

Lecture Notes  
in Business Information Processing

138

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# Business Intelligence

Second European Summer School, eBISS 2012  
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Tutorial Lectures



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# Preface

The Second European Business Intelligence Summer School (eBISS 2012) took place in Brussels, Belgium, in July 2012. Tutorials were given by experts in business intelligence and covered various hot topics. This volume contains the lecture notes of the summer school.

The first chapter shows how to support multidimensional business intelligence for complex application domains such as medical data, location-based services, music data, web data, and text data. In particular, complex dimension hierarchies, complex measures, and integration of multidimensional data with complex external data are detailed.

The second chapter introduces business process modeling. Business process management can be seen as an extension of classical workflow management systems. This chapter discusses the similarities and differences between these two notions, and then introduces the current OMG standard BPMN 2.0 (Business Process Modeling and Notation) and discusses BPEL (Business Process Execution Language). Finally, hot research topics in this field such as business process mining are depicted.

The third chapter provides an overview of machine learning techniques in time series forecasting, and outlines the challenging issues related to predicting the future in applied sciences. Three aspects are discussed in this chapter: the formalization of one-step forecasting problems as supervised learning tasks, the discussion of local learning techniques as an effective tool for dealing with temporal data, and the role of the forecasting strategy when we move from one-step to multiple-step forecasting.

The fourth chapter gives an overview of Markov logic networks from a theoretical and a practical viewpoint. Statistical relational learning approaches, more specifically Bayesian logic networks, are then detailed. Inferencing and learning processes are then explained together with the best scaling algorithms known today. This chapter concludes with an overview of application areas.

The fifth chapter focuses on recent developments, challenges, and potential solutions for mining large graphs. The main challenge of new tools and frameworks lies in the development of new paradigms that are scalable, efficient, and flexible. Distributed computing is depicted through the MapReduce paradigm. Finally, a new field of research, graph data warehousing, which is deeply linked with large graph mining, is introduced.

The sixth chapter addresses the challenges induced by big data analytics on modern architectures. Massively parallel analysis systems and their programming models are discussed, as well as the application of these modern architectures on database processing.

The seventh chapter introduces decision aid, and more specifically multicriteria decision aid, with a focus on two methods: PROMETHEE and GAIA. An illustrative example, highlighting the added value of using interactive and visual tools in complex decision processes, is analyzed with the D-Sight software.

The eighth chapter explores the importance of semantic technologies (ontologies) and knowledge extraction techniques for knowledge management, search, and capture in e-business processes. Semantic technologies and ontology learning from web data are detailed, and the use of ontologies for business intelligence is discussed through use cases described in several fields.

Finally, the ninth chapter presents the Business Semantics Management (BSM) method, a fact-oriented approach to knowledge modeling grounded in natural language. This method constitutes an interface between Enterprise Information Management and the Web of Data. BSM was implemented in the Flemish Public Administration for building the Flanders Research Information Space (FRIS) program.

We would like to thank the attendants of the summer school for their active participation, as well as the speakers and their co-authors for the high quality of their contributions in a constantly evolving and highly competitive domain. Finally, the lectures in this volume greatly benefited from the comments of the external reviewers.

November 2012

Marie-Aude Aufaure  
Esteban Zimányi  
eBISS 2012 Co-chairs

# Organization

The Second European Business Intelligence Summer School (eBISS 2012) was organized by the MAS Laboratory of the Ecole Centrale de Paris and the Department of Computer and Decision Engineering (CoDE) of the Université Libre de Bruxelles.

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