

# Preface

Intelligent computing is a new emerging computing paradigm inspired by a remarkable ability of animate systems, meant both as individuals and groups of individuals, in solving complex problems, notably related to decision making and support. This broad definition covers many specific disciplines, notably—in the context of this volume—including the following ones: artificial and computational intelligence, fuzzy logic, granular computing, intelligent database systems, information retrieval, information fusion, intelligent search (engines), data mining, cluster analysis, unsupervised learning, machine learning, intelligent data analysis, (group) decision support systems, decision theory, collective intelligence, case-based reasoning, intelligent agents and multi-agent systems, artificial neural networks, genetic algorithms, evolutionary computation, particle swarm optimization, artificial immune system, knowledge-based systems, approximate reasoning, knowledge engineering, expert systems, imprecision and uncertainty handling, human–computer interface, Internet computing, semantic web, electronic commerce, e-learning and Web-intelligence, cognitive systems, distributed systems, intelligent control, advanced computer modeling and simulation, bioinformatics, etc. Thus the paradigm of intelligent computing is meant to cover the areas of interest of traditional artificial intelligence as well as many other related topics, notably those inspired by the observation of biological systems and those which emerged with the development of advanced IT. Such a wide set of tools and techniques available does clearly promise that some challenging problems solved so far mainly by human beings may be formalized and solved by the “machine”.

The growing interest and importance of this branch of research made a group of researchers, including the editors of this volume, to think of joining forces and working together on their topics of interest belonging to the above-mentioned broadly meant area. One goal was to define a common ground for sometimes seemingly disparate problems dealt with by particular teams involved and to address the identified problems using the paradigm of broadly perceived intelligent computing and/or intelligent systems. Another important goal was to get young researchers involved, to give them a chance to develop their careers in the modern

and prospective field. As a result, in 2010, a consortium of three Polish academic institutions: the Systems Research Institute of the Polish Academy of Sciences, the Institute of Computer Science, also of the Polish Academy of Sciences, and the Faculty of Mathematics and Information Science, Warsaw University of Technology, started a large-scale project, entitled “International Ph.D. Projects in Intelligent Computing”, which was supported by the Foundation for Polish Science, financed from the European Union within the Innovative Economy Operational Programme 2007–2013 and the European Regional Development Fund. The project had been carried out with intensive collaboration with 17 foreign partners, leading academic and research institutions from Australia, Belgium, Canada, Denmark, Finland, France, Germany, Japan, Luxembourg, Spain, the United Kingdom, and the USA. The core of the group, formed around senior researchers of high international stature in the field, had been the Ph.D. students selected in a highly competitive contest. Thanks to the support of the International Ph.D. Projects Programme, operated by the Foundation for Polish Science as mentioned above, these Ph.D. students had been supervised by well-known scientists and had an opportunity to work at the foreign partner institutions via a system of scientific internships.

The research program prepared for the Ph.D. students covered both theoretical and practical aspects of the intelligent computing paradigm. In particular, the theoretical foundations and the practical problems of implementation of the advanced IT/ICT tools and techniques were addressed. Five areas were in focus: foundations of intelligent computing, intelligent techniques in data mining, intelligent computing for supporting decision making, multi-agent-based technologies, and intelligent text and data retrieval.

Now, when the project is close to completion, we are happy to publish this volume, which constitutes another opportunity to present and promote the results obtained during the project. The participants have published numerous papers in scientific journals and presented their results during many international scientific conferences. Nevertheless, this volume provides a broad panorama of research carried out in the framework of the project, and a comprehensive collection of modern views and approaches that can be of use to a broader audience. The majority of the papers are authored by the Ph.D. students participating in the project and co-authored by their supervisors. In a few cases, we have also invited other valuable contributions from the supervisors and their younger collaborators: graduate students, Ph.D. students, and postdocs, showing thereby a broader view of the community, and the scale and depth of the research endeavor associated with the project.

Some of the papers collected in this volume are extended versions of the presentations given by the participants at special sessions on intelligent computing organized within many respected international conferences, notably the recent FQAS 2015, the Flexible Query Answering Systems 2015 conference that took place in Cracow during October 26–28, 2015, which constituted another opportunity to promote and summarize the results of the project to a large international audience, including a number of foreign members of the project consortium.

Special thanks are due to the Foundation for Polish Science for their continuous support for our efforts to provide the Ph.D. students and their supervisors with the best opportunity to carry out their research.

We express our particular gratitude to all the participants of the project's community, whose contribution, cooperation, ideas, as well as purely human qualities enriched all of us, and made the project for most of us a memorable stage in life, with quite essential consequences for many, especially the Ph.D. students. With this, we extend our best wishes to all those involved.

Peer reviewers deserve also deep appreciations because their insightful and constructive remarks and suggestions have considerably improved the contribution.

And last but not least, we wish to thank Dr. Tom Ditzinger, Dr. Leontina di Cecco, and Mr. Holger Schaepe for their dedication and help to implement and finish this large publication project on time maintaining the highest publication standards.

November 2015

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Challenging Problems and Solutions in Intelligent  
Systems

Tré, G. de; Grzegorzewski, P.; Kacprzyk, J.; Owsinski, J.W.;

Penczek, W.; Zadrozny, S. (Eds.)

2016, X, 347 p. 66 illus., 51 illus. in color., Hardcover

ISBN: 978-3-319-30164-8