Lecture Notes in Artificial Intelligence 9403

Subseries of Lecture Notes in Computer Science

More information about this series at http://www.springer.com/series/1244

Songmao Zhang · Martin Wirsing
Zili Zhang (Eds.)

Knowledge Science, Engineering and Management

8th International Conference, KSEM 2015
Chongqing, China, October 28–30, 2015
Proceedings

Springer

Editors
Songmao Zhang
Chinese Academy of Sciences
Beijing
China

Zili Zhang
Southwest University
Chongqing
China

Martin Wirsing
Ludwig-Maximilians-Universität München
Munich
Germany

ISSN 0302-9743 ISSN 1611-3349 (electronic)
Lecture Notes in Artificial Intelligence
ISBN 978-3-319-25158-5 ISBN 978-3-319-25159-2 (eBook)
DOI 10.1007/978-3-319-25159-2

Library of Congress Control Number: 2015950047

LNCS Sublibrary: SL7 – Artificial Intelligence

Springer Cham Heidelberg New York Dordrecht London

Printed on acid-free paper

Springer International Publishing AG Switzerland is part of Springer Science+Business Media (www.springer.com)

Preface

The 8th International Conference on Knowledge Science, Engineering and Management 2015 (KSEM 2015) was the latest of the KSEM series, building on the success of seven previous events held, respectively, in Guilin, China (KSEM 2006); Melbourne, Australia (KSEM 2007); Vienna, Austria (KSEM 2009); Belfast, UK (KSEM 2010); Irvine, USA (KSEM 2011); Dalian, China (KSEM 2013), and Sibiu, Romania (KSEM 2014). The series was initiated in 2006 by Prof. Ruqian Lu from the Chinese Academy of Sciences, with the aim of providing a forum for researchers in the broad areas of knowledge science, knowledge engineering, and knowledge management to exchange ideas and to report state-of-the-art research results.

KSEM 2015 was held in Chongqing, a major city in Southwest China and the largest of China's four direct-controlled municipalities by administration the other three being Beijing, Shanghai, and Tianjin. The conference was hosted by Southwest University, which was officially established in July 2005 with a history that can be traced back to the foundation of East Sichuan Teachers College in 1906. The main theme of KSEM 2015 was on how knowledge science, engineering, and management contribute to big data analytics. This yielded a larger part of the presentations and discussions on machine learning, classification and clustering, knowledge discovery and recognition, and text mining and analysis. Knowledge and data processing techniques in various types of domains were tackled, including mobile data analytics, bioinformatics, and recommendation systems. Theoretical studies in formal reasoning and ontologies, detection, evidence theory, and conceptual analysis dealt with the fundamental issues in knowledge representation, management, and acquisition.

KSEM 2015 consisted of the main conference and three special sessions. It attracted a total of 247 submissions from 17 countries all over the world, including 58 papers submitted to the special sessions. The Program Committee members together with external reviewers contributed 546 reviews. As a result, a combination of 57 full papers and 22 short papers were selected to be included in the proceedings with a very competitive full paper acceptance rate of 23% and overall acceptance rate of 32%. Moreover, we were honored to have five prestigious scholars giving keynote speeches at the conference, Dr. Dean Allemang (Working Ontologist LLC, USA), Dr. Sheng-Chuan Wu (Franz Inc., USA), Prof. Aoying Zhou (East China Normal University, China), Prof. Mark Reynolds (University of Western Australia, Australia), and Prof. Lorna Uden (Staffordshire University, UK). The abstracts of their talks are included in this volume.

KSEM 2015 would not have been possible without the contributions and efforts of a large scientific community. We thank our authors for being willing to submit their work to KSEM. We sincerely appreciate the large amount of valuable and timely reviews from the members of the Program Committee, the members of three special session committees, and helpful external reviewers. Moreover, we would like to express our gratitude to the conference honorary general chair, Prof. Hojjat Adeli (The Ohio State

University, USA), the conference general co-chair, Prof. Dimitris Karagiannis (University of Vienna, Austria), and the co-chairs of the special sessions, Prof. Li Liu (National University of Singapore, Singapore), Prof. Li Li (Southwest University, China), Prof. Le Zhang (Southwest University, China), and Prof. Yong Deng (Southwest University, China). The organization committee from Southwest University in Chongqing provided extensive support for the conference, and we especially thank Prof. Guoqiang Xiao and Associate Prof. Guoxian Yu. We are also grateful to the team at Springer led by Alfred Hofmann for publication of this volume.

Many thanks go to Franz Inc. for sponsoring the best paper award of KSEM 2015. The conference management system EasyChair was used to handle the submissions, conduct the electronic Program Committee meetings, and assist with the assembly of the proceedings.

August 2015

Songmao Zhang
Martin Wirsing
Zili Zhang

Organization

KSEM 2015 was hosted and organized by the Faculty of Computer and Information Science of Southwest University, China. The conference was held during October 28–30, 2015, in Chongqing, China.

Organizing Committee

Honorary General Chair

Hojjat Adeli	The Ohio State University, USA

General Co-chairs

Zili Zhang	Southwest University, China
Dimitris Karagiannis	University of Vienna, Austria

Program Committee Co-chairs

Songmao Zhang	Chinese Academy of Sciences, China
Martin Wirsing	Ludwig-Maximilians-Universität München, Germany

Local Organizing Chair

Guoqiang Xiao	Southwest University, China

Publication Chair

Yong Deng	Southwest University, China

Publicity Co-chairs

Li Tao	Southwest University, China
Guoxian Yu	Southwest University, China
Shiping Chen	CSIRO, Australia

Special Session Chair

Li Li	Southwest University, China

Webmasters

Guodong Wang	Southwest University, China
Yuxin Liu	Southwest University, China

Steering Committee

Ruqian Lu (Honorary Chair)	Chinese Academy of Sciences, China
Chengqi Zhang (Past Chair)	University of Technology, Sydney, Australia

Hui Xiong (Chair)	The State University of New Jersey, Rutgers, USA
Dimitris Karagiannis (Deputy Chair)	University of Vienna, Austria
David Bell	Queen's University, Belfast, UK
Yaxin Bi	Ulster University, Belfast, UK
Cungen Cao	Chinese Academy of Sciences, China
Zhi Jin	Peking University, China
Claudiu Kifor	Sibiu University, Romania
Jérome Lang	University Paul Sabatier, France
Yoshiteru Nakamori	JAIST, Japan
Jörg Siekmann	DFKI and Saarland University, Saarbrücken, Germany
Eric Tsui	The Hong Kong Polytechnic University, Hong Kong, SAR China
Zongtuo Wang	Dalian Science and Technology University, China
Kwok Kee Wei	City University of Hong Kong, Hong Kong, SAR China
Mingsheng Ying	Tsinghua University, China
Zili Zhang	Southwest University, China

Program Committee

Andreas Albrecht	Middlesex University, UK
Klaus-Dieter Althoff	DFKI/University of Hildesheim, Germany
Nathalie Aussenac-Gilles	IRIT CNRS, France
Serge Autexier	DFKI, Germany
Costin Badica	University of Craiova, Romania
Salem Benferhat	Université d'Artois, France
Philippe Besnard	IRIT CNRS, France
Remus Brad	Lucian Blaga University of Sibiu, Romania
Krysia Broda	Imperial College, UK
Robert Andrei Buchmann	University of Vienna, Austria
Cungen Cao	Chinese Academy of Sciences, China
Melisachew Chekol	University of Mannheim, Germany
Enhong Chen	University of Science and Technology of China, China
Paolo Ciancarini	University of Bologna, Italy
Ireneusz Czarnowski	Gdynia Maritime University, Poland
Richard Dapoigny	LISTIC/Polytech'Savoie, France
Juan Manuel Dodero	Universidad de Cádiz, Spain
Josep Domenech	Universitat Politècnica de València, Spain
Josep Domingo-Ferrer	Universitat Rovira i Virgili, Spain
Dieter Fensel	University of Innsbruck, Austria
Hans-Georg Fill	University of Vienna, Austria
Adina Magda Florea	University Politehnica of Bucharest, Romania
Fausto Guinchiglia	University of Trento, Italy
Yoshinori Hara	Kyoto University, Japan

Maritta Heisel	University of Duisburg-Essen, Germany
Knut Hinkelmann	FHNW University of Applied Sciences and Arts Northwestern Switzerland, Switzerland
Jun Hong	Queen's University Belfast, UK
Zhisheng Huang	Vrije University Amsterdam, The Netherlands
Van Nam Huynh	JAIST, Japan
Takayuki Ito	Nagoya Institute of Technology, Japan
Zhi Jin	Peking University, China
Gabriele Kern-Isberner	Technische Universität Dortmund, Germany
Claudiu Kifor	Lucian Blaga University of Sibiu, Romania
Konstantinos Kotis	University of Piraeus, Greece
Ge Li	Peking University, China
Weiru Liu	Queen's University Belfast, UK
James Lu	Emory University, USA
Xudong Luo	Sun Yat-sen University, China
Zhendong Ma	Austrian Institute of Technology, Austria
Pierre Marquis	CRIL-CNRS and Université d'Artois, France
Stewart Massie	Robert Gordon University, UK
John-Jules Meyer	Utrecht University, The Netherlands
Mihaela Muntean	West University of Timisoara, Romania
Oleg Okun	Kreditech Holding SSL GmbH, Germany
Dan Oleary	University of Southern California, USA
Dantong Ouyang	Jilin University, China
Jihong Ouyang	Jilin University, China
Maurice Pagnucco	The University of New South Wales, Australia
Sven-Volker Rehm	WHU, Otto Beisheim School of Management, Germany
Ulrich Reimer	University of Applied Sciences St. Gallen, Switzerland
Gheorghe Cosmin Silaghi	Babes-Bolyai University, Romania
Yong Tang	South China Normal University, China
A. Min Tjoa	Vienna University of Technology, Austria
Leon Urbas	Technische Universität Dresden, Germany
Abel Usoro	University of the West of Scotland, UK
Emil Vassev	University College Dublin, Ireland
Lucian Vintan	Lucian Blaga University of Sibiu, Romania
Carl Vogel	Trinity College Dublin, Ireland
Daniel Volovici	Lucia Blaga University of Sibiu, Romania
Kewen Wang	Griffith University, Australia
Robert Woitsch	BOC Asset Management, Austria
Jian Yu	Beijing Jiaotong University, China
Slawomir Zadrozny	Systems Research Institute, Polish Academy of Sciences, Poland
Franco Zambonelli	University of Modena and Reggio Emilia, Italy

Qingtian Zeng	Shandong University of Science and Technology, China
Chunxia Zhang	Beijing Institute of Technology, China
Shuigeng Zhou	Fudan University, China

Special Session Organizing Committees

Special Session on Mobile Data Analytics and Knowledge Management

Co-chairs

Li Liu	National University of Singapore, Singapore
Li Li	Southwest University, China

Program Committee

Shiping Chen	CSIRO, Australia
Rong Xie	Wuhan University, China
Huawen Liu	Zhejiang Normal University, China
Lifei Chen	Fujian Normal University, China
Xianchuan Yu	Beijing Normal University, China
Yufang Zhang	Chongqing University, China
Ying Xia	Chongqing University of Posts and Telecommunications, China
Jason Teutsch	National University of Singapore, Singapore
Guoxin Su	National University of Singapore, Singapore
Xianyue Li	Lanzhou University, China
Yonggang Lu	Lanzhou University, China
Zigang Huang	Arizona State University, USA

Special Session on Bioinformatics and Computational Biology

Chair

Le Zhang	Southwest University, China

Program Committee

Badong Chen	Xi'an Jiaotong University, China
Ge Gao	Peking University, China
Jianxin Wang	Central South University, China
Linqiang Pan	Huazhong University of Science and Technology, China
Yan Qiang	Taiyuan University of Technology, China

Special Session on Evidence Theory and Its Application

Chair

Yong Deng	Southwest University, China

Program Committee

Sankaran Mahadevan	Vanderbilt University, USA
Rehan Sadiq	University of British Columbia, Canada
Deqiang Han	Xi'an Jiaotong University, China
Zhunga Liu	Northwestern Polytechnical University, China
Jean Dezert	The French Aerospace Lab (ONERA), France
Yan Qiang	Taiyuan University of Technology, China

Additional Reviewers

Acar, Erman
Akbar, Zaenal
Alebrahim, Azadeh
Ayzenshtadt, Viktor
Becheru, Alex
Belzner, Lenz
Bouraoui, Zied
Bouzar, Lydia
Breazu, Macarie
Calvino, Aida
Chen, Badong
Chen, Lifei
Chen, Weihua
Chen, Xiaohong
Colhon, Mihaela
de Lima, Tiago
de Oliveira Melo, Andre
Dranidis, Dimitris
Dutta, Arnab
Efendioglu, Nesat
Everaere, Patricia
Falcioni, Damiano
Fensel, Anna
Furtmueller, Elfi
Ghiran, Ana-Maria
He, Gang
Heap, Bradford
Huang, Jie
Huang, Zi-Gang
Jin, Xiaolong
Jurek, Anna
Kröger, Peer
Kärle, Elias
Li, Xiaoyu
Lila, Meziani
Liu, Huawen
Liu, Lin
Lu, Yonggang
Maier, Edith
Mailly, Jean-Guy
Mandel, Christian
Mao, Wenji
Martinez, Sergio
Mcconville, Ryan
Meilicke, Christian
Meis, Rene
Moca, Mircea
Mocanu, Andrei
Moldovan, Darie
Morariu, Daniel
Pan, Linqiang
Papasalouros, Andreas
Patroumpas, Kostas
Petrusel, Razvan
Przybylinski, Thomas
Qian, Wei
Qiang, Yan
Rajaratnam, David
Ren, Xuguang
Reuss, Pascal
Ritze, Dominique
Sabaté Pla, Albert
Salas, Julián
Santen, Thomas
Santipantakis, Georgios
Schwind, Nicolas
Sitar-Taut, Dan-Andrei
Slavkovik, Marija
Soria-Comas, Jordi
Spahiu, Blerina
Stan, Alexandru-Ioan
Su, Guoxin
Thiel, Christian
Toma, Ioan
Ulfat-Bunyadi, Nelufar
Ullrich, Carsten
Varzinczak, Ivan
Wang, Zhe
Wilke, Gwendolin
Xie, Rong
Yu, Jian
Zhang, Hong
Zhang, Yufang
Zhao, Hong
Zheng, Shuai
Zhuang, Zhiqiang
Zied, Bouraoui
Zirn, Caecilia

Sponsors

Southwest University, China

Franz Inc., USA

Keynotes

Industrial Big Data - When Big Data Meets Big Business

Dean Allemang

Working Ontologist, LLC
Oakland, CA, USA
dallemang@workingontologist.com

Abstract. It is no secret that the world is drowning in data. Technologies for collecting and storing data have resulted in a data glut that has given rise to the rather general, catch-all topic of "Big Data".

In many circles, Big Data has taken on a very specific meaning of searching through large amounts of end-user data for a web site, to project their behavior and tune the site to some optimal performance. In this sense, Big Data is closely associated with SEO. It is natural that this sort of application of Big Data would come first; the data is collected by and belongs to a single organization, and the value from correct analysis of that data goes back to that same organization.

In this talk, I want to introduce a trend in Big Data that has much more potential for having a lasting impact on the world. It is something that I call Industrial Big Data. Like Big Data within an enterprise, Industrial Big Data involves large amounts of interconnected data, over which we wish to perform a wide variety of complex queries. But in addition to these features of Big Data, Industrial Big Data involves data from multiple sources, with multiple ownership, where the data has to be linked not just on an enterprise scale, but an industrial scale. In short, industrial Big Data requires Semantic Web technology as well as large-scale data technology.

Several industries (including Pharmaceuticals, Oil and Gas, and Finance) are facing and addressing Industrial Big Data challenges today. In order to gain real insights into production and consumption, industries need to connect data across the supply chain, from tiny produces through international traders all the way to retail customers. These insights provide value far beyond improved sales figures for some quarter; these insights are being used to improve transparency of financial data, improve accountability of these industries, and to streamline utilization of scarce resources.

For all of these industries, the stakes are high. In this talk, I will summarize how these industries are approaching these challenges, and lessons we can learn from them.

Separating the Reality from the Hypes of Big Data

Sheng-Chuan Wu

Franz Inc.
Oakland, CA, USA
scw@franz.com

Abstract. The world is drowning in data. Modern technologies and digital devices have made it very easy to generate, collect and store mammoth data that gives rise to the term, Big Data. Everyone wants to collect, analyze, invest in and make money from Big Data. Market research firms predict exciting business opportunity of US$50 billions for Big Data tools by 2017. Industrial experts promise Big Data to solve virtually any problem we encounter. Is Big Data really what all the market hypes allege to be? There is no doubt that, by combining the enormous modern and inexpensive computing power and sophisticated Data Mining programs, we are able to process the zettabytes of digital data produced every minute. However, several challenges besides the sheer data size make it difficult to extract the essential value from big data, namely heterogeneous data sources, convolute data relations and complex queries inherent to predictive analytics. A new analytic architecture has been developed, combining the popular big data Hadoop framework, semantic index and distributed query to extract actionable business insight from big data in nearly real-time. A couple of real-world examples in Customer Relation Management (CRM) and Healthcare are discussed to show the power of this new architecture.

Big Data Knowledge Engineering: Essence and Applications

Aoying Zhou

Institute for Data Science and Engineering
Software Engineering Institute
East China Normal University
Shanghai, China
ayzhou@sei.ecnu.edu.cn

Abstract. Knowledge Engineering has been evolved for almost four decades. Since it was proposed by Edward Feigenbaum in 1977, a lot of significant progress has been made in this area, not only in theoretical aspects but also in practice. The emergence of Internet has been changing the world, knowledge engineering is no exception. In the era of big data, knowledge engineering faces fundamental challenges induced by fragmented knowledge from heterogeneous, autonomous sources with complex and uncertain relationships, which are generally called User Generated Content. It means that knowledge creation is not proprietary to experts, everyone who are Internet service consumers could be knowledge creators to some extent. Therefore, knowledge engineering and the associated issues which were studied profoundly should be reexamined in the new context.

In this talk, in addition to the retrospect of the glorious history of knowledge engineering, the essential issues of big data knowledge engineering will be discussed, which distinguished it from the conventional one. It is anticipated that the advance in big data knowledge engineering will bring dramatic impact on knowledge infrastructure construction and knowledge services and even lead to paradigm shift in the field of knowledge engineering.

Representing Knowledge About Continuous Time

Mark Reynolds

The University of Western Australia
Perth, Australia
mark.reynolds@uwa.edu.au

Abstract. Temporal logic is a widely used formalism for specification and reasoning about the correctness of hardware and software systems. For many applications there are good reasons to use a formalisms based on some sort of dense or continuous model of time rather than the traditional discrete model. Examples include multi-agent systems, AI planning, concurrency and refinement.

In contrast to the solid understanding of the reasoning tasks for discrete time temporal languages, the development of techniques for working with more general linear flows of time have been rather patchy. We discuss some recent developments in this direction.

Big Data in Knowledge Management for Innovation

Lorna Uden

School of Computing, FCES
Staffordshire University
Stafford, UK
L.uden@staffs.ac.uk

Abstract. Big Data is the bridge to the next wave of innovation and growth. By combining data from multiple channels and sources and discovering patterns of interest, a business can realize operational efficiency and find new ways of growing the business. Data by itself is useless, especially for improved decision making, unless it can be turned into knowledge. Knowledge is the true destination in the pursuit of data. When the enterprise turns its data into knowledge, it has the potential to gain competitive advantage, and even build entirely new business models.

Knowledge is the most valuable asset of all organizations. Knowledge creation is the process that produces new knowledge and innovation. Effective knowledge management involves (a) identifying knowledge (b) creation of new knowledge (c) building competence (d) effective management of innovation.

A goal of knowledge management is the ability to integrate information from multiple perspectives to provide the insights required for valid decision-making. Knowledge Management today has the opportunity and capability to synthesize data from diverse sources and arrive at new knowledge.

These data can be used to improve the design, operation, maintenance, and repair of assets or to enhance how an activity is carried out. Converting data and analysis collected through the Internet of Things generates better information and analysis, which can significantly enhance decision making. The real time data also enables rapid, real-time sensing of unpredictable conditions and instantaneous responses guided by automated systems.

Combining real-time events with historic patterns allows predictive and prescriptive analytics to emerge. Such evolutionary analytics allows of knowledge management applications to solve issues and prescribe solutions in real-time. A smarter approach to the challenge of Big Data can be achieved through better knowledge management. This talk discusses the importance of effective knowledge management from big data to create value for innovation.

Contents

Formal Reasoning and Ontologies

Knowledge Management and Concept Analysis

Knowledge Discovery and Recognition Methods

Text Mining and Analysis