
PREFACE TO SPECIAL ISSUE ON CONTEMPORARY PROBLEMS OF COMPUTER SCIENCE, PHYSICS AND APPLIED MATHEMATICS

DOI: 10.14313/JAMRIS/3-2019/25

This special issue of the Journal of Automation, Mobile Robotics and Intelligent Systems is dedicated to informing the readership of selected aspects of Contemporary issues of Computer Science, Physics, Economy and Applied Mathematics. The articles contained in this issue of the journal have been introduced in 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 special edition was to create a specific volume containing a number of interesting cutting edge scientific articles. Herein, one can find contributions dealing with computational algorithms, data mining, clustering, variance analysis, trend analysis, logical connectives, orthomodular lattice, quantum logic, copulas, elliptically contoured distribution, and some aspects of tomography. This issue contains the following original papers in their special, extended versions.

The first paper is entitled **Decomposition Integral without Alternatives, its Equivalence to Lebesgue Integral, and Computational Algorithms**, and was authored by Adam Šeliga. It introduces a new class of decomposition integrals called 'collection integrals'. The paper is focused upon two special types of collection integrals, namely the chain integral and the min-max integral. Some computational algorithms are also discussed.

Jana Kalicka, Maria Minarova, Jaroslav Halvonik and Lucia Majtanova in their work entitled **Statistical Analysis of Models for Punching Resistance Ensuring**, provide a statistical assessment of models that ensure the safety of reinforced concrete slabs. The obtained results, hence, the best model, will become the European Union standard after 2020. Based on the statistical parameter evaluation and in accordance with engineer best practice, a new model was suggested, statistically verified and nominated as the normative.

The work entitled **Global and local trend analysis and change-point analysis of selected financial and market indices**, by Dominika Ballová, uses trend analysis. Herein, the author uncover the global evolution of selected indices. After evaluating the global trend in the series, local trend analysis occur, and the two sets of figures are compared. Using change-point analysis, the intent was to detect the moments in which the indices differ. By means of cluster analysis, indices that are most similar in long-term development are made to stand out. In each analysis, the most appropriate methodology is uncovered and compared.

Oľga Nánásiová, Viera Čerňanová and Ľubica Valášková authored the paper **Probability Measures and logical connectives on Quantum Logics**. In this paper, the authors delve into aspects for modelling of the probability of logical connectives in quantum logic via G -mapping. What is interesting is that in this article, authors show that unlike classical (Boolean) logic, probability measures of projections in quantum logic are not necessarily pure projections. They then go on to indicate how it is possible to define a probability measure of implication in quantum logic using G -mapping, and subsequently provide a study of some properties of this measure that are different from measure of implication in Boolean algebra.

The paper entitled **2D-Raman Correlation Spectroscopy as a Method to Recognize of the Interaction at the Interface of Carbon Layer and Albumin** was written by the team consisting of Anna Kołodziej, Aleksandra Wesełucha-Birczyńska, Paulina Moskal, Ewa Stodolak-Zych, Maria Dużyja, Elżbieta Długoń, Julia Sacharz and Marta Błażewicz. The article is devoted to the analysis of two types of model carbon layers differing primarily in topography, and to their interactions with blood plasma proteins. Herein, the first layer was formed of pyrolytic carbon C (CVD) and the second was constructed of multi-walled carbon nanotubes obtained by electrophoretic deposition (EPD), both layers are set on a Ti support.

Finally, Tomas Bacigal, Magdalena Komornikova and Jozef Komornik, provide a paper entitled **State-of-the-art in Modelling Nonlinear Dependence Among Many Random Variables With Copulas and Application to Financial Indexes**. The study focuses attention on multi-dimensional copula models for returns of the indexes of selected prominent international financial markets. In this paper, the authors dig into modelling results based on elliptic copulas, 7-dimensional hierarchical Archimedean copulas, vine copulas and factor copulas, and demonstrate the dominant role of the SPX index among the considered major stock indexes. It is noteworthy that the dominance of these models is most striking over the interval of the recent financial market crisis. At the same time, the best Student class models were providing a substantially poorer fit.

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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