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IFIP is the global non-profit federation of societies of ICT professionals that aims at achieving a worldwide professional and socially responsible development and application of information and communication technologies.

IFIP is a non-profit-making organization, run almost solely by 2500 volunteers. It operates through a number of technical committees and working groups, which organize events and publications. IFIP's events range from large international open conferences to working conferences and local seminars.

The flagship event is the IFIP World Computer Congress, at which both invited and contributed papers are presented. Contributed papers are rigorously refereed and the rejection rate is high.

As with the Congress, participation in the open conferences is open to all and papers may be invited or submitted. Again, submitted papers are stringently refereed.

The working conferences are structured differently. They are usually run by a working group and attendance is generally smaller and occasionally by invitation only. Their purpose is to create an atmosphere conducive to innovation and development. Refereeing is also rigorous and papers are subjected to extensive group discussion.

Publications arising from IFIP events vary. The papers presented at the IFIP World Computer Congress and at open conferences are published as conference proceedings, while the results of the working conferences are often published as collections of selected and edited papers.

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Zhongzhi Shi · Sunil Vadera
Gang Li (Eds.)

Intelligent Information Processing VIII

9th IFIP TC 12 International Conference, IIP 2016
Melbourne, VIC, Australia, November 18–21, 2016
Proceedings

Editors
Zhongzhi Shi
Chinese Academy of Sciences
Beijing
China

Gang Li
Deakin University
Burwood, VIC
Australia

Sunil Vadera
University of Salford
Salford
UK

ISSN 1868-4238 ISSN 1868-422X (electronic)
IFIP Advances in Information and Communication Technology
ISBN 978-3-319-48389-4 ISBN 978-3-319-48390-0 (eBook)
DOI 10.1007/978-3-319-48390-0

Library of Congress Control Number: 2016955500

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Printed on acid-free paper

This Springer imprint is published by Springer Nature
The registered company is Springer International Publishing AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

Preface

This volume comprises the 9th IFIP International Conference on Intelligent Information Processing. As the world proceeds quickly into the Information Age, it encounters both successes and challenges, and it is well recognized that intelligent information processing provides the key to the Information Age and to mastering many of these challenges. Intelligent information processing supports the most advanced productive tools that are said to be able to change human life and the world itself. However, the path is never a straight one and every new technology brings with it a spate of new research problems to be tackled by researchers; as a result we are not running out of topics; rather the demand is ever increasing. This conference provides a forum for engineers and scientists in academia, university and industry to present their latest research findings in all aspects of intelligent information processing.

We received more than 40 papers, of which 24 papers are included in this program as regular papers and 3 as short papers. We are grateful for the dedicated work of both the authors and the referees, and we hope these proceedings will continue to bear fruit over the years to come. All papers submitted were reviewed by two referees.

A conference such as this cannot succeed without the help from many individuals who contributed their valuable time and expertise. We want to express our sincere gratitude to the Program Committee members and referees, who invested many hours for reviews and deliberations. They provided detailed and constructive review reports that significantly improved the papers included in the program.

We are very grateful the sponsorship of the following organizations: IFIP TC12, Deakin University, and Institute of Computing Technology, Chinese Academy of Sciences. Thanks to Gang Ma for carefully checking the proceedings.

Finally, we hope you find this volume inspiring and informative.

August 2016

Zhongzhi Shi
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**Keynote and Invited Presentations
(Abstracts)**

Automated Reasoning and Cognitive Computing

Ulrich Furbach

University of Koblenz, Mainz, Germany
uli@furbach.de

Abstract. This talk discusses the use of first order automated reasoning in question answering and cognitive computing. The history of automated reasoning systems and the state of the art are sketched. In a first part of the talk the natural language question answering project LogAnswer is briefly depicted and the challenges faced therein are addressed. This includes a treatment of query relaxation, web-services, large knowledge bases and co-operative answering. In a second part a bridge to human reasoning as it is investigated in cognitive psychology is constructed; some examples from human reasoning are discussed together with possible logical models. Finally the topic of benchmark problems in commonsense reasoning is presented together with our approach.

Keywords: Automated reasoning · Cognitive computing · Question answering · Cognitive science · Commonsense reasoning

An Elastic, On-demand, Data Supply Chain for Human Centred Information Dominance

Elizabeth Chang

The University of New South Wales, Canberra, Australia
elizabeth.chang@unsw.edu.au

Abstract. We consider different instances of this broad framework, which can roughly be classified into two cases. In one instance, the system is assumed to be a black box, whose inner working is not known, but whose states can be (partially) observed during a run of the system. In the second instance, one has (partial) knowledge about the inner working of the system, which provides information on which runs of the system are possible. In this talk, we will review some of our recent research that investigates different instances of this general framework of ontology-based monitoring of dynamic systems. Getting the right data from any data sources, in any formats, with different sizes and have different multitudes of complexity, in real time to the right person at the right time and in a form which they can rapidly assimilate and use is the concept of Elastic On-demand Data Supply Chain. Finding out what data is needed from which system, where and why is it needed, how is the data searched, extracted, aggregated represented and how should it be presented visually so that the user can use and operate the information without much training is applying a human centred approach to on-demand data supply chain. Information Dominance represents how by using guided analytics and self-service on the data, human cognitive information capabilities including optimization of systems and resources for decision making in the dynamic and complex environment are built. In this presentation, I explain these concepts and demonstrate how the effectiveness and efficiency of the above integrated approach is validated by providing both theoretical concept proofing with stratification, target sets, reachability, incremental enlargement principle and practical concept proofing through implementation of the Faceplate. The project is funded by Australian Department of Defence.

Why Is My Entity Typical or Special? Approaches for Inlying and Outlying Aspects Mining

James Bailey

Department of Computing and Information Systems,
The University of Melbourne, Parkville, Australia
baileyj@unimelb.edu.au

Abstract. When investigating an individual entity, we may wish to identify aspects in which it is usual or unusual compared to other entities. We refer to this as the inlying/outlying aspects mining problem and it is important for comparative analysis and answering questions such as “How is this entity special?” or “How does it coincide or differ from other entities?” Such information could be useful in a disease diagnosis setting (where the individual is a patient) or in an educational setting (where the individual is a student). We examine possible algorithmic approaches to this task and investigate the scalability and effectiveness of these different approaches.

Advanced Reasoning Services for Description Logic Ontologies

Kewen Wang

School of Information Technology, Griffith University, Nathan, Australia
k.wang@griffith.edu.au

Abstract. Ontology-like knowledge bases (KBs) have become a promising modeling tool in a wide variety of applications such as intelligent Web search, question understanding, in-context advertising, social media mining, and biomedicine. Such KBs are distinct from traditional KBs in that they are based on *ontologies* (as schemas) that assist in organization and access of information on the Web and from other sources. However, practical ontology-like KBs are usually associated with data of large volume, dynamic with content, and updated rapidly. Efficient systems have been developed for standard reasoning and query answering for OWL/Description Logic (DL) ontologies. In recent years, the issue of facilitating advanced reasoning services is receiving extensive attention in the research community. In this talk, we will discuss recent research results and challenges of three important reasoning tasks of ontologies including ontology change, query explanation and rule-based reasoning for OWL/DL ontologies.

Brain-Like Computing

Zhongzhi Shi

Key Laboratory of Intelligent Information Processing, Institute of Computing
Technology, Chinese Academy of Sciences, Beijing, 100190, China
shizz@ics.ict.ac.cn

Abstract. Human-level artificial intelligence, which makes machines with intelligent behavior of the human brain, is the most challenging major scientific issues of this century, but also is the current hot topics in academic and industry area. Brain-like computing has become the leading edge technology in twenty-first Century, many countries have started the brain science and cognitive computing projects. Intelligence science has brought a number of inspiration to the machine intelligence, and promote the research on brain science, cognitive science, intelligent computing technology and intelligent robot. In this talk, I will focus on the research progress and development trend of cognitive models, brain-machine collaboration, and brain-like intelligence.

Brain-like intelligence is a new trend of artificial intelligence that aims at human-level artificial intelligence through modeling the cognitive brain and obtaining inspiration from it to power new generation intelligent systems. In recent years, the upsurges of brain science and intelligent technology research have been developed in worldwide.

Acknowledgements. This work is supported by the National Program on Key Basic Research Project (973) (No. 2013CB329502).

Contents

Machine Learning

- An Attribute-Value Block Based Method of Acquiring Minimum Rule Sets:
A Granulation Method to Construct Classifier. 3
Zuqiang Meng and Qiuling Gan
- Collective Interpretation and Potential Joint Information Maximization 12
Ryotaro Kamimura
- A Novel Locally Multiple Kernel k-means Based on Similarity 22
Shuyan Fan, Shifei Ding, Mingjing Du, and Xiao Xu
- Direction-of-Arrival Estimation for CS-MIMO Radar Using Subspace
Sparse Bayesian Learning 31
Yang Bin, Huang Dongmei, and Li Ding

Data Mining

- Application of Manifold Learning to Machinery Fault Diagnosis. 41
Jiangping Wang, Tengfei Duan, and Lujuan Lei
- p -Spectral Clustering Based on Neighborhood Attribute Granulation 50
Shifei Ding, Hongjie Jia, Mingjing Du, and Qiankun Hu
- Assembly Sequence Planning Based on Hybrid Artificial Bee
Colony Algorithm. 59
Wenbing Yuan, Liang Chang, Manli Zhu, and Tianlong Gu
- A Novel Track Initiation Method Based on Prior Motion Information
and Hough Transform 72
Jun Liu, Yu Liu, and Wei Xiong

Deep Learning

- A Hybrid Architecture Based on CNN for Image Semantic Annotation 81
Yongzhe Zheng, Zhixin Li, and Canlong Zhang
- Convolutional Neural Networks Optimized by Logistic Regression Model . . . 91
Bo Yang, Zuopeng Zhao, and Xinzheng Xu
- Event Detection with Convolutional Neural Networks
for Forensic Investigation. 97
Bo Yang, Ning Li, Zhigang Lu, and Jianguo Jiang

Boltzmann Machine and its Applications in Image Recognition 108
Shifei Ding, Jian Zhang, Nan Zhang, and Yanlu Hou

Social Computing

Trajectory Pattern Identification and Anomaly Detection of Pedestrian
Flows Based on Visual Clustering. 121
Li Li and Christopher Leckie

Anomalous Behavior Detection in Crowded Scenes Using Clustering
and Spatio-Temporal Features. 132
*Meng Yang, Sutharshan Rajasegarar, Aravinda S. Rao,
Christopher Leckie, and Marimuthu Palaniswami*

An Improved Genetic-Based Link Clustering for Overlapping
Community Detection 142
Yong Zhou and Guibin Sun

Opinion Targets Identification Based on Kernel Sentences Extraction
and Candidates Selection 152
Hengxun Li, Chun Liao, Ning Wang, and Guangjun Hu

Semantic Web and Text Processing

A Study of URI Spotting for Question Answering over Linked
Data (QALD) 163
KyungTae Lim, NamKyoo Kang, and Min-Woo Park

Short Text Feature Extension Based on Improved Frequent Term Sets. 169
Huifang Ma, Lei Di, Xiantao Zeng, Li Yan, and Yuyi Ma

Research on Domain Ontology Generation Based on Semantic Web 179
Jiguang Wu and Ying Li

Towards Discovering Covert Communication Through Email Spam 191
Bo Yang, Jianguo Jiang, and Ning Li

Image Understanding

Combining Statistical Information and Semantic Similarity for Short
Text Feature Extension 205
Xiaohong Li, Yun Su, Huifang Ma, and Lin Cao

Automatic Image Annotation Based on Semi-supervised Probabilistic CCA . . . 211
Bo Zhang, Gang Ma, Xi Yang, Zhongzhi Shi, and Jie Hao

A Confidence Weighted Real-Time Depth Filter for 3D Reconstruction 222
*Zhenzhou Shao, Zhiping Shi, Ying Qu, Yong Guan, Hongxing Wei,
and Jindong Tan*

Brain-Machine Collaboration

Noisy Control About Discrete Liner Consensus Protocol 235
Quansheng Dou, Zhongzhi Shi, and Yuehao Pan

Incomplete Multi-view Clustering 245
Hang Gao, Yuxing Peng, and Songlei Jian

Brain-Machine Collaboration for Cyborg Intelligence 256
Zhongzhi Shi, Gang Ma, Shu Wang, and Jianqing Li

A Cyclic Cascaded CRFs Model for Opinion Targets Identification
Based on Rules and Statistics 267
Hengxun Li, Chun Liao, Guangjun Hu, and Ning Wang

Author Index 277