PREFACE

Special section on
Information Technology for Systems Research

Information technology (IT)—highly sophisticated information processing—forms the intellectual foundation of the current, third scientific-technical revolution. However, contrary to the two previous revolutions, based on steam and electricity, this one is intangible in nature. In essence, it constitutes the collection, treatment, and transmission of data, so the subject of research and operation is here abstract, unreal objects. Being widely understood, information technology has become the dominant discipline of innovative development and progress. If, therefore, the crux of the changes does not mean creating new machines or devices but performing a radical transformation of the existing essence and character, then the spectrum of research and practical interests is unusually broad or even unlimited in the framework of contemporary science and application fields. Thus, such was the varied material of the 3rd Conference on *Information Technology, Systems Research and Computational Physics (ITSRCP'18)*, held on July 2–5, 2015, at the AGH University of Science and Technology in Kraków, Poland, together with the sister event—the 6th International Symposium on *Computational Modeling of Objects Presented in Images: Fundamentals, Methods, and Applications (CompIMAGE'18)*. In total, participants from 21 countries and 5 continents presented their papers at this event.

This special section consists of seven significantly extended versions of selected papers from the *ITSRCP'18* conference:

1. *The effect of elastic and inelastic scattering on electronic transport in open systems* by K. Kulinowski, M. Wołoszyn, M. Radecka, B.J. Spisak;
2. *The phase-space approach to time evolution of quantum states in confined systems: The spectral split-operator method* by D. Kołaczek, B.J. Spisak, M. Wołoszyn;
3. *On the convergence of sigmoidal fuzzy grey cognitive maps* by I.Á. Harmati, L.T. Kóczy;
4. *Efficient astronomical data condensation using approximate nearest neighbors* by S. Łukasik, K. Lalik, P. Sarna, P.A. Kowalski, M. Charytanowicz, P. Kulczycki;
5. *A hybrid cascade neuro-fuzzy network with pools of extended neo-fuzzy neurons and its deep learning* by Y.V. Bodyanskiy, O.K. Tyshchenko;
6. *A three-level aggregation model for evaluating software usability by fuzzy logic* by E. Rakovská, M. Hudec;
7. *Using neural networks with data quantization for time series analysis in LHC superconducting magnets* by M. Wielgosz, A. Skoczeń.

All of the above describe applications of information technology to different tasks in science and practical activity; however, it is worth noting that the papers 1, 2 and 7 concern sophisticated problems of contemporary physics that rarely appear in relation to the use of complex IT methods.

We would hereby like to express our heartfelt thanks to all reviewers of the papers that constitute this special section for their significant contribution to the editorial process, as well as to the *AMCS* team, in particular to Professor Józef Korbicz for his friendly cooperation and continuous support of our efforts.

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Piotr Kulczycki graduated in electrical engineering from the AGH University of Science and Technology, and in applied mathematics from Jagiellonian University. He received the title of a professor of technical sciences in 2007. Piotr Kulczycki currently holds professorial positions at the Systems Research Institute of the Polish Academy of Sciences, where he is the head of the Centre of Information Technology for Data Analysis Methods, as well as the AGH University of Science and Technology, Faculty of Physics and Applied Computer Science, where he is the head of the Division of Information Technology and Systems Research. He has cooperated with scientific units in Denmark, Hungary, the USA, Slovakia, Czech Republic, Austria, Finland, and Belgium. His scientific activity to date concerns diverse aspects of information technology, as well as data analysis and mining applied to contemporary systems research and control engineering.

Janusz Kacprzyk is a Polish engineer and mathematician, notable for his multiple contributions to the field of computational and artificial intelligence tools like fuzzy sets, mathematical optimization, decision-making under uncertainty, computational intelligence, intuitionistic fuzzy sets, data analysis and mining with applications for databases, as well as mobile robotics. Janusz Kacprzyk is a professor of computer science at the Systems Research Institute and an academic (full member) of the Polish Academy of Sciences. Currently he is the president of the Polish Operational and Systems Research Society and a past president of the International Fuzzy Systems Association (IFSA) (2009–2011). He is a foreign member of the Spanish Royal Academy of Economic and Financial Sciences, the Bulgarian Academy of Sciences, the Finnish Society of Sciences and Letters, as well as a member of Academia Europaea and the European Academy of Sciences and Arts.

László T. Kóczy graduated from the Budapest University of Technology and Economics in 1975 and 1976 with MSc and MPhil degrees, respectively, and a doctoral degree in 1977. He received his DSc from the Hungarian Academy of Sciences in 1998. Professor Kóczy has been a lecturer, reader and professor at the above university since 1976; since 2002 he has also been a professor at Szechenyi University, where he was the dean of the Engineering Faculty in 2002–2011. Professor Kóczy has also been a chair professor at the Tokyo Institute of Technology, a visiting professor at the Pohang University of Science and Technology (Korea), Australian National University, the University of New South Wales, Murdoch University (Perth), and several European universities. His research area is computational intelligence, in particular fuzzy systems, optimization, fuzzy rule extraction and model fitting by population-based meta-heuristics.

Radko Mesiar graduated in 1974 from the Faculty of Mathematics and Physics at Comenius University, where he obtained his PhD in 1979. He received his DSc from the Czech Academy of Sciences in 1996. Radko Mesiar has been a full professor since 1998. Since 1978 he has been working at the Slovak University of Technology in Bratislava. Professor Mesiar is a fellow member of the Institute of Information and Automation at the Czech Academy of Sciences (Prague) and IRAFM at the University of Ostrava. He has held visiting positions at Università "La Sapienza" (Italy), Universidad de Alcalá (Spain) and Johannes Kepler Universität (Austria), and has undertaken research in Belgium, Germany, France, Italy, Poland, Serbia, and China. His research interest area is measure theory, uncertainty modelling, fuzzy sets and fuzzy logic, multicriteria decision support, copulas, triangular norms, intelligent computing, aggregation and related operators.