

Preface

The disciplines of Data Science and Big Data, coming hand in hand, form one of the rapidly growing areas of research, have already attracted attention of industry and business. The prominent characterization of the area highlighting the essence of the problems encountered there comes as a 3V (volume, variety, variability) or 4V characteristics (with veracity being added to the original list). The area itself has initialized new directions of fundamental and applied research as well as led to interesting applications, especially those being drawn by the immediate needs to deal with large repositories of data and building some tangible, user-centric models of relationships in data.

A general scheme of Data Science involves various facets: descriptive (concerning reporting—identifying what happened and answering a question why it has happened), predictive (embracing all the investigations of describing what will happen), and prescriptive (focusing on acting—make it happen) contributing to the development of its schemes and implying consecutive ways of the usage of the developed technologies. The investigated models of Data Science are visibly oriented to the end-user, and along with the regular requirements of accuracy (which are present in any modeling) come the requirements of abilities to process huge and varying data sets and the needs for robustness, interpretability, and simplicity.

Computational intelligence (CI) with its armamentarium of methodologies and tools is located in a unique position to address the inherently present needs of Data Analytics in several ways by coping with a sheer volume of data, setting a suitable level of abstraction, dealing with distributed nature of data along with associated requirements of privacy and security, and building interpretable findings at a suitable level of abstraction.

This volume consists of twelve chapters and is structured into two main parts: The first part elaborates on the fundamentals of Data Analytics and covers a number of essential topics such as large scale clustering, search and learning in highly dimensional spaces, over-sampling for imbalanced data, online anomaly detection, CI-based classifiers for Big Data, Machine Learning for processing Big Data and event detection. The second part of this book focuses on applications demonstrating

the use of the paradigms of Data Analytics and CI to safety assessment, management of smart grids, real-time data, and power systems.

Given the timely theme of this project and its scope, this book is aimed at a broad audience of researchers and practitioners. Owing to the nature of the material being covered and a way it has been organized, one can envision with high confidence that it will appeal to the well-established communities including those active in various disciplines in which Data Analytics plays a pivotal role.

Considering a way in which the edited volume is structured, this book could serve as a useful reference material for graduate students and senior undergraduate students in courses such as those on Big Data, Data Analytics, intelligent systems, data mining, computational intelligence, management, and operations research.

We would like to take this opportunity to express our sincere thanks to the authors for presenting advanced results of their innovative research and delivering their insights into the area. The reviewers deserve our thanks for their constructive and timely input. We greatly appreciate a continuous support and encouragement coming from the Editor-in-Chief, Prof. Janusz Kacprzyk, whose leadership and vision makes this book series a unique vehicle to disseminate the most recent, highly relevant, and far-reaching publications in the domain of Computational Intelligence and its various applications.

We hope that the readers will find this volume of genuine interest, and the research reported here will help foster further progress in research, education, and numerous practical endeavors.

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