

Table of Contents

Keynote Speech

Comparative Study on Mathematical Foundations of Type-2 Fuzzy Set, Rough Set and Cloud Model	1
<i>Deyi Li</i>	
Scientific Challenges in Contextual Advertising	2
<i>Jianchang Mao</i>	
F-granulation, Generalized Rough Entropy and Pattern Recognition	3
<i>Sankar K. Pal</i>	
Knowledge Discovery about Preferences Using the Dominance-Based Rough Set Approach	4
<i>Roman Slowinski</i>	
Wikipedia and How to Use It for Semantic Document Representation ...	6
<i>Ian H. Witten</i>	
Granular Computing and Computational Complexity	7
<i>Bo Zhang</i>	

Rough Sets and Computing Theory

Some Comparative Analyses of Data in the RSDS System	8
<i>Zbigniew Suraj and Piotr Grochowalski</i>	
Rough Temporal Vague Sets in Pawlak Approximation Space	16
<i>Yonghong Shen</i>	
Poset Approaches to Covering-Based Rough Sets	25
<i>Shiping Wang, William Zhu, and Peiyong Zhu</i>	
1-vs-Others Rough Decision Forest	30
<i>Jinmao Wei, Shuqin Wang, and Guoying Wang</i>	
Knowledge Reduction in Random Incomplete Information Systems via Evidence Theory	38
<i>Wei-Zhi Wu</i>	
Knowledge Reduction Based on Granular Computing from Decision Information Systems	46
<i>Lin Sun, Jiucheng Xu, and Shuangqun Li</i>	

Pattern Classification Using Class-Dependent Rough-Fuzzy Granular Space	54
<i>Sankar K. Pal, Saroj K. Meher, and Soumitra Dutta</i>	
Generate (F, ϵ) -Dynamic Reduct Using Cascading Hashes	62
<i>Pai-Chou Wang</i>	
Incorporating Great Deluge with Kempe Chain Neighbourhood Structure for the Enrolment-Based Course Timetabling Problem	70
<i>Salwani Abdullah, Khalid Shaker, Barry McCollum, and Paul McMullan</i>	
Ordered Weighted Average Based Fuzzy Rough Sets	78
<i>Chris Cornelis, Nele Verbiest, and Richard Jensen</i>	
On Attribute Reduction of Rough Set Based on Pruning Rules	86
<i>Hongyuan Shen, Shuren Yang, and Jianxun Liu</i>	
Set-Theoretic Models of Granular Structures	94
<i>Yiyu Yao, Duoqian Miao, Nan Zhang, and Feifei Xu</i>	
A Robust Fuzzy Rough Set Model Based on Minimum Enclosing Ball	102
<i>Shuang An, Qinghua Hu, and Daren Yu</i>	
Indiscernibility and Similarity in an Incomplete Information Table	110
<i>Renpu Li and Yiyu Yao</i>	
A New Fitness Function for Solving Minimum Attribute Reduction Problem	118
<i>Dongyi Ye, Zhaojiong Chen, and Shenglan Ma</i>	
Temporal Dynamics in Rough Sets Based on Coverings	126
<i>Davide Ciucci</i>	
Data Classification Using Rough Sets and Naïve Bayes	134
<i>Khadija Al-Aidarooos, Azuraliza Abu Bakar, and Zalinda Othman</i>	
A Heuristic Reduction Algorithm in IIS Based on Binary Matrix	143
<i>Huaxiong Li, Xianzhong Zhou, and Meimei Zhu</i>	
Generalized Distribution Reduction in Inconsistent Decision Systems Based on Dominance Relations	151
<i>Yan Li, Jin Zhao, Na-Xin Sun, and Sankar Kumar Pal</i>	
Towards Multi-adjoint Property-Oriented Concept Lattices	159
<i>Jesús Medina</i>	
Extension of Covering Approximation Space and Its Application in Attribute Reduction	167
<i>Guo-Yin Wang and Jun Hu</i>	

A New Extended Dominance Relation Approach Based on Probabilistic Rough Set Theory	175
<i>Decui Liang, Simon X. Yang, Chaozhe Jiang, Xiangui Zheng, and Dun Liu</i>	

An Equivalent Form of Rough Logic System RSL	181
<i>Yingchao Shao, Zhongmin Xie, and Keyun Qin</i>	

Fuzzy Sets

Conceptual Reduction of Fuzzy Dual Concept Lattices	187
<i>Xiao-Xue Song, Wen-Xiu Zhang, and Qiang Zhao</i>	

Qualitative Approximations of Fuzzy Sets and Non-classical Three-Valued Logics (I)	195
<i>Xiaohong Zhang, Yiyu Yao, and Yan Zhao</i>	

Qualitative Approximations of Fuzzy Sets and Non-classical Three-Valued Logics (II)	204
<i>Xiaohong Zhang, Yiyu Yao, and Yan Zhao</i>	

Implication Operator of Linguistic Truth-Valued Intuitionistic Fuzzy Lattice	212
<i>Chunying Guo, Fengmei Zhang, Li Zou, and Kaiqi Zou</i>	

Robust Granular Neural Networks, Fuzzy Granules and Classification...	220
<i>G. Avatharam and Sankar K. Pal</i>	

Perturbed Iterative Approximation of Common Fixed Points on Nonlinear Fuzzy and Crisp Mixed Family Operator Equation Couples in Menger PN-Spaces	228
<i>Heng-you Lan, Tian-xiu Lu, Huang-lin Zeng, and Xiao-hong Ren</i>	

Improving the Learning of Recurring Concepts through High-Level Fuzzy Contexts	234
<i>João Bártolo Gomes, Ernestina Menasalvas, and Pedro A.C. Sousa</i>	

Knowledge Technology

A Frequent Pattern Mining Method for Finding Planted (l, d)-motifs of Unknown Length	240
<i>Caiyan Jia, Ruqian Lu, and Lusheng Chen</i>	

A Quick Incremental Updating Algorithm for Computing Core Attributes	249
<i>Hao Ge, Chuanjian Yang, and Wanlian Yuan</i>	

Using Lexical Ontology for Semi-automatic Logical Data Warehouse Design	257
<i>Mior Nasir Mior Nazri, Shahrul Azman Noah, and Zarinah Hamid</i>	
Likelihood-Based Sampling from Databases for Rule Induction Methods	265
<i>Shusaku Tsumoto, Shoji Hirano, and Hidenao Abe</i>	
Residual Analysis of Statistical Dependence in Multiway Contingency Tables	273
<i>Shusaku Tsumoto and Shoji Hirano</i>	
A Note on the Effect of Knowledge Refinement on Bag Structures	281
<i>Kankana Chakrabarty</i>	
A Belief Structure for Reasoning about Knowledge	288
<i>S.K.M. Wong and Nasser Noroozi</i>	
Research on Mapping Mechanism of Learning Expression	298
<i>Lili Zhou and Fanzhang Li</i>	
Linking Open Spatiotemporal Data in the Data Clouds	304
<i>He Hu and Xiaoyong Du</i>	
Review of Software Security Defects Taxonomy	310
<i>Zhanwei Hui, Song Huang, Zhengping Ren, and Yi Yao</i>	
A New Hybrid Method of Generation of Decision Rules Using the Constructive Induction Mechanism	322
<i>Wiesław Paja, Krzysztof Pancierz, and Mariusz Wrzesień</i>	

Intelligent Information Processing

An Effective Principal Curves Extraction Algorithm for Complex Distribution Dataset	328
<i>Hongyun Zhang, Duoqian Miao, Lijun Sun, and Ying Ye</i>	
Parallel Reducts Based on Attribute Significance	336
<i>Dayong Deng, Dianxun Yan, and Jiyi Wang</i>	
A Rough Sets Approach to User Preference Modeling	344
<i>Siyuan Jing and Kun She</i>	
A Tool for Study of Optimal Decision Trees	353
<i>Abdulaziz Alkhalid, Igor Chikalov, and Mikhail Moshkov</i>	
Automatic Part of Speech Tagging for Arabic: An Experiment Using Bigram Hidden Markov Model	361
<i>Mohammed Albared, Nazlia Omar, Mohd. Juzaidin Ab Aziz, and Mohd Zakree Ahmad Nazri</i>	

Application of Rough Sets Theory in Air Quality Assessment	371
<i>Pavel Jirava, Jiri Krupka, and Miloslava Kasparova</i>	
An Interactive Approach to Outlier Detection	379
<i>R.M. Konijn and W. Kowalczyk</i>	

Health Informatics and Biometrics Authentication

Rules for Ontology Population from Text of Malaysia Medicinal Herbs Domain	386
<i>Zaharudin Ibrahim, Shahrul Azman Noah, and Mahanem Mat Noor</i>	
Gait Recognition Based on Outermost Contour	395
<i>Lili Liu, Yilong Yin, and Wei Qin</i>	
Pseudofractal 2D Shape Recognition	403
<i>Krzysztof Gdawiec</i>	
Classification of MMPI Profiles of Patients with Mental Disorders – Experiments with Attribute Reduction and Extension	411
<i>Jerzy Gomula, Krzysztof Pancierz, and Jaroslaw Szkola</i>	
Automatic 3D Face Correspondence Based on Feature Extraction in 2D Space	419
<i>Xun Gong, Shuai Cao, Xinxin Li, Ping Yuan, Hemin Zou, Chao Ye, Junyu Guo, and Chunyao Wang</i>	
The Neuropathological Diagnosis of the Alzheimer's Disease under the Consideration of Verbal Decision Analysis Methods	427
<i>Isabelle Tamanini, Plácido Rogério Pinheiro, and Mirian Calíope D. Pinheiro</i>	
Autonomous Adaptive Data Mining for u-Healthcare	433
<i>Andrea Zanda, Santiago Eibe, and Ernestina Menasalvas</i>	
Fast Iris Localization Based on Improved Hough Transform	439
<i>Lu Wang, Gongping Yang, and Yilong Yin</i>	
Face Recognition Using Consistency Method and Its Variants	447
<i>Kai Li, Nan Yang, and Xiuchen Ye</i>	

Neural Networks

Clonal Selection Algorithm for Learning Concept Hierarchy from Malay Text	453
<i>Mohd Zakree Ahmad Nazri, Siti Mariyam Shamsuddin, and Azuraliza Abu Bakar</i>	

Action Potential Classification Based on LVQ Neural Network	462
<i>Jian-Hua Dai, Qing Xu, Mianrui Chai, and Qida Hu</i>	
Back Propagation Approach for Semi-supervised Learning in Granular Computing	468
<i>Hong Hu, Weimin Liu, and Zhongzhi Shi</i>	

Complex Networks

WebRank: A Hybrid Page Scoring Approach Based on Social Network Analysis	475
<i>Shaojie Qiao, Jing Peng, Hong Li, Tianrui Li, Liangxu Liu, and Hongjun Li</i>	
Superficial Method for Extracting Social Network for Academics Using Web Snippets	483
<i>Mahyuddin K.M. Nasution and Shahrul Azman Noah</i>	
Research of Spatio-temporal Similarity Measure on Network Constrained Trajectory Data	491
<i>Ying Xia, Guo-Yin Wang, Xu Zhang, Gyoung-Bae Kim, and Hae-Young Bae</i>	

Granular Computing

Dampster-Shafer Evidence Theory Based Multi-Characteristics Fusion for Clustering Evaluation	499
<i>Shihong Yue, Teresa Wu, Yamin Wang, Kai Zhang, and Weixia Liu</i>	
Recognition of Internet Portal Users on the Basis of Their Behaviour . . .	520
<i>Wojciech Jaworski</i>	
Hierarchical Information System and Its Properties	528
<i>Qinrong Feng</i>	
Feature-Weighted Mountain Method with Its Application to Color Image Segmentation	537
<i>Wen-Liang Hung, Miin-Shen Yang, Jian Yu, and Chao-Ming Hwang</i>	
An Improved FCM Clustering Method for Interval Data	545
<i>Shen-Ming Gu, Jian-Wen Zhao, and Ling He</i>	
An Improved FCM Algorithm for Image Segmentation	551
<i>Kunlun Li, Zheng Cao, Liping Cao, and Ming Liu</i>	
A Neighborhood Density Estimation Clustering Algorithm Based on Minimum Spanning Tree	557
<i>Ting Luo and Caiming Zhong</i>	

Metaheuristic

Hybrid Differential Evolution for Global Numerical Optimization	566
<i>Liyuan Jia, Lei Li, Wenyin Gong, and Li Huang</i>	
A Tabu-Based Memetic Approach for Examination Timetabling Problems	574
<i>Salwani Abdullah, Hamza Turabieh, Barry McCollum, and Paul McMullan</i>	
The Geometric Constraint Solving Based on the Quantum Particle Swarm	582
<i>Cao Chunhong, Wang Limin, and Li Wenhui</i>	
Fish Swarm Intelligent Algorithm for the Course Timetabling Problem	588
<i>Hamza Turabieh, Salwani Abdullah, Barry McCollum, and Paul McMullan</i>	

Special Session: Cloud Model and Its Application

A Supervised and Multivariate Discretization Algorithm for Rough Sets	596
<i>Feng Jiang, Zhixi Zhao, and Yan Ge</i>	
Comparative Study of Type-2 Fuzzy Sets and Cloud Model	604
<i>Kun Qin, Deyi Li, Tao Wu, Yuchao Liu, Guisheng Chen, and Baohua Cao</i>	
Operations of Fuzzy Numbers via Genuine Set	612
<i>Jun Han and Baoqing Hu</i>	
An Uncertain Control Framework of Cloud Model	618
<i>Baohua Cao, Deyi Li, Kun Qin, Guisheng Chen, Yuchao Liu, and Peng Han</i>	
A Comparative Study of Cloud Model and Extended Fuzzy Sets	626
<i>Changyu Liu, Wenyan Gan, and Tao Wu</i>	
A Variable Step-Size LMS Algorithm Based on Cloud Model with Application to Multiuser Interference Cancellation	632
<i>Wen He, Deyi Li, Guisheng Chen, and Songlin Zhang</i>	
A Qualitative Requirement and Quantitative Data Transform Model . . .	640
<i>Yuchao Liu, Junsong Yin, Guisheng Chen, and Songlin Zhang</i>	

Special Session: Data Mining in Cloud Computing

The High-Activity Parallel Implementation of Data Preprocessing
Based on MapReduce..... 646
Qing He, Qing Tan, Xudong Ma, and Zhongzhi Shi

Parallel Implementation of Classification Algorithms Based on
MapReduce 655
Qing He, Fuzhen Zhuang, Jincheng Li, and Zhongzhi Shi

Research on Data Processing of RFID Middleware Based on Cloud
Computing..... 663
Zheng-Wu Yuan and Qi Li

Attribute Reduction for Massive Data Based on Rough Set Theory and
MapReduce 672
Yong Yang, Zhengrong Chen, Zhu Liang, and Guoyin Wang

Special Session: Decision-Theoretic Rough Set Model

Analysis of Rough and Fuzzy Clustering 679
Manish Joshi, Pawan Lingras, and C. Raghavendra Rao

Autonomous Knowledge-Oriented Clustering Using Decision-Theoretic
Rough Set Theory 687
Hong Yu, Shuangshuang Chu, and Dachun Yang

An Attribute Reduction of Rough Set Based on PSO 695
Hongyuan Shen, Shuren Yang, and Jianxun Liu

Multiple-Category Classification with Decision-Theoretic Rough Sets ... 703
Dun Liu, Tianrui Li, Pei Hu, and Huaxiong Li

A Multi-agent Decision-Theoretic Rough Set Model 711
Xiaoping Yang and Jingtao Yao

Naive Bayesian Rough Sets..... 719
Yiyu Yao and Bing Zhou

**Special Session: Quotient Space Theory Research
and Application**

Protein Interface Residues Recognition Using Granular Computing
Theory 727
Jiaying Cheng, Xiuquan Du, and Jiehua Cheng

Application of Quotient Space Theory in Input-Output Relationship
Based Combinatorial Testing 735
Longshu Li, Yingxia Cui, and Sheng Yao

Granular Analysis in Clustering Based on the Theory of Fuzzy Tolerance Quotient Space	743
<i>Lunwen Wang, Lunwu Wang, and Zuguo Wu</i>	
Computing the Point-to-Point Shortest Path: Quotient Space Theory's Application in Complex Network.....	751
<i>Fugui He, Yanping Zhang, Shu Zhao, and Ling Zhang</i>	
Fuzzy Measures and Granular Computing	759
<i>Ling Zhang and Bo Zhang</i>	
Identifying Protein-Protein Interaction Sites Using Granularity Computing of Quotient Space Theory	766
<i>Yanping Zhang, Yongcheng Wang, Jun Ma, and Xiaoyan Chen</i>	
Moving Object Detection Based on Gaussian Mixture Model within the Quotient Space Hierarchical Theory	772
<i>Yanping Zhang, Yunqiu Bai, and Shu Zhao</i>	
Author Index	779