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Vol. 131. Kusum Deep, Atulya Nagar,  
Millie Pant, and Jagdish Chand Bansal (Eds.)  
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*Knowledge Discovery and Data Mining, 2012*  
ISBN 978-3-642-27707-8

Honghua Tan (Ed.)

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# Knowledge Discovery and Data Mining

*Editor*

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ISSN 1867-5662

ISBN 978-3-642-27707-8

DOI 10.1007/978-3-642-27708-5

Springer Heidelberg New York Dordrecht London

e-ISSN 1867-5670

e-ISBN 978-3-642-27708-5

Library of Congress Control Number: 2011946230

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Printed on acid-free paper

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# Preface

This book collects papers selected from the 4<sup>th</sup> International conference on Knowledge Discovery and Data Mining, March 1–2, 2012, Macau, China, which is to bring together researchers and developers from academia, industry, and government to advance the science, engineering, and technology in Knowledge Discovery and Data Mining.

The first Annual Conference of the WKDD was held in Adelaide, Australia in 2008. Since then, we have held conferences in many cities, like Moscow, Russia (2009), Phuket, Thailand (2010).

Knowledge discovery is a concept of the field of computer science that describes the process of automatically searching large volumes of data for patterns that can be considered knowledge about the data. It is often described as deriving knowledge from the input data. This complex topic can be categorized according to 1) what kind of data is searched; and 2) in what form is the result of the search represented. Knowledge discovery developed out of the Data mining domain, and is closely related to it both in terms of methodology and terminology.

The most well-known branch of data mining is knowledge discovery, also known as Knowledge Discovery in Databases (KDD). Just as many other forms of knowledge discovery it creates abstractions of the input data. The knowledge obtained through the process may become additional data that can be used for further usage and discovery.

Another promising application of knowledge discovery is in the area of software modernization which involves understanding existing software artifacts. This process is related to a concept of reverse engineering. Usually the knowledge obtained from existing software is presented in the form of models to which specific queries can be made when necessary. An entity relationship is a frequent format of representing knowledge obtained from existing software. Object Management Group (OMG) developed specification Knowledge Discovery Metamodel (KDM) which defines an ontology for the software assets and their relationships for the purpose of performing knowledge discovery of existing code. Knowledge discovery from existing software systems, also known as software mining is closely related to data mining, since existing software artifacts contain enormous business value, key for the evolution of software systems. Instead of mining individual data sets, software mining focuses on metadata, such as database schemas.

Data mining (the analysis step of the knowledge discovery in databases process, or KDD), a relatively young and interdisciplinary field of computer science is the process of discovering new patterns from large data sets involving methods at the intersection of artificial intelligence, machine learning, statistics and database systems. The goal of data mining is to extract knowledge from a data set in a human-understandable structure and involves database and data management, data preprocessing, model and inference

considerations, interestingness metrics, complexity considerations, post-processing of found structure, visualization and online updating.

The term is a buzzword, and is frequently misused to mean any form of large scale data or information processing (collection, extraction, warehousing, analysis and statistics) but also generalized to any kind of computer decision support system including artificial intelligence, machine learning and business intelligence. In the proper use of the word, the key term is discovery, commonly defined as “detecting something new”. Even the popular book “Data mining: Practical machine learning tools and techniques with Java” (which covers mostly machine learning material) was originally to be named just “Practical machine learning”, and the term “data mining” was only added for marketing reasons. Often the more general terms “(large scale) data analysis” or “analytics” or when referring to actual methods, artificial intelligence and machine learning are more appropriate.

The actual data-mining task is the automatic or semi-automatic analysis of large quantities of data to extract previously unknown interesting patterns such as groups of data records (cluster analysis), unusual records (anomaly detection) and dependencies (association rule mining). This usually involves using database techniques such as spatial indexes. These patterns can then be seen as a kind of summary of the input data, and used in further analysis or for example in machine learning and predictive analytics. For example, the data mining step might identify multiple groups in the data, which can then be used to obtain more accurate prediction results by a decision support system. Neither the data collection, data preparation nor result interpretation and reporting are part of the data mining step, but do belong to the overall KDD process as additional steps.

The Editors would like to thank the members of the organizing Committee for their efforts and successful preparation of this event.

We would like to thank all colleagues who have devoted much time and effort to organize this meeting.

The efforts of the authors of the manuscripts prepared for the proceedings are also gratefully acknowledged.

We are looking forward to seeing more friends at the forthcoming conference.

Honghua Tan

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# Contents

<b>Study on Detection Technology of Load Waveform Based on Fuzzy Pattern Recognition</b> .....	1
<i>Xiao Li Wang, Wei Wu, Lei Yu</i>	
<b>On the Analysis of Speciality Construction and Development in Independent Institute</b> .....	7
<i>Zhuoya Wang</i>	
<b>EVA and DEA, Which Is Better in Reflecting the Capital Efficiency?</b> .....	15
<i>Yadong Shi</i>	
<b>Research on the Impact of VAT Transformation on Investment in Fixed Assets and the Performance of Listed Companies in Northeast China</b> .....	25
<i>Lan Fengyun, Wang Chunhua</i>	
<b>Design and Implementation of Tracking System for Dish Solar Thermal Energy Based on Embedded System</b> .....	31
<i>Jian Kuang, Wei Zhang</i>	
<b>An Alternating Simultaneously Minimizing Diagonal Matrix Error and Covariant Matrix Error Trilinear Decomposition Algorithm for Second-Order Calibration</b> .....	39
<i>Jianqi Sun</i>	
<b>Indoor Comfortable Environment Self-adjust System Based on Microchip EM78F668N</b> .....	47
<i>Jingjing Li, Renjie Zhang, Jun Fang</i>	
<b>High-Gain Stacked Minkowski Fractal Patch Antenna with Superstrate for 60GHz Communications</b> .....	53
<i>Yabing Shi, Wenjun Zhang</i>	
<b>Embedded Control System for Atomic Clock</b> .....	61
<i>Wei Deng, Peter Yun, Yi Zhang, Jiehua Chen, Sihong Gu</i>	



<b>Green Supply Chain: Comparative Research on the Waste Printing Plate of the Computer</b> .....	69
<i>Jing Zhang, Lei Su</i>	
<b>Tree-Mesh Based P2P Streaming Data Distribution Scheme</b> .....	77
<i>Jianming Zhao, Nianmin Yao, Shaobin Cai, Xiang Li</i>	
<b>The Transform of the National Geographic Grids for China Based on the Axial Minimum Enclosing Rectangle</b> .....	85
<i>Quanfu Bao, Zhengguo Li, Xiaochong Tong, Caijiao Jin</i>	
<b>A Dual-Decomposition-Based Resource Allocation for the Data Transmission in the Internet</b> .....	93
<i>Youmao Bai</i>	
<b>Distributed Electronic Evidence Forensics Laboratory Design and Practice That Based on High-Speed 3G and Cloud Computing Model</b> .....	101
<i>Qingyi Tian, Peiyun Luo, Qingjun Liu</i>	
<b>Research on Indoor Positioning Technology Based on RFID</b> .....	109
<i>Huaichang Du</i>	
<b>Virtual Polarization Technology in Adaptive Polarization Radar System</b> ...	117
<i>Xi Su, Feifei Du, Peng Bai, Yanping Feng</i>	
<b>Applying Fourth-Order Partial Differential Equations and Contrast Enhancement to Fluorescence Microscopic Image Denoising</b> .....	123
<i>Yu Wang, Hong Xue</i>	
<b>Design of Programmable Laser Receiver Signal Simulator</b> .....	129
<i>Mingang Wang, Chuanxin Sun</i>	
<b>Fault Current Limit (FCL) Technology (Magnetic Valve Controlled Reactor-Type Fault Current Limiter Principle and Simulation)</b> .....	135
<i>Chunzhe Shi</i>	
<b>The Scattering from an Object below 2D Rough Surface</b> .....	143
<i>Huang Xue-Yu, Tong Chuang-Ming</i>	
<b>Moving Target Localization Based on Multi-sensor Distance Estimation</b> ...	151
<i>Zhao Wang, Chao Zhang, Zhong Chen</i>	
<b>A Wavelet Transform Based Structural Similarity Model for Semi-structured Texts</b> .....	159
<i>Jie Su, Junpeng Bao</i>	
<b>Performance of Adaptive Modulation with Space-Time Block Coding and Imperfect Channel State Information over Rayleigh Fading Channel</b> .....	169
<i>Xiangbin Yu, Yuyu Xin, Xiaoshuai Liu, Xiaomin Chen</i>	

<b>A Spectrum Allocation System Model of Internet of Things Based on Cognitive Radio</b> .....	177
<i>Liguo Qu, Yourui Huang, Ming Shi, Chaoli Tang</i>	
<b>Low Cost Dual-Basis Multiplier over <math>GF(2^m)</math> Using Multiplexer Approach</b> .....	185
<i>Hung Wei Chang, Wen-Yew Liang, Che Wun Chiou</i>	
<b>Multi-precision Indoor Location System Based on Ultrasonic and ZigBee</b> .....	193
<i>Lei Zhang, Yang Tian, Xiaomei Yu</i>	
<b>A Trust-Third-Party Based Key Management Protocol for Secure Mobile RFID Service Based on the Internet of Things</b> .....	201
<i>Tao Yan, Qiaoyan Wen</i>	
<b>The Smart Home System Design Based on i.MX51 Platform</b> .....	209
<i>Haibin Sun</i>	
<b>Study of Self-optimizing Load Balancing in LTE-Advanced Networks</b> .....	217
<i>Zhengrong Xiao, Yaoxu Zhang, Zhaobiao Lv</i>	
<b>Research on the Methods of Similarity Measures between Vague Sets</b> .....	223
<i>Jun-min Li, Hu Li</i>	
<b>A Signal Processing Scheme for CPT Atomic Clock</b> .....	231
<i>Yi Zhang, Wei Deng, Yuan Tian, Sihong Gu</i>	
<b>Mobile Application of Land Law Enforcement and Supervision</b> .....	239
<i>Zhirong Chen, Tianhe Yin</i>	
<b>A New Mechanism of EAB in RCS</b> .....	247
<i>Peng Zhao, Qun Wei, Hailun Xia, Zhimin Zeng</i>	
<b>Design of Security Solution to Mobile Cloud Storage</b> .....	255
<i>Xiaojun Yu, Qiaoyan Wen</i>	
<b>A Study on Usability of Finger's Moving Direction in Direct Touch Environment</b> .....	265
<i>Feng Wang, Hui Deng, Kaifan Ji, Lipeng Yang</i>	
<b>Double R-Tree and Double Indexing for Mobile Objects</b> .....	271
<i>Ye Liang</i>	
<b>Activity Recognition in Ubiquitous Computing Environment</b> .....	279
<i>Tao Lu, Xin Wang, Shaokun Zhang</i>	
<b>Circuit Diagram Design for DAS Based on Single Chip Microcosm</b> .....	287
<i>Xiaolin Lu</i>	

<b>Network Management System for Employment Service and Social Insurance Application</b> .....	295
<i>Xiaolin Lu</i>	
<b>CSCW Based Labor and Social Security and Employment Information System</b> .....	303
<i>Wei Zhou, Dong Zhang</i>	
<b>XML Based Asynchronous Communication for Labor and Social Security Systems</b> .....	311
<i>Jian Yu</i>	
<b>Research on Grain Moisture Curve Fitting Based on Support Vector Machine Regression</b> .....	319
<i>Cheng-shi Luo</i>	
<b>Optimized Location Planning of Logistics Park Based on Implicit Enumeration</b> .....	327
<i>Liu Xiaohui, Zhao Xueyu, Xue Yapei, Zhu Cuijuan</i>	
<b>Preliminary Study on Remote Sensing Teaching in Environmental Engineering Specialty</b> .....	333
<i>Jinxiang Yang, Xiaolong Li, Wenjuan Liu</i>	
<b>Architectural Study on Undergraduate Teaching System of Hydrology and Water Resources Major</b> .....	337
<i>Xiaolong Li, Jinxiang Yang, Xiaojun Zhang</i>	
<b>Exploration of Data Structure Experiment Teaching</b> .....	343
<i>WenJuan Liu, JinXiang Yang, XiaoLong Li, DiLin Pan</i>	
<b>Survey of Job Happiness of College Students in Enterprise</b> .....	349
<i>Xiujian Yan, Shanshan Liu, Jianfeng Hu</i>	
<b>Study on the Physical Education Reform of Colleges and Universities Based on the Regulation on National Fitness</b> .....	355
<i>Liyang Ren, Xueming Yang, Xiaoping Xia, Jinliang Shi</i>	
<b>A Study on Problems and Countermeasures of China's Higher Vocational Education</b> .....	361
<i>Xiaozheng Liu</i>	
<b>Research on Cost Accounting Informatization</b> .....	369
<i>Ping Cheng, Xiongyu Zhou</i>	
<b>Analysis of Factors Affecting Audit Charge in China's Listed Companies</b> .....	375
<i>Juan Wang, Jingya Zhao</i>	

<b>The Research of Workflow Management System in Teaching Procedures . . .</b>	383
<i>Qiongjie Kou, Quanyou Zhang</i>	
<b>The Master of Engineering Program in Integrated Circuits and Systems: A Case Study in Tsinghua University . . . . .</b>	387
<i>Hong Chen, Zihua Wang, Yangdong Deng</i>	
<b>Research on Risk Management of Project Schedule . . . . .</b>	397
<i>Jinling Liu</i>	
<b>Seizing the Big and Freeing the Small in Program Design Teaching . . . . .</b>	405
<i>JunRui Liu, XueFeng Jiang</i>	
<b>The Research of Teaching Mode in Basic Computer Courses . . . . .</b>	411
<i>XueFeng Jiang, JunRui Liu</i>	
<b>Web Service Registry and Load Balance of Invocation Based on JXTA . . . . .</b>	415
<i>Chenni Wu, Wei Zhang, Shuangshuang Zhou</i>	
<b>Improved Dynamic Frame Slotted ALOHA Algorithm for Anti-collision in RFID Systems . . . . .</b>	423
<i>Shian Liu, Xiaojuan Peng</i>	
<b>NC Skill Cultivation for Students with Specialty of Mechanical Design, Manufacturing and Automation . . . . .</b>	431
<i>Xueguang Li, Shuren Zhang</i>	
<b>Research and Application of Heterogeneous Network Topology Discovery Algorithm Based on Multiple Spanning Tree Protocol . . . . .</b>	437
<i>Dancheng Li, Chen Zheng, Chunyan Han, Yixian Liu</i>	
<b>Research of Photoelectric Position Acquisition System . . . . .</b>	445
<i>Haima Yang, Siyong Fu, Yihua Hu, Jin Liu, Jianyu Wang</i>	
<b>An Improved Particle Swarm Algorithm Based on Cultural Algorithm for Constrained Optimization . . . . .</b>	453
<i>Lina Wang, Cuiwen Cao, Zhenhao Xu, Xingsheng Gu</i>	
<b>The Comparison of Program Implementations of the Acquisition of Vibration Data Based on LabVIEW . . . . .</b>	461
<i>Wen Li, Changjing Wu, Huimin Zhao</i>	
<b>Study the Social Adaptability of University Students and the Relationship with Mental Health and Personality . . . . .</b>	467
<i>Bingwei Wang, Qiuping Guo, Qiuyun Liu, Jia Gao, Shuangfeng Wei</i>	
<b>The Study and Analysis on Psychological Commissioners' Mental Health and Personality . . . . .</b>	473
<i>Bingwei Wang, Li Guo, Qiuyun Liu, Yongduo Wang, Shuangfeng Wei</i>	

<b>Queueing Analysis of the Decoding Process for Intra-session Network Coding with Random Linear Codes</b> .....	481
<i>Yuan Yuan, Zhen Huang, Shengyun Liu, Yuxing Peng</i>	
<b>The Teaching Reform and Practice of the Improvement of the Application Ability of Mechanical and Electrical Transmission Control</b> .....	489
<i>Yunlong Yuan, Weimin Zhao, Jie Hu</i>	
<b>An Analysis of the Application of Granular Computing in Private Data Protection</b> .....	497
<i>Zhuqing Yang</i>	
<b>P Systems with Proteins Working in the Minimally Parallel Mode</b> .....	503
<i>Chun Lu, Xiao-jie Chen, Xiao-long Shi</i>	
<b>Interactive Research of Traditional Aesthetics and Teaching of Art and Design</b> .....	511
<i>Jinxiang Ma, Xuguang Yang, Mingyu Gao</i>	
<b>The Analysis of “BRAND” Image and Performance Tendencies in Space Design</b> .....	517
<i>Jinxiang Ma, Jun Liu, Mingyu Gao</i>	
<b>Application of Regression Analysis in Data Processing of Physical Experiment of College</b> .....	525
<i>Jianxin Peng, Yigang Lu</i>	
<b>Importance and Challenges of Digital Construction for Academic Library</b> .....	533
<i>Mingfeng Xu</i>	
<b>The Research on Physical Education Teaching in Sino-foreign Cooperation in Running Schools</b> .....	539
<i>Baoling Ma, Xiangdong Wang, Qiang Li</i>	
<b>Using EDA Technology to Design Comprehensive Experiments of Digital Circuit Course</b> .....	547
<i>Shimin Du, Xiangsheng Yang, Runping Yang</i>	
<b>Improve Practice Engineering Teaching Ability of Young Teachers by School-Enterprise Cooperation</b> .....	555
<i>Dong Guo, Lei Mao, Huilan Sun, Bo Wang, Xuezheng Zhang, Yunfeng Yao</i>	
<b>On Countermeasures and Dilemma for Higher Engineering Education Infiltrating Humane Education in China</b> .....	561
<i>Xiaoping Li, Yan Gao, Huilin Chen, Lifang Cheng</i>	

<b>Discussion on Training of Engineering Students' Ability of Professional English Application</b> .....	567
<i>Yufeng Duan, Zhaoxia Fu</i>	
<b>The Construction of the Secondary Vocational Teachers Training System Based on 'Cooperation between School and Enterprise'</b> .....	573
<i>Chen Lidong, Ma Shuying, Shi Lei, Li Guofang, Zhang Liang, Zheng Lixin</i>	
<b>Research on High-Precision Time Synchronization Algorithm for Wireless Sensor Network</b> .....	579
<i>Chunxiang Zheng, Jiadong Dong</i>	
<b>The Social Value and Development Strategies of Modern Distance Education Based on Humanistic Utility</b> .....	585
<i>Shurong Yan, Min Gao</i>	
<b>Research on Cultivation Mechanism of Enterprise Ability for Undergraduates on the View of Employment</b> .....	593
<i>Shurong Yan</i>	
<b>Teaching Reform Exploration of Automobile Examination and Diagnosis Based on Ability Training</b> .....	601
<i>Liang Zhang, Shuzhen Li, Lei Shi, Guofang Li, Lidong Chen, Shuying Ma, Lixin Zheng</i>	
<b>Research on Teaching Reform of Mechanism and Machine Theory</b> .....	607
<i>Xiulong Chen, Xiuli Qi, Suyu Wang</i>	
<b>Research on Cultivation Model to Full-Time Postgraduate of Engineering Major</b> .....	615
<i>Xiulong Chen, Yu Deng, Xiuli Qi, Suyu Wang</i>	
<b>Discussion on Measures of Training Innovative Talents in Science and Technology in Regional Colleges</b> .....	621
<i>Zhaoxia Fu, Yufeng Duan, Chen Wang</i>	
<b>Construction of the Training System in Ascendant Helix for the Computer Application Courses in Higher Vocational Colleges</b> .....	627
<i>Qiming Tian</i>	
<b>On Sino-foreign Investment College PE Curriculum Setting from the Perspective of International View</b> .....	635
<i>Shujuan Yuan, Zhanguo Fu, Hongwu Yang, Yu Xi</i>	
<b>Automatic Summarization of Web Page Based on Statistics and Structure</b> .....	643
<i>Shuangyi Zheng, Junyang Yu</i>	

<b>Design and Application of New Structure of Prefabricating Multi-Column Wall</b> .....	651
<i>Yu Rui, Cheng Ming</i>	
<b>Discussion on Six-Step Approach of Programming Courses in Vocational Colleges</b> .....	659
<i>Shaojie Du, Xiaoju Zhang</i>	
<b>Inspiration of Cooperation between School and Enterprise in Germany and USA to China</b> .....	667
<i>Shaojie Du, Shan Su</i>	
<b>Building Computer Graphics into an Independent Sub-discipline</b> .....	673
<i>Wei Haitao, Lu Hanrong, Xiong Jiajun, Gao Yan, Hu Jinsheng, Wu Caihua</i>	
<b>New Design for Water Quality Early Warning System</b> .....	681
<i>Tian Jing, Zheng Shuyin, Zhang Guangxin, Hou Dibo, Huang Pingjie, Zhang Jian</i>	
<b>Sliding Window Calculating Method of Time Synchronization Based on Information Fusion</b> .....	687
<i>Chunxiang Zheng, Jiadong Dong</i>	
<b>Study on Evaluation Method of University Library Website</b> .....	693
<i>Jian-shan Gao, Yan-ling Zheng</i>	
<b>The Construction of Online Video Resource Library with Streaming Media</b> .....	701
<i>Tongming Wang</i>	
<b>Scheduling Algorithm of Wireless Sensor Cluster Head Based on Multi-dimensional QoS</b> .....	709
<i>Wuqi Gao, Fengju Kang</i>	
<b>An Improved Adaptive Genetic Algorithm</b> .....	717
<i>Tang Hongcheng</i>	
<b>Determinants of Financial Restatements in the Listed Companies in China</b> .....	725
<i>Guiling Zhang</i>	
<b>The Effects of Exercise on IL-2/sIL-2R</b> .....	731
<i>Liqiang Su</i>	
<b>The Influence of Sports about Internet Addiction on Teenagers' Health in Different Dimensions</b> .....	739
<i>Wei Zhang</i>	
<b>A Unified Frame of Swarm Intelligence Optimization Algorithm</b> .....	745
<i>Chen Jia-zhao, Zhang Yu-xiang, Luo Yin-sheng</i>	

<b>The Innate Problems and Suggestions on Inquiry Learning under Network Environment</b> .....	753
<i>Yangli Zhang, Qiong Wu</i>	
<b>Finding Maximum Noncrossing Subset of Nets Using Longest Increasing Subsequence</b> .....	759
<i>Xinguo Deng, Rui Zhong</i>	
<b>An Optimization Algorithm for Minimizing Weight of the Composite Beam</b> .....	769
<i>Peng-yu Jiang, Zhu-ming, Lin Jin Xu</i>	
<b>Optimal Filtering for Stochastic Singular Systems with Uncertain Observations</b> .....	777
<i>Wang Huiying</i>	
<b>Centralized Fusion White Noise Estimator for Multi-sensor Systems with Missing Measurements</b> .....	785
<i>Wang Huiying</i>	
<b>Author Index</b> .....	793