

Preface

Information Technology (IT)—highly sophisticated information processing—forms the intellectual basis at the forefront of the current, third scientific–technical revolution. The first, generally placed at the turn of the eighteenth and nineteenth centuries, created the foundations for replacing muscle power with that of steam, and—as a consequence—manual production started to be displaced by industrial mass production. The second, which took place at the turn of the nineteenth and twentieth centuries, was brought about by the large number of groundbreaking concepts and inventions occurring, thanks to the new energy carrier—electricity. This third scientific–technical revolution, rooted in the fifties, is of a different character from the previous ones in that it is nonmaterial. In essence it constitutes the collection, treatment, and transmission of data, and so the subject of research and operation is here abstract, unreal objects. The dominant discipline for innovative development and progress became Information Technology as it is widely understood.

If therefore the crux of the changes does not consist of creating new machines or devices, but of the radical transformation of preexisting essence and character, then the spectrum of research and practical interests is unusually broad, even unlimited in the framework of contemporary science and applicational fields. Techniques used can be divided into different, partially intersecting groups. Generally, the first group consists of disciplines, which actually originated within the context of and for the needs of IT: computational intelligence and data analysis (especially exploratory). The second is the application of new technologies for tasks appropriate to distinct practical problems; a typical example of this is image processing. The third comprises support for basic sciences, dedicated to describing the world’s reality, mainly physics and mathematics. This subject of this edited book has a similar division; each of its parts represents one of these groups.

The opening part concerns Intelligent Computing and Data Analysis. The first (Zadrozny, Kacprzyk, Gajewski) and second (Kulczycki, Kowalski) chapters deal with the classification of text and interval *data*, respectively. In turn, fuzzy logic was used in the third chapter (Pósfai, Magyar, Kóczy) to synthesize a recommender system for social networks, and in the fourth (Nicolau, Andrei) for predictive

diagnosis via sophisticated clustering. Finally, the last chapter (Hudec) investigates quality measure of data summaries, related to outliers.

The second part is devoted to Information Systems and Image Processing as they are broadly understood. The opening sixth chapter (Rolik, Halushko, Kolesnik) concerns management of service of corporate IT infrastructures. Next, the authors of the seventh chapter (López de Luise, Bel, Mansilla, Lobatos, Blanc, Malca la Rosa) use statistical and heuristic tools to investigate the prediction of risk associated with traffic accidents. The subject of considerations of the next chapter (Andrei, Nicolau) is the task of robustness of wireless communication systems. The subject of the ninth chapter (Krivá, Handlovičová) is evaluation of gradient norms on a deformed quadtree grid. In the tenth chapter (Grigorescu, Macesanu) a robust facial features detector is considered. And finally, the last in this part, the eleventh chapter (Świebocka-Więk), is devoted to aspects of medical diagnosis based on analysis of tomographic images.

Finally, the subject of the third part constitutes tasks of basic sciences—computational physics and applied mathematics. In the twelfth chapter (Kozik, Łużny) of this edited book, genetic algorithms were used to determine the structure of crystals. The next text (Poliński, Stęgowski) considers the computational fluid dynamics method to model flow behavior in a photoreactor. In turn, the authors of the fourteenth chapter (Palutkiewicz, Wołoszyn, Spisak) deal with transport characteristics of semiconductor nanowire transistors. Closing this book, the material of the fifteenth chapter (Mesiari, Kolesárová) investigates new methods for constructing bivariate copulas which provide a mathematical apparatus to aggregate available knowledge.

The subject choice of particular parts of this edited book was determined through discussions and reflection arising during the *Congress on Information Technology, Computational and Experimental Physics* (CITCEP 2015), 18–20 December 2015, Kraków, Poland. The authors of selected papers were invited to present extended descriptions of their research as part of this post-conference publication.

We would hereby like to express our heartfelt thanks to the technical associate editors of this book, Dr. Piotr A. Kowalski and Dr. Szymon Łukasik, as well as the co-organizers of the above conference, Dr. Joanna Świebocka-Więk and Artur Nowosielski, as well as all participants of this interesting interdisciplinary event.

Kraków/Warsaw, Poland
Győr/Budapest, Hungary
Bratislava, Slovakia
Warsaw, Poland
April 2016

Piotr Kulczycki
László T. Kóczy
Radko Mesiari
Janusz Kacprzyk

Information Technology and Computational Physics

Kulczycki, P.; Kóczy, L.T.; Mesiar, R.; Kacprzyk, J. (Eds.)

2017, VIII, 255 p. 102 illus., 65 illus. in color., Softcover

ISBN: 978-3-319-44259-4