

*Commenced Publication in 1973*

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

## Editorial Board

David Hutchison

*Lancaster University, Lancaster, UK*

Takeo Kanade

*Carnegie Mellon University, Pittsburgh, PA, USA*

Josef Kittler

*University of Surrey, Guildford, UK*

Jon M. Kleinberg

*Cornell University, Ithaca, NY, USA*

Friedemann Mattern

*ETH Zurich, Zürich, Switzerland*

John C. Mitchell

*Stanford University, Stanford, CA, USA*

Moni Naor

*Weizmann Institute of Science, Rehovot, Israel*

C. Pandu Rangan

*Indian Institute of Technology, Madras, India*

Bernhard Steffen

*TU Dortmund University, Dortmund, Germany*

Demetri Terzopoulos

*University of California, Los Angeles, CA, USA*

Doug Tygar

*University of California, Berkeley, CA, USA*

Gerhard Weikum

*Max Planck Institute for Informatics, Saarbrücken, Germany*

More information about this series at <http://www.springer.com/series/7409>

Xin Luna Dong · Xiaohui Yu  
Jian Li · Yizhou Sun (Eds.)

# Web-Age Information Management

16th International Conference, WAIM 2015  
Qingdao, China, June 8–10, 2015  
Proceedings

*Editors*

Xin Luna Dong  
Google  
USA

Jian Li  
Tsinghua University  
Beijing  
China

Xiaohui Yu  
Shandong University  
China

Yizhou Sun  
Northeastern University  
Boston  
USA

ISSN 0302-9743

ISSN 1611-3349 (electronic)

Lecture Notes in Computer Science

ISBN 978-3-319-21041-4

ISBN 978-3-319-21042-1 (eBook)

DOI 10.1007/978-3-319-21042-1

Library of Congress Control Number: 2015942482

LNCS Sublibrary: SL3 – Information Systems and Applications, incl. Internet/Web, and HCI

Springer Cham Heidelberg New York Dordrecht London

© Springer International Publishing Switzerland 2015

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, express or implied, with respect to the material contained herein or for any errors or omissions that may have been made.

Printed on acid-free paper

Springer International Publishing AG Switzerland is part of Springer Science+Business Media  
([www.springer.com](http://www.springer.com))

# Preface

We are delighted to welcome you to the proceedings of 16<sup>th</sup> International Conference on Web-Age Information Management (WAIM 2015), which was held in the beautiful coastal city of Qingdao, China. WAIM is a premier international conference for researchers, practitioners, developers, and users to share and exchange ideas, results, experience, techniques, and tools in connection with all aspects of data management.

As the 16<sup>th</sup> installment of this increasingly popular series, WAIM 2015 attracted submissions from researchers around the globe—Australia, Germany, The Netherlands, Japan, USA, and China. Out of the 164 submissions to the research track and 15 to the demonstration track, the conference accepted 33 full research papers, 31 short research papers, and 6 demonstrations. Our sincere thanks go out to all authors for their submissions, and to all Program Committee members, who worked hard in reviewing submissions and providing suggestions for improvements.

The technical program of WAIM 2015 also included three keynote talks by Profs. Donald Kossman (ETH Zurich and Microsoft Research), Michael Benedikt (Oxford University), and Wang-Chiew Tan (University of California at Santa Cruz); three talks in the Distinguished Young Lecturer Series by Profs. Lei Zou (Peking University), Floris Geerts (University of Antwerp), and Feida Zhu (Singapore Management University); and a panel moderated by Prof. Feifei Li (University of Utah). We are immensely grateful to these distinguished guests for their invaluable contributions to the conference program.

Our deepest thanks go to the members of the Organizing Committee for their tremendous efforts in making WAIM 2015 a success. In particular, we thank the workshop co-chairs, Xiaokui Xiao (Nanyang Technological University) and Zhenjie Zhang (Advanced Digital Sciences Center, Singapore); demonstration co-chairs, Nan Zhang (George Washington University) and Wook-shin Han (POSTECH, South Korea); Distinguished Young Lecturer Series co-chairs, Yufei Tao (Chinese University of Hong Kong), Lizhu Zhou (Tsinghua University), and Wenfei Fan (University of Edinburgh); industry chair, Wei Fan (Huawei); Best Paper Award co-chairs, Xiaofang Zhou (University of Queensland), Kyuseok Shim (Seoul National University), and Aoying Zhou (East China Normal University); publicity co-chairs, Zhenhui Jessie Li (Penn State University), Yang Liu (Shandong University), and Yongluan Zhou (University of Southern Denmark); local organization co-chairs, Lizhen Cui (Shandong University), Zhenbo Guo (Qingdao University), and Lei Liu (Shandong University); registration chair and finance co-chair, Zhaohui Peng (Shandong University); finance co-chair, Howard Leung (City University of Hong Kong); Web chair, Xingcan Cui (Shandong University); and WAIM/SAP Summer School co-chairs, Xiaofeng Meng (Renmin University), Lei Zou (Peking University), and Guoliang Li (Tsinghua University). We also thank our tireless liaisons: Weiyi Meng

(Binghamton University) to the WAIM Steering Committee; Xiaofeng Meng (Renmin University) to the China Computer Federation Technical Committee on Database; Xuemin Lin (University of New South Wales) and Yanchun Zhang (Victoria University) to our sister conferences APWeb and WISE.

We thank the many WAIM 2015 supporters, without whose contributions the conference would not have been possible. Shandong University and Qingdao University were wonderful hosting institutions. SAP and Inspur were our generous sponsors.

We hope you will enjoy the proceedings of WAIM 2015!

June 2015

Fengjing Shao  
Jun Yang  
Xin Luna Dong  
Xiaohui Yu  
Jian Li  
Yizhou Sun

# Organization

## Organizing Committee

### General Co-chairs

Jun Yang                      Duke University, USA  
Fengjing Shao                Qingdao University, China

### Program Co-chairs

Xin Luna Dong                Google, USA  
Xiaohui Yu                      Shandong University, China

### Workshop Co-chairs

Xiaokui Xiao                  Nanyang Technological University, Singapore  
Zhenjie Zhang                 Advanced Digital Sciences Center, Singapore

### Demo Co-chairs

Nan Zhang                      George Washington University, USA  
Wook-shin Han                 POSTECH, South Korea

### Panel Chair

Feifei Li                         University of Utah, USA

### DYL Series Co-chairs (Distinguished Young Lecturer)

Yufei Tao                        Chinese University of Hong Kong, SAR China  
Lizhu Zhou                      Tsinghua University, China  
Wenfei Fan                        University of Edinburgh, UK

### Industry Chairs

Wei Fan                         Huawei

### Best Paper Award Co-chairs

Xiaofang Zhou                 University of Queensland, Australia  
Kyuseok Shim                 Seoul National University, Korea  
Aoying Zhou                     East China Normal University, China

### Proceedings Co-chairs

Jian Li                            Tsinghua University, China  
Yizhou Sun                        Northeastern University, USA

**Publicity Co-chairs**

Zhenhui Jessie Li Penn State University, USA  
Yang Liu Shandong University, China  
Yongluan Zhou University of Southern Denmark

**Local Organization Co-chairs**

Lizhen Cui Shandong University, China  
Zhenbo Guo Qingdao University, China  
Lei Liu Shandong University, China

**Registration Chair**

Zhaohui Peng Shandong University, China

**Finance Co-chairs**

Zhaohui Peng Shandong University, China  
Howard Leung City University of Hong Kong, SAR China

**Web Chair**

Xingcan Cui Shandong University, China

**Steering Committee Liaison**

Weiyi Meng Binghamton University, USA

**CCF DBS Liaison**

Xiaofeng Meng Renmin University, China

**Summer School Chair**

Xiaofeng Meng Renmin University, China  
Lei Zou Peking University, China  
Guoliang Li Tsinghua University, China

**APWeb Liaison**

Xuemin Lin University of New South Wales, Australia

**WISE Liaison**

Yanchun Zhang Victoria University, Australia

**Program Committee**

Wolf-Tilo Balke TU-Braunschweig, Germany  
Zhifeng Bao University of Tasmania, Australia  
Sourav Bhowmick National Taiwan University



|                   |  |
|-------------------|--|
| Gang Chen         | Zhejiang University, China   |
| Enhong Chen       | University of Science and Technology of China                            |
| Shimin Chen       | Institute of Computing Technology, Chinese Academy<br>of Sciences, China |
| Yueguo Chen       | Renmin University of China   |
| Hong Chen         | Renmin University of China   |
| Jian Chen         | South China University of Technology, China                              |
| Jinchuan Chen     | Renmin University of China   |
| Ling Chen         | University of Technology, Sydney, Australia                              |
| Reynold Cheng     | The University of Hong Kong, SAR China                                   |
| James Cheng       | The Chinese University of Hong Kong, SAR China                           |
| David Cheung      | The University of Hong Kong, SAR China                                   |
| Fei Cheung        | McMaster University, Canada  |
| Gao Cong          | Nanyang Technological University, Singapore                              |
| Bin Cui           | Peking University, China   |
| Ting Deng         | Beihang University, China  |
| Dejing Dou        | University of Oregon, USA  |
| Xiaoyong Du       | Renmin University of China   |
| Ju Fan            | National University of Singapore   |
| Yaokai Feng       | Kyushu University, Japan   |
| Jun Gao           | Peking University, China   |
| Yunjun Gao        | Zhejiang University, China   |
| Hong Gao          | Harbin Institute of Technology, China                                    |
| Zhiguo Gong       | University of Macau, China   |
| Giovanna Guerrini | Università di Genova, Italy  |
| Jingfeng Guo      | Yanshan University, China  |
| Takahiro Hara     | Osaka University, Japan  |
| Qinmin Hu         | East China Normal University, China                                      |
| Luke Huan         | University of Kansas, USA  |
| Jianbin Huang     | Xidian University, China   |
| Xuanjing Huang    | Fudan University, China  |
| Seung-won Hwang   | Pohang University of Science and Technology POSTECH,<br>South Korea      |
| Yan Jia           | National University of Defense Technology, China                         |
| Lili Jiang        | Max Planck Institute for Informatics, Germany                            |
| Peiquan Jin       | University of Science and Technology of China                            |
| Wooley Lee        | Inha University, Korea   |
| Carson Leung      | University of Manitoba, Canada   |
| Chengkai Li       | University of Texas at Arlington, USA                                    |
| Cuiping Li        | Renmin University of China   |
| Guohui Li         | Huazhong University of Science and Technology, China                     |
| Jian Li           | Tsinghua University, China   |
| Chuan Li          | Sichuan University, China  |
| Guoliang Li       | Tsinghua University, China   |
| Zhanhuai Li       | Northwestern Polytechnical University, China                             |
| Zhoujun Li        | Beihang University, China  |

|                    |  |
|--------------------|--|
| Qingzhong Li       | Shandong University, China                                   |
| Tao Li             | Florida International University, USA                        |
| Xiang Lian         | University of Texas - Pan American, USA                      |
| Guoqiong Liao      | Jiangxi University of Finance and Economics, China           |
| Hongyan Liu        | Tsinghua University, China                                   |
| Qi Liu             | University of Science and Technology of China                |
| Yang Liu           | Shandong University, China                                   |
| Jiaheng Lu         | Renmin University of China                                   |
| Jizhou Luo         | Harbin Institute of Technology, China                        |
| Shuai Ma           | Beihang University, China                                    |
| Xiaofeng Meng      | Renmin University of China                                   |
| Yang-Sae Moon      | Kangwon National University, Korea                           |
| Shinsuke Nakajima  | Kyoto Sangyo University, Japan                               |
| Weiwei Ni          | Southeast University, China                                  |
| Baoning Niu        | Taiyuan University of Technology, China                      |
| Hiroaki Ohshima    | Kyoto University, Japan                                      |
| Zhiyong Peng       | Wuhan University, China                                      |
| Ken Pu             | University of Ontario Institute of Technology, Canada        |
| Jianbin Qin        | The University of New South Wales, Australia                 |
| Jie Shao           | University of Electronic Science and Technology of China     |
| Kyuseok Shim       | Seoul National University, South Korea                       |
| Lidan Shou         | Zhejiang University, China                                   |
| Hailong Sun        | Beihang University, China                                    |
| Weiwei Sun         | Fudan University, China                                      |
| Chih-Hua Tai       | National Taipei University                                   |
| Alex Thomo         | University of Victoria, Canada                               |
| Taketoshi Ushiyama | Kyushu University, Japan                                     |
| Jianmin Wang       | Tsinghua University, China                                   |
| Jiannan Wang       | University of California - Berkeley, USA                     |
| Peng Wang          | Fudan University, China                                      |
| Yijie Wang         | National University of Defense Technology, China             |
| Hongzhi Wang       | Harbin Institute of Technology, China                        |
| Wei Wang           | University of New South Wales, Australia                     |
| Wei Wang           | Fudan University, China                                      |
| Qiang Wei          | Tsinghua University, China                                   |
| Shengli Wu         | Jiangsu University, China                                    |
| Junjie Wu          | Beihang University, China                                    |
| Yinghui Wu         | University of California, Santa Barbara, USA                 |
| Yanhua Xiao        | Fudan University, China                                      |
| Jianliang Xu       | Hong Kong Baptist University, SAR China                      |
| Lianghuai Yang     | Zhejiang University of Technology, China                     |
| Xiaochun Yang      | Northeast University, China                                  |
| Bin Yao            | Shanghai Jiaotong University, China                          |
| Zheng Ye           | York University, Canada                                      |
| Ke Yi              | Hong Kong University of Science and Technology,<br>SAR China |

|                  |  |
|------------------|--|
| Jian Yin         | Zhongshan University, China  |
| Jeffrey Yu       | Chinese University of Hong Kong, SAR China                                 |
| Ming Zhang       | Peking University, China   |
| Xiangliang Zhang | King Abdullah University of Science and Technology,<br>KAUST, Saudi Arabia |
| Dongxiang Zhang  | National University of Singapore   |
| Richong Zhang    | Beihang University, China  |
| Yong Zhang       | Tsinghua University, China   |
| Ying Zhao        | Tsinghua University, China   |
| Wenjun Zhou      | University of Tennessee, Knoxville, USA                                    |
| Xuan Zhou        | Renmin University of China   |
| Junfeng Zhou     | Yanshan University, China  |
| Feida Zhu        | Singapore Management University, Singapore                                 |
| Xingquan Zhu     | Florida Atlantic University, USA   |
| Yi Zhuang        | Zhejiang Gongshang University, China                                       |
| Fuzhen Zhuang    | ICT, Chinese Academy of Sciences, China                                    |
| Zhaonian Zou     | Harbin Institute of Technology, China                                      |
| Lei Zou          | Peking University, China   |
| Quan Zou         | Xiamen University, China   |

# Contents

## Graph and Social Network

|   |    |
|---|----|
| An Influence Field Perspective on Predicting User's Retweeting Behavior . . . .   | 3  |
| <i>Yi Shen, Jianjun Yu, Kejun Dong, Juan Zhao, and Kai Nan</i>  |    |
| Realizing Impact Sourcing by Adaptive Gold Questions: A Socially Responsible Measure for Workers' Trustworthiness . . . . . | 17 |
| <i>Kinda El Maarry, Ulrich Güntzer, and Wolf-Tilo Balke</i>   |    |
| A Coalition Formation Game Theory-Based Approach for Detecting Communities in Multi-relational Networks. . . . .            | 30 |
| <i>Lihua Zhou, Peizhong Yang, Kevin Lü, Zidong Zhang, and Hongmei Chen</i>  |    |
| Individual Influence Maximization via Link Recommendation . . . . .   | 42 |
| <i>Guowei Ma, Qi Liu, Enhong Chen, and Biao Xiang</i>   |    |
| Community Detection Based on Minimum-Cut Graph Partitioning . . . . .   | 57 |
| <i>Yashen Wang, Heyan Huang, Chong Feng, and Zhirun Liu</i>   |    |
| Coherent Topic Hierarchy: A Strategy for Topic Evolutionary Analysis on Microblog Feeds . . . . .                           | 70 |
| <i>Jiahui Zhu, Xuhui Li, Min Peng, Jiajia Huang, Tieyun Qian, Jimin Huang, Jiping Liu, Ri Hong, and Pinglan Liu</i>         |    |
| Age Detection for Chinese Users in Weibo . . . . .  | 83 |
| <i>Li Chen, Tieyun Qian, Fei Wang, Zhenni You, Qingxi Peng, and Ming Zhong</i>  |    |
| Batch Mode Active Learning for Networked Data With Optimal Subset Selection . . . . .                                       | 96 |
| <i>Haihui Xu, Pengpeng Zhao, Victor S. Sheng, Guanfeng Liu, Lei Zhao, Jian Wu, and Zhiming Cui</i>                          |    |

## Information and Knowledge

|   |     |
|---|-----|
| A Question Answering System Built on Domain Knowledge Base . . . . .                    | 111 |
| <i>Yicheng Liu, Yu Hao, Xiaoyan Zhu, and Jiao Li</i>                                    |     |
| Fast and Accurate Computation of Role Similarity via Vertex Centrality. . . .           | 123 |
| <i>Longjie Li, Lvjian Qian, Victor E. Lee, Mingwei Leng, Mei Chen, and Xiaoyun Chen</i> |     |

|   |     |
|---|-----|
| Multimodal-Based Supervised Learning for Image Search Reranking . . . . .   | 135 |
| <i>Shengnan Zhao, Jun Ma, and Chaoran Cui</i>   |     |
| Novel Word Features for Keyword Extraction . . . . .  | 148 |
| <i>Yiqun Chen, Jian Yin, Weiheng Zhu, and Shiding Qiu</i>   |     |
| A Multi-round Global Performance Evaluation Method for Interactive<br>Image Retrieval . . . . .                       | 161 |
| <i>Jiyi Li</i>  |     |
| Resorting Relevance Evidences to Cumulative Citation Recommendation<br>for Knowledge Base Acceleration. . . . .       | 169 |
| <i>Jingang Wang, Lejian Liao, Dandan Song, Lerong Ma,<br/>Chin-Yew Lin, and Yong Rui</i>                              |     |
| Relevance Search on Signed Heterogeneous Information Network Based<br>on Meta-path Factorization . . . . .            | 181 |
| <i>Min Zhu, Tianchen Zhu, Zhaohui Peng, Guang Yang, Yang Xu,<br/>Senzhang Wang, Xiangwei Wang, and Xiaoguang Hong</i> |     |
| Improving the Effectiveness of Keyword Search in Databases<br>Using Query Logs. . . . .                               | 193 |
| <i>Jing Zhou, Yang Liu, and Ziqiang Yu</i>  |     |
| cluTM: Content and Link Integrated Topic Model on Heterogeneous<br>Information Networks . . . . .                     | 207 |
| <i>Qian Wang, Zhaohui Peng, Senzhang Wang, Philip S. Yu,<br/>Qingzhong Li, and Xiaoguang Hong</i>                     |     |
| <b>Recommender Systems</b>  |     |
| Learning to Recommend with User Generated Content . . . . .   | 221 |
| <i>Yueshen Xu, Zhiyuan Chen, Jianwei Yin, Zizheng Wu, and Taojun Yao</i>  |     |
| Combining Positive and Negative Feedbacks with Factored Similarity<br>Matrix for Recommender Systems . . . . .        | 233 |
| <i>Mengshuang Wang, Jun Ma, Shanshan Huang, and Peizhe Cheng</i>  |     |
| Review Comment Analysis for Predicting Ratings . . . . .  | 247 |
| <i>Rong Zhang, Yifan Gao, Wenzhe Yu, Pingfu Chao, Xiaoyan Yang,<br/>Ming Gao, and Aoying Zhou</i>                     |     |
| Adaptive Temporal Model for IPTV Recommendation . . . . .   | 260 |
| <i>Yan Yang, Qinmin Hu, Liang He, Minjie Ni, and Zhijin Wang</i>  |     |

|   |     |
|---|-----|
| RPCV: Recommend Potential Customers to Vendors in Location-Based Social Network . . . . .           | 272 |
| <i>Yuanliu Liu, Pengpeng Zhao, Victor S. Sheng, Zhixu Li, An Liu, Jian Wu, and Zhiming Cui</i>      |     |
| Mining Dependencies Considering Time Lag in Spatio-Temporal Traffic Data . . . . .                  | 285 |
| <i>Xiabing Zhou, Haikun Hong, Xingxing Xing, Wenhao Huang, Kaigui Bian, and Kunqing Xie</i>         |     |
| Location Semantics Protection Based on Bayesian Inference . . . . .                                 | 297 |
| <i>Zhengang Wu, Zhong Chen, Jiawei Zhu, Huiping Sun, and Zhi Guan</i>                               |     |
| <b>Big Data</b>   |     |
| SALA: A Skew-Avoiding and Locality-Aware Algorithm for MapReduce-Based Join . . . . .               | 311 |
| <i>Ziyu Lin, Minxing Cai, Ziming Huang, and Yongxuan Lai</i>  |     |
| Energy-Proportional Query Processing on Database Clusters . . . . .                                 | 324 |
| <i>Jiazhuang Xie, Peiquan Jin, Shouhong Wan, and Lihua Yue</i>                                      |     |
| SparkRDF: In-Memory Distributed RDF Management Framework for Large-Scale Social Data . . . . .      | 337 |
| <i>Zhichao Xu, Wei Chen, Lei Gai, and Tengjiao Wang</i>   |     |
| Distributed Grid-Based K Nearest Neighbour Query Processing Over Moving Objects . . . . .           | 350 |
| <i>Min Yang, Yang Liu, and Ziqiang Yu</i>   |     |
| An Efficient Block Sampling Strategy for Online Aggregation in the Cloud . . . . .                  | 362 |
| <i>Xiang Ci and Xiaofeng Meng</i>   |     |
| Computing Probability Threshold Set Similarity on Probabilistic Sets . . . . .                      | 374 |
| <i>Lei Wang, Ming Gao, Rong Zhang, Cheqing Jin, and Aoying Zhou</i>                                 |     |
| Region-aware Top-k Similarity Search . . . . .  | 387 |
| <i>Sitong Liu, Jianhua Feng, and Yongwei Wu</i>   |     |
| A Partition-Based Bi-directional Filtering Method for String Similarity JOINS . . . . .             | 400 |
| <i>Ying Huang, Baoning Niu, and Chunhua Song</i>  |     |
| Fast Multiway Maximum Margin Clustering Based on Genetic Algorithm via the Nyström Method . . . . . | 413 |
| <i>Ying Kang, Dong Zhang, Bo Yu, Xiaoyan Gu, Weiping Wang, and Dan Meng</i>                         |     |

**Short Papers**

DTMF: A User Adaptive Model for Hybrid Recommendation . . . . . 429  
*Wenlong Yang, Jun Ma, and Shanshan Huang*

An Adaptive Skew Handling Join Algorithm for Large-scale Data  
 Analysis . . . . . 433  
*Di Wu, Tengjiao Wang, Yuxin Chen, Shun Li, Hongyan Li, and Kai Lei*

NokeaRM: Employing Non-key Attributes in Record Matching . . . . . 438  
*Qiang Yang, Zhixu Li, Jun Jiang, Pengpeng Zhao, Guanfeng Liu,  
 An Liu, and Jia Zhu*

Efficient Foreign Key Discovery Based on Nearest Neighbor Search . . . . . 443  
*Xiaojie Yuan, Xiangrui Cai, Man Yu, Chao Wang,  
 Ying Zhang, and Yanlong Wen*

OntoEvent: An Ontology-Based Event Description Language for Semantic  
 Complex Event Processing. . . . . 448  
*Meng Ma, Ping Wang, Jun Yang, and Chao Li*

Differential Trust Propagation with Community Discovery for Link-Based  
 Web Spam Demotion . . . . . 452  
*Xianchao Zhang, Yafei Feng, Hua Shen, and Wenxin Liang*

Inferring User Preference in Good Abandonment from Eye Movements . . . . . 457  
*Wanxuan Lu and Yunde Jia*

Private Range Queries on Outsourced Databases . . . . . 461  
*Lu Li, Liusheng Huang, An Liu, Yao Shen, Wei Yang, and Shengnan Shao*

Efficient Influence Maximization Based on Three Degrees of Influence  
 Theory. . . . . 465  
*Yadong Qin, Jun Ma, and Shuai Gao*

Bichromatic Reverse  $k$ NN Query Algorithm on Road Network Distance . . . . . 469  
*Tin Nilar Win, Htoo Htoo, and Yutaka Ohsawa*

IIRS: A Novel Framework of Identifying Commodity Entities  
 on E-commerce Big Data. . . . . 473  
*Qiqing Fang, Yamin Hu, Shujun Lv, Lejiang Guo, Lei Xiao,  
 and Yahui Hu*

Extracting Appraisal Expressions from Short Texts. . . . . 481  
*Peiquan Jin, Yongbo Yu, Jie Zhao, and Lihua Yue*

Friendship Link Recommendation Based on Content Structure Information . . . . . 486  
*Xiaoming Zhang, Qiao Deng, and Zhoujun Li*

Overlapping Community Detection in Directed Heterogeneous Social Network. . . . . 490  
*Changhe Qiu, Wei Chen, Tengjiao Wang, and Kai Lei*

Efficient MapReduce-Based Method for Massive Entity Matching . . . . . 494  
*Pingfu Chao, Zhu Gao, Yuming Li, Junhua Fang, Rong Zhang, and Aoying Zhou*

The Role of Physical Location in Our Online Social Networks . . . . . 498  
*Jia Zhu, Pui Cheong Gabriel Fung, Kam-fai Wong, Binyang Li, Zhixu Li, and Haoye Dong*

Hierarchical Community Evolution Mining from Dynamic Networks . . . . . 502  
*Yonghui Zhang, Chuan Li, Yanmei Li, Changjie Tang, and Ning Yang*

Exploiting Conceptual Relations of Sentences for Multi-document Summarization . . . . . 506  
*Hai-Tao Zheng, Shu-Qin Gong, Ji-Min Guo, and Wen-Zhen Wu*

Towards Narrative Information Systems . . . . . 511  
*Philipp Wille, Christoph Lof, and Wolf-Tilo Balke*

Maximizing the Spread of Competitive Influence in a Social Network Oriented to Viral Marketing. . . . . 516  
*Hong Wu, Weiyi Liu, Kun Yue, Weipeng Huang, and Ke Yang*

SEMR: Secure and Efficient Multi-dimensional Range Query Processing in Two-tiered Wireless Sensor Networks . . . . . 520  
*Lei Dong, Jianxiang Zhu, Xiaoying Zhang, Hong Chen, Cuiping Li, and Hui Sun*

A Sampling-Based Framework for Crowdsourced Select Query with Multiple Predicates . . . . . 525  
*Jianhong Feng, Huiqi Hu, Xueping Weng, Jianhua Feng, and Yongwei Wu*

A Customized Schema Design Framework for Multi-tenant Database . . . . . 530  
*Jiacai Ni, Jianhua Feng, and Yongwei Wu*

A Multi-attribute Probabilistic Matrix Factorization Model for Personalized Recommendation . . . . . 535  
*Feng Tan, Li Li, Zeyu Zhang, and Yunlong Guo*

A Novel Knowledge Extraction Framework for Resumes Based on Text Classifier . . . . . 540  
*Jie Chen, Zhendong Niu, and Hongping Fu*



SimRank Based Top-k Query Aggregation for Multi-Relational Networks. . . 544  
*Jing Xu, Cuiping Li, Hong Chen, and Hui Sun*

On Dynamic Top-k Influence Maximization . . . . . 549  
*Hao Wang, Nana Pan, U. Leong Hou, Bohan Zhan, and Zhiguo Gong*

Community Based Spammer Detection in Social Networks . . . . . 554  
*Dehai Liu, Benjin Mei, Jinchuan Chen, Zhiwu Lu, and Xiaoyong Du*

LDM: A DTD Schema Mapping Language Based on Logic Patterns . . . . . 559  
*Xuhui Li, Yijun Guan, Mengchi Liu, Rui Cai, Ming Zhong,  
 and Tieyun Qian*

Effective Sampling of Points of Interests on Maps Based on Road  
 Networks . . . . . 563  
*Ziting Zhou, Pengpeng Zhao, Victor S. Sheng, Jiajie Xu, Zhixu Li,  
 Jian Wu, and Zhiming Cui*

Associated Index for Big Structured and Unstructured Data. . . . . 567  
*Chunying Zhu, Qingzhong Li, Lanju Kong, Xiangwei Wang,  
 and Xiaoguang Hong*

**Demo Papers**

Web Knowledge Base Improved OCR Correction for Chinese  
 Business Cards . . . . . 573  
*Xiaoping Wang, Yanghua Xiao, and Wei Wang*

Shortest Path and Word Vector Based Relation Representation  
 and Clustering . . . . . 577  
*Xiaoping Wang, Yanghua Xiao, and Wei Wang*

CrowdSR: A Crowd Enabled System for Semantic Recovering  
 of Web Tables . . . . . 581  
*Huaxi Liu, Ning Wang, and Xiangran Ren*

A Personalized News Recommendation System Based on Tag  
 Dependency Graph . . . . . 584  
*Pengqiang Ai, Yingyuan Xiao, Ke Zhu, Hongya Wang,  
 and Ching-Hsien Hsu*

SmartInt: A Demonstration System for the Interaction Between Schema  
 Mapping and Record Matching. . . . . 587  
*Jun Jiang, Zhixu Li, Qiang Yang, Pengpeng Zhao,  
 Guanfeng Liu, and Lei Zhao*

CDSG: A Community Detection System Based on the Game Theory . . . . . 590  
*Peizhong Yang, Lihua Zhou, Lizhen Wang, Xuguang Bao,  
and Zidong Zhang*

Erratum to: Web-Age Information Management . . . . . E1  
*Xin Luna Dong, Xiaohui Yu, Jian Li, and Yizhou Sun*

**Author Index** . . . . . 593