

## Preface

Collecting, processing, and analyzing data have become important branches of computer science. Many areas of our existence generate a wealth of information that must be stored in a structured manner and processed appropriately in order to gain the knowledge from the inside. Databases have become a ubiquitous way of collecting and storing data. They are used to hold data describing many areas of human life and activity, and as a consequence, they are also present in almost every IT system. Today's databases have to face the problem of data proliferation and growing variety. More efficient methods for data processing are needed more than ever. New areas of interests that deliver data require innovative algorithms for data analysis.

Beyond Databases, Architectures and Structures (BDAS) is a series of conferences located in Central Europe and very important for this geographic region. The conference intends to give the state of the art of the research that satisfies the needs of modern, widely understood database systems, architectures, models, structures, and algorithms focused on processing various types of data. The aim of the conference is to reflect the most recent developments of databases and allied techniques used for solving problems in a variety of areas related to database systems, or even go one step forward — beyond the horizon of existing databases, architectures, and data structures.

The 12th International BDAS Scientific Conference (BDAS 2016), held in Ustrón, Poland, during May 31–June 3, 2016, was a continuation of the highly successful BDAS conference series started in 2005. For many years BDAS has been attracting hundreds or even thousands of researchers and professionals working in the field of databases. Among attendees of our conference were scientists and representatives of IT companies. Several editions of BDAS were supported by our commercial, world-renowned partners, developing solutions for the database domain, such as IBM, Microsoft, Oracle, Sybase, and others. BDAS annual meetings have become an arena for exchanging information on the widely understood database systems and data-processing algorithms.

BDAS 2016 was the 12th edition of the conference, organized under the technical co-sponsorship of the IEEE Poland Section. We also continued our successful cooperation with Springer, which resulted in the publication of this book. The conference attracted more than 100 participants from 15 countries, who made this conference a successful and memorable event. There were five keynote talks given by leading scientists: Prof. Jarek Gryz from the Department of Computer Science and Engineering, York University, Toronto, Canada, had a keynote talk on “Interactive Visualization of Big Data.” Prof. Abdelkader Hameurlain from Pyramid Team, Institut de Recherche en Informatique de Toulouse IRIT, Paul Sabatier University, Toulouse Cedex, France, gave an interesting lecture entitled “Big Data Management in the Cloud: Evolution or Crossroad?” Prof. Dirk Labudde from Bioinformatics group Mittweida (bigM) and Forensic Science Investigation Lab (FoSIL), University of Applied Sciences, Mittweida, Germany, gave an excellent talk entitled “From Data to Evidence: Digital

Forensic Analyses of Communication Networks.” Prof. Jean-Charles Lamirel from SYNALP team, LORIA, Vandoeuvre-lès-Nancy, France, had a very enlightening speech on “Performing and Visualizing Temporal Analysis of Large Text Data Issued for Open Sources: Past and Future Methods.” Prof. Zbigniew W. Raś from the Department of Computer Science, University of North Carolina, Charlotte, USA, honored us with a presentation on “Reduction of Readmissions to Hospitals Based on Actionable Knowledge Mining and Personalization.” The keynote speeches and plenary sessions allowed participants to gain insight into new areas of data analysis and data processing.

BDAS is focused on all aspects of databases. It is intended to have a broad scope, including different kinds of data acquisition, processing, and storing, and this book reflects fairly well the large span of research presented at BDAS 2016. This volume consists of 57 carefully selected papers. The first four papers accompany the stunning keynote talks. The remainder of the papers are assigned to seven thematic groups:

- Artificial intelligence, data mining, and knowledge discovery
- Architectures, structures, and algorithms for efficient data processing
- Data warehousing and OLAP
- Natural language processing, ontologies, and Semantic Web
- Bioinformatics and biomedical data analysis
- Data processing tools
- Novel applications of database systems

The first group, containing eight papers, is related to various methods used in data mining and knowledge discovery. Papers assembled in this group show a wide spectrum of applications of various exploration methods, like decision rules, knowledge-based and neuro-fuzzy systems, clustering and memetic algorithms, rough sets, to solve many real problems. The second group contains 11 papers devoted to database architectures, structures, and algorithms used for efficient data processing. Papers in this group discuss hot topics of effectiveness of query execution, Big Data, testing performance of various database systems, NoSQL, scalability, task scheduling in processing data in OLTP systems, and in-memory, cloud, and probabilistic databases. The next group of papers concerns issues related to data integration, data warehousing, and OLAP. The group consists of three papers presenting research devoted to the scalability of extraction, transformation and load processes, novel data integration architectures, and spatiotemporal OLAP queries. The fourth group consists of five papers devoted to natural language processing, text mining, ontologies, and the Semantic Web. These papers discuss problems of extraction of concepts from text, mapping semantic features to words, text classification, building ontology for underutilized crops, and querying large RDF data with GPUs. The research devoted to bioinformatics and biomedical data analysis is presented in six papers gathered in the fifth group.

The next group of papers is focused on different data processing tools. It presents tools for content modeling, multitenant applications, frameworks for Big Data and biometric identification, as well as benchmarks and simulators constructed by authors.

The last group consisting of ten papers introduces novel applications for which database systems proved to be useful. Some examples include: water demand forecasting, combat identification, drug abuse extraction, hand pose recognition, or methane concentration value prediction.

We hope that the broad scope of topics related to databases covered in this proceedings volume will help the reader to understand that databases have become an important element of nearly every branch of computer science.

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