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Editorial

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This special issue is dedicated to Academician Gheorghe Păun on the occasion of his 75^{th} birthday anniversary.

This issue contains a selection of papers from the 13^{th} Asian Conference on Membrane Computing (ACMC 2024) and the International Conference on Machine Learning, Pattern Recognition and Automation Engineering (MLPRAE 2024), which have been held successfully in Singapore, 7–9 August 2024. The conferences were sponsored by the International Membrane Computing Society (IMCS).

In 1998, Gheorghe Păun opened a brand-new computational paradigm [1], membrane computing, which focuses on the investigation of computational models [2], membrane systems or P systems (from the first letter of Păun), motivated by the structure and functioning of living cells, and applications [5, 7] and implementation [4, 6]. Membrane Computing community has succeeded to achieve during its 25 year-old history a set of landmarking successes: the establishment of IMCS, the organization of four regular conference/workshop events, namely European Conference on Membrane Computing (ECMC), ACMC, Brainstorming Week on Membrane Computing (BWMC) and China Workshop on Membrane Computing (CWMC), and the gestation and birth of two periodic publications, Journal of Membrane Computing (JMC) and IMCS Bulletin.

ACMC is one of the flagship conferences on Membrane Computing, aiming to provide a high-level international forum for researchers working in membrane computing and related areas, especially for those from the Asia-Pacific region. The twelve previous editions had been held successfully

in Wuhan (China, 2012), Chengdu (China, 2013), Coimbatore (India, 2014), Anhui (China, 2015), Bangi (Malaysia, 2016), Chengdu (China, 2017), Auckland (New Zealand, 2018), Xiamen (China, 2019), Ulaanbaatar (Mongolia, 2020), Chengdu (China, 2021), Quezon City (Philippines, 2022) and Chengdu (China, 2023), respectively. Accordingly, special issues were edited in International Journal of Unconventional Computing (Volume 9, Numbers 5-6, 2013), Romanian Journal of Information Science and Technology (Volume 17, Number 1, 2014), Journal of Computational and Theoretical Nanoscience (Volume 12, Number 7, 2015), Natural Computing (Volume 15, Issue 4, December 2016), Journal of Computational and Theoretical Nanoscience (Volume 13, Number 6, 2016), Romanian Journal of Information Science and Technology (Volume 20, Number 1, 2017), Journal of Optimization (Volume 2017, 2017), Theoretical Computer Science (Volume 736, 2018), Fundamenta Informaticae (Volume 164, Numbers 2-3, 2019), International Journal of Parallel, Emergent and Distributed Systems (Volume 36, Number 1, 2021), International Journal of Unconventional Computing (Volume 15, Number 1-2, 2020), International Journal of Unconventional Computing (Volume 16, Number 2-3, 2021), Journal of Membrane Computing (Volume 5, Issue 3, 2023), Journal of Membrane Computing (Volume 6, Issue 3, 2024), Journal of Membrane Computing (Volume 6, Number 4, 2024) and International Journal of Parallel, Emergent and Distributed Systems (Volume 40, Number 3, 2025) [3].

The eight papers in this issue represent a broad range of topics on membrane computing, covering cell-like P systems, spiking neural P systems (SN P systems) and their applications in a variety of fields, and machine learning like long short-term memory.

The first paper, by Reyes, et al., introduced Numerical WebSnapse: a tool intended for simulating and visualizing numerical SN P systems (NSN P systems), which is based on a hybrid Simulation and Visualization (S&V) architecture, and discussed the design and architecture of Numerical WebSnapse, how it improves on previous S&V tools for SN P systems.

The second paper, by Li, et al., presented an automated design method that introduces a novel approach for generating the initial population in evolutionary processes. The method specifically addresses the challenge of multi-natural-number addition combinations by dynamically adjusting the rules of neurons and their interconnection.

The third paper, by Duan, et al., proposed a multi-environment population dynamics P system (MPDP system) to estimate the minimum viability population (MVP) of giant pandas released into the wild from Chengdu Research Base of Giant Panda Breeding (GPBB) and China Conservation and Research Center for Giant Panda (CCRCGP). The MPDP system considers diseases

and natural disasters. The parameters, birth rate and mortality rate and population size, are also discussed.

The fourth paper, by Rong, et al., made the first attempt to extend a fuzzy reasoning spiking neural P system (FRSNPS) from an electrical system to an electromechanical system and correspondingly, a requesting numerical spiking neural P system and a fuzzy reasoning numerical spiking neural P system (FRNSNPS) are proposed to diagnose faults in the lubrication system of aviation piston engines.

The fifth paper, by Liu, et al., discussed a new kind of variant of SNP systems, that is, SNP systems with anti-spikes and autapses (ASNP-AU systems). The system is also designed to exclude the delay feature in neurons. By simulating the register machine, it can be shown that this system can generate/accept Turing computable numbers with reduced use of rules or neurons.

The sixth paper, by Sureshkumar, et al., introduced a novel variant of array P systems, i.e., parallel 8-directional array P system, and a methodology for moving a robot in a rectangular grid from source to destination without colliding with obstacles. Four cases of robot motion are discussed.

The seventh paper, by Lazar, introduced a new type of Spiking Neural P systems (SN P systems), called Learning SN P system with Error Propagation (LSNPEP system), with an architecture similar to that of a Layered Spiking Neural P system (LSN P system). The LSNPEP system uses the membrane computing mechanisms and their rules to learn in a way which is similar to Multi-Layer Perceptrons (MLPs) and therefore, showing that LSNPEP systems can learn anything MLPs can do.

The final paper, by Rong et al., proposed a novel dispatch data-driven fusion method containing long short-term memory for single phase-to-ground fault feeder selection in small current grounding systems. Two submodels are combined to handle different grounding situations. A feature-based sub-module extracts features from zero-current and reactive power in order to efficiently detect faults in ungrounded systems when all needed information is available. A data-driven long short-term memory sub-module is designed to select faulty feeders when the previous submodule is unable to effectively detect or cannot be used due to information loss.

We would like to thank the Editor-in-Chief, professor Andrew Adamatzky, for the opportunity to publish the special issue, the anonymous reviewers for their timely and insightful comments/suggestions to enhance the quality, and the contributions of the authors.

On behalf of all authors in this special issue, we are indebted to Academician Gheorghe Păun for his creation of membrane computing, friendship, collaboration, and scientific generosity and we wish him Happy Birthday!

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