Preface
A Special Issue on Computational Intelligence and Fuzzy Systems in Management: Innovation and Sustainability

GUEST EDITORS
ERNESTO LEÓN-CASTRO[1], VICTOR ALFARO-GARCÍA[2], FABIO BLANCO-MESA[3], ANNA M. GIL-LAFUENTE AND OSCAR CASTILLO[5],*

[1]*Universidad Católica de la Santísima Concepcion (Chile), E-mail:* eleon@ucsc.cl
[2]*Universidad Michoacana de San Nicolas de Hidalgo (México), E-mail:* victor.alfaro@umich.mx
[3]*Pedagogical and Technological University of Colombia (Colombia),*
E-mail: fabio.blanco01@uptc.edu.co
[4]*University of Barcelona (Spain), E-mail:* amgil@ub.edu
[5]*Tijuana Institute of Technology, TecNM (Mexico)*

The use of computational, intelligent, and fuzzy systems to solve problems and improve decision-making processes in organizations has been in the works for some years (Li et al., 2022; López-Herrera et al., 2010; Merigó et al., 2015), having relevant milestones, such as the introduction of fuzzy sets by Zadeh (1965), Multiple methodologies and applications for data analysis have been developed to improve decision-making processes in Management (Carlsson et al., 2012; Kumar et al., 2022), innovation (Gärtner et al., 2024; Zaenchkovski et al., 2020), sustainability (Phillis & Andriantiatsalelanaina, 2001; Puška et al., 2021), among other areas. Similarly, a combination of methods using computational (Dehghan et al., 2006; Masoudi-Sobhanzadeh et al., 2021; Pant et al., 2023; Stach et al., 2010) and intelligent systems has been generated (Castillo & Melin, 2014; Khan & Jaffar, 2015; Loussifi et al., 2016; Wang et al., 2022), which have made it possible to facilitate and improve the analysis of information. In this way, this special edition aims to enable the reader to identify a series

---

* Corresponding author: ocastillo@tectijuana.mx

of papers that contain related applications and methodologies and their respective applications, allowing them to visualize their different uses.

The first paper works on a multi-criteria outranking methodology for the measurement of public safety in the State of Sinaloa, Mexico, specifically through the use of ELECTRE III and the induced ordered weighted average (IOWA) operator, it is possible to identify the importance of the subjectivity of the information and generate new public policies that allow differences in the security realities of each city. The second paper presents a novel chi-square similarity measure explicitly designed for Intuitionistic Fuzzy Sets (IFS) and Pythagorean Fuzzy Sets (PFS). Also, the proposed new method is applied to three problems: one based on pattern recognition, the second based on a streaming service decision-making problem, and the third on a medical diagnosis.

The third paper considers the use of expert variables and linguistic variables to determine the perception of the type of packaging used in products to relate it to corporate strategy and sustainability; this demonstrates how different fuzzy techniques help better understand certain relationships within the management world. The fourth article analyzes the biohazard waste assessment by generation centers in Morelia, Mexico, in a prioritized sequence based on the Criteria Importance Through Intercriteria Correlation (CRITIC) method to identify which type of business has the most significant waste generation problems.

The fifth paper employs interval type-3 fuzzy logic to adjust the Crossover (CR) of differential evolution and apply the method (DE+IT3FS) to the optimization of a controller for a problem, being the interval type-3 fuzzy systems a method that has shown promising results in algorithms, metaheuristics, and genetic algorithms, helping to enhance algorithm performance and prevent issues such as deadlocks and local optima. The sixth paper applies fuzzy methodologies to identify garment design patterns based on body fit and design styles, demonstrating how such methods can help improve garment design decisions.

In the case of paper seven presents an application for Condition monitoring and predictive maintenance using a model that integrates a Long Short-Term Memory (LSTM) anomaly detector with a Convolutional Neural Network (CNN) classifier, enabling automatic labeling and learning of new conditions; this is an application that saves time and money for companies that must stop their activities due to unexpected maintenance activities.

As can be seen, the articles presented in this special edition seek to contribute new methodologies and applications of different computational, intelligent, and fuzzy methods in administration, engineering, and sustainability. This Special Issue is an adequate compilation to understand how they can help improve processes and decisions. Finally, we would like to thank the reviewers for their time and comments that allowed us to enhance and select the best articles for this issue, which without their work, it would not have been possible to reach this level of quality. In turn, we would like to thank all the researchers who submitted

their contributions to this special issue and the Editor-in-Chief of the MVLSC journal, Prof. Dan Simovici, for his support and help.

REFERENCES

[1] Carlsson, C., Fedrizzi, M., & Fullér, R. (2012). *Fuzzy logic in management* (Vol. 66). Springer Science & Business Media.

[2] Castillo, O., & Melin, P. (2014). A review on interval type-2 fuzzy logic applications in intelligent control. *Information Sciences*, *279*, 615-631.

[3] Dehghan, M., Hashemi, B., & Ghatee, M. (2006). Computational methods for solving fully fuzzy linear systems. *Applied mathematics and computation*, *179*(1), 328-343.

[4] Gärtner, Q., Bianchi, A., Mulrav, H., & Reinhart, G. (2024). Combining the analytical hierarchy process, fuzzy expert systems, and the exponential risk priority number for the holistic evaluation of innovation projects in manufacturing. *Production & Manufacturing Research*, *12*(1), 2378200.

[5] Khan, A., & Jaffar, M. A. (2015). Genetic algorithm and self organizing map based fuzzy hybrid intelligent method for color image segmentation. *Applied soft computing*, *32*, 300-310.

[6] Kumar, S., Sahoo, S., Lim, W. M., Kraus, S., & Bamel, U. (2022). Fuzzy-set qualitative comparative analysis (fsQCA) in business and management research: A contemporary overview. *Technological Forecasting and Social Change*, *178*, 121599.

[7] Li, B., Xu, Z., Hong, N., & Hussain, A. (2022). A bibliometric study and science mapping research of intelligent decision. *Cognitive Computation*, *14*(3), 989-1008.

[8] López-Herrera, A. G., Cobo, M. J., Herrera-Viedma, E., & Herrera, F. (2010). A bibliometric study about the research based on hybridating the fuzzy logic field and the other computational intelligent techniques: A visual approach. *International Journal of Hybrid Intelligent Systems*, *7*(1), 17-32.

[9] Loussifi, H., Nouri, K., & Braiek, N. B. (2016). A new efficient hybrid intelligent method for nonlinear dynamical systems identification: The Wavelet Kernel Fuzzy Neural Network. *Communications in Nonlinear Science and Numerical Simulation*, *32*, 10-30.

[10] Masoudi-Sobhanzadeh, Y., Esmaeili, H., & Masoudi-Nejad, A. (2021). A fuzzy logic-based computational method for the repurposing of drugs against COVID-19. *BioImpacts: BI*, *12*(4), 315.

[11] Merigó, J. M., Gil-Lafuente, A. M., & Yager, R. R. (2015). An overview of fuzzy research with bibliometric indicators. *Applied Soft Computing*, *27*, 420-433.

[12] Pant, M., Bisht, K., & Negi, S. (2023). Computational-based partitioning and Strong α, β-cut based novel method for intuitionistic fuzzy time series forecasting. *Applied Soft Computing*, *142*, 110336.

[13] Phillis, Y. A., & Andriantiatsaholiniaina, L. A. (2001). Sustainability: An ill-defined concept and its assessment using fuzzy logic. *Ecological economics*, *37*(3), 435-456.

[14] Puška, A., Nedeljković, M., Hashemkhani Zolfani, S., & Pamučar, D. (2021). Application of interval fuzzy logic in selecting a sustainable supplier on the example of agricultural production. *Symmetry*, *13*(5), 774.

[15] Stach, W., Kurgan, L., & Pedrycz, W. (2010). Expert-based and computational methods for developing fuzzy cognitive maps. En *Fuzzy Cognitive Maps: Advances in Theory, Methodologies, Tools and Applications* (pp. 23-41). Springer.

[16] Wang, R.-Y., Meng, Y., Chen, T., & Chen, Z. (2022). Intelligent algorithm and optimum design of fuzzy theory for structural control. *Smart Structures and Systems, An International Journal*, *30*(5), 537-544.

[17] Zadeh, L. A. (1965). Fuzzy sets. *Inf. Control*, *8*, 338-353.

[18] Zaenchkovski, A. E., Kirillova, E. A., Golovinskaya, M. V., Sazonova, E. A., & Borisova, V. L. (2020). Cognitive fuzzy-logic modeling tools to develop innovative process management procedures for scientific-industrial clusters. En *Frontier Information Technology and Systems Research in Cooperative Economics* (pp. 209-221). Springer.