Preface

Knowledge-based technologies are gaining momentum and they are currently achieving a certain degree of maturity. They are especially valuable in situations in which the amount of available information is prohibitive for the intuition of an unaided human decision maker and in which precision and optimality are of importance. Knowledge-based systems can aid human cognitive deficiencies by integrating various sources of information, providing intelligent access to relevant knowledge, and aiding the process of structuring decisions. They can also support choice among well-defined alternatives and build on formal approaches, such as the methods of engineering economics, operations research, statistics analysis, and decision theory. They can also employ artificial intelligence methods to address heuristically problems that are intractable by formal techniques. They provide a consistent and reliable basis to face the challenges for organization, manipulation and visualization of the data and knowledge, playing a crucial role as the technological basis of the development of a large number of Computational Intelligence Systems.

These technologies draw on standard and novel techniques from various disciplines within Computer Science, including Knowledge Engineering, Natural Language Processing, Decision Support Systems, Artificial Intelligence, Databases, Software Agents, etc. The methods and tools developed and integrated for this purpose are generic and have a very large application potential in a large amounts of fields like Information Retrieval, Semantic Searches, Information Integration, Information Interoperability, Bioinformatics, eHealth, eLearning, Software Engineering, eCommerce, eGovernment, Social Networks, eSupply Chain, etc. This book considers the following industrial sectors, but is not limited: Aerospace, Agriculture, Automotive, Banking, Business Services, Food Manufacturing, Mining and Mineral Extraction, National Government, Insurance, Energy Services and others.

The aim of this book is to disseminate current trends among innovative and high-quality research regarding the implementation of conceptual frameworks, strategies, techniques, methodologies, informatics platforms and models for

developing advanced Knowledge-based methods and techniques and their application in different fields. The specific objectives can be summarized as:

- Create a collection of theoretical, real-world and original research works in the field of Knowledge Based Systems.
- Go beyond the state-of-the-art in the field of Knowledge-Based Systems.
- Publish successful applications and use cases of new approaches, applications, methods, techniques for developing advanced Knowledge-Based Systems and their application in different fields.
- Provide an appropriate dissemination venue from both academia and industrial communities.

This book contains one kind of contribution: regular research papers. These works have been edited according to the norms and guidelines of Springer Verlag Editorial. Several call for chapters were distributed among the main mailing lists of the field for researchers to submit their works to this issue. In the first deadline, we received a total of 25 expressions of interest in the form of abstracts. Due to the large amount of submissions, abstracts were subject to a screening process to ensure their clarity, authenticity, and relevancy to this book. Proposals came from several countries such as Brazil, Colombia, India, Greece, India, Ireland, the Republic of Korea, Malaysia, Malta, Mexico, New Zealand, Norway, Philippines, Poland, Romania, Serbia, Spain, Taiwan, Tunisia, Turkey, United Kingdom of Great Britain, Northern Ireland, and United States of America.

After the screening process, 15 proposals were invited to submit full versions. At least two reviewers were assigned to every work to proceed with the peer review process. 13 chapters were finally accepted for their publication after corrections requested by reviewers and editors were addressed.

The book content is structured in three parts: (1) Semantic Web applications, (2) Knowledge Acquisition & Representation, (3) Knowledge-based Decision Support Systems (Tools for Industrial Knowledge Management).

Semantic Web Applications: This part contains four chapters.

Chapter 1, entitled *im4Things: An Ontology-based Natural Language Interface for controlling devices in the Internet of Things*, proposes a natural language interface for the Internet of Things, which takes advantage of Semantic Web technologies to allow non-expert users to control their home environment through an instant messaging application in an easy and intuitive way. Several experiments were conducted with a group of end users aiming to evaluate the effectiveness of the approach proposed to control home appliances by means of natural language instructions. The evaluation results proved that without the need for technicalities, the user was able to control the home appliances in an efficient way.

Chapter 2, entitled *Knowledge-Based Leisure Time Recommendations in Social Networks*, presents a novel knowledge-based recommendation algorithm for leisure time information to be used in social networks, which enhances the state-of-the-art in this algorithm category by taking into account (a) qualitative aspects of the recommended places (restaurants, museums, tourist attractions etc.), such as price,

service and atmosphere, (b) influencing factors between social network users, (c) the semantic and geographical distance between locations and (d) the semantic categorization of the places to be recommended. The combination of these features leads to more accurate and better user-targeted leisure time recommendations.

Chapter 3, entitled *An Ontology based System for Knowledge Profile Management: A Case Study in the Electric Sector*, presents an ontology to help manage knowledge profiles in organizations. The ontology was implemented by using information obtained from a real case, where the roles and knowledge required for the people in charge of the processes of an electricity generation enterprise were analyzed.

Chapter 4, entitled *Sentiment Analysis based on Psychological and Linguistic Features for Spanish language*, presents an extensive experiments to evaluate the effectiveness of the psychological and linguistic features for sentiment classification. To this purpose, four psycholinguistic dimensions obtained from LIWC were used, and one stylometric dimension obtained from WordSmith, for the subsequent training of the SVM, Naïve Bayes, and J48 algorithms. A corpus of tourist reviews from the travel website TripAdvisor was created. The findings reveal that the stylometric dimension is quite feasible for sentiment classification. Finally, with regard to the classifiers, SVM provides better results than Naïve Bayes and J48 with an F-measure rate of 90.8%.

Knowledge Acquisition and Representation: This part contains four chapters.

Chapter 5, entitled *Knowledge-based System in an Affective and Intelligent Tutoring System*, proposes an affective and intelligent tutoring system called Fermat that integrates emotion or affective states with an Intelligent Learning Environment. The system applies Knowledge Space Theory to implement the knowledge representation in the domain and student modules and Fuzzy Logic to implement a new knowledge tracing algorithm, which is used to track student's pedagogical and affective states. The Intelligent Learning Environment was implemented with two main components: an affective and intelligent tutoring system for elementary mathematics and an educational social network. The tutoring system generates math exercises by using a fuzzy system that is fed with cognitive and effective values.

Chapter 6, entitled *A software strategy for knowledge transfer in a pharmaceutical distribution company*, presents an approach to solve knowledge transfer problems faced by a family owned pharmaceutical distribution company. The main objective is to improve knowledge transfer efficiency, recover outdated knowledge and improve the company's operation.

Chapter 7, entitled *GEODIM: A semantic model-based system for 3D recognition of industrial scenes*, presents GEODIM a semantic model-based system for recognition of 3D scenes of indoor spaces in factories. The system relies on the two technologies to describe industrial digital scenes with logical, physical, and semantic information. GEODIM extends the functionality of traditional object recognition algorithms by incorporating semantics in order to identify and characterize recognized geometric primitives along with rules for the composition of

real objects. The research also describes a real case where GEODIM processes were applied and presents its qualitative evaluation.

Chapter 8, entitled *Beyond Interoperability in Critical Systems Engineering,* in this chapter a conceptual layer of interoperability is outlined describing what kind of features a powerful new interoperability technology should support in order to fuel desired changes in engineering and production paradigms.

Knowledge-Based Decision Support Systems: This part contains five chapters.

Chapter 9, entitled *Knowledge-based Decision Support Systems for Personalized u-lifecare Big Data Services*, proposes an architecture and case study of a Knowledge-based Big data acquisition, storage and processing platform for personalized u-lifecare services including data analytics and reasoning and inferencing services. Provides high performance computing for intensive data processing in cost effective manner. The main objective of the platform is to permit a systematic data management and effective utilization of the users' generated data to help users to visualize the personal behaviour patterns and to facilitate u-lifecare services to manage their daily routines.

Chapter 10, entitled *Decision support system for operational risk management in supply chain with 3PL providers*, presents a multicriteria decision support system for effective management of the operational risks present in a supply chain that includes 3PL providers, specifically in ground transportation of goods. The model is supported by Fuzzy QFD for the prioritization of risks in terms of their impact on the performance indicators that are considered relevant by the actors in the supply chain. Findings indicate that the proposed model allows prioritizing the risks according with the most important indicators.

Chapter 11, entitled *Expert System Development for the Assessment of Ergonomic Compatibility: Selection of Advanced Manufacturing Technology*, proposes the development of an expert system for ergonomic compatibility assessment on the selection of Advanced Manufacturing Technology (AMT). The research proposes a novel axiomatic design methodology under fuzzy environment including two stages: the generation of fuzzy If-Then rules using Mamdani's fuzzy inference system and the development of the system by mean of experts' opinions. A numerical example is presented for the selection of three CNC milling machines using the Weighted Ergonomic Incompatibility Content (WEIC).

Chapter 12, entitled *Developing Geo-recommender systems for Industry*, presents an integration architecture for developing a geo-recommender system. The architecture is composed of different layers, where the functionalities and interrelations of the layer components are distributed in order to ensure maintenance and scalability. A web-based system called GEOREMSYS was developed in order to recommend and to select Points Of Sale (POS).

Chapter 13, entitled *Evaluation of Denoising Methods in the Spatial Domain for Medical Ultrasound Imaging Applications*, presents the evaluation of denoising techniques, designed specifically for multiplicative noise models, applied in the spatial domain. The evaluation is analyzed and compared by using a synthetic

image, a phantom image and real images. The aim of this study is to compare denoising methods when no transformation of the image is carried out.

Once a brief summary of chapters has been provided, we would also like to express our gratitude to the reviewers who kindly accepted to contribute in the evaluation of chapters at all stages of the editing process.

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