PREFACE TO SPECIAL ISSUE ON RECENT ADVANCES IN MACHINE LEARNING AND ITS APPLICATIONS

This special issue of the Journal of Automation, Mobile Robotics and Intelligent Systems (JAMRIS) is aimed to inform the readers about selected issues of contemporary Computer Science, in particular, Machine Learning in both theoretical and practical aspects. The papers contained in this issue of the journal have been introduced in their preliminary version between 2-5 July, 2018, during the 3rd Conference on Information Technology, Systems Research and Computational Physics (ITSRCP'18), as well as the 6th International Symposium CompIMAGE'18 – Computational Modeling of Objects Presented in Images: Fundamentals, Methods, and Applications (CompIMAGE'18), which were organized by the Faculty of Physics and Applied Computer Science of the AGH University of Science and Technology and co-organized by the Systems Research Institute of the Polish Academy of Sciences in Warsaw, Poland. The idea behind this second special edition volume was to create a specific section containing a number of interesting cutting edge scientific articles. Inside, one can find contributions dealing with computational algorithms, data mining, classification, time series analysis, as well as some aspects of image analysis. The contributions raise problems of well-known machine learning methods such as fuzzy logic, wavelet analysis and neural networks. The previous special issue of JAMRIS, which was dedicated selected aspects of Contemporary issues of Computer Science, Physics, Economy and Applied Mathematics, was published in vol. 13 no. 3 in 2019. This issue contains the following original papers in their special, extended versions.

The first paper is entitled **On Wavelet based Enhancing Possibilities of Fuzzy Classification Methods**, and was authored by Ferenc Lilik, Levente Solecki, Brigita Sziová, László T. Kóczy, Szilvia Nagy. It introduces a new class classifier based on synergy of fuzzy logic and wavelet analysis. Some computational examples of two fuzzy classification schemes to show the improvement caused by wavelet analysis are also discussed.

Maciej Pachocki and Anna Wróblewska, in their work entitled **Categorization of Persons based on their Occurrences in Polish News Texts**, provide a method of categorizing the occurrences of persons in Polish news texts. Based on the statistical evaluation and in accordance with tests that were conducted on own and chosen solutions from literature, and by applying the use of six classifiers, a new model based on the categorization method was suggested and numerically verified.

The work entitled **Supporting Decisions on the Forex Market Using Fuzzy Approach**, by Przemysław Juszczuk and Lech Kruś, proposed a new conceptualization of the multi-criteria fuzzy trading system using technical analysis. The proposed system treats all considered indicators jointly through applying the multi-criteria approach wherein binary information is extended with the use of the fuzzy approach. An experimental comparison of the proposed method, with the traditional crisp trading system, was shown. Herein, the numerical testing procedure is based on different sets of real-world data for different types of trading: short-term, medium and long-term.

Sergii Nikolaiev, Sergii Telenyk and Yury Tymoshenko authored the paper **Non-contact Video-based Remote Photoplethysmography for Human Stress Detection**. In this paper, the authors present the experimental results for a stress index calculation using information technology developed by the authors for non-contact remote human heart rate variability (HRV) retrieval under various conditions from a video stream using common date derived from wide-spread web cameras with minimal frame resolution of 640x480 pixels at average frame rate of 25 frames per second. The use-cases of measuring stress index in a wide variety of situations starting with vehicle operators at work, and finishing with students passing exams, are presented and analyzed in detail. The results of the experiments show that the rPPG system is capable of deriving stress level data that is in accordance with the actual feelings of the experiments' participants.

The paper entitled **Radon-Wavelet based Novel Image Descriptor for Mammogram Mass Classification** was written by the team consisting of Sk Md Obaidullah, Sajib Ahmed, Teresa Goncalves and Luis Rato. The article is devoted to the analysis of a very important issue – that of classifying mammogram images. For this issue, some machine learning tools are proposed, but in the paper before the reader, a novel image descriptor that is based on the idea of radon and wavelet transform is put-forward. The performance of the method is subsequently evaluated by way of applying six different classifiers namely: Bayesian network, linear discriminant analysis, logistic, support vector machine, multilayer perceptron and random forest so as to choose the best outcomes. What is interesting, the

experimental results show the highest accuracy for the proposed solution when using only the carniocaudal view, as compared to when using only the mediolateral oblique or combining both approaches.

Himadri Mukherjee, Sk Md Obaidullah, K.C. Santosh, Teresa Goncalves, Santanu Phadikar and Kaushik Roy, in their work entitled **Segregation of Songs and Instrumentals – a Precursor to Voice/Accompaniment Separation from Songs in Noisy Scenario**, provide a system to be first able to detect whether a piece of music contains vocals or not prior to attempting source separation. In this work, the Authors were challenged to perform source separation from audio that is contaminated with noise. Included in the work are some computational examples based on a database of more than 99 hours of instrumentals and songs wherein six different classifiers were applied during tests and which show the proper and high quality results of the proposed methodology.

In a contribution entitled **The Method of Selecting the Interval of Functional Tests, Taking into Account Economic Aspects and Legal Requirements** written by Jan Piesik, Emilian Piesik and Marcin Śliwiński, some discussion is made on the problem of choosing the optimal frequency of functional tests, bearing in mind reliability and legal requirements, but also the impact of business aspects. Here, the authors propose a solution for selecting the interval of functional tests of safety elements and the necessity for additional machine protection measures as a compromise to achieve satisfactory results in terms of safety, performance and legal requirements.

Finally, Kata Vöröskői, Gergő Fogarasi, Adrienn Buruzs, Péter Földesi, László T. Kóczy, provide a paper entitled **Three Level Fuzzy Signature-Based Decision Methodology for Packaging System Design.** The study focuses upon three different fuzzy signatures connected by fuzzy rules modelling the packaging-choice decisions as based on logistics expert opinions, in order to support the decision making process of choosing the right packaging system. Two real life examples are also given, one in the field of customer packaging and one in industrial packaging.

We would like to thank all those who participated in, and contributed to the Conference program, as well as all the authors who had submitted their papers. We also wish to thank all our colleagues and the members of the Program Committee, both for their hard work during the review process and for their cordiality and outstanding efforts in the local organization of the Conference.

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