Marmolejo-Saucedo, J. A. (2022). An application of interactive fuzzy optimization model for redesigning supply chain for resilience. *Annals of Operations Research*, 315(2), 1803-1839. doi: 10.1007/s10479-022-04542-5. Article.

## ABRAHAM MENDOZA ANDRADE

Investigador Titular D, SNI Nivel I

### COORDINATION OF PRICING AND INVENTORY REPLENISHMENT DECISIONS IN A SUPPLY CHAIN WITH MULTIPLE GEOGRAPHICALLY DISPERSED RETAILERS

**ABSTRACT.** We study the efficiency of a multi-stage supply chain controlled by a single decision-maker with the goal of maximizing the total profit per time unit for a single product by coordinating the purchasing of raw materials from an external supplier, manufacturing and shipping the product between consecutive stages, and determining the selling price and final demand for the product sold by multiple retailers. Retailers are geographically dispersed, control their own market areas, and differ in terms of operating costs and marketing strategies. Each retailer has a different price-sensitive demand function. In this study, we propose a mixed integer nonlinear programming model that maximizes the total profit per time unit, which includes the revenue of the final

product, echelon holding costs, and fixed costs for ordering and shipping items at each stage and at each retailer location. Using a numerical example, we show that the model with varying selling prices at the retailers yields higher profits than the model with the same selling price across all the retailers. We also perform an analysis comparing the coordinated approach versus the sequential approach for pricing and inventory replenishment decisions by varying the market size and demand function parameters. The results show that, as the market size parameter decreases, the coordinated approach yields a higher profit than the sequential approach does. Additionally, given a constant market size setting, the results show that pricing and inventory replenishment decisions are very sensitive to the demand function parameters. The analysis also shows that the coordinated approach yields an average profit gain of 24.18% compared to the profit of 3.53% yielded by the sequential approach. Similarly, it is shown that the coordinated approach always yields a better profit than the sequential approach across all scenarios generated by varying the demand parameters. Moreover, we propose a Simulated Annealing (SA) algorithm to obtain near-optimal solutions in a timely manner. A computational comparison shows that the average solution reached by the proposed SA algorithm is at 0.04% from the optimal solution. © 2022 Elsevier B.V.

Adeinat, H., Pazhani, S., Mendoza, A., & Ventura, J. A. (2022). Coordination of pricing and inventory replenishment decisions in a supply chain with multiple geographically dispersed retailers. *International Journal of Production Economics*, 248. doi: 10.1016/j.ijpe.2022.108461. Article.

## ORLANDO MONTAÑA MÁRQUEZ

Profesor investigador

### THERMAL PERFORMANCE OF A LOW AND MEDIUM TEMPERATURE FLAT PLATE SOLAR COLLECTOR WHEN CONTROLLING THE OUTPUT-INPUT TEMPERATURE DIFFERENCE AND THE TILT ANGLE

**ABSTRACT.** This work presents a sensitivity analysis of the overall heat loss coefficient UL and the thermal efficiency  $\eta$  in low and medium temperature encapsulated flat plate solar collectors when controlling the output-input temperature difference  $\Delta T$  and the angle of inclination  $\beta$ . The UL and  $\eta$

were determined by heat flow calorimetry at indoor conditions, emulating the solar radiation by the Joule effect and a PID control. The angle of inclination  $\beta$  range was 0-90 deg, and the  $\Delta T$  range was 5.0-25.0 K. The ambient temperature and the mass flowrate were preset for each test. The UL experimental uncertainty was  $\pm 0.85$  W/m<sup>2</sup>K for the inclination range of 0-45 deg and  $\pm 0.27$  W/m<sup>2</sup>K for the inclination range of 45-90 deg. The results matched previous outcomes with a difference of up to 0.3 W/m<sup>2</sup>K. The UL exponentially increased with  $\beta$  from horizontal to vertical position and linearly with  $\Delta T$ . The UL and the efficiency were sensitive to the confined air-flow variations. The efficiency increased 140% when  $\beta$  was raised and 40% with  $\Delta T$ . Copyright © 2021 by ASME.

García-Rincón, M. A., Flores-Prieto, J. J., & Montoya-Márquez, O. (2022). Thermal Performance of a Low and Medium Temperature Flat Plate Solar Collector When Controlling the Output-Input Temperature Difference and the Tilt Angle. *Journal of Solar Energy Engineering, Transactions of the ASME*, 144(2). doi: 10.1115/1.4053177. Article.

## ERNESTO MOYA ALBOR

Investigador Titular D, SNI Nivel I

### HIRAM EREDÍN PONCE ESPINOSA

Investigador Titular D, SNI Nivel I

### JORGE EDUARDO BRIEVA RICO

Investigador Titular D, SNI Nivel I

### AUTOMATIC CLASSIFICATION OF CORONARY STENOSIS USING CONVOLUTIONAL NEURAL NETWORKS AND SIMULATED ANNEALING

**ABSTRACT.** Automatic detection of coronary stenosis plays an essential role in systems that perform computer-aided diagnosis in cardiology. Coronary stenosis is a narrowing of the coronary arteries caused by plaque that reduces the blood flow to the heart. Automatic classification of coronary stenosis images has been recently addressed using deep and machine learning techniques. Generally, the machine learning methods form a bank of empirical and automatic features from the angiographic images. In the present work, a novel method for the automatic classification of coronary stenosis X-ray images is presented. The method is based on convolutional neural networks, where the neural architecture search is performed by using the path-based metaheuristics of simulated annealing. To perform the

neural architecture search, the maximization of the F1-score metric is used as the fitness function. The automatically generated convolutional neural network was compared with three deep learning methods in terms of the accuracy and F1-score metrics using a testing set of images obtaining 0.88 and 0.89, respectively. In addition, the proposed method was evaluated with different sets of coronary stenosis images obtained via data augmentation. The results involving a number of different instances have shown that the proposed architecture is robust preserving the efficiency with different datasets © 2023 Şaban öztürk. All rights reserved.

Rendon-Aguilar, L. D., Cruz-Aceves, I., Fernandez-Jaramillo, A. A., Moya-Albor, E., Brieva, J., & Ponce H. (2022). Automatic classification of coronary stenosis using convolutional neural networks and simulated annealing. In Ozturk, S. (Ed.), *Convolutional Neural Networks for Medical Image Processing Applications* (pp. 227-247). CRC Press. doi: 10.1108/978-1-83867-973-620201012. Book Chapter.

## ERNESTO MOYA ALBOR

Investigador Titular D, SNI Nivel I

### HIRAM EREDÍN PONCE ESPINOSA

Investigador Titular D, SNI Nivel I

### JORGE EDUARDO BRIEVA RICO

Investigador Titular D, SNI Nivel I

### OPTICAL FLOW-HERMITE AND FUZZY Q-LEARNING BASED ROBOTIC NAVIGATION APPROACH

**ABSTRACT.** The present paper presents a bio-inspired optical flow approach to autonomous robotics navigation. It uses a Fuzzy Q-Learning (FQL) method to take decisions in an unknown environment through a reinforcement signal. The proposed method was implemented in a virtual robotics system using the V-REP software and in communication con MATLAB. The preliminary results show that the robot was able to navigate successfully in unknown environments. © 2021 IEEE.

Moya-Albor, E., Brieva, J., Ponce, H., & Gomez-Coronel, S. L. (2021). Optical Flow-Hermite and Fuzzy Q-Learning Based Robotic Navigation Approach. 2021 International Conference on Mechatronics, Electronics and Automotive Engineering, ICMEAE 2021, Virtual, Online, Mexico, 22 November 2021 through 26 November 2021, Category number CFP2190W-ART, Code 183273. *Proceedings-2021 International Conference on Mechatronics, Electronics and Automotive Engineering, ICMEAE 2021*, 26-31. doi: 10.1109/ICMEAE55138.2021.00012. Conference Paper.

## ERNESTO MOYA ALBOR

Investigador Titular D, SNI Nivel I

## HIRAM EREDÍN PONCE ESPINOSA

Investigador Titular D, SNI Nivel I

## JORGE EDUARDO BRIEVA RICO

Investigador Titular D, SNI Nivel I

### RADAMA: DESIGN OF AN INTELLIGENT WASTE SEPARATOR WITH THE COMBINATION OF DIFFERENT SENSORS

**ABSTRACT.** Nowadays, trash generation is a real problem. It is expected that high-income countries will experience waste generation growth in the future. A forecast shows that by 2050 there will be an exponential increase of close to 3.4 billion tonnes per year. Therefore, it is urgent to reduce the levels of garbage that are produced in the world. A possible solution is to develop recycling systems in all the big cities. In this regard, we propose a mechatronic system to separate solid wastes into four categories. To determine the category to which the inorganic waste belongs, we used a combination of four different sensors: inductive, capacitive, infrared, and ultrasonic sensors. To evaluate the efficiency of this proposal, we carried out tests that showed the individual conduct of every component and the total efficiency of the device, obtaining at least 75 percent in overall efficiency. © 2021 IEEE.

Vega, R. A. D., De La Sema, M. D. H., Herz, D. M., Martinon, D. J., Gomory, M. D. L. M., Martinez, A. G. P., Moya-Albor, E., Ponce, H., & Brieve, J. (2021). RADAMA: Design of an Intelligent Waste Separator with the Combination of Different Sensors. 2021 International Conference on Mechatronics, Electronics and Automotive Engineering, ICMEAE 2021, Virtual, Online, Mexico, 22 November 2021 through 26 November 2021, Category number CFP2190W-ART, Code 183273. *Proceedings-2021 International Conference on Mechatronics, Electronics and Automotive Engineering, ICMEAE 2021*, 208-213. doi: 10.1109/ICMEAE55138.2021.00012. Conference Paper.

## ERNESTO MOYA ALBOR

Investigador Titular D, SNI Nivel I

## JORGE EDUARDO BRIEVA RICO

Investigador Titular D, SNI Nivel I

### SECURE MEDICAL IMAGE ENCRYPTION APPROACH BASED ON LANGTON'S ANT AND JIGSAW TRANSFORM

**ABSTRACT.** In this work, we propose a medical image encryption method. It is based on the Jigsaw transform, cyclic permutations,

and a deterministic noise approach to hide visual information in the images. On the other hand, Langton's ant is used to encrypt the images. The method proposed was tested on fundus retinal photographs. The robustness of our algorithm has been proven through several testing, such as statistical analysis (histograms and correlation distributions), visual testing, entropy testing, and key-space assessment, showing in each one a high-security level. © 2021 SPIE.

Moya-Albor, E., Romero-Arellano, A., Brieve, J., Cruz-Aceves, I., Avina-Cervantes, J. G., Hernandez-Gonzalez, M. A., & Lopez-Montero, L. M. (2021). Secure Medical Image Encryption Approach Based on Langton's Ant and Jigsaw Transform. 17th International Symposium on Medical Information Processing and Analysis, Campinas, Brazil, 17 November 2021 through 19 November 2021, Code 176104. *Proceedings of SPIE-The International Society for Optical Engineering*, 12088. doi: 10.1117/12.2606294. Conference Paper.

## ISABEL JOAQUÍNA NIEMBRO GARCÍA

Profesora investigadora

### LIFE CYCLE COST AND LIFE CYCLE ASSESSMENT: AN APPROXIMATION TO UNDERSTAND THE REAL IMPACTS OF THE ELECTRICITY SUPPLY INDUSTRY

**ABSTRACT.** The real cost that consumers should pay for the use of electrical energy could be estimated using a life cycle approach (LCT). This approach is about visualizing not the traditional focus on the production site and manufacturing processes but the focus on environmental, social, and economic impacts of goods or services over its entire life cycle. The LCT is really a new thought form on which tools such as the life cycle assessment (LCA) and the life cycle cost (LCC) are based. The LCA applied to the Electricity Supply Industry includes the study of each and every one of the steps from the production and extraction of raw materials, processing, transportation, storage, distribution, and use. Each of these can have an impact on different dimensions: environmental, economic, and social. On the other hand, the LCC considers together the analysis of all the costs and the environmental repercussions throughout its life cycle. The costs of a product throughout its life cycle can be easily visible (direct costs of production) or they can have less visibility (indirect costs for the manufacturer, or costs for society). Electric power is a commodity; since it cannot differentiate, its

profit margin is small. Some of its characteristics are (1) large variations in demand, so that the generation and transmission capacity necessary to guarantee the peak is not used at other times. This also implies variation in its price. (2) The demand must be solved almost instantaneously and there are limitations for its storage. (3) In order to lower the cost, a diversified portfolio is required. Electricity is a single, basic good, for which a balance between supply and demand must be guaranteed at all times. The grid operator decides which and for what time the generating plants must generate electricity in order to achieve a balance between supply and demand. Electricity rates or prices depend on several factors: quantity demanded, technology used in its generation, the capacity of the transmission and distribution lines, the location of the generating sources, and the fuels. In addition, similar to many other products, environmental costs are not considered. Different approaches are used to calculate supply and demand: cost recovery, long-term marginal cost, price dynamics, etc. In this chapter, different approaches to the supply and demand calculation problem are proposed and analyzed, and the perspective of LCT, LCA, and LCC is included. © 2022 Elsevier Inc. All rights reserved.

Niembro-García, J., Marmolejo-Saucedo, J. A., & Alfaro-Martínez, P. (2022). Life cycle cost and life cycle assessment: an approximation to understand the real impacts of the Electricity Supply Industry. In Vasant, P., Thomas, J., Munapo, E., & Weber, G. (Eds.), *Advances of Artificial Intelligence in a Green Energy Environment* (pp. 83-110). Academic Press. doi: 10.1016/B978-0-323-89785-3.00017-7. Book Chapter.

## SAMUEL MOISÉS NUCAMENDI GUILLÉN

Investigador Titular D, SNI Nivel I

### A MIXED INTEGER FORMULATION AND AN EFFICIENT METAHEURISTIC FOR THE UNRELATED PARALLEL MACHINE SCHEDULING PROBLEM: TOTAL TARDINESS MINIMIZATION

**ABSTRACT.** In this paper, the unrelated parallel machine scheduling problem with the objective of minimizing the total tardiness is addressed. For such a problem, a mixed-integer linear programming (MILP) formulation, that considers assignment and positional variables, is presented. In addition, an iterated local search (ILS) algorithm that produces high-quality

solutions in reasonable times is proposed for large size instances. The ILS robustness was determined by comparing its performance with the results provided by the MILP. The instances used in this paper were constructed under a new approach which results in tighter due dates than the previous generation method for this problem. The proposed MILP formulation was able to solve instances of up to 150 jobs and 20 machines. Regarding the ILS, it yielded high-quality solutions in a reasonable time, solving instances of a size up to 400 jobs and 20 machines. Experimental results confirm that both approaches are efficient and promising. © 2022 The Author(s).

G. de-Alba, H., Nucamendi-Guillén, S., & Avalos-Rosales, O. (2022). A mixed integer formulation and an efficient metaheuristic for the unrelated parallel machine scheduling problem: Total tardiness minimization. *EURO Journal on Computational Optimization*, 10. doi: 10.1016/j.ejco.2022.100034. Article.

## SAMUEL MOISÉS NUCAMENDI GUILLÉN

Investigador Titular D, SNI Nivel I

## ALEJANDRO RODRÍGUEZ MAGAÑA

Investigador Titular A, SNI Nivel I

### AN IMPROVED LINMAP FOR MULTICRITERIA DECISION: DESIGNING CUSTOMIZED INCENTIVE PORTFOLIOS IN AN ORGANIZATION

**ABSTRACT.** This study proposes three new versions of the well-known linear programming technique for multidimensional preference analysis (LINMAP). LINMAP addresses the multi-criteria decision problem by analyzing individual differences in preferences in relation to a set of prespecified incentives in multidimensional attribute space. The proposed models satisfy the decision-maker's specific needs, such as determining a fixed number of incentives to be active or assigning a minimum/maximum weight for the active incentives. The performance of the developed models is assessed using information from a case study in which a decision-maker desires to determine an optimal portfolio of incentives based on the preferences of individuals surveyed. Experimental results confirm that the proposed models could obtain solutions according to the decision-maker's needs, yielding a better selection of incentives to activate and their corresponding distribution of the weights

than those of the original LINMAP model. Moreover, the consistency of the proposed models is evaluated by performing a sensitivity analysis over database variations of the case study and comparing the outcomes with the results provided in the original case study. Overall, this work is promising when creating a design portfolio, considering individuals' different preferences. © 2022, The Author(s).

Rubiano-Moreno, J., Nucamendi-Guillén, S., Cordero-Franco, A., & Rodríguez-Magaña, A. (2022). An improved LINMAP for multicriteria decision: designing customized incentive portfolios in an organization. *Operational Research*, 22(4), 3489-3520. doi: 10.1007/s12351-022-00698-x. Article.

## SAMUEL MOISÉS NUCAMENDI GUILLÉN

Investigador Titular D, SNI Nivel I

### NEW FORMULATIONS AND SOLUTION APPROACHES FOR THE LATENCY LOCATION ROUTING PROBLEM

**ABSTRACT.** The Latency Location Routing Problem (LLRP) belongs to a relatively new branch of routing problems, where latency, defined as the sum of the arrival times at customers, is the objective function to be minimized. Introduced by Moshref-Javadi and Lee (2016), this problem optimizes the location of depots, the vehicles allocation to open depots, the customers' assignment to vehicles and the routing strategy in a customer-oriented framework. In this paper, we address the problem from a modeling and computational viewpoint. From a modeling point of view, we propose two new mixed-integer formulations and introduce a general variant of the problem, which considers the presence of opening costs associated to the depots. Under this assumption, the optimal selection of suitable locations for depots is driven not only by the total latency but also by fixed costs related, for instance, to the construction/renting cost of depots. From a methodological standpoint, we propose different exact solution methods and a metaheuristic algorithm able to obtain near-optimal solutions for both variants, with and without opening costs. Extensive numerical experiments validate the effectiveness of the proposed models and the efficiency of the solution approaches. As a byproduct of the research, by slightly adapting our models, we obtained an effective mathematical for-

mulation for the multi-depot cumulative capacitated vehicle routing problem, which outperformed the state-of-the-art model, providing new optimal solutions in the benchmark dataset. © 2022 Elsevier Ltd.

Nucamendi-Guillén, S., Martínez-Salazar, I., Khodaparasti, S., & Bruni, M. E. (2022). New formulations and solution approaches for the latency location routing problem. *Computers and Operations Research*, 143. doi: 10.1016/j.cor.2022.105767. Article.

## SAMUEL MOISÉS NUCAMENDI GUILLÉN

Investigador Titular D, SNI Nivel I

### OPEN VEHICLE ROUTING PROBLEM WITH SPLIT DELIVERIES: MATHEMATICAL FORMULATIONS AND A CUTTING-PLANE METHOD

**ABSTRACT.** This study addresses the open vehicle routing problem with split deliveries, a variant of the classical vehicle routing problem that allows open routes and partitioned deliveries for customers (i.e., multiple vehicles may serve one customer). This approach may be beneficial for companies interested in reducing their logistics and distribution costs. This study is motivated by a company in the pharmaceutical industry, that seeks to explore the possibility of splitting their deliveries to improve quality indicators related to on-time deliveries and customer satisfaction. Two mixed-integer formulations of the problem are proposed. Additionally, a cutting-plane method is designed to improve the optimization performance. Computational experiments were conducted to validate the performance of the formulations. The second formulation effectiveness was confirmed by providing optimal solutions for instances of up to 30 nodes in a reasonable computational time. The incorporation of the cutting-plane method improves performance with a substantial reduction in the GAP. In the case study, this new approach shows its effectiveness in economic terms by providing savings of up to 20% of the current distribution costs. © 2020, Springer-Verlag GmbH Germany, part of Springer Nature.

Ruiz y Ruiz, E., García-Calvillo, I., & Nucamendi-Guillén, S. (2022). Open vehicle routing problem with split deliveries: mathematical formulations and a cutting-plane method. *Operational Research*, 22(2), 1017-1037. doi: 10.1016/j.cor.2022.105767. Article.



## SAMUEL MOISÉS NUCAMENDI GUILLÉN

Investigador Titular D, SNI Nivel I

### THE MULTI-DEPOT K-TRAVELING REPAIRMAN PROBLEM

**ABSTRACT.** In this paper, we study the multi-depot k-traveling repairman problem. This problem extends the traditional traveling repairman problem to the multi-depot case. Its objective, similar to the single depot variant, is the minimization of the sum of the arrival times to customers. We propose two distinct formulations to model the problem, obtained on layered graphs. In order to find feasible solutions for the largest instances, we propose a hybrid genetic algorithm where initial solutions are built using a splitting heuristic and a local search is embedded into the genetic algorithm. The efficiency of the mathematical formulations and of the solution approach are investigated through computational experiments. The proposed models are scalable enough to solve instances up to 240 customers. © 2022, The Author(s).

Bruni, M. E., Khodaparasti, S., Martínez-Salazar, I., & Nucamendi-Guillén, S. (2022). The multi-depot k-traveling repairman problem. *Optimization Letters*, 16(9), 2681-2709. doi: 10.1007/s11590-021-01845-7. Article.

## ELÍAS OLIVARES BENÍTEZ

Investigador Titular D, SNI Nivel I

### AN ANALYSIS AND DESIGN FOR THE REPAIR PROCESS OF LATE SHOW SHIPMENTS IN THE EXPORT CARGO PROCESS AT SPL HUB

**ABSTRACT.** Export shipments arriving late at the freight building of KLM Cargo at Schiphol Airport is a trigger to deviations in the standard acceptance process. These Late Shows are currently handled ad-hoc making it difficult to plan and predict these events. By conducting a data analysis to quantitatively identify the characteristics of the Late Shows, and by conducting stakeholder interviews to understand the current process and discuss the future process, this research tried to design the operational process of the Late Shows to improve the operational excellence and quality of the acceptance process. The research shows that currently, late shipments are often still tried to be build up for the planned flight. It is found that 13% of these shipments do eventu-

ally not depart on the planned flight. The research concludes that the design of the Late Show process should include a check on whether the shipment was delivered on time, before acceptance of the shipment. By only accepting the shipment once it is decided that the planned flight is achievable or when it is rebooked to another flight, it is assured that the Late Show will be on time at the build-up buffer for the booked flight.

Van Rooden, S., Zuniga, C., Krol, B., & Olivares-Benitez, E. (2021). An Analysis and Design for the Repair Process of Late Show Shipments in the Export Cargo Process at SPL HUB. *Proceedings of the 11th International Conference on Operations Research and Enterprise Systems-ICORES*, 123-130. doi: 10.5220/0010797500003117. Conference Paper.

## ELÍAS OLIVARES BENÍTEZ

Investigador Titular D, SNI Nivel I

### BENCHMARKING THE OPERATIONAL EFFICIENCY OF MAJOR CONTAINER PORTS IN FIVE DEVELOPING REGIONS

**ABSTRACT.** The objective of this study is to benchmark the operational efficiency of container ports located in five different developing regions that include North Africa, West Africa, South America, North and Central America, and the Caribbean. A bootstrap data envelopment analysis approach is utilized with a panel data set from 2013 to 2018. The inputs are quay length, land area, draft length, and number of berths; container number and total cargo are the corresponding outputs. The results reveal that most of the ports were not operating at their optimal scale of operations. The bootstrap CRS scores showed an increasing trend, while a decreasing trend was identified in the bootstrap VRS scores. One major finding is that most of the container ports have encountered an increase in their scale of operations without strengthening their technical competences. The significant increase in CRS efficiency scores supports the expanded ports' role in the global trade environment. Furthermore, this article tests whether there is statistical significant difference in the bias-corrected scale efficiency estimates between the distinct developing regions. © 2022 IISE Annual Conference and Expo 2022. All rights reserved.

Ablanedo-Rosas, J. H., Olivares-Benitez, E., & Guerrero-Campanur, A. (2022). Benchmarking the operational efficiency of major container

ports in five developing regions. IISE Annual Conference and Expo 2022, Hyatt Regency Seattle/Seattle, United States, 21 May 2022 through 24 May 2022, Code 182057. *IISE Annual Conference and Expo 2022*. Conference Paper.

## ELÍAS OLIVARES BENÍTEZ

Investigador Titular D, SNI Nivel I

### BLOCKCHAIN FOR AGRI-FOOD SUPPLY CHAIN TRACEABILITY

**ABSTRACT.** The supply chains around the agri-food sector are, in economic terms, one of the most relevant activities at an international level, employing millions of people, mainly in developing countries. The complexity of this supply chain includes key aspects related to the identification of food, from origin to final consumption. This article conceptually describes a proposal for developing a traceability system based on Blockchain and smart contracts as a disruptive technology, integrating tools for the consensus and participation of the parties involved in this supply chain. In this approach, incorporating the Public Participation Geographic Information System (PPGIS) is proposed as an information management mechanism. The different entities for the supply chain are described, including the inclusion of logistics operators (3PL). The results show a model for the implementation of Blockchain based on smart contracts and traceability tools such as PPGIS. This proposal facilitates the development of logistical aspects to increase the competitiveness of the agri-food sector. © IEOM Society International.

Granillo-Macías, R., González-Hernández, I. J., & Olivares-Benitez, E. (2022). Blockchain for Agri-Food Supply Chain Traceability. 4th European International Conference on Industrial Engineering and Operations Management, IEOM 2021, Virtual, Online, 2 August 2021 through 5 August 2021, Code 273059. *IEOM, Proceedings of the International Conference on Industrial Engineering and Operations Management*, 1095-1103. Conference Paper.

## ELÍAS OLIVARES BENÍTEZ

Investigador Titular D, SNI Nivel I

### MULTI-START ITERATED LOCAL SEARCH METAHEURISTIC FOR THE MULTI-MODE RESOURCE-CONSTRAINED PROJECT SCHEDULING PROBLEM

**ABSTRACT.** In this paper a multi-start iterated local search (MS-ILS) algorithm is presented as a new and effective approach to solve the multi-mode resource-constrained



project scheduling problem (MRCPSP). The MRCPSP is a well-known project scheduling NP-Hard optimization problem, in which there is a trade-off between the duration of each project activity and the amount of resources they require to be completed. The proposed algorithm generates an initial solution, performs a local search to obtain a local optimum, subsequently, for a certain number of iterations, makes a perturbation to that local optimum and performs a new local search on the perturbed solution. This whole process then restarts with a different initial solution for a certain number of restarts. The algorithm was tested on benchmark instances of projects with 30, 50 and 100 activities from well-known libraries. The obtained results were compared to recent benchmark results from the literature. The proposed algorithm outperforms other solution methods found in related literature for the largest tested instances (100 activities), while for smaller instances it shows to be quite competitive, in terms of the average deviation against known lower bounds. © 2021 John Wiley & Sons Ltd.

Ramos, A. S., Olivares-Benitez, E., & Miranda-Gonzalez, P. A. (2021). Multi-start iterated local search metaheuristic for the multi-mode resource-constrained project scheduling problem. *Expert Systems*, 39(1). doi: 10.1111/exsy.12830. Article.

### ELÍAS OLIVARES BENÍTEZ

Investigador Titular D, SNI Nivel I

### JUAN CARLOS LÓPEZ PIMENTEL

Profesor investigador

### MIGUEL ALCARAZ RIVERA

Profesor investigador

#### TRACEABILITY OF MEXICAN AVOCADO SUPPLY CHAIN: A MICROSERVICE AND BLOCKCHAIN TECHNOLOGICAL SOLUTION

**ABSTRACT.** Currently, the Mexican avocado supply chain has some social limitations that make the traceability process a difficult task and severely limits the regions that can add their harvest to the international market. We hypothesize that modernizing the traceability process and improving the trust of the final user could help in opening the market to other regions. This paper describes the Mexican avocado supply chain characteristics, identifies the actors involved in the supply chain, and emphasizes the problems that the current actors have when exporting them to the US market. On this basis, we propose a technological solution system to automate

the traceability process. The system was designed to comply with the authority and consumer requirements. It proposes a combination of the benefits of traditional data traceability using Microservices architecture with a new layer of Blockchain auditing that will add value to current and new actors in every step of the supply chain. We contribute by proposing a model that adds value to the avocado supply chain with the following characteristics: Integrity, auditing service, dual traceability, transparency, and a front-end application with trust user-oriented. Our proofs demonstrate that the blockchain layer does not represent a considered high extra transaction cost; it could be regarded as despicable for the economy of the consumer considering costs and benefits.

Lopez-Pimentel, J. C., Alcaraz-Rivera, M., Granillo-Macias, R., & Olivares-Benitez, E. (2022). Traceability of Mexican Avocado Supply Chain: A Microservice and Blockchain Technological Solution. *Sustainability*, 14(21). doi: 10.3390/su142114633. Article.

### DAVID GARCÍA PELÁEZ CRUZ

Profesor investigador

#### LIGHT PROPAGATION THROUGH OPTICAL MEDIA USING METRIC CONTACT GEOMETRY

**ABSTRACT.** In this work, we show that the orthogonality between rays and fronts of light propagation in a medium is expressed in terms of a suitable metric contact structure of the optical medium without boundaries. Moreover, we show that considering interfaces (modeled as boundaries), orthogonality is no longer fulfilled, leading to optical aberrations and, in some cases, total internal reflection. We present some illustrative examples of this latter point. © 2022 Author(s).

García-Peláez, D., López-Monsalvo, C. S., & Rubio Ponce, A. (2022). Light propagation through optical media using metric contact geometry. *Journal of Mathematical Physics*, 63(7). doi: 10.1063/5.0087143. Article.

### HIRAM EREDÍN PONCE ESPINOSA

Investigador Titular D, SNI Nivel I

#### CREDIT RISK MODELS IN THE MEXICAN CONTEXT USING MACHINE LEARNING

**ABSTRACT.** The Default Rate is related to the period of the economic cycle in which

they are observed, during expansion periods of the economy the default rate tends to be lower. But in contraction periods, the default rate tends to increase and this could be a risk for the stability of a country's economy. Therefore, it is important to monitor the perspective of the economy in case it is expected to decrease or have abrupt movements. This work aims to identify the economic variables that determine the default rate of the Mexican Financial System and to find a machine learning model that forecasts the default rate. For this, we aggregate a dataset based on three official Mexican sources that compile data from 2013 to 2022, including the COVID-19 pandemic time frame. Then, we propose the analysis using two machine learning models. After the analysis, the results confirm that the artificial neural networks model shows better predictive power for the default rate values. We also implement an easy to use web application to estimate the default rate based on three simple variables. We anticipate this work might help on estimating the default rate and might impact on the strategic policies in the Mexican economy. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

López, A. L., López, E., & Ponce, H. (2022). Credit Risk Models in the Mexican Context Using Machine Learning. 21st Mexican International Conference on Artificial Intelligence, MICAI 2022, Monterrey, Mexico, 24 October 2022 through 29 October 2022, Code 285899. *Lecture Notes in Computer Science (including sub-series Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 13613 LANI, 339-347. doi: 10.1007/978-3-031-19496-2\_26. Conference Paper.

### HIRAM EREDÍN PONCE ESPINOSA

Investigador Titular D, SNI Nivel I

### MARÍA DE LOURDES MARTÍNEZ VILLASEÑOR

SNI Nivel I

#### DESIGN OF A NON-ACTUATOR SOFT GRIPPER FOR A CHAMELEON-LIKE ROBOT

**ABSTRACT.** Four-legged robots are terrestrial mobile robots widely applied in tasks of navigation that imply complex mobility, the difficulty of obstacle avoidance, efficient energy management, or handling the speed of motion. In previous work, we designed and implemented a prototype of a robot inspired by the biomechanics of the chameleon, for future applications in rescue and maintenance.

nance. But, the legs of the prototype slip into the contact surface, resulting in the diminishing of the locomotion performance. Hence, it is necessary to add a gripper in the tip of the legs, like a prehensile hand, for avoiding relative sliding between the legs and the surface. Thus, in this paper, we propose the first soft gripper designed for the chameleon-like robot. The key feature of the gripper is its activation without any actuator due to size restrictions and the prevention of using pneumatic or hydraulic actuators. To validate the proposal, we simulate the gripper and we run a finite element analysis, providing us insights into the soft gripper model. © 2021 IEEE.

Ponce, H., Martínez-Villasenor, L., & Mayorga-Acosta, C. (2021). Design of a Non-Actuator Soft Gripper for a Chameleon-Like Robot. 2021 International Conference on Mechatronics, Electronics and Automotive Engineering, ICMEAE 2021, Virtual, Online, Mexico, 22 November 2021 through 26 November 2021, Category number CFP2190W-ART, Code 183273. *Proceedings-2021 International Conference on Mechatronics, Electronics and Automotive Engineering, ICMEAE 2021*, 88-93. doi: 10.1109/ICMEAE55138.2021.00022. Conference Paper.

**HIRAM EREDÍN PONCE ESPINOSA**  
*Investigador Titular D, SNI Nivel I*

**MARÍA DE LOURDES MARTÍNEZ VILLASENOR**  
*SNI Nivel I*

#### DESIGN OF A SOFT GRIPPER USING GENETIC ALGORITHMS

**ABSTRACT.** In this paper, we present an artificial intelligence-assisted design of a soft robotic gripper. First, we formulate the design of the soft gripper as an optimization problem. Then, we design and configure a genetic algorithm (GA) method to solve the problem under design constraints. Lastly, we implement the whole system in co-simulation between the GA and a computer-aided design software that evaluates the candidate solutions using finite element analysis. A network-attached storage server connecting multiple nodes runs the GA method in parallel, to accelerate the process. After experimentation, we present simulation results to validate our approach. © 2021 Instituto Politécnico Nacional. All rights reserved.

Ponce, H., Martínez-Villasenor, L., & Mayorga-Acosta, C. (2021). Design of a Soft Gripper Using Genetic Algorithms. *Computación y Sistemas*, 25(4), 835-842. doi: 10.13053/CyS-25-4-4095. Article.

**HIRAM EREDÍN PONCE ESPINOSA**  
*Investigador Titular D, SNI Nivel I*

#### HEART FAILURE DISEASE PREDICTION USING MACHINE LEARNING MODELS

**ABSTRACT.** Heart failure disease affects 26 million people worldwide and it has a lower survival rate than breast or prostate cancer. An early diagnostic of the disease is very important for prevention and possible treatment. In this work, we propose using machine learning models to predict the probability of developing a heart failure disease in a patient. We compare two machine learning models over a public dataset of risk factors and patients' clinical features. After a comparative analysis, we find that a logistic regression model can predict 87% of the cases on the data base. After that, we implement an easy web application for heart failure disease prediction. We anticipate that applying this model hospitals will be able to reduce their patient admission due to heart failure disease and patients will be able to reduce their risk and avoid all the implicit costs. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

Tiburcio, P., Guerrero, V., & Ponce, H. (2022). Heart Failure Disease Prediction Using Machine Learning Models. 21st Mexican International Conference on Artificial Intelligence, MICAI 2022, Monterrey, Mexico, 24 October 2022 through 29 October 2022, Code 285899. *MICAI, Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 13612 LNAI, 183-191. doi: 10.1007/978-3-031-19493-1\_15. Conference Paper.

**HIRAM EREDÍN PONCE ESPINOSA**  
*Investigador Titular D, SNI Nivel I*

#### MACHINE LEARNING MODEL OF DIGITAL TRANSFORMATION INDEX FOR MEXICAN HOUSEHOLDS

**ABSTRACT.** Digital transformation refers to the change in all aspects of human society by the adoption of digital technologies. Different methodologies and measurements have been proposed to determine the level of digital transformation in regions or countries. In this work, we propose the creation of a digital transformation index for Mexican households using machine learning models for digital transformation measurement analysis and estimation. We include three dimensions in terms of the information and communication technologies infrastructure, availability of services, and

usage. We also use a public dataset from the Mexican government to build and train three machine learning models. Experimental results validate that our methodology can deliver a digital transformation measurement using machine learning models consistently with 84% of accuracy and 84% of F1-score. We also prototype a simple web application using the best machine learning model found. We anticipate that measuring the digital transformation in companies, governments, and households allows better decisions in business intelligence and public policy. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

García, A., Salazar, V., & Ponce, H. (2022). Machine Learning Model of Digital Transformation Index for Mexican Households. 21st Mexican International Conference on Artificial Intelligence, MICAI 2022, Monterrey, Mexico, 24 October 2022 through 29 October 2022, Code 285899. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 13613 LNAI, 328-338. doi: 10.1007/978-3-031-19496-2\_25. Conference Paper.

**HIRAM EREDÍN PONCE ESPINOSA**  
*Investigador Titular D, SNI Nivel I*

#### MACHINE LEARNING TECHNIQUES IN CREDIT DEFAULT PREDICTION

**ABSTRACT.** Digital transformation after the pandemic is a must if a company wants to survive in a highly competitive environment. Machine Learning (ML) applications are no strangers to Digital Transformations, and banks are looking for ways to improve efficiency by means of similar technologies. In this work, we propose a machine learning model for predicting the credit default using the Lending-Club public dataset. The accepted loans include data ranging from 2007 to 2017. For this purpose, we implement support vector machines and logistic regression models. The results showed that support vector machines is a high accurate model (93%) for predicting the credit default. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

Malagon, E., Troncoso, D., Rubio, A., & Ponce, H. (2022). Machine Learning Techniques in Credit Default Prediction. 21st Mexican International Conference on Artificial Intelligence, MICAI 2022, Monterrey, Mexico, 24 October 2022 through 29 October 2022, Code 285899. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 13612 LNAI, 204-211. doi: 10.1007/978-3-031-19493-1\_17. Conference Paper.

**HIRAM EREDÍN PONCE ESPINOSA***Investigador Titular D, SNI Nivel I***MARÍA DE LOURDES MARTÍNEZ VILLASEÑOR***SNI Nivel I***MARIO ACEVEDO ALVARADO***SNI Nivel I***MODELING AND SIMULATION FOR DESIGNING A LINE WALKING CHAMELEON-LIKE LEGGED ROBOT**

**ABSTRACT.** Legged robots have been developed to move on uneven terrains. They can move smoother and step over obstacles easily, and they are more versatile in various environmental scenarios. These features make them desirable for maintenance and/or search-and-rescue tasks where mobility is restricted on these complex terrains. A problem arises when legged robots are required to walk on the top of narrow support, e.g. thin beams or tubes. In this work, we present the design of a line walking legged robot for narrowed support. To achieve this goal, we get inspiration from the chameleon locomotion. From these observations, we simulate the robot, design an intelligent control strategy for self-balancing and walking, and we implement a robot prototype. The experimental results show that the balance controller provides a tilt angle of  $2.24 \pm 2.21^\circ$ , while the robot walks in a straight line with a maximum offset of 3.0 cm and with a walking velocity of 0.2 cm/s. Our results demonstrate that the robot can move on narrowed support lines. We anticipate that the design of legged robots inspired by the chameleon locomotion might open wider possibilities for rescue and maintenance missions. © 2022 Elsevier B.V.

Ponce, H., Acevedo, M., González-Juárez, J., Martínez-Villaseñor, L., Díaz-Ramos, G., & Mayorga-Acosta, C. (2022). Modeling and simulation for designing a line walking chameleon-like legged robot. *Simulation Modelling Practice and Theory*, 121. doi: 10.1016/j.simpat.2022.102648. Article.

**HIRAM EREDÍN PONCE ESPINOSA***Investigador Titular D, SNI Nivel I***JORGE EDUARDO BRIEVA RICO***Investigador Titular D, SNI Nivel I***ERNESTO MOYA ALBOR***Investigador Titular D, SNI Nivel I***MODULAR IOT-BASED AUTOMATED HYDROPONIC SYSTEM**

**ABSTRACT.** The growth of population and the rapid urbanization have demanded over-

production of food while reducing the water supply, increasing energy consumption, limiting the land, and augmenting the cost of food transportation. Moreover, overproduction comes with food waste and a negative impact on the ecosystem. As an alternative, urban farming has been proposed to mitigate this problem. It includes cultivating in rooftops and residential indoors. In this regard, this work proposes the development of an automatic modular and vertical hydroponic system capable to regulate the water flow, the artificial lights, and the pH of the water. The hydroponic system is made of modules which means the user can upgrade the system depending on the needs like higher production or space reconfiguration. Also, the hydroponic system implements Internet-of-Things to monitor and operate it remotely. A first prototype is presented, and the experimental results validate its potential applicability. © 2021 IEEE.

Aranda, M., Savage, A., Roman, J. S., Noguera, L., Ponce, H., Brieve, J., & Moya-Albor, E. (2021). Modular IoT-based Automated Hydroponic System. 2021 International Conference on Mechatronics, Electronics and Automotive Engineering, ICMEAE 2021, Virtual, Online, Mexico, 22 November 2021 through 26 November 2021, Category number CFP2190W-ART, Code 183273. *Proceedings-2021 International Conference on Mechatronics, Electronics and Automotive Engineering, ICMEAE 2021*, 220-226. doi: 10.1109/ICMEAE55138.2021.00042. Conference Paper.

**HIRAM EREDÍN PONCE ESPINOSA***Investigador Titular D, SNI Nivel I***VENTILATOR PRESSURE PREDICTION USING A REGULARIZED REGRESSION MODEL**

**ABSTRACT.** The mechanical ventilation is one of the most frequent methods used in Intensive Care Units (ICUs) to improve the breathing of patients. During the early days of the COVID-19 pandemic, the use of mechanical ventilators has been crucial. In this work, we propose to build a Lasso regression model based on lung simulators for predicting the airway pressure in the respiratory circuit of ventilators while breathing. We model the whole breathing process in two separate states. After that, we analyze the feature importance in the regression model to better understand the ventilator pressure prediction. We anticipate this model would help improving the patient's health and overcoming the cost barrier of new methods for mechanical ventilators. © 2022,

The Author(s), under exclusive license to Springer Nature Switzerland AG.

Arellano, A., Bustamante, E., Garza, C., & Ponce, H. (2022). Ventilator Pressure Prediction Using a Regularized Regression Model. 21st Mexican International Conference on Artificial Intelligence, MICAI 2022, Monterrey, Mexico, 24 October 2022 through 29 October 2022, Code 285899. *MICAI, Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 13613 LNAI, 348-355. doi: 10.1007/978-3-031-19496-2\_27. Conference Paper.

**HÉCTOR ROGELIO ROBLES CAMPOS***Profesor investigador***DETAILED ASSESSMENT OF MODULATION STRATEGIES FOR HEXVERTER-BASED MODULAR MULTILEVEL CONVERTERS**

**ABSTRACT.** Modular multilevel converters are playing a key role in the present and future development of topologies for medium-to-high-power applications. Among this category of power converters, there is a direct AC-AC modular multilevel converter called "Hexverter", which is well suited to connect three-phase AC systems operating at different frequencies. This topology is the subject of study in this manuscript. The complete Hexverter system is composed of an Hexverter power converter and several control layers, namely, a "virtual VC2 controller", a branch current controller in a two-frequency dq reference frame, a modulator, and a voltage balancing algorithm. The paper presents a thorough description and analysis of the entire Hexverter system, providing research contributions in three key aspects: (i) modeling and control in a unified two-frequency dq framework; (ii) developing a "virtual VC2 controller" to dynamically account for Hexverter's active power losses allowing to achieve active power balance on the fly; and (iii) a comparative evaluation of modulation strategies (nearest level control and phase disposition-sinusoidal pulse width modulation). To this end, a detailed switched simulation was implemented in the PSCAD/EMTDC software platform. The proposed "virtual VC2 controller" is evaluated through the measurement of its settling time and calculation of active power losses. Each modulation technique is assessed through total harmonic distortion and frequency spectrum of the synthesized three-phase voltages and currents. The results obtained suggest that the control scheme is able to properly regulate the Hexverter system under both modulation

strategies. Furthermore, the “virtual VC2 controller” is able to accurately determine the active power loss, which allows the assessment of the efficiency of the modulation strategies. The nearest level control technique yielded superior efficiency. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

Robles-Campos, H. R. & Mancilla-David, F. (2022). Detailed Assessment of Modulation Strategies for Hexverter-Based Modular Multilevel Converters. *Energies*, 15(6). doi: 10.3390/en15062132. Article.

## PEDRO MANUEL RODRIGO CRUZ

SNi Nivel I

### QUANTIFYING THE REAR AND FRONT LONG-TERM SPECTRAL IMPACT ON BIFACIAL PHOTOVOLTAIC MODULES

**ABSTRACT.** The demand for bifacial photovoltaic modules is continuously increasing. However, some aspects of their behaviour under realistic operating conditions still require more in-depth investigations. Indeed, the long-term analysis of the spectral impact on bifacial modules remains pending. This is particularly true for the rear incident spectrum, which changes depending on the ground type. In this paper, the rear and front long-term spectral impact on bifacial modules is analysed for three locations (Tabernas, Spain; Solar Village, Saudi Arabia; Alta Floresta, Brazil) and four ground types (light soil, white sand, green grass, and concrete slab) at daily, monthly and annual timescales. The SMARTS model is used to generate front and ground-reflected annual spectra. The investigation leads to the definition of a novel metric, called bifacial spectral factor, which quantifies the combined front and rear spectral impact. Results show that the annual bifacial spectral impact differs from the monofacial one due to the influence of the rear spectral irradiance. Green grass is found to have the higher bifacial spectral benefit, leading to yields in between 1.19% and 1.65% higher than in the monofacial case. However, thanks to its high albedo coefficient, white sand is the most convenient ground among the analysed types in terms of bifacial spectral energy gains. The rear spectral factor shows a great range of variation as a function of ground type (between 0.989 and 1.150). However, this is only a non-negligible second order effect compared to the bifacial

spectral factor, which is mainly influenced by the front spectral factor. © 2022 International Solar Energy Society.

Mouhib, E., Rodrigo, P. M., Micheli, L., Fernández, E. F., & Almonacid, F. (2022). Quantifying the rear and front long-term spectral impact on bifacial photovoltaic modules. *Solar Energy*, 247, 202-213. doi: 10.1016/j.solener.2022.10.035. Article.

## ARTURO JAFET RODRÍGUEZ MUÑOZ

Profesor Investigador

### ADAPTIBRUSH: ADAPTIVE GENERAL AND PREDICTABLE VR RIBBON BRUSH

**ABSTRACT.** Virtual reality drawing applications let users draw 3D shapes using brushes that form ribbon shaped, or ruled-surface, strokes. Each ribbon is uniquely defined by its user-specified ruling length, path, and the ruling directions at each point along this path. Existing brushes use the trajectory of a handheld controller in 3D space as the ribbon path, and compute the ruling directions using a fixed mapping from a specific controller coordinate-frame axis. This fixed mapping forces users to rotate the controller and thus their wrists to change ribbon normal or ruling directions, and requires substantial physical effort to draw even medium complexity ribbons. Since human ability to rotate their wrists continuously is heavily restricted, the space of ribbon geometries users can comfortably draw using these brushes is limited. These brushes can be unpredictable, producing ribbons with unexpectedly varying width or flipped and wobbly normals in response to seemingly natural hand gestures. Our AdaptiBrush ribbon brush system dramatically extends the space of ribbon geometries users can comfortably draw while enabling them to accurately predict the ribbon shape that a given hand motion produces. We achieve this by introducing a novel adaptive ruling direction computation method, enabling users to easily change ribbon ruling and normal orientation using predominantly translational controller, and thus wrist, motion. We facilitate ease-of-use by computing predictable ruling directions that smoothly change in both world and controller coordinate systems, and facilitate ease-of-learning by prioritizing ruling directions which are well-aligned with one of the controller coordinate system axes. Our comparative user studies confirm that our more general and predictable ruling computation

leads to significant improvements in brush usability and effectiveness compared to all prior brushes; in a head to head comparison users preferred AdaptiBrush over the next-best brush by a margin of 2 to 1.

Rosales, E., Araujo, C., Rodriguez, J., Vining, N., Yoon, D., & Sheffer, A. (2021). AdaptiBrush: adaptive general and predictable VR ribbon brush. *ACM Transactions on Graphics*, 40(6), 1-15. doi: 10.1145/3478513.3480511. Article.

## ARTURO JAFET RODRÍGUEZ MUÑOZ

Profesor Investigador

### CAROLINA DEL VALLE SOTO

Investigadora Titular D, SNi Nivel I

### AFFECTIVE STATES AND VIRTUAL REALITY TO IMPROVE GAIT REHABILITATION: A PRELIMINARY STUDY

**ABSTRACT.** Over seven million people suffer from an impairment in Mexico; 64.1% are gait-related, and 36.2% are children aged 0 to 14 years. Furthermore, many suffer from neurological disorders, which limits their verbal skills to provide accurate feedback. Robot-assisted gait therapy has shown significant benefits, but the users must make an active effort to accomplish muscular memory, which usually is only around 30% of the time. Moreover, during therapy, the patients' affective state is mostly unsatisfied, wide-awake, and powerless. This paper proposes a method for increasing the efficiency by combining affective data from an Emotiv Insight, an Oculus Go headset displaying an immersive interaction, and a feedback system. Our preliminary study had eight patients during therapy and eight students analyzing the footage using the self-assessment Manikin. It showed that it is possible to use an EEG headset and identify the affective state with a weighted average precision of 97.5%, recall of 87.9%, and F1-score of 92.3% in general. Furthermore, using a VR device could boost efficiency by 16% more. In conclusion, this method allows providing feedback to the therapist in real-time even if the patient is non-verbal and has a limited amount of facial and body expressions. © 2022 by the authors.

Rodriguez, J., Del-Valle-Soto, C., & Gonzalez-Sanchez, J. (2022). Affective States and Virtual Reality to Improve Gait Rehabilitation: A Preliminary Study. *International Journal of Environmental Research and Public Health*, 19(15). doi: 10.3390/ijerph19159523. Article.



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## RODRIGO ROMERO SILVA

Profesor Investigador

### TRADE-OFFS IN THE LANDSIDE OPERATIONS OF AIR CARGO HUBS: HORIZONTAL COOPERATION AND SHIPMENT CONSOLIDATION POLICIES CONSIDERING CAPACITATED NODES

**ABSTRACT.** Landside operations in air cargo terminals consist of many freight forwarders (FFWs) delivering and picking up cargo at the capacity-constrained loading docks at the airport's ground handlers' (GHs) facilities. To improve the operations of the terminal and take advantage of their geographical proximity a small set of FFWs can build a coalition to consolidate stochastically-arriving shipments and share truck fleet capacity while other FFWs continue bringing cargo to the terminal in a non-cooperative manner. Results from a detailed discrete-event simulation model of the cargo landside operations in Amsterdam Airport showed that all operational policies had trade-offs in terms of the average shipment cycle time of coalition FFWs, the average shipment cycle time of non-coalition FFWs, and the total distance traveled by the coalition fleet, suggesting that horizontal cooperation in this context was not always beneficial, contrary to what previous studies on horizontal cooperation have found. Since dock capacity constitutes a significant constraint on operations in air cargo hubs, this paper also investigates the effect of dock capacity utilization and horizontal cooperation on the performance of consolidation policies implemented by the coalition. Thus, we built a general model of the air cargo terminal to analyze the effects caused by dock capacity utilization without the added complexity of landside operations at Amsterdam Airport to investigate whether the results hold for more general scenarios. Results from the general simulation model suggest that, in scenarios where dock and truck capacity become serious constraints, the average shipment cycle times of non-coalition FFWs are reduced at the expense of an increase in the cycle times of FFWs who constitute the coalition. A good balance among all the performance measures considered in this study is reached by following a policy that takes advantage of consolidating shipments based on individual visits to GH. © 2022 The Authors.

Romero-Silva, R. & Mujica Mota, M. (2022). Trade-offs in the landside operations of air cargo hubs: Horizontal cooperation and shipment consolidation policies considering capacitated nodes. *Journal of Air Transport Management*, 103. doi: 10.1016/j.jairtraman.2022.102253. Article.

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## LUIS ALBERTO ROSA SIERRA

SNI Nivel II

### GABRIELA DURÁN AGUILAR

Profesora investigadora

### DESIGN OF AN AUXILIARY ARTIFICIAL LYMPHATIC VESSEL IN TREATMENT OF SECONDARY LYMPHEDEMA DUE TO BREAST CANCER

**ABSTRACT.** Breast cancer is the most common malignant tumor that affects women in the United States, Europe, and Mexico. As an adverse effect when performing treatments for this condition, secondary lymphedema associated with breast cancer occurs in some cases. This complication occurs due to the interruption of lymphatic flow in the upper extremities in conjunction with other factors such as radiation, sedentary lifestyle, removal of lymph nodes, damage to lymphatic vessels, and others. This article reviews breast cancer incidence, mortality, and survival patterns, confirming that, specifically, lymphedema has high health, social, and economic impacts. Research demonstrates that it fundamentally affects women at an early age. In approximately a third of the cases, it becomes a chronic disease. Therefore, physical therapy is essential for a better quality of life in patients who survive this disease. Surgeries and manual and pharmacological treatments are the current procedures done to reduce to reduce the alterations suffered by patients with lymphedema; however, the success of the treatments depends on each patient's characteristics. To face this problem, the design of a lymphatic vessel has been proposed to assist the mechanical failure of the damaged lymphatic system. In this work, the design methodology used for the blueprint of the lymphatic vessel is presented, as well as the computer analysis of fluid simulation and the selection of the proposed material, resulting in the production of a micrometric design. In the future, it is expected that a surgeon will be able to implant the design of the vessel to restore lymph flow through the lymphatic system,

thus helping to combat lymphedema. © 2021 by the authors. Licensee MDPI, Basel, Switzerland.

Durán-Aguilar, G., Rossa-Sierra, A., & Fuentes-Aguilar, R. Q. (2022). Design of an Auxiliary Artificial Lymphatic Vessel in Treatment of Secondary Lymphedema Due to Breast Cancer. *Healthcare*, 10(1). doi: 10.3390/healthcare10010068. Article.

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## JULIO CÉSAR ROSAS CARO

SNI Nivel I

### ANTONIO VALDERRÁBANO GONZÁLEZ

SNI Nivel I

### A STEP-UP CONVERTER WITH LARGE VOLTAGE GAIN AND LOW VOLTAGE RATING ON CAPACITORS

**ABSTRACT.** Step-up converters are widely used in many applications, such as renewable energy generation with photovoltaic panels and fuel cell stacks. In many cases, the required voltage gain is larger for those applications than a traditional boost converter can achieve. Several large-voltage gain converters have been recently studied. This paper introduces a converter topology in which the voltage gain is larger than a traditional boost converter. The main advantages of the proposed topology are: (i) it provides a large voltage gain without the use of an extreme duty cycle; (ii) its capacitors require a smaller voltage to be sustained compared with other, similar state-of-the-art converters; (iii) the voltage among the ground input and output is not pulsating; and (iv) it can be synthesized with commercial, off-the-shelf half-bridge packed transistors. The proposed converter can be employed in different applications, such as distributed generation and microgrids. This paper presents the steady-state analysis of the proposed converter in the continuous conduction mode, a short comparison with similar topologies, and their voltage on capacitors. Computer-based simulation results are provided to verify the principle of the proposed converter in different operating conditions. © 2022 by the authors.

Ramirez-Carrillo, M., Ortega-Cisneros, S., Rosas-Caro, J. C., Rivera, J., Valdez-Resendiz, J. E., Mayo-Maldonado, J. C., & Valderrabano-Gonzalez, A. (2022). A Step-Up Converter with Large Voltage Gain and Low Voltage Rating on Capacitors. *Energies*, 15(21). doi: 10.3390/en15217944. Article.



## JULIO CÉSAR ROSAS CARO

SNI Nivel I

### AVELINA ALEJO REYES

SNI Nivel I

#### AN OVERVIEW OF NON-ISOLATED HYBRID SWITCHED-CAPACITOR STEP-UP DC-DC CONVERTERS

**ABSTRACT.** Featured Application: Power conversion for electrical engineering and appliances. The increasing interest in renewable energy sources has brought attention to large voltage-gain dc-dc converters; among the different available solutions to perform a large voltage-gain conversion, this article presents an overview of non-isolated dc-dc converter topologies that utilize switched-capacitor circuits, i.e., diode-capacitors voltage multipliers. The review includes combinations of a traditional power stage with a diode-capacitor-based voltage multiplier, such as the multilevel boost converter. This article starts by reviewing switched-capacitor (SC) circuits, different topologies, and different types of charge exchange; it provides a straightforward analysis to understand the discharging losses. It then covers the multilevel boost converter and other topologies recently introduced to the state-of-the-art. Special attention is put on SC circuits with resonant charge interchange that have recently been probed to achieve very good efficiency. An additional contribution of the article is new proof of the discharging losses in resonant switched-capacitor circuits focused on the initial and final stored energy in capacitors, and this proof explains the relatively large efficiency obtained with SC resonant converters. © 2022 by the authors.

Rosas-Caro, J. C., Mayo-Maldonado, J. C., Valdez-Resendiz, J. E., Alejo-Reyes, A., Beltran-Carbajal, F., & López-Santos, O. (2022). An Overview of Non-Isolated Hybrid Switched-Capacitor Step-Up DC-DC Converters. *Applied Sciences*, 12(17). doi: 10.3390/app12178554. Review.

## JULIO CÉSAR ROSAS CARO

SNI Nivel I

#### DATA-DRIVEN PASSIVITY-BASED CONTROL DESIGN FOR MODULAR DC MICROGRIDS

**ABSTRACT.** This article contains a new passivity-based control design approach for dc microgrids. The design is purely based on experi-

mental data - bypassing the requirement of the network modeling. This approach permits the control of dc microgrids and preserve stability, despite of further interconnection of new passive loads and new passivity-based-controlled converters. This model-free approach generates control laws in a pure numerical way; bypassing the requirement of dealing with a high number of variables and equations that naturally appear in an increasingly complex dc microgrid. Experimental results are presented to corroborate the advantages of our approach. © 1982-2012 IEEE.

Loranca, J., Mayomaldonado, J. C., Escobar, G., Maupong, T., Valdez-Resendiz, J. E., & Rosas-Caro, J. (2021). Data-Driven Passivity-Based Control Design for Modular DC Microgrids. *IEEE Transactions on Industrial Electronics*, 69(3), 2545-2556. doi: 10.1109/TIE.2021.3065615. Article.

## JULIO CÉSAR ROSAS CARO

SNI Nivel I

#### DIRECT OUTPUT-VOLTAGE CONTROL OF NONMINIMUM PHASE HIGHER ORDER DC-DC CONVERTERS

**ABSTRACT.** This article addresses a fundamental issue in power converter control. Namely, the direct output-voltage control of power converters with higher order dynamics. We argue that despite of the burst in the development of new topologies, legacy control design principles-inherited from second-order converter analysis-have been unduly adopted as de facto rules of procedure. In particular, we refer to the minimum-phase requirement on the feedback variable, as the underlying stabilizing mechanism. In this article, we demonstrate that the requirement of minimum-phasesness for higher order converters and the legacy ad hoc solution via ancillary current control, can be bypassed without compromising closed-loop performance. To prove this, we unveil important differences between stability properties of second-order and higher order converters. Then, we introduce new linear and nonlinear control design strategies that permit direct output-voltage control. Experimental results are provided to validate the theory. © 1982-2012 IEEE.

Garza-Arias, E., Mayo-Maldonado, J. C., Valdez-Resendiz, J. E., Escobar G., Rosas-Caro, J., & Guillen, D. (2023). Direct Output-Voltage Control of Non-minimum Phase Higher Order DC-DC Converters. *IEEE Transactions on Industrial Electronics*, 70(2), 1455-1466. doi: 10.1109/TIE.2022.3157984. Article.

## JULIO CÉSAR ROSAS CARO

SNI Nivel I

### PEDRO MANUEL RODRIGO CRUZ

SNI Nivel I

#### FUEL-CELL POWER CONVERSION SYSTEM BASED ON DOUBLE DUAL TOPOLOGIES

**ABSTRACT.** This article describes (and demonstrates through experiments) the feasible implementation of a power conversion system designed for a Fuel Cell (FC) application in renewable energy generation. The system is designed to be powered by an FC stack, which output is a low (in amplitude) non-regulated dc voltage, with a relatively wide range of variation. The system must boost the voltage from the power source to an internal 200 V dc bus, while the final output voltage (after the inversion) must be provided at a level of 120 V ac. The main feature of the described system is that it is based on double-dual converters, a family of converters with several advantages such as automatic power balance and large voltage gain; this leads to a good performance and power quality. The system is based on a double dual boost converter to increase and regulate the dc-voltage, and a double dual buck converter, to invert the dc-voltage and provide an ac-voltage as output. The article shows the system's feasibility through theoretical analysis and provides experimental results with an FC stack. Experimental results are provided to demonstrate the feasibility of the proposed system. © 2022 Hydrogen Energy Publications LLC.

Garza-Arias, E., Valdez-Resendiz, J. E., Rosas-Caro, J. C., Mayo-Maldonado, J. C., Sanchez, V. M., Escobar, G., Rodriguez, A., & Rodrigo, P. M. (2022). Fuel-cell power conversion system based on double dual topologies. *International Journal of Hydrogen Energy*, 47(70), 30277-30290. doi: 10.1016/j.ijhydene.2022.04.078. Article.

## JULIO CÉSAR ROSAS CARO

SNI Nivel I

#### LEAKAGE-GROUND CURRENTS COMPENSATION IN A TRANSFORMERLESS HB-NPC TOPOLOGY USING A DC-LINK-TIED LC FILTER FOR PHOTOVOLTAIC APPLICATIONS

**ABSTRACT.** In this article, a solution to mitigate the leakage-ground currents (LGCs) in a grid-tied H-bridge neutral-point-clamped inverter is presented. This

solution consists in splitting the LC filter capacitor and connecting each capacitor to a dc-link terminal. The proposal is referred to as the dc-link-tied LC output filter. Out of this hardware modification, it is not necessary to increase the number of switches nor design a new modulation scheme. Furthermore, a formal analysis is provided based on the common-mode (CM) model describing the role of this particular connection of the output LC filter on the minimization of the LGC. In addition, a closed-loop control strategy has been implemented to allow testing the prototype connected to the electrical grid. The mitigation of the LGCs has been evaluated under this condition as well. To validate the proposed circuit modification, numerical simulations and experimental tests have been performed in a 1-kW laboratory prototype of the H-bridge neutral-point-clamped inverter with the dc-link-tied LC filter solution. © 2013 IEEE.

Iturriaga-Medina, S., Martínez-Rodríguez, P. R., Escobar, G., Vázquez-Guzmán, G., Langarica-Córdoba, D., Rosas-Caro, J. C., Sosa-Zuniga, J. M., & Mayo-Maldonado, J. (2021). Leakage-Ground Currents Compensation in a Transformerless HB-NPC Topology Using a DC-Link-Tied LC Filter for Photovoltaic Applications. *IEEE Journal of Emerging and Selected Topics in Power Electronics*, 10(4), 4725-4737. doi: 10.1109/JESTPE.2021.3132239. Article.

### OMAR FERNANDO RUÍZ MARTÍNEZ

SNI Nivel I

#### AN OVERVIEW ON FAULT MANAGEMENT FOR ELECTRIC VEHICLE ONBOARD CHARGERS

**ABSTRACT.** Onboard charging systems (OBCs) convert AC power from an external charging source into a DC voltage used to charge the battery pack of an electric vehicle (EV). OBCs are versatile since they can convert energy from almost every AC source, including standard household electrical receptacles, without needing wall chargers or charging stations. Since the same motor-drive electronics are reconfigured for onboard charging, weight and cost barely increase. However, the power quality and reliability of the OBCs are essential elements for proper grid interconnection. This article reviews the failures of power electronic converters that can be used for onboard charging and their most promi-

nent fault-tolerance techniques. The various fault-tolerance methods are evaluated and compared in terms of complexity, cost, and performance to provide insights for future developments and research directions. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

Gaona-Cárdenas, L. F., Vázquez-Nava, N., Ruíz-Martínez, O. F., Espinosa-Calderón, A., Barranco-Gutiérrez, A. I., & Rodríguez-Licea, M. A. (2022). An Overview on Fault Management for Electric Vehicle Onboard Chargers. *Electronics*, 11(7). doi: 10.3390/electronics11071107. Review.

### CLAUDIA NALLELY SÁNCHEZ GÓMEZ

Investigadora Titular B, SNI Nivel Candidato

### JULIETA DOMÍNGUEZ SOBERANES

Investigadora Titular A, SNI Nivel I

#### NIGHT CLUB RECOMMENDATION SYSTEM BASED ON DECISION TREES

**ABSTRACT.** The following document presents the use of a recommendation system designed for nightclubs in Aguascalientes City, Mexico, which offers customized services according to different profiles based on user's information such as age, gender, and preferred type of music. The advantage of this system is that it improves users' experience. A preference questionnaire was applied to 75 young people in order to collect their preferences. One decision tree per nightclub was modeled to predict the user's evaluation based on their profile. Based on the data collected, the most important features for choosing a nightclub are age and type of music that the customer likes, being reggaeton, banda, and electronic the most preferred ones. The absolute error average of predictions was 0.96 using a scale of 4 points. Besides, data from INEGI and the Kernel Density Estimation technique were used to locate the nightclubs. It was found that nightclubs are located mainly in two points in the city: north and downtown. © 2021 IEEE.

Sanchez, C. N., Delgado-Gomez, J. C., Ramirez-Espana, P., Garcia-Zermeno, L., Licea, S., & Domínguez-Soberanes, J. (2021). Night club recommendation system based on decision trees. 2021 IEEE International Conference on Machine Learning and Applied Network Technologies, ICMLANT 2021, Virtual, Soyapango, El Salvador, 16 December 2021 through 17 December 2021, Category number CFP21BGE-ART, Code 176854. *Proceedings*

of the 2021 IEEE International Conference on Machine Learning and Applied Network Technologies, ICMLANT 2021. doi: 10.1109/ICMLANT53170.2021.9690547. Conference Paper.

### CLAUDIA NALLELY SÁNCHEZ GÓMEZ

Investigadora Titular B, SNI Nivel Candidato

#### SELECTION HEURISTICS ON SEMANTIC GENETIC PROGRAMMING FOR CLASSIFICATION PROBLEMS

**ABSTRACT.** Individual semantics have been used for guiding the learning process of Genetic Programming. Novel genetic operators and different ways of performing parent selection have been proposed with the use of semantics. The latter is the focus of this contribution by proposing three heuristics for parent selection that measure the similarity among individuals' semantics for choosing parents that enhance the addition, Naive Bayes, and Nearest Centroid. To the best of our knowledge, this is the first time that functions' properties are used for guiding the learning process. As the heuristics were created based on the properties of these functions, we apply them only when they are used to create offspring. The similarity functions considered are the cosine similarity, Pearson's correlation, and agreement. We analyze these heuristics' performance against random selection, state-of-the-art selection schemes, and 18 classifiers, including auto-machine-learning techniques, on 30 classification problems with a variable number of samples, variables, and classes. The result indicated that the combination of parent selection based on agreement and random selection to replace an individual in the population produces statistically better results than the classical selection and state-of-the-art schemes, and it is competitive with state-of-the-art classifiers. Finally, the code is released as open-source software. © 2021 Massachusetts Institute of Technology.

Sánchez, C. N. & Graff, M. (2022). Selection Heuristics on Semantic Genetic Programming for Classification Problems. *Evolutionary Computation*, 30(2), 253-289. doi: 10.1162/evco\_a\_00297. Article.

## FIDENCIO TAPIA RODRÍGUEZ

SNI Nivel Candidato

## HÉCTOR RUBÉN ACEVEDO PARRA

Profesor Investigador

### MECHANICAL PROPERTIES OPTIMIZATION FOR PLA, ABS AND NYLON + CF MANUFACTURED BY 3D FDM PRINTING

**ABSTRACT.** The mechanical characteristics and properties of 3D printed parts are highly influenced by the printing parameters, the printer characteristics, the raw material and the capabilities of the G-code generating software. This work is distinguished by presenting a systematic study to optimize the mechanical properties of PLA, ABS and Nylon + carbon fiber (N + CF) parts manufactured by 3D fused deposition modeling (FDM) printing. To perform the optimization and statistical analysis of the effect of 3D printing parameters (geometric pattern, infill percentage, printing direction and the layer height) on ultimate tensile stress (UTS) and modulus of elasticity (E), two nk designs of experiments (DOE) were systematically applied. In this way, the printing parameters that maximize the UTS and those that are not significant for the three materials were defined which is the main contribution of this work. Additionally, a correlation analysis between density and UTS is presented ( $R^2 = 94.4\%$ ). In the first DOE it was found that the material and the percentage of infill (33 %, 66 % and 100 %) are decisive factors in the impression; the geometric pattern (tridimensional, hexagonal and linear) is no longer relevant and is not considered in the following analysis. In a second DOE it was found that by decreasing the layer height from 0.18 mm to 0.14 mm and modifying the printing direction from  $0^\circ/90^\circ$  to  $+45^\circ/-45^\circ$  there is an increase in the ultimate tensile stress (UTS) for all three materials. The specimen with the highest UTS reached 85 MPa, which was printed with N + CF linearly with 100 % infill, with 0.14 mm printing layer height and  $+45^\circ/-45^\circ$  in the printing direction. Through systematic analysis by DOE, it was possible to achieve higher UTS values than their own filaments in the case of N + CF and PLA by 49 % and 18 %, respectively, while for ABS its value is very close to the filament. In conclusion, an algorithm is presented to systematically analyze by DOE to evaluate the hypothesis of achieving a higher UTS than the filament

for ABS, PLA and N + CF specimens manufactured by 3D printing.

Rodriguez-Reyna, S. L., Mata, C., Diaz-Aguilera, J. H., Acevedo-Parra, H. R., & Tapia, F. (2022). Mechanical properties optimization for PLA, ABS and Nylon + CF manufactured by 3D FDM printing. *Materials Today Communications*, 33. doi: 10.1016/j.mtcomm.2022.104774. Article.

## ANTONIO VALDERRÁBANO GONZÁLEZ

SNI Nivel I

### AN ASYMPTOTIC AND ALGEBRAIC ESTIMATION METHOD OF HARMONICS

**ABSTRACT.** A new on-line and time-domain parameter estimation approach of harmonics in electric power system signals is introduced. The developed parametrical identification perspective is based on asymptotic and algebraic estimation techniques, and vibrating signal modeling. Specified harmonics and DC offset component of some measured distorted oscillating signal are reconstructed asymptotically. In this fashion, closed-form explicit formulae to compute into a small window of time, algebraically, on-line and in time-domain, the parameters of amplitude, frequency and phase of harmonics are then derived. Analytical, numerical and experimental results of six and twelve pulses converter reveal the effectiveness and efficiency of the proposed selective estimation approach for harmonics and corresponding parameters of measured oscillating electric signals into an operating frequency bandwidth. Among others, synchronization of power converters or switches to grid without the use of filtering can be achieved with this strategy. © 2022.

Beltran-Carbajal, F., Tapia-Olvera, R., Valderrabano-Gonzalez, A., & Yanez-Badillo, H. (2022). An asymptotic and algebraic estimation method of harmonics. *Electric Power Systems Research*, 206. doi: 10.1016/j.eprsr.2022.107771. Article.

## ANTONIO VALDERRÁBANO GONZÁLEZ

SNI Nivel I

### ON ACTIVE VIBRATION ABSORPTION IN MOTION CONTROL OF A QUADROTOR UAV

**ABSTRACT.** Conventional dynamic vibration absorbers are physical control devices designed to be coupled to flexible mechan-

ical structures to be protected against undesirable forced vibrations. In this article, an approach to extend the capabilities of forced vibration suppression of the dynamic vibration absorbers into desired motion trajectory tracking control algorithms for a four-rotor unmanned aerial vehicle (UAV) is introduced. Nevertheless, additional physical control devices for mechanical vibration absorption are unnecessary in the proposed motion profile reference tracking control design perspective. A new dynamic control design approach for efficient tracking of desired motion profiles as well as for simultaneous active harmonic vibration absorption for a quadrotor helicopter is then proposed. In contrast to other control design methods, the presented motion tracking control scheme is based on the synthesis of multiple virtual (nonphysical) dynamic vibration absorbers. The mathematical structure of these physical mechanical devices, known as dynamic vibration absorbers, is properly exploited and extended for control synthesis for underactuated multiple-input multiple-output four-rotor nonlinear aerial dynamic systems. In this fashion, additional capabilities of active suppression of vibrating forces and torques can be achieved in specified motion directions on four-rotor helicopters. Moreover, since the dynamic vibration absorbers are designed to be virtual, these can be directly tuned for diverse operating conditions. In the present study, it is thus demonstrated that the mathematical structure of physical mechanical vibration absorbers can be extended for the design of active vibration control schemes for desired motion trajectory tracking tasks on four-rotor aerial vehicles subjected to adverse harmonic disturbances. The effectiveness of the presented novel design perspective of virtual dynamic vibration absorption schemes is proved by analytical and numerical results. Several operating case studies to stress the advantages to extend the undesirable vibration attenuation capabilities of the dynamic vibration absorbers into trajectory tracking control algorithms for nonlinear four-rotor helicopter systems are presented. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

Beltran-Carbajal, F., Yañez-Badillo, H., Tapia-Olvera, R., Favela-Contreras, A., Valderrabano-Gonzalez, A., & Lopez-Garcia, I. (2022). On Active Vibration Absorption in Motion Control of a Quadrotor UAV. *Mathematics*, 10(2). doi: 10.3390/math10020235. Article.

**LEONARDO JESÚS VALDIVIA PARGA**

SNI Nivel I

**JOSÉ ALBERTO DEL PUERTO FLORES**

Profesor investigador

**CAROLINA DEL VALLE SOTO**

Investigadora Titular D, SNI Nivel I

**CHANNEL CHARACTERIZATION AND SC-FDM MODULATION FOR PLC IN HIGH-VOLTAGE POWER LINES**

**ABSTRACT.** Digital communication over power lines is an active field of research and most studies in this field focus on low-voltage (LV) and medium-voltage (MV) power systems. Nevertheless, as power companies are starting to provide communication services and as smart-grid technologies are being incorporated into power networks, high-voltage (HV) power-line communication has become attractive. The main constraint of conventional HV power-line carrier (PLC) systems is their unfeasibility for being migrated to wideband channels, even with a high signal-to-noise ratio (SNR). In this scenario, none of the current linear/non-linear equalizers used in single carrier schemes achieve the complete compensation of the highly dispersive conditions, which limits their operation to 4 kHz channels. In this paper, a new PLC-channel model is introduced for transmission lines incorporating the effects of the coupling equipment. In addition, the use of the single-carrier frequency-division modulation (SC-FDM) is proposed as a solution to operate PLC systems in a wide bandwidth, achieving transmission speeds above those of the conventional PLC system. The results presented in this paper demonstrate the superior performance of the SC-FDM-PLC over conventional PLC systems, obtaining a higher transmission capacity in 10 to 30 times. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

Del Puerto-Flores, J. A., Naredo, J. L., Peña-Campos, F., Del-Valle-Soto, C., Valdivia, L. J., & Parra-Michel, R. (2022). Channel Characterization and SC-FDM Modulation for PLC in High-Voltage Power Lines. *Future Internet*, 14(5). doi: 10.3390/fi14050139. Article.

**CAROLINA DEL VALLE SOTO**

Investigadora Titular D, SNI Nivel I

**FABIOLA CORTÉS CHÁVEZ**

Profesora investigadora

**ANALYSIS AND CORRELATION BETWEEN A NON-INVASIVE SENSOR NETWORK SYSTEM IN THE ROOM AND THE IMPROVEMENT OF SLEEP QUALITY**

**ABSTRACT.** Good sleep quality is essential in human life due to its impact on health. Currently, technology has focused on providing specific features for quality sleep monitoring in people. This work represents a contribution to state of the art on non-invasive technologies that can help improve the quality of people's sleep at a low cost. We reviewed the sleep quality of a group of people by analyzing their good and bad sleeping habits. We take that information to feed a proposed algorithm for a non-invasive sensor network in the person's room for monitoring factors that help them fall asleep. We analyze vital signs and health conditions in order to be able to relate these parameters to the person's way of sleeping. We help people get valuable information about their sleep with technology to live a healthy life, and we get about a 15% improvement in sleep quality. Finally, we compare the implementations given by the network with wearables to show the improvement in the behavior of the person's sleep. © 2022 by the authors.

Morales-Vizcarra, E., Del-Valle-Soto, C., Visconti, P., & Cortes-Chavez, F. (2022). Analysis and Correlation between a Non-Invasive Sensor Network System in the Room and the Improvement of Sleep Quality. *Future Internet*, 14(10). doi: 10.3390/fi14100270. Article.

**CAROLINA DEL VALLE SOTO**

Investigadora Titular D, SNI Nivel I

**MAINTENANCE 5.0: TOWARDS A WORKER-IN-THE-LOOP FRAMEWORK FOR RESILIENT SMART MANUFACTURING**

**ABSTRACT.** Due to the global uncertainty caused by social problems such as COVID-19 and the war in Ukraine, companies have opted for the use of emerging technologies, to produce more with fewer resources and thus maintain their productivity; that is why the market for wearable artificial intelligence (AI) and wireless sensor networks (WSNs)

has grown exponentially. In the last decade, maintenance 4.0 has achieved best practices due to the appearance of emerging technologies that improve productivity. However, some social trends seek to explore the interaction of AI with human beings to solve these problems, such as Society 5.0 and Industry 5.0. The research question is: could a human-in-the-loop-based maintenance framework improve the resilience of physical assets? This work helps to answer this question through the following contributions: first, a search for research gaps in maintenance; second, a scoping literature review of the research question; third, the definition, characteristics, and the control cycle of Maintenance 5.0 framework; fourth, the maintenance worker 5.0 definition and characteristics; fifth, two proposals for the calculation of resilient maintenance; and finally, Maintenance 5.0 is validated through a simulation in which the use of the worker in the loop improves the resilience of an Industrial Wireless Sensor Network (IWSN). © 2022 by the authors.

Cortés-Leal, A., Cárdenas, C., & Del-Valle-Soto, C. (2022). Maintenance 5.0: Towards a Worker-in-the-Loop Framework for Resilient Smart Manufacturing. *Applied Sciences*, 12(22). doi: 10.3390/app122211330. Article.

**CAROLINA DEL VALLE SOTO**

Investigadora Titular D, SNI Nivel I

**MOOD STATE DETECTION IN HANDWRITTEN TASKS USING PCA-MFCBF AND AUTOMATED MACHINE LEARNING**

**ABSTRACT.** In this research, we analyse data obtained from sensors when a user handwrites or draws on a tablet to detect whether the user is in a specific mood state. First, we calculated the features based on the temporal, kinematic, statistical, spectral and cepstral domains for the tablet pressure, the horizontal and vertical pen displacements and the azimuth of the pen's position. Next, we selected features using a principal component analysis (PCA) pipeline, followed by modified fast correlation-based filtering (mFCBF). PCA was used to calculate the orthogonal transformation of the features, and mFCBF was used to select the best PCA features. The EMOTHAW database was used for depression, anxiety and stress scale (DASS) assessment. The process involved the augmentation of the



training data by first augmenting the mood states such that all the data were the same size. Then, 80% of the training data was randomly selected, and a small random Gaussian noise was added to the extracted features. Automated machine learning was employed to train and test more than ten plain and ensembled classifiers. For all three moods, we obtained 100% accuracy results when detecting two possible grades of mood severities using this architecture. The results obtained were superior to the results obtained by using state-of-the-art methods, which enabled us to define the three mood states and provide precise information to the clinical psychologist. The accuracy results obtained when detecting these three possible mood states using this architecture were 82.5%, 72.8% and 74.56% for depression, anxiety and stress, respectively. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

Nolazco-Flores, J. A., Faundez-Zanuy, M., Velázquez-Flores, O. A., Del-Valle-Soto, C., Cordasco, G., & Esposito, A. (2022). Mood State Detection in Handwritten Tasks Using PCA-mFCBF and Automated Machine Learning. *Sensors*, 22(4). doi: 10.3390/s22041686. Article.

### CAROLINA DEL VALLE SOTO

*Investigadora Titular D, SNI Nivel I*

**ARTURO JAFET RODRÍGUEZ MUÑOZ**  
*Profesor Investigador*

**ALBA VIOLETA CORONA CABRERA**  
*Investigadora Asistente, Profesora Investigadora*

### NEUROMARKETING IN THE DIGITAL AGE: THE DIRECT RELATION BETWEEN FACIAL EXPRESSIONS AND WEBSITE DESIGN

**ABSTRACT.** User experience (UX) is key in the immediate and future relationship between the client and business. Achieving a satisfying UX can only be achieved by understanding the wishes and user needs. The following study is carried out as an improvement tool for a Mexican coffee company. The objective is to achieve greater efficiency, attraction, and engagement on the part of the user. The main question is whether the new dynamic website design can directly increase the valence of user emotions compared to the static website design. To answer this question, 39 participants were exposed to the two different web page designs and elicited the following emotions using eye

tracking and facial expression analysis (FEA) techniques: joy, anger, surprise, fear, contempt, disgust, sadness, neutral, positive, and negative. Through a Wilcoxon signed-rank test, the results showed a significant increase for the new dynamic design in the following emotions; joy, anger, surprise, disgust, fear and neutral. Thus, five of the seven basic emotions had a significant change that could lead to greater attraction and commitment on the part of the user and also influence, either consciously or unconsciously, their decision when interacting with the company. © 2022 by the authors.

González-Mena, G., Del-Valle-Soto, C., Corona, V., & Rodríguez, J. (2022). Neuromarketing in the Digital Age: The Direct Relation between Facial Expressions and Website Design. *Applied Sciences*, 12(16). doi: 10.3390/app12168186. Article.

### CAROLINA DEL VALLE SOTO

*Investigadora Titular D, SNI Nivel I*

**RAMIRO VELÁZQUEZ GUERRERO**  
*SNI Nivel I*

### NEW WEARABLE TECHNOLOGIES AND DEVICES TO EFFICIENTLY SCAVENGE ENERGY FROM THE HUMAN BODY: STATE OF THE ART AND FUTURE TRENDS

**ABSTRACT.** Wearable technology represents a new technological paradigm for promoting physical activity, enabling monitoring of performances and athletic gestures. In addition, they can be employed for remote health monitoring applications, allowing continuous acquisition of users' vital signs directly at home, emergency alerting, and computer-assisted rehabilitation. Commonly, these devices depend on batteries which are not the better option since researchers aim for dispositive who need minimal human intervention. Energy harvesting devices can be useful to extract energy from the human body, especially by integrating them into the garments, giving health monitoring devices enough energy for their independent operation. This review work focuses on the main new wearable technologies and devices to scavenge energy from the human body. First, the most suitable energy sources exploitable for wearable applications are investigated. Afterward, an overview of the main harvesting technologies (piezoelectric, triboelectric,

thermoelectric, solar fabrics, and hybrid solution) is presented. In detail, we focused on flexible and thin textiles with energy harvesting capability, allowing easy integration into clothes fabric. Furthermore, comparative analyses of each harvesting technology are proposed, providing useful insights related to the best technologies for developing future self-sustainable wearable devices. Finally, a comparison between our review work and similar ones is introduced, highlighting its strengths in completeness and specificity. © 2022 by the authors.

De Fazio, R., Proto, R., Del-Valle-Soto, C., Velázquez, R., & Visconti, P. (2022). New Wearable Technologies and Devices to Efficiently Scavenge Energy from the Human Body: State of the Art and Future Trends. *Energies*, 15(18). doi: 10.3390/en15186639. Review.

### CAROLINA DEL VALLE SOTO

*Investigadora Titular D, SNI Nivel I*

**LEONARDO JESÚS VALDIVIA PARGA**  
*SNI Nivel I*

**JOSÉ ALBERTO DEL PUERTO FLORES**

*Profesor investigador*

### PERFORMANCE METRIC ANALYSIS FOR A JAMMING DETECTION MECHANISM UNDER COLLABORATIVE AND COOPERATIVE SCHEMES IN INDUSTRIAL WIRELESS SENSOR NETWORKS

**ABSTRACT.** The emergence of Industry 4.0 technologies, such as the Internet of Things (IoT) and Wireless Sensor Networks (WSN), has prompted a reconsideration of methodologies for network security as well as reducing operation and maintenance costs, especially at the physical layer, where the energy consumption plays an important role. This article demonstrates through simulations and experiments that, while the cooperative scheme is more efficient when a WSN is at normal operating conditions, the collaborative scheme offers more enhanced protection against the aggressiveness of jamming in the performance metrics, thus making it safer, reducing operation and maintenance costs and laying the foundations for jamming mitigation. This document additionally offers an algorithm to detect jamming in real time. Firstly, it examines the characteristics and damages caused by the type of aggressor. Secondly, it reflects on the natural immunity of the WSN (which



depends on its node density and a cooperative or collaborative configuration). Finally, it considers the performance metrics, especially those that impact energy consumption during transmission. © 2021 by the authors. Licensee MDPI, Basel, Switzerland.

Cortés-Leal, A., Del-Valle-Soto, C., Cardenas, C., Valdivia, L. J., & Del Puerto-Flores, J. A. (2022). Performance metric analysis for a jamming detection mechanism under collaborative and cooperative schemes in industrial wireless sensor networks. *Sensors*, 22(1). doi: 10.3390/s22010178. Article.

## CAROLINA DEL VALLE SOTO

Investigadora Titular D, SNI Nivel I

## LEONARDO JESÚS VALDIVIA PARGA

SNI Nivel I

## RAMIRO VELÁZQUEZ GUERRERO

SNI Nivel I

### REMOTELY VITAL SIGNS CAPTURER FOR OLDER ADULTS APPLIED IN RESIDENTIAL ZONES

**ABSTRACT.** Assisted technology combined with sensor networks is an emerging technology for better homecare of people requiring specific support. In this work, we focus our attention on monitoring vital signs and accident prevention of older adults in residential areas without invasive and uncomfortable medical devices. We prototyped two vital signal monitoring devices integrated in structures deployed in common areas such as an arch and a bench. In addition, an alarm system was implemented to monitor residents in common areas and prevent vehicle accidents. The system was tested using Zigbee and LoRa wireless technologies and the network's overall performance was compared. In addition, the proposal was compared to commercially available medical equipment and results show a 96% similarity in vital signs monitoring. The system offers a silent non-invasive operation together with a friendly user interaction. It allows caregivers and family members to monitor vital signs of the residents remotely without the need of wearable specialized devices. © 2012 IEEE.

Del-Valle-Soto, C., Valdivia, L. J., Velazquez, R., & Visconti, P. (2022). Remotely Vital Signs Capturer for Older Adults Applied in Residential Zones. *IEEE Consumer Electronics Magazine*, 11(5), 87-93. doi: 10.1109/MCE.2022.3146127. Article.

## CAROLINA DEL VALLE SOTO

Investigadora Titular D, SNI Nivel I

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Profesor investigador

## JULIO CÉSAR ROSAS CARO

SNI Nivel I

### STATISTICAL STUDY OF USER PERCEPTION OF SMART HOMES DURING VITAL SIGNAL MONITORING WITH AN ENERGY-SAVING ALGORITHM

**ABSTRACT.** Sensor networks are deployed in people's homes to make life easier and more comfortable and secure. They might represent an interesting approach for elderly care as well. This work highlights the benefits of a sensor network implemented in the homes of a group of users between 55 and 75 years old, which encompasses a simple home energy optimization algorithm based on user behavior. We analyze variables related to vital signs to establish users' comfort and tranquility thresholds. We statistically study the perception of security that users exhibit, differentiating between men and women, examining how it affects the person's development at home, as well as the reactivity of the sensor algorithm, to optimize its performance. The proposed algorithm is analyzed under certain performance metrics, showing an improvement of 15% over a sensor network under the same conditions. We look at and quantify the usefulness of accurate alerts on each sensor and how it reflects in the users' perceptions (for men and women separately). This study analyzes a simple, low-cost, and easy-to-implement home-based sensor network optimized with an adaptive energy optimization algorithm to improve the lives of older adults, which is capable of sending alerts of possible accidents or intruders with the highest efficiency. © 2022 by the authors.

Del-Valle-Soto, C., Nolasco-Flores, J. A., Del Puerto-Flores, J. A., Velázquez, R., Valdivia, L. J., Rosas-Caro, J., & Visconti, P. (2022). Statistical Study of User Perception of Smart Homes during Vital Signal Monitoring with an Energy-Saving Algorithm. *International Journal of Environmental Research and Public Health*, 19(6). doi: 10.3390/ijerph19169966. Article.

## RAMIRO VELÁZQUEZ GUERRERO

SNI Nivel I

### A NEW APPROACH TO ASSIST VIRTUAL IMAGE ACCESSIBILITY FOR VISUALLY IMPAIRED PEOPLE

**ABSTRACT.** Currently, graphical data is becoming increasingly ubiquitous with new technologies. However, today's technologies are still of limited access to such representations (images, graphs, charts ...) for Visually Impaired People (VIP). The quantity and quality of presented information are key points of efficient accessibility. Therefore, this paper proposes the presentation of such information via a tactile gist (a tactile representation of essential data). New rules for 2D data representation (e.g. paintings, images, maps) are proposed via the tactile gist, which helps us, especially VIP, to understand them. These rules are deduced from experiments lead with VIP for tactile gist representations on two supports - thermoformed paper and dedicated original force-feedback based device named F2T (Fore Feedback Tablet). These rules take into account the human touch/haptic sense specificities and human cognitive capabilities. Such rules should be included in the design of any assistance to 2D data accessible by the VIP. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

Pissaloux, E., Djoussouf, L., Romeo, K., Velázquez, R., Gay, S. L., Truong, N. T., & Dao, S. D. (2021). A New Approach to Assist Virtual Image Accessibility for Visually Impaired People. 16th International Conference on Universal Access in Human-Computer Interaction, UAHCI 2022 Held as Part of the 24th HCI International Conference, HCII 2022, Virtual, Online, 26 June 2022 through 1 July 2022, Code 279339. *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*, 13309 LNCS, 251-261. doi: 10.1007/978-3-031-05039-8\_18. Conference Paper.

## RAMIRO VELÁZQUEZ GUERRERO

SNI Nivel I

### A REMOTE-CONTROLLED GLOBAL NAVIGATION SATELLITE SYSTEM BASED ROVER FOR ACCURATE VIDEO-ASSISTED CADASTRAL SURVEYS

**ABSTRACT.** One of the main tasks of a cadastral surveyor is to accurately determine property boundaries by measuring control points and calculating their coordinates.

This paper proposes the development of a remotely-controlled tracking system to perform cadastral measurements. A Bluetooth-controlled rover was developed, including a Raspberry Pi Zero W module that acquires position data from a VBOX 3iSR global navigation satellite system (GNSS) receiver, equipped with a specific modem to download real-time kinematic (RTK) corrections from the internet. Besides, the Raspberry board measures the rover speed with a hall sensor mounted on a track, adjusting the acquisition rate to collect data at a fixed distance. Position and inertial data are shared with a cloud platform, enabling their remote monitoring and storing. Besides, the power supply section was designed to power the different components included in the acquisition section, ensuring 2 hours of energy autonomy. Finally, a mobile application was developed to drive the rover and real-time monitor the travelled path. The tests indicated a good agreement between rover measurements and those obtained by a Trimble R10 GNSS receiver (+0.25% mean error) and proved the superiority of the presented system over a traditional metric wheel. © 2022 Institute of Advanced Engineering and Science. All rights reserved.

Visconti, P., Luceri, M., Velázquez, R., Roberto, D. F. (2022). A remote-controlled global navigation satellite system based rover for accurate video-assisted cadastral surveys. *International Journal of Electrical and Computer Engineering*, 12(4), 3551-3563. doi: 10.11591/ijece.v12i4.pp3551-3563. Article.

## RAMIRO VELÁZQUEZ GUERRERO

SNI Nivel I

### AVAILABLE TECHNOLOGIES AND COMMERCIAL DEVICES TO HARVEST ENERGY BY HUMAN TRAMPLING IN SMART FLOORING SYSTEMS: A REVIEW

**ABSTRACT.** Technological innovation has increased the global demand for electrical power and energy. Accordingly, energy harvesting has become a research area of primary interest for the scientific community and companies because it constitutes a sustainable way to collect energy from various sources. In particular, kinetic energy generated from human walking or vehicle movements on smart energy floors represents a promising research topic. This paper aims to analyze the state-of-art of smart energy harvesting floors to determine the best solu-

tion to feed a lighting system and charging columns. In particular, the fundamentals of the main harvesting mechanisms applicable in this field (i.e., piezoelectric, electromagnetic, triboelectric, and relative hybrids) are discussed. Moreover, an overview of scientific works related to energy harvesting floors is presented, focusing on the architectures of the developed tiles, the transduction mechanism, and the output performances. Finally, a survey of the commercial energy harvesting floors proposed by companies and startups is reported. From the carried-out analysis, we concluded that the piezoelectric transduction mechanism represents the optimal solution for designing smart energy floors, given their compactness, high efficiency, and absence of moving parts. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

Visconti, P., Bagordo, L., Velázquez, R., Cafagna, D., & De Fazio, R. (2022). Available Technologies and Commercial Devices to Harvest Energy by Human Trampling in Smart Flooring Systems: A Review. *Energies*, 15(2). doi: 10.3390/en15020432. Review.

## RAMIRO VELÁZQUEZ GUERRERO

SNI Nivel I

### MARÍA TERESA ORVAÑANOS GUERRERO

Profesora investigadora

### MARIO ACEVEDO ALVARADO

SNI Nivel I

### CLAUDIA NALLELY SÁNCHEZ GÓMEZ

Investigadora Titular B, SNI Nivel Candidato

### BALANCING OPTIMIZATION OF A PLANAR MECHANISM BY MASS REDISTRIBUTION

**ABSTRACT.** Balancing methods for mechanisms have been used over the years to extend the lifespan of machinery by reducing vibration, wear, and fatigue on their components. These techniques have grown in effectiveness but also in mathematical complexity. Nowadays most balancing methods use Cartesian coordinates, which generate complex equations involving trigonometric functions that are difficult to simplify. This paper presents the use of natural coordinates to obtain the balancing parameters of a simplified crank-connecting rod-slide mechanism avoiding the use of trigonometric functions. The balancing optimization of the

mechanism is carried out by using a stochastic optimization algorithm based on populations allowing to reduce the Shaking Moment (ShM) by 97.76% and the Shaking Force (ShF) by 94.58%. © 2022, Universidad de Tarapaca. All rights reserved.

Orvañanos-Guerrero, M. T., Cisneros-Barba, J., Acevedo, M., Carrasco, M., Sánchez, C. N., & Velázquez, R. (2022). Balancing optimization of a planar mechanism by mass redistribution. *Ingeniare*, 30(1), 134-144. doi: 10.4067/S0718-33052022000100134. Article.

## RAMIRO VELÁZQUEZ GUERRERO

SNI Nivel I

### MARÍA TERESA ORVAÑANOS GUERRERO

Profesora investigadora

### MARIO ACEVEDO ALVARADO

SNI Nivel I

### CLAUDIA NALLELY SÁNCHEZ GÓMEZ

Investigadora Titular B, SNI Nivel Candidato

### COMPLETE BALANCING OF THE SIX-BAR MECHANISM USING FULLY CARTESIAN COORDINATES AND MULTIOBJECTIVE DIFFERENTIAL EVOLUTION OPTIMIZATION

**ABSTRACT.** The high-speed operation of unbalanced machines may cause vibrations that lead to noise, wear, and fatigue that will eventually limit their efficiency and operating life. To restrain such vibrations, a complete balancing must be performed. This paper presents the complete balancing optimization of a six-bar mechanism with the use of counterweights. A novel method based on fully Cartesian coordinates (FCC) is proposed to represent such a balanced mechanism. A multiobjective optimization problem was solved using the Differential Evolution (DE) algorithm to minimize the shaking force (ShF) and the shaking moment (ShM) and thus balance the system. The Pareto front is used to determine the best solutions according to three optimization criteria: only the ShF, only the ShM, and both the ShF and ShM. The dimensions of the counterweights are further fine-tuned with an analysis of their partial derivatives, volumes, and area-thickness relations. Numerical results show that the ShF and ShM can be reduced by 76.82% and 77.21%, respectively, when importance is given to either of them and by 45.69% and 46.81%, respectively, when equal importance is given to both. A comparison of these results with

others previously reported in the literature shows that the use of FCC in conjunction with DE is a suitable methodology for the complete balancing of mechanisms.

Orvananos-Guerrero, M. T., Acevedo, M., Sanchez, C. N., Campos-Delgado, D. U., Ghavifekr, A. A., Visconti, P., & Velazquez, R. (2022). Complete Balancing of the Six-Bar Mechanism Using Fully Cartesian Coordinates and Multiobjective Differential Evolution Optimization. *Mathematics*, 10(11). doi: 10.3390/math10111830. Article.

## RAMIRO VELÁZQUEZ GUERRERO

SNI Nivel I

### DEVELOPMENT AND TESTING OF PIEZORESISTIVE AND INERTIAL-BASED CHEST BANDS FOR BREATHING MONITORING

**ABSTRACT.** This work proposes the development of two BLE-connected chest bands for monitoring breathing activity. The first relies on a custom strain sensor based on a piezoresistive fabric and a low-power conditioning and acquisition section. A microcontroller unit jointly processes the collected strain data with inertial ones provided by an integrated IMU to extract the respiration rate (RR). Also, the second band uses an inertial-based detection method through a dual-accelerometer approach for deriving the respiratory signal. In detail, two IMUs are placed on the user's chest and back for extracting the differential inertial signal, containing information related to the breathing activity regardless of the body movements. Both chest bands integrate a BLE module to remotely transmit the acquired information to a host device. Several tests were carried out to determine the performances of the two respiratory monitoring systems. The performance comparison demonstrates the effectiveness of the dual-inertial solution, obtaining a -0.4 BrPM mean difference (MD) and +1.21 and -2.01 BrPM limits of agreement (LoA). © 2022 University of Split, FESB.

De Fazio, R., Visconti, P., Perrone, E., Greco, M. R., Velazquez, R. (2022). Development and Testing of Piezoresistive and Inertial-Based Chest Bands for Breathing Monitoring. 7th International Conference on Smart and Sustainable Technologies, SpliTech 2022, Split, Croatia, 5 July 2022 through 8 July 2022, Category numberCFP22F09-ART, Code 182191. 2022 7th International Conference on Smart and Sustainable Technologies, SpliTech 2022. doi: 10.23919/SpliTech55088.2022.9854335. Conference Paper.

## RAMIRO VELÁZQUEZ GUERRERO

SNI Nivel I

### MODELING AND PROTOTYPE IMPLEMENTATION OF AN AUTOMATED GUIDED VEHICLE FOR SMART FACTORIES

**ABSTRACT.** This paper overviews the modeling, implementation, and mechanical characterization of an Automated Guided Vehicle (AGV) devoted to transport materials and tools in smart factories. The design is based on a differential-drive mobile robot configuration for which the mathematical model was obtained. Such model allows the simulation of the AGV's motion and can be used to improve productivity, increase automation, and reduce transportation costs in industrial facilities. The prototype's implementation was conducted with highly resistant materials and automated manufacturing processes. A finite element analysis (FEA) shows that the prototype is capable of transporting 700 kg loads without suffering any structural damage and that critical cases involving collisions might cause only minimal harm. An IoT approach has been considered for the AGV's electronic architecture. © 2021 IEEE.

Sasamoto, H., Velázquez, R., Gutierrez, S., Cardona, M., Ghavifekr, A. A., & Visconti, P. (2021). Modeling and Prototype Implementation of an Automated Guided Vehicle for Smart Factories. 2021 IEEE International Conference on Machine Learning and Applied Network Technologies, ICMLANT 2021, Virtual, Soyapango, El Salvador, 16 December 2021 through 17 December 2021, Category numberCFP21BGE-ART, Code 176854. *Proceedings of the 2021 IEEE International Conference on Machine Learning and Applied Network Technologies, ICMLANT 2021*. doi: 10.23919/SpliTech55088.2022.9854335. Conference Paper.

## RAMIRO VELÁZQUEZ GUERRERO

SNI Nivel I

### MULTIRATE ADAPTIVE INVERSE DYNAMICS CONTROL OF 5 DOF INDUSTRIAL GRYPHON ROBOT

**ABSTRACT.** A multirate adaptive inverse dynamic controller is presented in this study to provide the stability and reliable trajectory for robotic manipulators. The proposed controller has been implemented on the experimental Gryphon which is a five degrees of freedom industrial robot and has emulated the movement of human arm in take and place missions. The multirate structure leads to proper choosing of sampling periods and

adequate refresh rates for actuators which apparently improve the tracking performance of the manipulator. By applying the proposed controller, the end-effector motion tracking error asymptotically converges to zero besides preserving the stability. Experimental results are performed to illustrate the performance of the proposed controller. © 2021 IEEE.

Ghavifekr, A. A., Velázquez, R., & Safari, A. (2021). Multirate Adaptive Inverse Dynamics Control of 5 DOF Industrial Gryphon Robot. 9th RSI International Conference on Robotics and Mechatronics, ICRoM 2021, New Research Technologies Center, Amirkabir University of Technology, Tehran, Iran, 17 November 2021 through 19 November 2021, Category numberCFP21RSI-ART, Code 176197. 9th RSI International Conference on Robotics and Mechatronics, ICRoM 2021, 255-260. doi: 10.1109/ICRoM54204.2021.9663447. Conference Paper.

## RAMIRO VELÁZQUEZ GUERRERO

SNI Nivel I

## RICARDO MACÍAS QUIJAS

Profesor investigador

### RELIABLE E-NOSE FOR AIR TOXICITY MONITORING BY FILTER DIAGONALIZATION METHOD

**ABSTRACT.** This paper introduces a compact, affordable electronic nose (e-nose) device devoted to detect the presence of toxic compounds that could affect human health, such as carbon monoxide, combustible gas, hydrogen, methane, and smoke, among others. Such artificial olfaction device consists of an array of six metal oxide semiconductor (MOS) sensors and a computer-based information system for signal acquisition, processing, and visualization. This study further proposes the use of the filter diagonalization method (FDM) to extract the spectral contents of the signals obtained from the sensors. Preliminary results show that the prototype is functional and that the FDM approach is suitable for a later classification stage. Example deployment scenarios of the proposed e-nose include indoor facilities (buildings and warehouses), compromised air quality places (mines and sanitary landfills), public transportation, mobile robots, and wireless sensor networks. © 2022 Institute of Advanced Engineering and Science. All rights reserved.

Macías-Quijas, R., Velázquez, R., De Fazio, R., Visconti, P., Giannoccaro, N. I., & Lay-Ekuakille, A. (2022). Reliable e-nose for air toxicity monitoring by filter diagonalization method. *International Journal of Electrical and Computer Engineering*, 12(2), 1286-1298. doi: 10.11591/ijece.v12i2.pp1286-1298. Article.

## RAMIRO VELÁZQUEZ GUERRERO

SNI Nivel I

### SELF-POWERED WIFI-CONNECTED MONITORING STATIONS FOR ENVIRONMENTAL POLLUTION APP-BASED CONTROL IN URBAN AND INDUSTRIAL AREAS

**ABSTRACT.** This paper presents the design of a sensing device for monitoring and storing the atmospheric and noise pollution data, using technology with zero impact on the environment. The system consists of an eco-friendly sensor pitch equipped with a multi-sources harvesting system used to scavenge energy from renewable sources (wind and solar light), making it suitable to be accumulated into a storage device. The harvested energy is used to feed a sensing section, which samples the environmental parameters (i.e. PM2.5, PM10, NH3, CO2, NO2, CO) at regular intervals. The hardware and firmware development of the sensor node is discussed; this last is based on the Arduino Pro Micro microcontroller board, which acquires, processes and stores the data from sensors and manages their transmissions towards the cloud platform. Finally, the test results of the developed sensor pitch are presented, demonstrating the correct operation of all system sections. © 2022 IEEE.

Visconti, P., De Fazio, R., Velazquez, R., Al-Naami, B., & Ghavifekr, A. A. (2022). Self-powered WiFi-connected monitoring stations for environmental pollution app-based control in urban and industrial areas. 8th International Conference on Control, Instrumentation and Automation, ICCIA 2022, Iranian Society of Instrumentation and Control Engineers CenterVirtual, Online, Iran, 2 March 2022 through 3 March 2022, Category numberCFP2279S-ART, Code 177933. 2022 8th International Conference on Control, Instrumentation and Automation, ICCIA 2022. doi: 10.1109/ICCIA54998.2022.9737209. Conference Paper.

## RAMIRO VELÁZQUEZ GUERRERO

SNI Nivel I

### SENSORS ALLOCATION AND OBSERVER DESIGN FOR DISCRETE BILATERAL TELEOPERATION SYSTEMS WITH MULTI-RATE SAMPLING

**ABSTRACT.** This study addresses sensor allocation by analyzing exponential stability for discrete-time teleoperation systems. Previous studies mostly concentrate on the continuous-time teleoperation systems and neglect the management of significant practical phenomena, such as data-swap, the effect of

sampling rates of samplers, and refresh rates of actuators on the system's stability. A multi-rate sampling approach is proposed in this study, given the isolation of the master and slave robots in teleoperation systems which may have different hardware restrictions. This architecture collects data through numerous sensors with various sampling rates, assuming that a continuous-time controller stabilizes a linear teleoperation system. The aim is to assign each position and velocity signals to sensors with different sampling rates and divide the state vector between sensors to guarantee the stability of the resulting multi-rate sampled-data teleoperation system. Sufficient Krasovskii-based conditions will be provided to preserve the exponential stability of the system. This problem will be transformed into a mixed-integer program with LMIs (linear matrix inequalities). These conditions are also used to design the observers for the multi-rate teleoperation systems whose estimation errors converge exponentially to the origin. The results are validated by numerical simulations which are useful in designing sensor networks for teleoperation systems. © 2022 by the authors. Licensee MDPI, Basel, Switzerland.

Ghavifekr, A. A., De Fazio, R., Velázquez, R., & Visconti, P. (2022). Sensors Allocation and Observer Design for Discrete Bilateral Teleoperation Systems with Multi-Rate Sampling. *Sensors*, 22(7). doi: 10.3390/s22072673. Article.

## RAMIRO VELÁZQUEZ GUERRERO

SNI Nivel I

### JULIETA DOMÍNGUEZ SOBERANES

Investigadora Titular A, SNI Nivel I

### TEXTURE ANALYSIS OF CORN-BASED SNACKS WITH FAST FOURIER TRANSFORM

**ABSTRACT.** This paper introduces a computer-based system devoted to process the sound that is produced when a corn-based food product is masticated. The system allows a simple and high-quality sound acquisition eliminating any interference caused by noise and other environmental artifacts. Its user interface displays the collected data in both time and frequency domains. Using the Fast Fourier Transform (FFT), some of the main characteristics related to food texture can be determined. The proposed implementation intends to be a simple yet effective tool that could complement sensory analysis in the food industry by assisting in determining

the crunchiness of corn-based snacks, which is often a desirable attribute by consumers. © 2022 IEEE.

Martinez-Velasco, J. D., Filomena-Ambrosio, A., Garzon-Castro, C. L., Dominguez-Soberanes, J., Visconti, P., & Velazquez, R. (2022). Texture Analysis of Corn-based Snacks with Fast Fourier Transform. 8th International Conference on Control, Instrumentation and Automation, ICCIA 2022, Iranian Society of Instrumentation and Control Engineers CenterVirtual, Online, Iran, 2 March 2022 through 3 March 2022, Category numberCFP2279S-ART, Code 177933. 2022 8th International Conference on Control, Instrumentation and Automation, ICCIA 2022. doi: 10.1109/ICCIA54998.2022.9737191. Conference Paper.

## RAMIRO VELÁZQUEZ GUERRERO

SNI Nivel I

### WEARABLE SENSING SMART SOLUTIONS FOR WORKERS' REMOTE CONTROL IN HEALTH-RISK ACTIVITIES

**ABSTRACT.** This paper presents a smart garment to monitor the environmental parameters and user's vital signs; the wearable application is meant to monitor workers' conditions in harsh workplaces. The smart jacket integrates a multisource harvesting section for gathering energy from sources associated with the human body (light, heat, movements), guaranteeing the energy autonomy of the sensing unit. This last relies on a custom microcontroller board to acquire and process biophysical and environmental data from several sensors distributed on the garment. Also, it wirelessly sends the acquired data towards the IBM Cloud platform, allowing remote monitoring of worker's conditions, real-time anomalies detection, and decentralized storing of acquired data. The tests indicated that the harvesting section could provide up to 217 mW mean power, fully covering the energy requirements of the sensing unit in all tested scenarios. However, the 380 mAh LiPo battery, charged by the harvesting system, allows the device about 16 days lifetime when no further energy contribution is available. © 2022 IEEE.

Visconti, P., De Fazio, R., Velazquez, R., Al-Naami, B., & Ghavifekr, A. A. (2022). Wearable sensing smart solutions for workers' remote control in health-risk activities. 8th International Conference on Control, Instrumentation and Automation, ICCIA 2022, Iranian Society of Instrumentation and Control Engineers CenterVirtual, Online, Iran, 2 March 2022 through 3 March 2022, Category numberCFP2279S-ART, Code 177933. 2022 8th International Conference on Control, Instrumentation and Automation, ICCIA 2022. doi: 10.1109/ICCIA54998.2022.9737182. Conference Paper.



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<sup>2</sup> Colaboración en un artículo en Escuela de Pedagogía (p. 20).





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**SANDRA ANCHONDO PAVÓN**

SNI Nivel I

**THE NEW EUGENICS OF NEOLIBERAL INDIVIDUALISM. A DISCUSSION FROM THE SOCIAL MODEL OF DISABILITY****[LA NUEVA EUGENESIA DEL INDIVIDUALISMO NEOLIBERAL. UNA DISCUSIÓN DESDE EL MODELO SOCIAL DE DISCAPACIDAD]**

**ABSTRACT.** Prejudices around disability are so deeply rooted in contemporary societies, especially in the Latin American context, that it is necessary to reflect on the roots of this phenomenon. Thus, delving into the eugenic projects of the last century, in relation to the new contemporary forms of eugenics, allows us to understand what a functional and capacitive conception has caused in the notion that we currently have of human nature. Moreover, when behind these projects there is an instrumental and individualistic defense that ignores the relational and social character of human beings. This article insists on the need to look again at the social model of disability to understand that it occurs when of personal limitations meet social barriers. © 2022, Universidad Nacional Autónoma de México. All rights reserved.

Anchondo Pavón, S. & Macip, C. G. (2022). The new eugenics of neoliberal individualism. A discussion from the social model of disability [La nueva eugenesia del individualismo neoliberal. Una discusión desde el modelo social de discapacidad]. *Andamios*, 19(49), 93-116. doi: 10.29092/uacm.v19i49.921. Article.

**FEDERICO NASSIM BRAVO JORDÁN**

SNI Nivel I

**GRUNDTVIG'S «UNPARALLELED DISCOVERY» AND THE DEBATE ON THE AUTHORITY OF SCRIPTURE****[EL «DESCUBRIMIENTO INCOMPARABLE» DE GRUNDTVIG Y EL DEBATE SOBRE LA AUTORIDAD DE LAS ESCRITURAS]**

**ABSTRACT.** In this paper I analyze the concept of Church presented by Danish theologian Nicolai Grundtvig (1783-1872) in the document known as «The Church's Rejoinder». In this text, published in 1825, Grundtvig denounces the rationalist theology of Henrik Nicolai Clausen, particularly his claim that the Bible is the only valid source of Christian revelation; the Scriptures, Clausen adds, ought to be inter-

preted by professional exegetes. Grundtvig will argue instead that the essence of the Church is the assembly of believers who embraces the message of Christ through the acceptance of the Creed, baptism and communion. © 2022 Servicio de Publicaciones de la Universidad de Navarra. All rights reserved.

Bravo, N. (2022). Grundtvig's «Unparalleled Discovery» and the Debate on the Authority of Scripture [El «descubrimiento incomparable» de Grundtvig y el debate sobre la autoridad de las Escrituras]. *Scripta Theologica*, 54(2), 339-368. doi: 10.15581/006.54.2.339-368. Article.

**FEDERICO NASSIM BRAVO JORDÁN**

SNI Nivel I

**JOHAN LUDVIG HEIBERG AND HIS DIAGNOSIS OF THE CRISIS IN GOLDEN AGE DENMARK****[JOHAN LUDVIG HEIBERG Y SU DIAGNÓSTICO DE LA CRISIS DE LA ÉPOCA EN LA EDAD DE ORO DE DINAMARCA]**

**ABSTRACT.** In this article, I explore Johan Ludvig Heiberg's diagnosis of the crisis of his age, Golden Age Denmark, in his treatise *On the Significance of Philosophy*, published in 1833. Although in recent times there is a renewed interest in the intellectual scene of Golden Age Denmark, in part due to the current relevancy of a thinker such as Søren Kierkegaard, it is a fact that one of its most important figures, J. L. Heiberg, has been more or less ignored by contemporary scholars. Thus, in this article I try to shed light on his figure and thought, especially on his attempt to use Hegelian philosophy to solve the cultural crisis of his time. © 2022 Universidad Panamericana. All rights reserved.

Bravo, N. (2022). Johan Ludvig Heiberg and his Diagnosis of the Crisis in Golden Age Denmark [Johan Ludvig Heiberg y su diagnóstico de la crisis de la época en la Edad de Oro de Dinamarca]. *Tópicos*, 63(1), 131-154. doi: 10.21555/top.v63i0.1645. Article.

**FEDERICO NASSIM BRAVO JORDÁN**

SNI Nivel I

**REINTERPRETING MEDIEVAL LORE THROUGH THE MODERN PRISM. THE MYTH OF ROBIN HOOD IN KIERKEGAARD'S EARLY JOURNALS**

**ABSTRACT.** This article offers an overview of Søren Kierkegaard's use in his early journals of a fictional figure called the Master-Thief

[Mestertyven], a modern reinterpretation of the late medieval legend of Robin Hood. I would like to argue that this early treatment of medieval folklore in the Dane's Nachlass can be used as a point of departure or foundation upon which we might get a better appreciation of the crucial role played by myth in Kierkegaard's philosophy. An analysis of the figure of the Master-Thief will also reveal the way in which a myth from the Middle Ages was reinterpreted and integrated into a modern worldview.

Bravo, N. (2021). Reinterpreting Medieval Lore through the Modern Prism. The Myth of Robin Hood in Kierkegaard's Early Journals. In Esparza, G. & Bravo, N. (Eds.), *The Bounds of Myth. The Logical Path from Action to Knowledge*, vol. 364, *Value Inquiry Book Series* (pp. 195-220). Brill. doi: 10.1163/9789004448674\_010. Book Chapter.

**CLAUDIO CÉSAR CALABRESE RUÍZ**

Investigador Titular D, SNI Nivel I

**ETHEL BEATRIZ JUNCO DE CALABRESE**

Investigadora Titular D, SNI Nivel I

**“AM I IMMORTAL?”. AUGUSTINE'S RESPONSES IN THE EARLY DIALOGUES****["SUNT NEMURITOR?". RĂSPUNSURILE LUI AUGUSTIN ÎN DIA-LOGURILE TIMPURII]**

**ABSTRACT.** In our article we follow Augustine's arguments in favor of the immortality of the soul, linked to the experience of Cassiciacus; methodologically, we focus the unity of discourse on the question in the first person ("Am I immortal?") and on the Neoplatonic line of reflection. There we recognize three instances: *esse cum Deo* or the soul that lives by faith, *non esse sine Deo* or the soul that seeks wisdom without having found faith, and *regressus in rationem* or turn of the soul that takes up the fact of faith by the rational way. Despite the difficulty of the solutions, proportional to the size of the problem, and the predominance of the aporetic argument, the author confirms the need for an absolute starting point in reasoning. This conclusion will be the basis for the treatment of the problem in later works, providing the key to the first person in the question of immortality. © 2022 Alexandru Ioan Cuza University of Iasi. All rights reserved.

Calabrese, C. & Junco, E. (2022). "Am I Immortal?". Augustine's Responses in the Early Dialogues ["sunt nemuritor?". Răspunsurile lui Augustin în dia-logurile timpurii]. *Classica et Christiana*, 17(1), 57-77. doi: 10.47743/CetC-2022-17.1.57. Article.

## CLAUDIO CÉSAR CALABRESE RUÍZ

Investigador Titular D, SNI Nivel I

## EDUARDO DE LA VEGA SEGURA

Profesor investigador

### ENERGY AND ENVIRONMENT. A LOOK AT THE ENCYCLICAL LAUDATO SI'

[ENERGÍA Y MEDIO AMBIENTE. UNA MIRADA DESDE LA ENCÍCLICA LAUDATO SI']

**ABSTRACT.** Our work raises the aspects that we consider to be central to the Encyclical, especially the unity between economy-society-ecology, taking as a central idea the notion of "ecological conversion" and, from this, the limits of growth of a civilization fundamentally based on oil. This is because consumption levels will quickly meet the barrier of nature itself, since humanity will have consumed most of the fossil fuels by the end of the 21st century. It is, in short, the exhaustion of an ideal of science and progress that has failed to keep the promises of the enlightened model in which it was born. In this context, we present the ecological catastrophes caused by oil spills in the last decade and the positive and negative aspects of the latest oil extraction procedures; Despite these efforts and the integration of renewable energies, ecology in a Christian key requires an interior renewal that leads to a fuller awareness of man as a collaborator and custodian of creation. © 2022 Instituto Teológico de Murcia. All rights reserved.

Calabrese, C., Brambila, F., de la Vega Segura, E., & Hernández, A. T. (2022). Energy and Environment. a Look at the Encyclical Laudato Si' [Energía y medio ambiente. Una mirada desde la encíclica Laudato Si']. *Carthaginensia*, 38(73), 187-204. Article.

## CLAUDIO CÉSAR CALABRESE RUÍZ

Investigador Titular D, SNI Nivel I

### FOOTPRINTS OF GOD IN THE HUMAN SPIRIT. SAINT AUGUSTINE, DE TRINITATE, BOOK IX

[HUELLAS DE DIOS EN EL ESPÍRITU HUMANO. SAN AGUSTÍN, DE TRINITATE, LIBRO IX]

**ABSTRACT.** We work on the ways in which Saint Augustine presents the Trinitarian footprints in the human person and the correlations he establishes between immanence and transcendence. In this sense, his contribution is considered perhaps more relevant to our present, from the philosophical point of view: Clarifying immanence is the previous and necessary step to circumscribe

the mystery of God, that is, to establish the reasonableness of the act of faith. Saint Augustine thus interrelates the intellectual instruments available to him: Scripture, exegesis, semiotics and Neoplatonic philosophy, which allow him to glimpse per similitudinem the principles of Being. © 2022 Servicio de Publicaciones de la Universidad de Navarra. All rights reserved.

Calabrese, C. (2022). Footprints of God in the Human Spirit. Saint Augustine, De Trinitate, Book IX [Huellas de Dios en el espíritu humano. San Agustín, De Trinitate, Libro IX]. *Scripta Theologica*, 54(1), 35-59. doi: 10.15581/006.54.1.35-59. Article.

## CLAUDIO CÉSAR CALABRESE RUÍZ

Investigador Titular D, SNI Nivel I

### FROM THE INTELLECTUAL CERTAINTY TO THE ACT OF FAITH: CONTRA ACADEMICOS 3, 34 AND SERMO 130 A (= DOLBEAU 19)

[DE LA CERTEZA INTELLECTUAL AL ACTO DE FE. CONTRA ACADEMICOS 3, 34 Y SERMO 130 A (= DOLBEAU 19)]

**ABSTRACT.** In our paper we propose the unity of Augustinian thought; To substantiate it, we present two chronologically distant works (one of youth, the other of old age) that work to establish respectively the foundations of credere: as a means of overcoming skepticism and as a support for the explanation of the act of faith, based on the subjective dispositions of the person. Consequently, the understanding of the immanent order constitutes the necessary step that allows us to understand what it means to believe and delimit the way to God. Faith, in fact, is not an end itself, but a means to understand revelation and bring it to life. © 2020 Universitatea "Alexandru Ioan Cuza" din Iasi. All rights reserved.

Calabrese, C. (2022). From the intellectual certainty to the act of faith: Contra academicos 3, 34 and Sermo 130 a (= Dolbeau 19) [De la certeza intelectual al acto de fe. Contra academicos 3, 34 y Sermo 130 a (= Dolbeau 19)]. *Meta*, 12(2), 532-550. Article.

## CLAUDIO CÉSAR CALABRESE RUÍZ

Investigador Titular D, SNI Nivel I

### THE MEANINGS OF DOCTRINE IN DE DOCTRINA CHRISTIANA

**ABSTRACT.** This article studies the meanings of the term doctrine in De doctrina christiana, as it is necessary to determine the

scope of a word that has been integrated into the worldview of Christianity after a long semantic journey. From a methodological point of view, we integrate two perspectives: on the one hand, a review of the secondary literature on Augustine, based on the turning point that the contributions of H.I. Marrou and P. Brown represented. On the other hand, we apply the philological method, since its historical nature lets us understand the nuances of the transition from classical culture to Christianity. Our contribution to Augustinian studies rests on the following affirmation: the cultural baggage of the grammarian was put in tension by the interpretation of the Scriptures that express, for Christianity, "the truth that God is," with the darkness and ambiguity of human language. The elementary experience of God involved finding an instrument to express a part of that primordial truth and beauty.

Calabrese, C. (2021). The Meanings of Doctrine in *De Doctrina Christiana*. In Esparza, G. & Bravo, N. (Eds.), *The Bounds of Myth. The Logical Path from Action to Knowledge*, vol. 364, *Value Inquiry Book Series* (pp. 85-113). Brill. doi:10.1163/9789004448674\_006. Book Chapter.

## MARÍA TERESA ENRÍQUEZ GÓMEZ

Investigadora Asociada, Profesora investigadora

### CONSIDERATIONS ON THE VISIBILITY OF ACTION IN ARISTOTLE

**ABSTRACT.** In this paper we analyze some passages of Aristotle's Problems related to the perception of movement and action, and then put them in relation to the theory of the dramatic composition of the Poetics. Exemplarity is an indispensable resource in moral formation for the ancient Greeks, in particular for Plato and Aristotle. However, there are only a few studies that consider the process of perception of movement and moral action. Ultimately, we explain why the imitation of actions present in the dramatic art is a valuable resource to understand the complexity of practical life precisely because of its ability to present human actions before the eye in its organic wholeness.

Sabido, C. & Enriquez, T. (2021). Considerations on the Visibility of Action in Aristotle. In Esparza, G. & Bravo, N. (Eds.), *The Bounds of Myth. The Logical Path from Action to Knowledge*, vol. 364, *Value Inquiry Book Series* (pp. 28-55). Brill. doi: 10.1163/9789004448674\_004. Book Chapter.

**GUSTAVO ADOLFO ESPARZA URZÚA**

SNI Nivel I

**ALAN TURING: BASE, FORM AND CRITICISM TO ARTIFICIAL INTELLIGENCE****[ALAN TURING: BASES, FORMA Y CRÍTICAS A LA INTELIGENCIA ARTIFICIAL]**

**ABSTRACT.** The objective of this article is to define the elements that Alan Turing contributed to the development of the concept of Artificial Intelligence (AI). As a problem, it is proposed to study the contributions of the mathematician to the genesis of the term as we know it today. Methodologically, the central works of the author are studied to define the logical and epistemological foundations through which an Intelligent Computer operates, in order to assess the contributions to the computational discipline and the eventual formulation of the term. The present investigation offers three results: (1) Turing conceives computers as authentic thinking material objects; (2) the design model of a computer with these characteristics, according to the author, must consider the pattern of brain development (and learning) in children; (3) the posthumous debate on Turing's thought was decisive for the construction of the agenda of problems that gave rise to the term AI. © 2021 Universidad Pontificia de Salamanca, Servicio de Publicaciones. All rights reserved.

Esparza, G. (2021). Alan Turing: Base, Form and Criticism to Artificial Intelligence [Alan Turing: bases, forma y críticas a la inteligencia artificial]. *Cuadernos Salmantinos de Filosofía*, 48, 49-74. Article.

**GUSTAVO ADOLFO ESPARZA URZÚA**

SNI Nivel I

**ETHEL BEATRIZ JUNCO DE CALABRESE**

Investigador Titular D, SNI Nivel I

**INDIVIDUAL AND COMMUNITY IN MYTHICAL THOUGHT****[INDIVIDUO Y COMUNIDAD EN EL PENSAMIENTO MÍTICO]**

**ABSTRACT.** In this article we establish that in mythical thought there is, as a natural quality, an expression of universality. Following Cassirer's Philosophy of Symbolic Forms, we show that through the expressive function of myth it is possible to develop an expressive way of thinking or a pre-logical type of knowledge. We then propose an interpretation of Oedipus at Colonos in order to show that (i) it offers a

plausible resource to relate the individual and the community, and (ii) that the framework in this tragedy works as a complex sign and symbolic path to delineate a form of expressive relationship through which it is possible to propose the unification of the individual with the community. © 2022 Universidad Panamericana. All rights reserved.

Esparza, G. & Junco, E. (2022). Individual and Community in Mythical Thought [Individuo y comunidad en el pensamiento mítico]. *Tópicos*, 63, 423-445. doi: 10.21555/top.v63i0.1851. Article.

**GUSTAVO ADOLFO ESPARZA URZÚA**

SNI Nivel I

**THE BOUNDS OF MYTH. THE LOGICAL PATH FROM ACTION TO KNOWLEDGE**

**ABSTRACT.** The purpose of this article is to delve into the role of myth in human culture as its archaic form. Despite the common conception that considers the mythical as a prelogical form that needs to be overcome, here it is argued that, regardless of the evolution of human thought, it continues to be based on its foundations that are expressed in mythological form. In this paper, three different historical conceptions are analyzed, together with their corresponding epistemic expressions achieved throughout their cultural evolution: their metaphorical base, the sign as a way of believing, and the ability to universalize. I would like to argue that myth allows us to understand the archaic as a logical path from action to knowledge. In the end, it will be argued that the myth has its own rules of knowledge and is a valid form of understanding.

Esparza, G. (2021). The Bounds of Myth. The Logical Path from Action to Knowledge. In Esparza, G. & Bravo, N. (Eds.), *The Bounds of Myth. The Logical Path from Action to Knowledge*, vol. 364, *Value Inquiry Book Series* (pp. 9-27). Brill. doi: 10.1163/9789004448674\_003. Book Chapter.

**GUSTAVO ADOLFO ESPARZA URZÚA**

SNI Nivel I

**FEDERICO NASSIM BRAVO JORDÁN**

SNI Nivel I

**INTRODUCTION. THE BOUNDS OF MYTH. THE LOGICAL PATH FROM ACTION TO KNOWLEDGE**

**ABSTRACT.** The articles in *The Bounds of Myth*, edited by Gustavo Esparza and Nassim Bravo, shed light on the internal shapes of the mythological discourse, showing the way in which

myth borders religion, science, literature, theology, i.e., other forms of rationality. The contributing authors of the volume claim that myth is a valid form of thought and that the former evolves within other forms of discourse, even though its composition is independent and even precedes the latter. The articles collected here demonstrate the importance of myth as a form of thought that is in constant development, a feature that shows in turn that in spite of its remote and archaic origin, myth remains a valuable and relevant tool to interpret our own culture.

Esparza, G. & Bravo, N. (2021). Introduction. In *The Bounds of Myth. The Logical Path from Action to Knowledge*, vol. 364, *Value Inquiry Book Series*. Brill. doi: 10.1163/9789004448674\_002. Book.

**GUSTAVO ADOLFO ESPARZA URZÚA**

SNI Nivel I

**THE MYTH OF SELF-KNOWLEDGE IN GENESIS 1-2. THE FASCINATION OF THE ENCOUNTER**

**ABSTRACT.** My purpose in this paper is to analyze the encounter between Adam and Eve as it is described in Genesis 1-2. Here I consider the myth as a valid source of self-knowledge, inasmuch as through its narration it is possible to experience the moment of fascination in which "man" realizes that "woman" is "bones of his bones and flesh of his flesh." I will emphasize that this expression is developed through a phenomenological process which implies, in turn, a pedagogical path to form in man the capacity to understand the woman as the culminating point of creation, and that, being "like" me means being different from me.

Esparza, G. (2021). The Myth of Self-Knowledge in Genesis 1-2. The Fascination of the Encounter. In Esparza, G. & Bravo, N. (Eds.), *The Bounds of Myth. The Logical Path from Action to Knowledge*, vol. 364, *Value Inquiry Book Series* (pp. 114-143). Brill. doi: 10.1163/9789004448674\_007. Book Chapter.

**YURIXHI GALLARDO MARTÍNEZ**

Investigadora Asociada, SNI Nivel I

**COLLABORATION IN A PROFESSIONAL ETHICS PROGRAM BETWEEN A PROFESSIONAL ASSOCIATION AND A UNIVERSITY: AN EXPERIENCE IN MEXICO**

**[COLABORACIÓN EN UN PROGRAMA DE ÉTICA PROFESIONAL ENTRE UN COLEGIO DE PROFESIONISTAS Y UNA UNIVERSIDAD: UNA EXPERIENCIA EN MÉXICO]**

**ABSTRACT.** The purpose of this paper is to show an experience of collaboration between a bar



association of law professionals in Mexico and academics from a higher education institution in the design and implementation of a program for teaching professional ethics to undergraduate students at a university in western Mexico. This activity was carried out in the framework of the dissemination of the Development Goals (SDG) 4, 5, 16 and 17. The methodology used was the approach and solution of ethical dilemmas developed from the experiences of the professionals of the school. The article is divided into three sections: the first explains the importance of teaching professional ethics based on the fourth SDG and the need for its incorporation into law degree curricula that contribute to achieving SDG 16; the second deals with the experience of developing practical ethics cases carried out in a professional college; finally, the experience of implementing such a program in a university in western Mexico is analyzed. The experience shows the results of using situations presented by professionals to train members of the college and undergraduate students in professional ethics. © 2021 University of Barcelona. All Rights Reserved.

Gallardo, Y., Romero, A. G. T. (2021). Collaboration in a professional ethics program between a professional association and a university: an experience in Mexico [Colaboración en un programa de ética profesional entre un colegio de profesionistas y una universidad: una experiencia en México]. *Revista de Educación y Derecho*, 1, 333-352. doi: 10.1344/REYD2021.1EXT.37707. Article.

### YURIXHI GALLARDO MARTÍNEZ

Investigadora Asociada, SNI Nivel I

#### TEACHING OF PROFESSIONALISM TO UNDERGRADUATE STUDENTS OF LAW IN MEXICO: THE IMPACT ON THE PRACTICE OF THE LEGAL PROFESSION

[LA ENSEÑANZA DEL PROFESIONALISMO A ESTUDIANTES DE LICENCIATURA EN DERECHO EN MÉXICO: INCIDENCIA EN EL EJERCICIO DE LA PROFESIÓN JURÍDICA]

**ABSTRACT.** Professionalism is a key element of professional ethics. The paper approaches professionalism as a competence that students of Law in Mexico will require. The work is divided into three sections: the first explains what is meant by professionalism and its link with professional ethics; the second part deals with the teaching of professionalism; finally, it analyzes the results of a self-evaluation carried out by first-year law students at a university in western Mexico. The study shows that professionalism is an element of professional ethics that needs to be taught and therefore proposes

to approach it as professional competence. On the other hand, it shows the results of the self-assessment in professionalism carried out by students. Self-evaluation appears as a first step in the development of professionalism as a professional competence. © 2021 Universidad de Chile. All rights reserved.

Gallardo Y. & Villaseñor M. G. (2021). Teaching of professionalism to undergraduate students of Law in Mexico: The impact on the practice of the legal profession [La enseñanza del profesionalismo a estudiantes de licenciatura en Derecho en México: Incidencia en el ejercicio de la profesión jurídica]. *Revista Pedagogía Universitaria y Didáctica del Derecho*, 8(2), 151-170. doi: 10.5354/0719-5885.2021.60850. Article.

### VICENTE DE HARO ROMO

SNI Nivel I

#### DUTIES TO ONESELF AND OTHER WAYS OF BEING BOUND IN FICHTE'S SITTENLEHRE

**ABSTRACT.** In this chapter, I will briefly explore a relatively recent discussion on the kind of normativity found in Fichte's 1798 *Das System der Sittenlehre nach den Prinzipien der Wissenschaftslehre*. Because of some ambiguity that the Fichtean argument presents in this book, some interpretations argue that Fichte's ethics could be understood as consequentialist or as agent-neutral perfectionism. I squarely argue against this consequentialist interpretation and express doubt about some aspects of the perfectionism alternative, and later focus on how I think we should understand, in the context of this discussion, Fichte's position on duties to oneself. Fichte accepts duties to oneself as part of his system of duties, but only as conditioned (bedingte) and mediated (mittelbare), because, for him, the object of the moral law is the moral law itself, and its presentation (Darstellung) to the moral agent is never instantiated in his or her own person, but rather only presented in the whole community of rational beings. Does this mean that, in Fichte's ethics, the individual person is irrelevant or even unthinkable as an end in itself? I will argue that this is not the case, and I will propose another way of understanding Fichte's argumentative strategy on duties to oneself, suggesting at the end of the chapter that Kant's position on this topic is preferable. © 2022, The Author(s), under exclusive license to Springer Nature Switzerland AG.

De Haro Romo, V. (2022). Duties to Oneself and Other Ways of Being Bound in Fichte's Sittenlehre. In *Library of Ethics and Applied Philosophy*, vol. 39 (pp. 71-85). Springer. doi: 10.1007/978-3-031-11469-4\_5. Book Chapter.

### ETHEL BEATRIZ JUNCO DE CALABRESE

Investigadora Titular D, SNI Nivel I

### CLAUDIO CÉSAR CALABRESE RUÍZ

Investigador Titular D, SNI Nivel I

#### APROPIACIÓN DE LA TRAGEDIA GRIEGA EN LA LITERATURA HISPANOAMERICANA: EL CASO ELENA GARRO

[APPROPRIATION OF THE GREEK TRAGEDY IN HISPANIC AMERICAN LITERATURE: THE ELENA GARRO CASE]

**ABSTRACT.** We start from the Greek tragedy as a genre that assumes and fixes the great myths of the tradition to establish intertextuality with Elena Garro's dramas; the tragic paradigm is applied to expose the vision of women according to time and space. The author uses the timelessness of the myth to update the notions of destiny, death and guilt in order to show its validity. The tragic model delimits the historical interpretation in a deterministic framework, in which the author postulates a pessimistic view of the female condition that she considers immobile despite the supposed evolution of cultures. The process examines the causes to induce criticism.

Junco, E. & Calabrese, C. (2022). Apropiación de la tragedia griega en la literatura hispanoamericana: el caso Elena Garro [Appropriation of the Greek tragedy in Hispanic American literature: the Elena Garro case]. *Agora-Estudios Clásicos em Debate*, 24, 335-356. doi: 10.34624/agora.v24i0.28009. Article.

### ETHEL BEATRIZ JUNCO DE CALABRESE

Investigadora Titular D, SNI Nivel I

#### OEDIPUS AND PERCEVAL. THE ENIGMA AS A HERMENEUTICAL PRINCIPLE

**ABSTRACT.** Based on two sources, one Greek and the other medieval, I underscore the consonances presented by the enigma, a construction of discourse that speaks and omits simultaneously. In both narrative treatments I ponder the principle of unity. I start with the enigma as the motive of action and stop with the particular answers—word and silence—as axes of self-knowledge. To support this claim, I examine the story of Oedipus in the Theban cycle, according to the dramatization of Sophocles in *Oedipus the King* and *Oedipus at Colonus*, and *Perceval* or *The Tale of the Grail* by Chrétien de Troyes; in each piece I focus on the core of



the enigma, namely, the test of the Sphinx at the gates of Thebes and the procession of the Grail in the castle of the Fisher King. The two cases are resolved according to the worldviews of each age, supported on the Greek rational resourcefulness and the path of medieval mystic silence.

Junco, E. (2021). Oedipus and Perceval. The Enigma as a Hermeneutical Principle. In Esparza, G. & Bravo, N. (Eds.), *The Bounds of Myth. The Logical Path from Action to Knowledge*, vol. 364, *Value Inquiry Book Series* (pp. 171-194). Brill. doi: 10.1163/9789004448674\_009. Book Chapter.

### ETHEL BEATRIZ JUNCO DE CALABRESE

Investigadora Titular D, SNI Nivel I

### CLAUDIO CÉSAR CALABRESE RUÍZ

Investigador Titular D, SNI Nivel I

#### REALISMO TRÁGICO EN TRES PIEZAS DE ELENA GARRO

[TRAGIC REALISM IN THREE PIECES BY ELENA GARRO]

**ABSTRACT.** En este trabajo proponemos examinar la apropiación de características reconocidas del teatro trágico griego en piezas de Elena Garro; consideramos en forma unificada las constantes de la tragedia ática postuladas igualmente por Esquilo, Sófocles y Eurípides, en tanto todos ellos partieron de la mitología recreándola con libertad (Romilly 171). Relevamos tres requisitos de la tragedia ática—la misión del héroe, la presencia del destino, la pertenencia a la comunidad de la polis—y los consideramos en la lectura de tres piezas selectas de Garro, a saber, *Un hogar sólido*, *Los pilares de doña Blanca* y *La señora en su balcón*.

Junco, E. & Calabrese, C. (2022). Realismo trágico en tres piezas de Elena Garro [Tragic realism in three pieces by Elena Garro]. *Confluencia*, 37(1), 99-111. doi: 10.1353/cnf.2021.0030. Article.

### ETHEL BEATRIZ JUNCO DE CALABRESE

Investigadora Titular D, SNI Nivel I

### CLAUDIO CÉSAR CALABRESE RUÍZ

Investigador Titular D, SNI Nivel I

#### THE DEPTHS OF MEMORY: LOS RECUERDOS DEL PORVENIR BY ELENA GARRO

[EL FONDO DE LA MEMORIA: LOS RECUERDOS DEL PORVENIR DE ELENA GARRO]

**ABSTRACT.** The paper formulates an approach to memory in Elena Garro's novel, its relationship with historical truth and its restatement

through active imagination according to the point of view of Paul Ricoeur. The story reviews conventional binomials (collective-individual, story-dream, reality-fiction, power-love) and transforms them from the notion of anámnesis, with which it blurs the present and eliminates the past-future distance. With a perspective that goes from critical operation to action, the novel sets out to replace a notion of memory-object by a notion of memory-illusion. The author raises the act of imagination as new knowledge in the face of misfortune and marginality, not as a historical-social alternative. © 2022 Universidad de Chile, Facultad de Filosofía y Humanidades, Departamento de Literatura. All rights reserved.

Junco, E. & Calabrese, C. (2022). The Depths of Memory: Los Recuerdos del Porvenir by Elena Garro [El fondo de la memoria: los recuerdos del porvenir de Elena Garro]. *Revista Chilena de Literatura*, (105), 369-394. doi: 10.4067/S0718-22952022000100369. Article.

### ETHEL BEATRIZ JUNCO DE CALABRESE

Investigadora Titular D, SNI Nivel I

### CLAUDIO CÉSAR CALABRESE RUÍZ

Investigador Titular D, SNI Nivel I

#### THE EXILE OF THE SOUL IN HE CHILDREN'S STORY: THE ADVENTURES OF PINOCCHIO

[EL EXILIO DEL ALMA EN EL CUENTO INFANTIL: LAS AVENTURAS DE PINOCHO]

**ABSTRACT.** In The Adventures of Pinocchio (1883) one of the fundamental sacred stories reappears: Carlo Collodi presents the theme of the exile of paradise and the vicissitudes to recover it. The text combines the form of the myth with rigor and clarity along with the simplicity and humor of the children's story. We read the book in relation to Paul Ricoeur's theory of the symbol, particularly with the methodological support of Finitud y culpabilidad (1960) and the first presentation of the symbols of evil, as indirect discourse. The mythical exposition of the problem of a religious and philosophical nature brings into play the question of identity; the presence of evil requires personal definition. We relate the journey of the protagonist's soul to the course of national history and consider the answer in parallel; the symbols of evil originally interpellate to order the course of personal and historical life. © 2022, Universitat Jaume I. All rights reserved.

Junco, E. & Calabrese, C. (2022). The exile of the soul in he children's story: The adventures of Pinocchio [El exilio del alma en el cuento infantil: Las aventuras de Pinocho]. *Cultura, Lenguaje y Representación*, 27, 41-55. doi: 10.6035/clr.6138. Article.

### RÓMULO RAMÍREZ DAZA Y GARCÍA

Investigador Titular A, SNI Nivel I

### ARMANDO ENRIQUE CRUZ COVARRUBIAS

SNI Nivel II

#### ARISTOTELIAN-ARGUMENTATIVE ASSESSMENT OF THE IGUALA CASE, ABOUT THE COMMISSION FOR TRUTH AND JUSTICE

[VALORACIÓN ARISTOTÉLICO-ARGUMENTATIVA DEL CASO IGUALA, A PROPÓSITO DE LA COMISIÓN POR LA VERDAD Y LA JUSTICIA]

**ABSTRACT.** In this investigation, the grounds for the amparo judgment in revision 203/2017 of the Iguala Case is analyzed, in its resolution to form an investigative commission of truth and justice, to clarify and resolve the case of the 43 disappeared. From the Aristotelian theory of argumentation, it is sought to study the sentence and decant its logical-argumentative results from said hermeneutical model. Finally, its rationality will be evaluated according to the triadic paradigm: analytical-dialectical-rhetorical that makes up Aristotle's logic, to see if the arguments presented are justified and convinced in themselves. © 2022 University of Valencia, Human Rights Institute. All right reserved.

Ramírez, R. & Cruz, A. (2022). Aristotelian-argumentative assessment of the Iguala case, about the Commission for Truth and Justice [Valoración aristotélico-argumentativa del caso Iguala, a propósito de la Comisión por la Verdad y la Justicia]. *Cuadernos Electrónicos de Filosofía del Derecho*, 46(1), 185-209. doi: 10.7203/CEFD.46.21429. Article.

### JOSÉ ALBERTO ROSS HERNÁNDEZ

SNI Nivel II

#### VALUE SYSTEMS AND THEIR INFLUENCE ON MANAGERIAL MINDSETS AND MANAGERS' VOLITIONS

**ABSTRACT.** Senior managers seek to align managerial endeavors with the organization's objectives. Traditionally, alignment has focused on monitoring and rewarding the achievement of assigned targets. However, there is evidence to suggest that organizations may also seek to align managerial "values" with those of

the organization. These attempts to influence managerial mindsets through management control systems raise non-trivial questions regarding the systems involved, the reasons behind them, and the possible consequences of such attempts. These questions form the basis of this research, and this chapter reports on two case studies of Mexican organizations that claim to have a values-based philosophy. This study contributes to the management literature by presenting empirical evidence related to certain philosophical ideas on the development of human potential and senior managers' attempts to influence their employees' will. In detailing the implementation process of two specific value systems, this chapter fills a gap identified in the management control literature. © 2020 Emerald Publishing Limited.

Casanueva-Fernández, A. & Ross-Hernández, J. A. (2020). Value Systems and Their Influence on Managerial Mindsets and Managers' Volitions. In García-Álvarez, S. & Atristain-Suárez, C. (Eds.), *Strategy, Power and CSR: Practices and Challenges in Organizational Management* (pp. 47-68). Emerald Publishing. doi: 10.1108/978-1-83867-973-620201006. Book Chapter.

## ALEJANDRO SADA MIER Y TERÁN

Profesor investigador

### CHRISTIANITY AND THE MEANING OF LIFE: A REFLECTION BASED ON THE THOUGHT OF JOSEPH RATZINGER

[CRISTIANISMO Y SENTIDO DE LA VIDA: UNA REFLEXIÓN A PARTIR DEL PENSAMIENTO DE JOSEPH RATZINGER]

**ABSTRACT.** This article is a reflection that sheds light on the question about the meaning of life in the perspective of Joseph Ratzinger. For the German theologian, man can only find meaning in his life in the truth. My intention is to demonstrate that the author's logocentrism offers the most adequate metaphysical foundation in order to emphasize the relationship that exists between meaning and truth. Analyzing each of the four senses of «meaning» identified by the Canadian philosopher Jean Grondin, I demonstrate that the Christian faith, as understood by Ratzinger, offers a very complete sense. © 2021 Servicio de Publicaciones de la Universidad de Navarra. All rights reserved.

Sada, A. (2021). Christianity and the Meaning of Life: A Reflection Based on the Thought of Joseph Ratzinger [Cristianismo y sentido de la vida: Una reflexión a partir del pensamiento de Joseph Ratzinger]. *Scripta Theologica*, 53(3), 595-624. doi: 10.15581/006.53.3.595-624. Article.

## LAURA TRUJILLO LIÑÁN

Investigadora Titular B, SNI Nivel I

## RICARDO MENESES CALZADA

Profesor investigador

### LEADERSHIP AND SOCIAL RESPONSIBILITY IN BUSINESS

**ABSTRACT.** Man's action at work is not a particular issue, nor does it separate him from his being or family life, but rather work helps man to develop and unifies each of his constitutive elements. Thus, the company must see man as a whole, as an end and not as a means, to achieve what the company must seek for society, that is, the common good, and, with it, the man's objective good. This chapter aims to demonstrate a thorough, structured way of knowing, understanding and potentiating human faculties, virtues and passions in favor of a kind of leadership that focuses more on the human person. It is framed by business's trend of social responsibility and its current impact. In this way, social responsibility takes on a different direction and inspires workers and companies' real commitment to the good of society. © 2020 Emerald Publishing Limited.

Trujillo-Liñán, L. & Meneses-Calzada, R. (2020). Leadership and Social Responsibility in Business. In García-Álvarez, S. & Atristain-Suárez, C. (Eds.), *Strategy, Power and CSR: Practices and Challenges in Organizational Management* (pp. 295-310). Emerald Publishing. doi: 10.1108/978-1-83867-973-620201016. Book Chapter.

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