About this Series

The series “Studies in Computational Intelligence” (SCI) publishes new developments and advances in the various areas of computational intelligence—quickly and with a high quality. The intent is to cover the theory, applications, and design methods of computational intelligence, as embedded in the fields of engineering, computer science, physics and life sciences, as well as the methodologies behind them. The series contains monographs, lecture notes and edited volumes in computational intelligence spanning the areas of neural networks, connectionist systems, genetic algorithms, evolutionary computation, artificial intelligence, cellular automata, self-organizing systems, soft computing, fuzzy systems, and hybrid intelligent systems. Of particular value to both the contributors and the readership are the short publication timeframe and the world-wide distribution, which enable both wide and rapid dissemination of research output.

More information about this series at http://www.springer.com/series/7092
Foreword

As the quantity of data increases and data processing hardware and related processing algorithms become increasingly efficient, also the scope of the field of Computational Intelligence is broadening. This parallels rapid extensions of heuristic and meta-heuristic computer science and engineering methods that are inspired by nature. These methods can tackle such demanding areas of inquiry as data mining, knowledge discovery, semantic databases, big data and data analytics… to name a few.

Along with the development of tools for producing, processing and storage of data, the technology makes it possible to process increasingly more complex information in many diverse forms. The forms include multimedia, streamed videos including spatial and acoustic channels, massive spatial data and geospatial maps, time flow diagrams, social network connections and communication patterns, including their frequency spectra and time series consisting of social and commercial interactions.

The emerging time/frequency data consisting of events, sequences and their analog or discrete descriptors typically base on classic concepts and transforms of J.B. Fourier, G. Boole, C. Shannon and others. However, augmented with computational intelligence techniques, they allow for increasingly deep insights into data. To meet the various challenges of data mining and knowledge discovery, researchers continue to investigate and use complex models and computational algorithms including Boolean reasoning and fast Boolean computation, data ontologies, description logic, grammatical optimization, fuzzy logic, data fusion, evolutionary approaches and other heuristic methods.

Applications and theoretical extensions presented in this book are inspired by both these classic and modern techniques. They include evolutionary computation for environmental monitoring, digital patterns for heritage and data preservation, bioinformatics, intelligent warehousing and logistics, business analytics, cognitive radio and software-defined networks, multimedia and image processing, smart grids, cloud computing and internet of things, wireless sensor networks and environmental monitoring.
The editors have carefully selected the best papers presented at the APCASE 2014 conference to provide an insightful and critical review of issues related to intelligent computing, covering the state of the art of various techniques and real-world applications. For easier reference, the extended versions of papers originally presented at the APCASE 2014 were grouped into four main parts related to: computational models and knowledge discovery; communications networks and cloud computing; computer-based systems; and data-oriented and software-intensive systems.

This carefully edited and reviewed volume addresses the increasingly popular demand for seeking more clarity in the data that we are immersed in. It should be of interest to scientists, Internet companies’ researchers, information technology professionals, or even ordinary users who are looking for nuggets of information across the vast universe of today’s Internet.

I sincerely hope that this book will be a valuable reading for both researchers and students in the area of computer science, telecommunications and electronics.

Louisville, October 2014

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The content of the book includes high quality contributions to APCASE 2014, the second Asia-Pacific Conference on the Computer Aided System Engineering, February 10–12, 2014 in South Kuta, Bali, Indonesia. APCASE 2014 was organized by the University of Technology, Sydney (Australia), Binus University of Technology (Indonesia), Warsaw University of Technology (Poland) and the University of Applied Sciences in Hagenberg (Austria). The aim of APCASE series of conferences is to provide a highly prestigious venue for academics, system engineering and applied science researchers as well as practitioners in the Asia-Pacific region.

The proposed volume includes an excellent choice of extended versions of papers presented at the APCASE 2014 conference. The book is made of four main parts that cover data-oriented engineering science research in a wide range of applications:

- Computational Models and Knowledge Discovery
- Communications, Networks, and Cloud Computing
- Computer-Based Systems
- Data-Oriented and Software-Intensive Systems

The first part presents recent advances in computational models and knowledge discovery. This part also covers heuristic computational models and model-driven system design. These approaches are highly applicable for problems which cannot be easily solved by deterministic methods, due to the dimensionality, complexity or specificity issues. The issues discussed in this part of the book include: Boolean reasoning and fast Boolean computation, data ontologies, description logic, accelerated and simulation-based optimization techniques, implicit solution spaces and dynamic solution space reduction, neural network methods, iterative back projection methods, identification and classification, location of objects and events, symbolic regression and search strategies for grammatical optimization. The second part discusses most recent advances in communication and networks. In this part, innovative computational models of data transmission, as well as, practices and
implementation issues related to sensor network software infrastructure; reliability in multistage interconnection networks; authentication, authorization and the task workflow in the cloud infrastructure. The third part presents most recent developments, challenges and practical applications related to computer-aided system optimization and design principles. A range of application fields and case studies is presented, including: tracking moving targets and image processing; control, data fusion and monitoring of biosignals; electronic manufacturing, multi-core processors and smart grid technologies. The fourth and the final part presents an overview of the most recent advances in the domain of data-oriented and software-intensive systems. Such areas as: intelligent warehousing, simulation of supply-chain logistic, steganographic image processing, augmented reality solutions, e-commerce applications, financial markets and Internet banking systems are covered.

The organization of the book allows highlighting the tremendous and steadily growing role of data-oriented and software intensive systems in almost all domains of human activity. Additionally, such organization enables authors to provide a comprehensive review of new challenges these systems are facing when dealing with increasingly more complex solutions for solving data explorations.

This book offers excellent examples of the intelligent ubiquitous computation, as well as recent advances in systems engineering and informatics. The content represents state-of-the-art foundations for researchers in the domain of modern computation, computer science, system engineering and networking, with many examples that are set in the industrial application context.

The readers will greatly benefit from acquiring knowledge of the advanced methods and applications in computational intelligence on what and how various engineering problems and challenges can be approached and resolved in several domains. They will learn various methods and techniques that could be applied in order to solve these problems. One of the most important benefits that potential readers will gain is not only good understanding of what the major challenges are but also the most practical and efficient solutions to address them.

There are very few books that currently could offer similar content, depth and practicality of the methodologies and techniques contained in the book. Additionally, the publication offers a very convenient entry for researchers and engineers who intend to work in the discussed research domains.

The book is mainly targeted at scientists, engineers and IT specialists in the fields of computational intelligence, telecommunication, control engineering, artificial intelligence, signal processing, software engineering, electrical engineering, mechanics, robotics, soft computing and many others who have interests and needs to understand the theory and practical applications of computational intelligence and heuristic methodologies. Many students at various educational levels (undergraduate, graduate and postgraduate) could benefit from this book, as it offers a
consistent material as well as a well-researched bibliography. From this perspective, the book can be used as a textbook in any course in the field of computational intelligence, computer system engineering, telecommunications, software engineering and IT.

Warsaw, October 2014
Sydney
Hagenberg

Grzegorz Borowik
Zenon Chaczko
Witold Jacak
Tadeusz Łuba
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