

Guest Editorial – Applications of intelligent systems

Amelia Badica¹, Costin Badica¹, Vladimir Kurbalija², Ladjel Bellatreche³, and Mirjana Ivanović²

¹ University of Craiova, Romania

² University of Novi Sad, Serbia

³ National Engineering School for Mechanics and Aerotechnics, France

This special section includes extended versions of selected papers from the International Conference on INnovations in Intelligent SysTems and Applications (INISTA 2020) held on August 24-26, 2020, in Novi Sad, Serbia and online due to the Covid-19 pandemic (hybrid approach). There were 51 accepted papers in the conference, and 7 of them was selected for this special issue. All of these papers were carefully revised, extended, improved, and judged acceptable for publication in this special section. Each paper has undergone a review process of two rounds; also, it has been reviewed by two referees at least. The aim of this special issue is to present some new directions and research results in the area of intelligent systems.

The first paper "Hyper-parameter Optimization of Convolutional Neural Networks for Classifying COVID-19 X-ray Images" by Grega Vrbančič, Špela Pečnik and Vili Podgorlec presented an approach to transfer learning based classification method for detecting COVID-19 from X-ray images. The authors employed different optimization algorithms for solving the task of hyper-parameter settings. This approach achieved overall accuracy of 84.44% on a dataset of 1446 X-ray images, which outperformed both conventional CNN method as well as the compared baseline transfer learning method. The authors also conducted a qualitative in-depth analysis and gain some in-depth view of COVID-19 characteristics and the predictive model perception.

The second paper "A Fast Non-dominated Sorting Multi-objective Symbiotic Organism Search Algorithm for Energy Efficient Locomotion of Snake Robot" by Yesim Aysel Baysal and Ismail Hakki Altas deals with energy efficient locomotion of a wheel-less snake robot. The optimum parameters for the energy efficient locomotion of the snake robot are obtained with two different multi-objective algorithms based on symbiotic organism search algorithm. These parameters are tuned considering both minimizing the average power consumption and maximizing the forward velocity of the robot. The paper also investigates the energy efficient locomotion of the snake robot under different environment conditions.

The problem of employing gated architectures in Echo State Networks (ESNs) is explored in the paper "On the effectiveness of Gated Echo State Networks for data exhibiting long-term dependencies" by Daniele Di Sarli, Claudio Gallicchio and Alessio Micheli. Gated architectures have contributed to the development of highly accurate machine learning models that can tackle long-term dependencies in the data, but with the cost of highly demanding algorithms which require backpropagation through time. On the other side, ESNs can produce models that can be trained efficiently thanks to the use of fixed random parameters. However, these algorithms are not ideal for dealing with data presenting long-term dependencies. The authors concluded that using pure reservoir

computing methodologies is not sufficient for effective gating mechanisms, while instead training even only the gates is highly effective in terms of predictive accuracy.

The fourth paper "A Comparison of Deep Learning Algorithms on Image Data for Detecting Floodwater on Roadways" by Salih Sarp, Murat Kuzlu, Yanxiao Zhao, Mecit Cetin and Ozgur Guler concentrates on object detection and segmentation algorithms. More precisely it investigates detection and segmentation of (partially) flooded roadways for the purpose of vehicle routing and traffic management systems. This paper proposes an automatic floodwater detection and segmentation method utilizing the Mask Region-Based Convolutional Neural Networks (Mask-R-CNN) and Generative Adversarial Networks (GAN) algorithms. The results show that the proposed Mask-R-CNN-based floodwater detection and segmentation outperform previous studies, whereas the GAN-based model has a straightforward implementation compared to other models.

The fifth paper "An Approach for Selecting Countermeasures against Harmful Information based on Uncertainty Management" by Igor Kotenko, Igor Saenko, Igor Parashchuk and Elena Doynikova explores the possibilities for the counteraction against the spread of harmful information in the Internet. The paper considers models, algorithms and a common techniques based on an assessment of the semantic content of information objects under conditions of uncertainty. An experimental evaluation has shown that it is possible to eliminate uncertainties of any type and, thereby, to increase the efficiency of choosing measures to counter harmful information.

The problem of using the consensus of collectives for solving problems is studied in the paper "An Effective Method for Determining Consensus in Large Collectives" by Dai Tho Dang, Thanh Ngo Nguyen and Dosam Hwang. The rapid development of information technology has facilitated the collection of distributed knowledge from autonomous sources to find solutions to problems. However, due to rapid increment of collectives, determining consensus for a large collective is very time-consuming and expensive operation. Therefore, this paper proposes a vertical partition method (VPM) to find consensus in large collectives. The authors show, both theoretically and experimentally, that the computational complexity of the VPM is lower than the basic consensus method.

The last paper in this special section "Automatic Derivation of the Initial Conceptual Database Model from a Set of Business Process Models" by Drazen Brdjanin, Aleksandar Vukotic, Danijela Banjac, Goran Banjac and Slavko Maric presents a possibility of automatically deriving the initial conceptual database model from a set of business process models. The proposed approach proposes the incremental synthesis of the target model by iteratively composing the partial conceptual database models that are derived from the models contained in the source set. The experimental evaluation shows that the implemented approach enables effective automatic derivation of the initial conceptual database model.

We gratefully acknowledge all the hard work and enthusiasm of authors and reviewers, without whom the special section would not have been possible.