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Current Trends in Semantic Web Technologies: Theory and Practice

Springer

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Preface

Semantic Web technologies are becoming more relevant to the research community. Such interest has inspired many people to create innovative technologies and applications such as Semantic Searches, Information Integration, Information Interoperability, Bioinformatics, eHealth, eLearning, Software Engineering, eCommerce, eGovernment, and Social Networks. In this sense, the application of Semantic Web has carried out a comprehensive use of ontologies in such diverse fields. In fact, through ontologies, systems have discovered several novel techniques to be capable of generating knowledge from analyzing enormous quantities of heterogeneous data sources. Thus, the use of the ontologies has supposed an incredible advance in developing techniques to manipulate, share, and reuse information across different kinds of systems.

On the other hand, with the arrival of ontologies, fundamental questions have emerged about which kind of elements should be defined in an ontology model to specify knowledge and how this knowledge should be represented. In response to these questions, Ontological Engineering, Knowledge Representation, and Reasoning research areas are working intensively to develop generic models which enable systems to employ reasoning techniques to produce knowledge.

In addition to the classic "Web of documents" and the ontologies, the paradigm of publication, linking, and consumption of data has evolved to support a "Web of data", whose main goal is generating a global Linked Data ecosystem known as Linked Open Data cloud (LOD cloud), which enables the computers to do more useful work and to develop systems that can support trusted interactions over the network. In this sense, the Web of data enables developing vertical applications that may bring forward specific and sometimes highly non-trivial use cases, focusing to provide solutions to problems of different industries, such as Health Care and Life Sciences, eGovernment, and Energy, to mention but a few, in order to improve collaboration, research and development, and innovation adoption through Semantic Web technology.

According to above, the main objective of this book is to collect and consolidate innovative and high-quality research contributions regarding Linked Data (Linked Open data), Intelligent Systems, and Semantic Web-based applications applied to

different disciplines such as Artificial Intelligence, Database Management, Knowledge Representation and Engineering, Natural Language and Processing, Cloud Computing, Social Web, and Web Science, among others. This book aims to provide insights on the recent advances in these topics by soliciting original scientific contributions in the form of theoretical foundations, models, experimental research, and case studies for developing Semantic Web-based applications.

The aim of this book is to provide insights on the recent advances in these topics by soliciting original scientific contributions in the form of theoretical foundations, models, experimental research, and case studies for developing Semantic Web-based applications in different fields. The specific objectives can be summarized as follows:

- Create a collection of theoretical, real-world, and original research works in the field of Semantic Web applications.
- Go beyond the state of the art in the Semantic Web.
- Publish successful applications and use cases of new approaches, applications, methods, and techniques for developing advanced Semantic Web applications 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 calls 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. Twelve chapters were finally accepted for their publication after corrections requested by reviewers and editors were addressed. The book content is structured in two parts: (1) Knowledge Acquisition and Representation, and (2) Semantic Web applications.

Knowledge Acquisition and Representation: this part contains seven chapters.

Chapter 1, entitled *Personalization of Ontologies Visualization: Use Case of Diabetes*, presents the current state of the art of personalization in ontology visualization initiatives, a brief summary of the diabetes mellitus domain, and existing ontologies in the diabetes domain. It also presents an approach for the personalization of ontologies visualization based on the implementation of the overview, zoom/filter, and details of interaction patterns. This is done by adapting the

Rhizomer tool so different views can be generated in the context of personalized medicine. All this is validated through a use case of a new ontology to model the diabetes domain from an existing open dataset of around 70,000 diabetic patients extracted from American hospitals. The conclusion is that the application of this approach has the potential to enhance personalization of medicine ontologies and their visualization.

Chapter 2, entitled *Semantic Data Integration of Big Biomedical Data for Supporting Personalised Medicine*, addresses the issues hindering knowledge exploration and discovery through the design of a knowledge-driven framework. The framework receives big data sources and integrates them into a knowledge graph. Semantic data integration methods are utilized for identifying equivalent entities, i.e., entities that correspond to the same real-world elements. Fusion policies enable the merging of equivalent entities inside the knowledge graph, as well as with entities in other knowledge graphs, e.g., DBpedia and Bio2RFD. Knowledge discovery allows for the exploration of knowledge graphs in order to uncover novel patterns and relations.

Chapter 3, entitled *Interaction Net as a Representation Model of a Programming Language*, presents an answer in the design of future solutions for highly interconnected environments based on the construction of a programming language; this language is a computational realization of the concept of interactions that uses the mathematical model of Interaction Nets. The purpose is to expose how this model adequately represents the needs of future challenges in the design and implementation of ad hoc networks, which are the floor of decentralized systems and the Internet of Things (IoT). It shows the conception of specific interactions and how they are written in the created language.

Chapter 4, entitled *An Adaptive Trust Model for Achieving Emergent Cooperation in Ad Hoc Networks*, explores the cooperation mechanisms that could be used in the next generation of communication systems to produce collective behaviors that allow the member of the system join efforts to achieve individual and collective goals in environments without a centralized controller, using socially inspired computing to introduce an adaptive trust model based on a theoretical analysis of cooperation through game theory and genetic algorithms.

Chapter 5, entitled *Operational Risk Identification in Ground Transportation Activities: Ontology—Approach*, presents an ontology-based approach oriented to improve communications about risks through the whole supply chain, achieving better results in risks management activities. The approach was validated in ground transportation activities and seems that is useful not only to risk identification but to the others steps in Supply Chain Risk Management System.

Chapter 6, entitled *Challenges in RDF Validation*, describes a couple of proposals for the RDF validation and enumerates some challenges and trends will foresee with regard to RDF validation. The chapter devotes more space to compare ShEx and SHACL and to understand their underlying foundations. To that end, authors propose an intermediate language and show how ShEx and SHACL can be converted to it.

Chapter 7, entitled *A Bayesian Network Model for the Parkinson's Disease: A Study of Gene Expression Levels*, presents a study about the modeled gene expression profiles of peripheral blood samples from 105 individuals (50 with Parkinson Disease (PD), 33 with control of neurodegenerative diseases, other than PD, and 22 healthy controls) using Bayesian networks with different dimensionality reduction techniques to create several sets of genes. From the obtained sets, classification models were generated and some genes that could be considered as PD candidates were obtained and some genes previously reported with this disease were corroborated.

Semantic Web applications: this part contains five chapters.

Chapter 8, entitled *Use of Sentiment Analysis Techniques in Healthcare Domain*, proposes a module based on sentiment analysis to obtain sentiments and emotions at the comment and entity levels from texts related to the healthcare domain. Also, different case studies are presented to validate the proposed module.

Chapter 9, entitled *A Medic-Us: Advanced Social Networking for Intelligent Medical Services and Diagnosis*, describes the design and development of a social network platform focused on the physician-patient and physician-physician interactions, in order to achieve better and faster diagnosis. Like other social networks or social media tools, it focusses on the collaboration among its members. This collaboration is improved with the help of paradigms as Collaborative Intelligence and Wisdom of the Crowd. Authors called this platform Medic-Us highlighting the collaborative practice among the practitioners, and the interaction with patients. This chapter describes the different modules of Medic-Us, the social network environment, medical consult service, information retrieval, and a trainer module for the medicine students.

Chapter 10, entitled *Semantic PHI-Base Web Interface: A Web Tool to Interact and Visualize Plant-Pathogen Interactions Data*, presents a proof of concept done to create an interface for Semantic PHI-Base dataset. A Web tool that allows interacting and visualizing the interactions contained in Semantic PHI database using an easy interface was created. This tool represents a case study of interacting and visualizing the knowledge contained within a semantic dataset allowing the use of such dataset by users with no expertise in semantic technologies.

Chapter 11, entitled *FASELOD: A Faceted Search Engine in Linked Open Datasets Using Voice Recognition,* presents the development of a faceted search engine on datasets that are part of the LOD cloud that provides a more natural and intuitive navigation through NLP. Through the use of facets, the user is provided with a list of results on which he performs an incremental refinement by selecting values of the facets of the data that become constraints on the dataset. FASELOD provides a mechanism based on Silk that allows obtaining other related results within other datasets that are part of the LOD cloud.

Chapter 12, entitled *ARLOD: Augmented Reality Mobile Application Integrating Information Obtained from the Linked Open Drug Data,* presents ARLOD an application for mobile devices that integrates AR information obtained from the LODD datasets, with the intention that between the two technologies they complement each other to help solve the limitations that each of them presents and with

the intention that ARLOD becomes a support tool for people involved in the field of health care. Likewise, a proposed architecture for the integration of these technologies is presented, demonstrating its usefulness through the development of ARLOD.

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.

Orizaba, Mexico — Giner Alor-Hernández
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Part II Semantic Web Applications

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