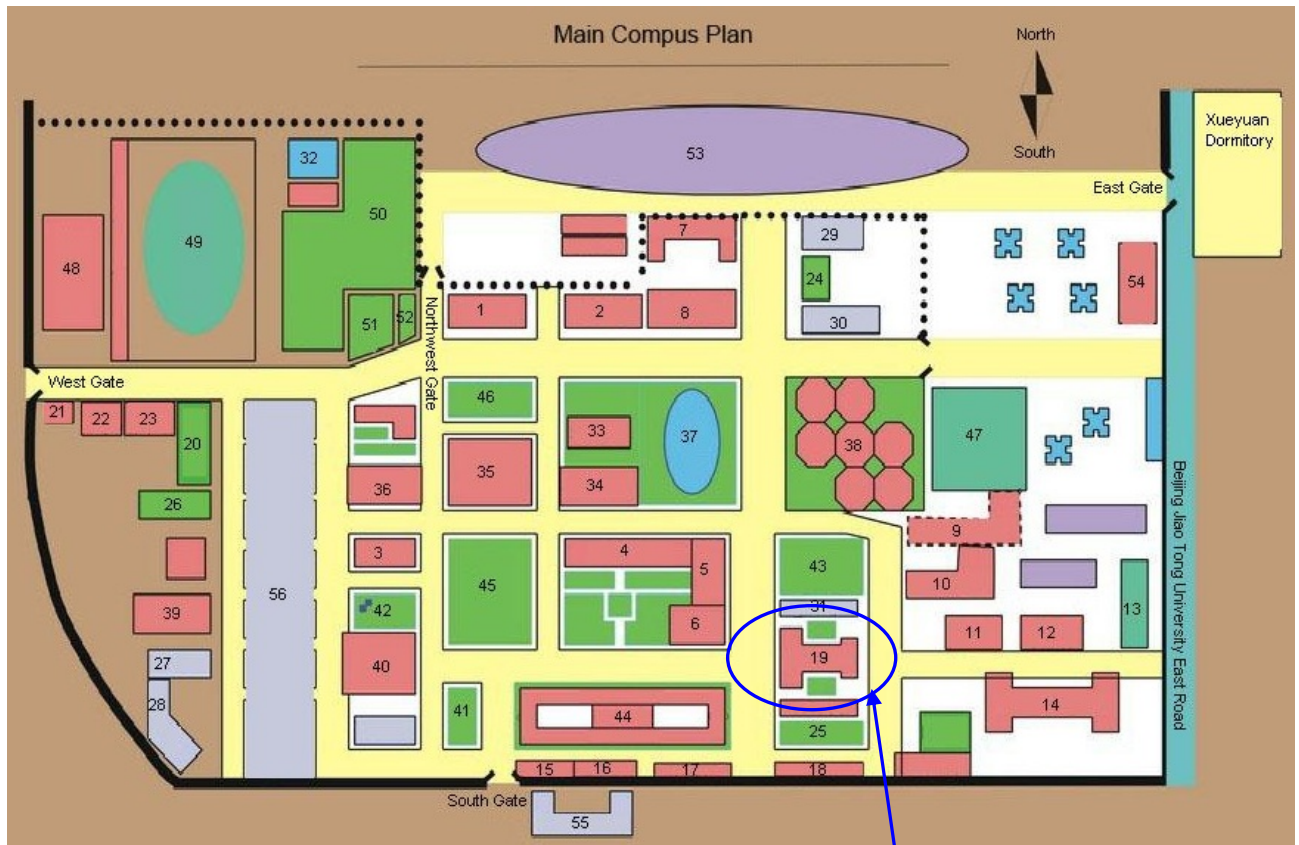


# **RSKT2010**

# **FINAL PROGRAM**

# The 5<sup>th</sup> International Conference on Rough Set and Knowledge Technology (RSKT2010)

## Maps: (Beijing Jiaotong University Campus)



- 1、 2、 3、 4、 5、 6、 9: Teaching Building      7: Transportation Equipment Building  
 8: Management Building 10: Electrical Engineering Building 11: Mechanical Laboratory Building  
 12: Electrical Engineering Laboratory Building 13: Light wave Building  
 14: Engineering Laboratory Building      15: Admissions Office      16: Security Department  
 17: Printing Factory      18: International Cooperation Center      19: Hong Guo Yuan Hotel  
 20: The Second Canteen      21: Security Guard      22: Fair price Supermarket      23: Catered Centre  
 24: The First Canteen      25: Foreign Experts Building      26: The Third Canteen  
 27、 28、 29、 30、 31、 56: Dormitory      32: Swimming Pool      33: Science Hall  
 34: Siyuan East Building      35: Siyuan Building      36: Siyuan West Building  
 37: Ming Lake      38: Libarary      39: Public Bath      40: Tianyou Hall  
 41: Grove      42: Garden      43: Fanghua Garden  
 44: School of Computer and Information Technology      45、 46: Lawn      47: East Playground  
 48: Gym      49: West Playground      50: Basketball Court      51: Volleyball court  
 52: Tennis court      53: Family District      54: Hospital      55: Jiayuan Dormitory

# The 5<sup>th</sup> International Conference on Rough Set and Knowledge Technology (RSKT2010)

## Sponsors:

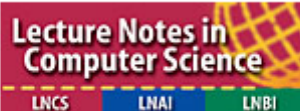
International Rough Set  
Society



National Natural Science  
Foundation of China



Beijing Jiaotong University



# The 5<sup>th</sup> International Conference on Rough Set and Knowledge Technology (RSKT2010)

## Message from the Conference and Program Chairs

We are pleased to give you a warm welcome to The 5th International Conferences on Rough Set and Knowledge Technology (RSKT 2010). On behalf of the RSKT 2010 Conference Committees, we would like to thank you for your participation and we do hope that you will enjoy the conference technical and social programs as well as our beautiful and long-history city Beijing.

The RSKT 2010 conference is sponsored and co-organized by Beijing Jiaotong University (BJTU), China, National Natural Science Foundation of China (NSFC), International Rough Set Society (IRSS), and the Rough Sets and Soft Computation Society of the Chinese Association for Artificial Intelligence (CRSSC).

RSKT serves as a major forum that brings researchers and industry practitioners together to discuss and deliberate on fundamental issues of knowledge processing and management and knowledge-intensive practical solutions in the current knowledge age. Experts from around the world meet to present state-of-the-art scientific results, to nurture academic and industrial interaction, and to promote collaborative research in rough sets and knowledge technology.

Following the success of the previous conferences, RSKT2010 continued the tradition of a very rigorous reviewing process. Every submission was reviewed by at least two reviewers. As a result, only top-quality papers were chosen for presentation at the conference, including 49 regular papers (acceptance rate of 28%) and 25 short papers (acceptance rate of 14.3%).

It is impossible to organize a high quality conference without the enormous support and expertise of many top class researchers and leaders. We wish to thank the members of the Steering Committee for their invaluable suggestions and support throughout the organization process. We are indebted to the area chairs, Program Committee members and external reviewers for their effort and engagement in providing a rich and rigorous scientific program for RSKT 2010. We express our gratitude to our Special Session Chairs (Zhongzhi Shi, Yong Yang, Fan Yang, Guisheng Chen, Jingtao Yao, Tianrui Li, Xiaoping Yang, Yanping Zhang) for selecting and coordinating the exciting sessions (total 24 papers in four special sessions). We are also grateful to the Local Arrangement Chairs Liping Jing and Zhen Han as well as the Local Organizing Committee, whose great effort ensured the success of the conference.

We are grateful to the following distinguished keynote speakers for their visionary talks on rough sets and knowledge technology: Deyi Li, Jianchang Mao, Sankar K. Pal, Roman Slowinski, Ian H. Witten, and Bo Zhang.

We wish to express our appreciation to the conference sponsors. We are grateful to the authors, presenters, participants and delegates for their contributions and participation.

**Jian Yu**  
*Program Chair*

**Bin Ning**  
*Conference Chair*

# The 5<sup>th</sup> International Conference on Rough Set and Knowledge Technology (RSKT2010)

## Information for Session Chairs and Presenters

### Facilities at the Presentation Room

All rooms are equipped with a desktop and digital projector connected to the desktop. The overhead projector will be available on request only.

### Presentation Time

The presentation time allocated to each paper is 20 minutes including questions and answers.

### Session Chairs

If you cannot fulfill your duties as a session chair, please ensure that someone else will take your place as the session chair, or contact the conference Program Chair to arrange a back-up.

Session chairs are kindly requested to help with the followings:

1. Note the time allocated for each paper in your session. Each accepted paper is allocated 20 minutes (15 minutes for the presentation plus 5 minutes for discussion).
2. Arrive at the room of the session 5 minutes before the session starts and identify each of the speakers for the session.
3. Suggest each speaker to keep corresponding time for discussions (questions and answers), and for transition to the next presentation. If a presentation extends into the time for discussions, please shorten the discussions accordingly or postpone the discussions until after the session.
4. Do not allow presentations or the subsequent discussions to spill beyond the starting time of the next presentation.
5. If the presenter of a paper is absent ("no-show"), please continue to the next presentation. Please check again at the end of the last presentation whether the "no-show" shows up. Best efforts have been made to reduce the number of no-shows; however, they may not be eliminated.
6. Each presentation room is equipped with a digital projector. If something is not working properly, please contact a volunteer for help.

### Presenters

Please check your presentation time and room. Please go to the room 5 minutes before the session starts and identify yourself to the session chairs.

1. Note the time allocated for each accepted paper is 20 minutes (15 minutes for your presentation plus 5 minutes for discussion).
2. When it is your turn to present, please
3. Please do not exceed your allocated time. Please follow the instructions of the Session Chairs.

If you cannot find your name in Sessions or your information is incorrect in the Program Booklet, please contact the Program Chair.

# The 5<sup>th</sup> International Conference on Rough Set and Knowledge Technology (RSKT2010)

## Program at a Glance

*[All rooms are located in the 2nd & 3rd levels of the Hong Guo Yuan Hotel, BJTU Campus]*

October 15	9:00-19:00 <b>Reception</b> [Hall, 1 <sup>st</sup> Floor Hong Guo Yuan Hotel]			
	19:00-21:00 <b>Dinner</b> [2 <sup>nd</sup> Floor, Hong Guo Yuan Restaurant]			
October 16	8:30-9:00 <b>Conference Opening</b> [Multi-functional Hall] Speaker: Prof. Yongsheng Wang, <b>Chair:</b> Zhi-hua Zhou			
	9:00-9:50 <b>Keynote Speaker- Roman Slowinski</b> [Multi-functional Hall] <b>Chair:</b> Weizhi Wu <b>Title:</b> Knowledge Discovery about Preferences using the Dominance-based Rough Set Approach			
	9:50-10:40 <b>Keynote Speaker- Sankar K. Pal</b> [Multi-functional Hall] <b>Chair:</b> Weizhi Wu <b>Title:</b> F-granulation, Generalized Rough Entropy and Pattern Recognition			
	10:40-11:00 Coffee Break [3 <sup>rd</sup> Floor, Hong Guo Yuan Hotel]			
	11:00 - 12:30	<b>Session 1</b> [Conf. Rm2] RSCT I <b>Chair:</b> Sankar K. Pal	<b>Session 2</b> [Conf. Rm3] HIB <b>Chair:</b> Krzysztof Pancierz	<b>Session 3</b> [Conf. Rm4] IIP <b>Chair:</b> Dayong Deng
	12:30-14:00 Lunch [3 <sup>rd</sup> Floor, Multi-functional Hall] Buffet			
	14:00-14:50 <b>Keynote Speaker- Ian H. Witten</b> [Multi-functional Hall] <b>Chair:</b> Roman Slowinski <b>Title:</b> Wikipedia and how to use it for semantic document representation			
	14:50-15:10 <b>Coffee Break</b> [3 <sup>rd</sup> Floor, Hong Guo Yuan Hotel]			
	15:10 - 17:30	<b>Session 4</b> [Conf. Rm2] RSKT II <b>Chair:</b> Ian H. Witten	<b>Session 5</b> [Conf. Rm3] KT <b>Chair:</b> Jianchang Mao	<b>Session 6</b> [Conf. Rm4] NN+CN+Meta <b>Chair:</b> Jianhua Dai
	18:00-21:30 <b>Reception Dinner</b> [Da Zhai Men Restaurant]			
	October 17	8:30-9:20 <b>Keynote Speaker- Bo Zhang</b> [Multi-functional Hall] <b>Chair:</b> Duoqian Miao <b>Title:</b> Granular Computing and Computational Complexity		
9:20-10:10 <b>Keynote Speaker- Jianchang Mao</b> [Multi-functional Hall] <b>Chair:</b> Duoqian Miao Scientific Challenges in Contextual Advertising				
10:10-10:30 Coffee Break [3 <sup>rd</sup> Floor, Hong Guo Yuan Hotel]				
10:30 - 12:30		<b>Session 7</b> [Conf. Rm2] RSCT III <b>Chair:</b> William Zhu	<b>Session 8</b> [Conf. Rm3] GC <b>Chair:</b> Wen-Liang Hung	<b>Session 9</b> [Conf. Rm4] FS <b>Chair:</b> Yiyu Yao

# The 5<sup>th</sup> International Conference on Rough Set and Knowledge Technology (RSKT2010)

12:30-14:00 Lunch [2 <sup>nd</sup> Floor, Hong Guo Yuan Restaurant] Buffet			
14:00-14:50 <b>Keynote Speaker- Deyi Li</b> [Multi-functional Hall] <b>Chair:</b> Guoyin Wang <b>Title:</b> Comparative Study on Mathematical Foundations of Type-2 Fuzzy Set, Rough Set and Cloud Model			
14:50-15:10 <b>Coffee Break</b> [3 <sup>rd</sup> Floor, Hong Guo Yuan Hotel]			
15:10 - 17:10	<b>Session 10</b> [Conf. Rm2] QSTRA <b>Chair:</b> Deyi Li	<b>Session 11</b> [Conf. Rm3] CMA <b>Chair:</b> Yanping Zhang	<b>Session 12</b> [Conf. Rm4] DMCC+DTRSM <b>Chair:</b> Tianrui Li
17:10-17:30 <b>Coffee Break</b> [3 <sup>rd</sup> Floor, Hong Guo Yuan Hotel]			
17:30-18:30 <b>Panel Discussion</b> [3 <sup>rd</sup> Floor, Multi-functional Hall]			
18:30-21:30 <b>Closing Ceremony</b> [2 <sup>nd</sup> Floor, Hong Guo Yuan Restaurant] <b>Chair:</b> Jian Yu			

# The 5<sup>th</sup> International Conference on Rough Set and Knowledge Technology (RSKT2010)

## RSKT 2010 Program

Saturday, October 16 (LOCATION)

### Conference Opening (8:30 - 9:00)

**Chair:** Zhi-hua Zhou (*Nanjing University, China*)

**Location:** 3<sup>rd</sup> Floor, Multi-functional Hall

**Welcome:** Prof. Yongsheng Wang (*Vice President of Beijing Jiaotong University*)

### RSKT: Keynote Speaker (9:00 - 9:50)

**Chair:** Weizhi Wu (*Zhejiang Ocean University, China*)

**Location:** 3<sup>rd</sup> Floor, Multi-functional Hall

**Title:** Knowledge Discovery about Preferences using the Dominance-based Rough Set Approach

**Speaker:** Prof. Roman Slowinski (*PoznanUniversity of Technology, Poland*)

### RSKT: Keynote Speaker (9:50 -10:40)

**Chair:** Weizhi Wu (*Zhejiang Ocean University, China*)

**Location:** 3<sup>rd</sup> Floor, Multi-functional Hall

**Title:** F-granulation, Generalized Rough Entropy and Pattern Recognition

**Speaker:** Prof. Sankar K. Pal (*Indian Statistical Institute, India*)

### Coffee Break (10:40 - 11:00)

**Location:** 3<sup>rd</sup> Floor, Hong Guo Yuan Hotel

### Session 1: Rough Set and Computing Theory I (2<sup>nd</sup> Floor, Conference Room 2)

**Session Chair:** Sankar K. Pal (*Indian Statistical Institute, India*)

**Session Time:** 11:00 - 12:30

#### Papers:

- Incorporating Great Deluge with Kempe Chain Neighbourhood Structure for the Enrolment-based Course Timetabling Problem  
*Salwani Abdullah, Khalid Shaker, Barry McCollum, and Paul McMullan*
- On Attribute Reduction of Rough Set Based on Pruning Rules  
*Hongyuan Shen, Shuren Yang, and Jianxun Liu*
- Data Classification using Rough Sets and Naïve Bayes  
*Khadija Al-Aidaros, Azuraliza Abu Bakar, and Zalinda Othman*
- Generalized Distribution Reductions in Inconsistent Decision Systems Based on Dominance Relations  
*Yan Li, Jin Zhao, Na-Xin Sun, and Sankar Kumar Pal*
- Pattern Classification Using Class-Dependent Rough-Fuzzy Granular Space  
*Sankar K. Pal, Saroj K. Meher, and Soumitra Dutta*
- Robust Granular Neural Networks, Fuzzy Granules and Classification  
*Avatharam. G and Sankar. K. Pal*



# The 5<sup>th</sup> International Conference on Rough Set and Knowledge Technology (RSKT2010)

- A Robust Fuzzy Rough Set Model Based on Minimum Enclosing Ball  
*Shuang An, Qinghua Hu, and Daren Yu*

**Session 2: Health Informatics and Biometrics Authentication** (2<sup>nd</sup> Floor, Conference Room 3)  
**Session Chair:** Krzysztof Pancierz (*Zamosc University of Management and Administration, Poland*)

**Session Time:** 11:00 - 12:30

**Papers:**

- Rules for Ontology Population from Text of Malaysia Medicinal Herbs Domain  
*Zaharudin Ibrahim, Shahrul Azman Noah, and Mahanem Mat Noor*
- Classification of MMPI Profiles of Patients with Mental Disorders - Experiments with Attribute Reduction and Extension  
*Jerzy Gomu la, Krzysztof Pancierz, and Jaros law Szko la*
- Autonomous adaptive data mining for u-Healthcare  
*Andrea Zanda, Santiago Eibe, and Ernestina Menasalvas*
- Face Recognition Using Consistency Method and Its Variants  
*Kai Li, Nan Yang and Xiuchen Ye*
- Gait Recognition Based on Outermost Contour  
*Lili Liu, Yilong Yin, and Wei Qin*
- Pseudofractal 2D Shape Recognition  
*Krzysztof Gdawiec*
- Automatic 3D Face Correspondence Based on Feature Extraction in 2D Space  
*Xun Gong, Shuai Cao, Xinxin Li, Ping Yuan, Hemin Zou1, Chao Ye, Junyu Guo, and Chunyao Wang*
- The Neuropathological Diagnosis of the Alzheimer's Disease under the Consideration of Verbal Decision Analysis Methods  
*Isabelle Tamanini, Placido Rogerio Pinheiro, and Mirian Caliope D.Pinheiro*
- Fast Iris Localization Based on Improved Hough Transform  
*Lu Wang, Gongping Yang, and Yilong Yin*

**Session 3: Intelligent Information Processing** (2<sup>nd</sup> Floor, Conference Room 4)  
**Session Chair:** Dayong Deng (*Zhejiang Normal University, China*)

**Session Time:** 11:00 - 12:30

**Papers:**

- A Tool for Study of Optimal Decision Trees  
*Abdulaziz Alkhalid, Igor Chikalov, and Mikhail Moshkov*
- Application of Rough Sets Theory in Air Quality Assessment  
*Pavel Jirava, Jiri Krupka, and Miloslava Kasparova*
- An Interactive Approach to Outlier Detection  
*R.M. Konijn and W. Kowalczyk*
- Automatic Part of Speech Tagging For Arabic: An Experiment Using Bigram Hidden Markov Model

# The 5<sup>th</sup> International Conference on Rough Set and Knowledge Technology (RSKT2010)

*Mohammed Albared, Nazlia Omar, and Mohd. Juzaidin Ab Aziz*

- Parallel Reducts Based on Attribute Significance  
*Dayong Deng, Dianxun Yan, and Jiyi Wang*
- A Rough Sets Approach to User Preference Modeling  
*Siyuan Jing and Kun She*
- An Effective Principal Curves Extraction Algorithm for Complex Distribution Dataset  
*Hongyun Zhang, Duoqian Miao, Lijun Sun, and Ying Ye*

**Conference Lunch (12:30 - 14:00)**

**Location:** 3<sup>rd</sup> Floor, Multi-functional Hall

**RSKT: Keynote Speaker (14:00 -14:50)**

**Chair:** Roman Slowinski (*PoznanUniversity of Technology, Poland*)

**Location:** 3<sup>rd</sup> Floor, Multi-functional Hall

**Title:** Wikipedia and how to use it for semantic document representation

**Speaker:** Prof. Ian H. Witen (*University of Waikato, New Zealand*)

**Coffee Break (14:50 - 15:10)**

**Location:** 3<sup>rd</sup> Floor, Hong Guo Yuan Hotel

**Session 4: Rough Set and Computing Theory II** (2<sup>nd</sup> Floor, Conference Room 2)

**Session Chair:** Ian H. Witen (*University of Waikato, New Zealand*)

**Session Time:** 15:10 - 17:30

**Papers:**

- Some Comparative Analyses of Data in the RSDS System  
*Zbigniew Suraj and Piotr Grochowalski*
- 1-vs-others Rough Decision Forest  
*Jinmao Wei, Shuqin Wang, and Guoying Wang*
- Ordered Weighted Average Based Fuzzy Rough Sets  
*Chris Cornelis, Nele Verbiest, and Richard Jensen*
- Indiscernibility and Similarity in An Incomplete Information Table  
*Renpu Li, Yiyu Yao*
- Knowledge Reduction Based on Granular Computing from Decision Information Systems  
*Lin Sun, Jiucheng Xu, and Shuangqun Li*
- Generate (F,  $\epsilon$ )-dynamic reduct using Cascading Hashes  
*Pai-Chou Wang*
- Rough Temporal Vague Sets in Pawlak Approximation Space  
*Yonghong Shen*
- Temporal Dynamics in Rough Sets based on Coverings  
*Davide Ciucci*
- A Heuristic Reduction Algorithm in IIS Based on Binary Matrix  
*Meimei Zhu, Huaxiong Li, Xianzhong Zhou*

# The 5<sup>th</sup> International Conference on Rough Set and Knowledge Technology (RSKT2010)

**Session 5: Knowledge Technology** (2<sup>nd</sup> Floor, Conference Room 3)

**Session Chair:** Jianchang Mao (*Yahoo! Lab, USA*)

**Session Time:** 15:10 - 17:30

**Papers:**

- Using Lexical Ontology for Semi-Automatic Logical Data Warehouse Design  
*Mior Nasir Mior Nazri, Shahrul Azman Noah, and Zarinah Hamid*
- Research On Mapping Mechanism Of Learning Expression  
*Lili Zhou and Fanzhang Li*
- Linking Open Spatiotemporal Data in the Data Clouds  
*He Hu and Xiaoyong Du*
- A New Hybrid Method of Generation of Decision Rules Using Constructive Induction Mechanism  
*Wieslaw Paja, Krzysztof Pancierz, and Mariusz Wrzesien*
- A Frequent Pattern Mining Method for Finding Planted (l, d)-Motifs of Unknown Length  
*Caiyan Jia, Ruqian Lu, and Lusheng Chen*
- A Quick Incremental Updating Algorithm for Computing Core Attributes  
*Hao Ge, Chuanjian Yang, and Wanlian Yuan*
- Likelihood-based Sampling from Databases for Rule Induction Methods  
*Shusaku Tsumoto, Shoji Hirano, and Hidenao Abe*
- Residual Analysis of Statistical Dependence in Multiway Contingency Tables  
*Shusaku Tsumoto and Shoji Hirano*
- A Note on the Effect of Knowledge Refinement on Bag Structures  
*Kankana Chakrabarty*
- A Belief Structure for Reasoning about Knowledge  
*S.K.M. Wong and Nasser Noroozi*
- Review of Software Security Defects Taxonomy  
*Zhanwei Hui, Song Huang, Zhengping Ren, and Yi Yao*

**Session 6: Neural Networks, Complex Networks, Metaheuristic** (2<sup>nd</sup> Floor, Conference Room 4)

**Session Chair:** Jianhua Dai (*Zhejiang University, China*)

**Session Time:** 15:10 - 17:30

**Papers:**

- Clonal Selection Algorithm for Learning Concept Hierarchy from Malay Text  
*Mohd Zakree Ahmad Nazri, Siti Mariyam Shamsuddin, and Azuraliza Abu Bakar*
- Back Propagation Approach for Semi-Supervised Learning in Granular Computing  
*Hong Hu, Weimin Liu, and Zhongzhi Shi*
- Action Potential Classification Based on LVQ Neural Network  
*Jianhua Dai, Qing Xu, Mianrui Chai, and Qida Hu*
- Superficial Method for Extracting Social Network for Academics using Web Snippets  
*Mahyuddin K. M. Nasution and Shahrul Azman Noah*
- WebRank: A Hybrid Page Scoring Approach Based on Social Network Analysis

# The 5<sup>th</sup> International Conference on Rough Set and Knowledge Technology (RSKT2010)

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*Shaojie Qiao, Jing Peng, Hong Li, Tianrui Li, Liangxu Liu, and Hongjun Li*

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

## **Reception Dinner (18:00 - 21:30)**

**Location:** Da Zhai Men Restaurant, No.3 Hui Xin Bei Li, Chao Yang District, Beijing.

**Sunday, October 17 (LOCATION)**

# The 5<sup>th</sup> International Conference on Rough Set and Knowledge Technology (RSKT2010)

## **RSKT: Keynote Speaker (8:30 - 9:20)**

**Chair:** Duoqian Miao (*Tongji University, Canada*)

**Location:** 3<sup>rd</sup> Floor, Multi-functional Hall

**Title:** Granular Computing and Computational Complexity

**Speaker:** Prof. Bo Zhang (*Tsinghua University, China*)

## **RSKT: Keynote Speaker (9:20 -10:10)**

**Chair:** Duoqian Miao (*Tongji University, Canada*)

**Location:** 3<sup>rd</sup> Floor, Multi-functional Hall

**Title:** Scientific Challenges in Contextual Advertising

**Speaker:** Dr. Jianchang Mao (*Yahoo! Lab, USA*)

## **Coffee Break (10:10 - 10:30)**

**Location:** 3<sup>rd</sup> Floor, Hong Guo Yuan Hotel

## **Session 7: Rough Set and Computing Theory III (2<sup>nd</sup> Floor, Conference Room 2)**

**Session Chair:** William Zhu (*University of Electronic Science and Technology of China, China*)

**Session Time:** 10:30 - 12:30

### **Papers:**

- Set-theoretic Models of Granular Structures  
*Yiyu Yao, Duoqian Miao, Nan Zhang, and Feifei Xu*
- A New Fitness Function for Solving Minimum Attribute Reduction Problem  
*Dongyi Ye, Zhaojiong Chen, and Shenglan Ma*
- Poset approaches to covering rough set  
*Shiping Wang, William Zhu, and Peiyong Zhu*
- Towards multi-adjoint property-oriented concept lattices  
*Jesus Medina*
- A New Extended Dominance Relation Approach Based on Probabilistic Rough Set Theory  
*Decui Liang, Simon X. Yang, Chaozhe Jiang, Xiangui Zheng, and Dun Liu*
- An equivalent form of rough logic System RSL  
*Yingchao Shao, Zhongmin Xie, and Keyun Qin*
- Extension of covering approximation space and its application in attribute reduction  
*Guoyin Wang and Jun Hu*

## **Session 8: Granular Computing (2<sup>nd</sup> Floor, Conference Room 3)**

**Session Chair:** Wen-Liang Hung (*National Hsinchu University of Education, Taiwan*)

**Session Time:** 10:30 - 12:30

### **Papers:**

- Dempster-Shafer Evidence Theory based Multi-Characteristics Fusion for Clustering Evaluation

# The 5<sup>th</sup> International Conference on Rough Set and Knowledge Technology (RSKT2010)

*Shihong Yue, Teresa Wu, IYamin Wang, Kai Zhang, and Weixia Liu*

- Recognition of Internet portal users on the basis of their behaviour  
*Wojciech Jaworski*
- Feature-Weighted Mountain Method with Its Application to Color Image Segmentation  
*Wen-Liang Hung, Miin-Shen Yang, Jian Yu, and Chao-Ming Hwang*
- An Improved FCM Clustering Method for Interval Data  
*Shen-Ming Gu, Jian-Wen Zhao, and Ling He*
- An Improved FCM Algorithm for Image Segmentation  
*Kunlun Li, Zheng Cao, Liping Cao, and Ming Liu*
- A Neighborhood Density Estimation Clustering Algorithm Based on Minimum Spanning Tree  
*Ting Luo and Caiming Zhong*
- Hierarchical information system and its properties  
*Qinrong Feng*

**Session 9: Fuzzy Sets** (2<sup>nd</sup> Floor, Conference Room 4)

**Session Chair:** Yiyu Yao (*University of Regina, Canada*)

**Session Time:** 10:30 - 12:30

**Papers:**

- Improving the learning of recurring concepts through high-level fuzzy contexts  
*Joao Bartolo Gomes, Ernestina Menasalvas, and Pedro A. C. Sousa*
- Knowledge Reduction in Random Incomplete Information Systems via Evidence Theory  
*Wei-Zhi Wu*
- Qualitative Approximations of Fuzzy Sets and Non-Classical Three-Valued Logics (I)  
*Xiaohong Zhang, Yiyu Yao, and Yan Zhao*
- Qualitative Approximations of Fuzzy Sets and Non-Classical Three-Valued Logics (II)  
*Xiaohong Zhang, Yiyu Yao, and Yan Zhao*
- Conceptual Reduction of Fuzzy Dual Concept Lattices  
*Xiao-Xue Song, Wen-Xiu Zhang, and Qiang Zhao*
- Research of Spatio-temporal Similarity Measure on Network Constrained Trajectory Data  
*Ying Xia, Guoyin Wang, Xu Zhang, Gyoung-Bae Kim, and Hae-Young Bae*
- Implication Operator of Linguistic Truth-Valued Intuitionistic Fuzzy Lattice  
*Chunying Guo, Fengmei Zhang, Li Zou, and Kaiqi Zou*
- Perturbed Iterative approximation of Common Fixed Points on Nonlinear Fuzzy and Crisp Mixed Family Operator Equation Couples in Menger PN-spaces  
*Heng-you Lan, Tian-xiu Lu, Huang-lin Zeng, and Xiao-hong Ren*

**Conference Lunch (12:30 - 14:00)**

**Location:** 2<sup>nd</sup> Floor, Hong Guo Yuan Restaurant.

**RSKT: Keynote Speaker (14:00 -14:50)**

**Chair:** Guoyin Wang (*Chongqing University of Posts and Telecommunications, China*)

# The 5<sup>th</sup> International Conference on Rough Set and Knowledge Technology (RSKT2010)

**Location:** Multi-functional Hall

**Title:** Comparative Study on Mathematical Foundations of Type-2 Fuzzy Set, Rough Set and Cloud Model

**Speaker:** Prof. Deyi Li (*Natural Science Foundation of China, China*)

**Coffee Break (14:50 - 15:10)**

**Location:** 3<sup>rd</sup> Floor, Hong Guo Yuan Hotel

**Session 10: Cloud Model and Its Application** (2<sup>nd</sup> Floor, Conference Room 2)

**Session Chair:** Deyi Li (*Natural Science Foundation of China, China*)

**Session Time:** 15:10 - 17:10

**Papers:**

- A Supervised and Multivariate Discretization Algorithm for Rough Sets  
*Feng Jiang, Zhixi Zhao, and Yan Ge*
- Comparative Study of Type-2 Fuzzy Sets and Cloud Model  
*Kun Qin, Deyi Li, Tao Wu, Yuchao Liu, Guisheng Chen, and Baohua Cao*
- An Uncertain Control Framework of Cloud Model  
*Baohua Cao, Deyi Li, Kun Qin, Guisheng Chen, Yuchao Liu, and Peng Han*
- A Comparative Study of Cloud Model and Extended Fuzzy Sets  
*Changyu Liu, Wenyan Gan, and Tao Wu*
- A Variable Step-size LMS Algorithm based on Cloud Model with Application to Multiuser Interference Cancellation  
*Wen He, Deyi Li, Guisheng Chen, and Songlin Zhang*
- A qualitative requirement and quantitative data transform model  
*Yuchao Liu, Junsong Yin, Guisheng Chen, and Songlin Zhang*
- Operations of fuzzy numbers via Genuine set  
*Jun Han and Baoqing Hu*

**Session 11: Quotient space theory research and application** (2<sup>nd</sup> Floor, Conference Room 3)

**Session Chair:** Yanping Zhang (*Anhui University, China*)

**Session Time:** 15:10 - 17:10

**Papers:**

- Computing the Point-to-Point Shortest Path: Quotient Space Theory's Application in Complex Network  
*Fugui He, Yanping Zhang, Shu Zhao, and Ling Zhang*
- Protein Interface Residues Recognition Using Granular Computing Theory  
*Jiaying Cheng, Xiuquan Du, and Jiehua Cheng*
- Application of Quotient Space Theory in Input-Output Relationship based Combinatorial Testing  
*Longshu Li, Yingxia Cui, and Sheng Yao*
- Granular Analysis in Clustering based on the Theory of Fuzzy Tolerance Quotient Space  
*Lunwen Wang, Lunwu Wang, and Zuguo Wu*

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- Fuzzy Measures and Granular Computing  
*Ling Zhang and Bo Zhang*
- Identifying protein-protein interaction sites using granularity computing of quotient space theory  
*Yanping Zhang, Yongcheng Wang, Jun Ma, and Xiaoyan Chen*
- Moving Object Detection Based on Gaussian Mixture Model within the Quotient Space Hierarchical theory  
*Yanping Zhang, Yunqiu Bai, and Shu Zhao*

**Session 12: Data Mining in Cloud Computing, Decision Theoretic Rough Set Model (2<sup>nd</sup> Floor, Conference Room 4)**

**Session Chair:** Tianrui Li (*Southwest Jiaotong University, China*)

**Session Time:** 15:10 - 17:10

## **Papers:**

- The High-activity Parallel Implementation of Data Preprocessing based on MapReduce  
*Qing He, Qing Tan, Xudong Ma, and Zhongzhi Shi*
- Parallel Implementation of Classification Algorithms based on MapReduce  
*Qing He, Fuzhen Zhuang, Jincheng Li, and Zhongzhi Shi*
- Research on Data Processing of RFID Middleware Based on Cloud Computing  
*Zheng-Wu Yuan and Qi Li*
- Attribute Reduction for Massive Data Based on Rough Set Theory and MapReduce  
*Yong Yang, Zhengrong Chen, Zhu Liang, and Guoyin Wang*
- Analysis of Rough and Fuzzy Clustering  
*Manish Joshi, Pawan Lingras, and C. Raghavendra Rao*
- An Attribute Reduction of Rough Set Based on PSO  
*Hongyuan Shen, Shuren Yang, and Jianxun Liu*
- Naive Bayesian Rough Sets  
*Yiyu Yao and Bing Zhou*
- Autonomous Knowledge-oriented Clustering Using Decision-Theoretic Rough Set Theory  
*Hong Yu, Shuangshuang Chu, and Dachun Yang*
- Multiple-category Classification with Decision-theoretic rough sets  
*Dun Liu, Tianrui Li, Pei Hu, and Huaxiong Li*
- A Multi-agent Decision-theoretic Rough Set Model  
*Xiaoping Yang, Jingtao Yao*

**Coffee Break (17:10 - 17:30)**

**Location:** 3<sup>rd</sup> Floor, Hong Guo Yuan Hotel

**Panel Discussion (17:30 - 18:30)**

**Location:** Multi-functional Hall

**Chair:** Guoyin Wang (*Chongqing University of Posts and Telecommunications, China*)



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**Closing Ceremony (19:00 - 21:30)**

**Location:** 2<sup>nd</sup> Floor, Hong Guo Yuan Restaurant.

**Chair:** Jian Yu

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## Keynote Speakers



**Deyi Li.** Deyi Li, graduated at the Electronic Engineering Dept., South East Univ. in 1967, received his PhD in Computer Science Dept., Heriot-Watt Univ. Edinburgh UK in 1983. He was elected as the member of Chinese Academy of Engineering in 1999, the member of Euroasian Academy of Science in 2004 respectively. At present, he is a professor in Qinghua Univ., the director at Dept. of Information Science, Natural Science Foundation of China, the vice president of both Chinese Institute of Electronics and Chinese Association of Artificial Intelligence. He has published over 120 papers on a wide range of topics in artificial intelligence and 4 monographs, owned Premium Award given by IEE Headquarters 1984/85, and the IFAC world congress outstanding paper 1999, currently interested in networked data mining, artificial intelligence with uncertainty, cloud computing, and cognitive physics.

**Speech Title:** Comparative Study on Mathematical Foundations of Type-2 Fuzzy Set, Rough Set and Cloud Model

**ABSTRACT:** Mathematical representation of a concept with uncertainty is one of foundations of Artificial Intelligence. The type-2 fuzzy set introduced by Mendel studies fuzziness of the membership grade of a concept. Rough set proposed by Pawlak defines an uncertain concept through two crisp sets. Cloud model, based on probability measure space, automatically produces random membership grades of a concept through a cloud generator. The three methods all concentrate on the essentials of uncertainty and have been applied in many fields for more than ten years. However, their mathematical foundations are quite different. The detailed comparative study on the three methods will discover the relationship in the between, and provide a fundamental contribution to Artificial Intelligence with uncertainty.

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Jianchang (JC) Mao. Dr. Jianchang (JC) Mao is a Vice President and the

head of Advertising Sciences in Y! Labs, overseeing the R&D of advertising technologies and products, including Search Advertising, Contextual Advertising, Display Advertising, Targeting, and Categorization. He was also a Science/Engineering director responsible for development of backend technologies for several Yahoo! Social Search products, including Y! Answers and Y! MyWeb (Social Bookmarks). Prior to joining Yahoo!, Dr. Mao was Director of Emerging Technologies & Principal Architect at Verity Inc., a leader in Enterprise Search (acquired by Autonomy), from 2000 to 2004. Prior to this, Dr. Mao was a research staff member at the IBM Almaden Research Center from 1994 to 2000. Dr. Mao's research interest includes Machine Learning, Data Mining, Information Retrieval, Computational Advertising, Social Networks, Pattern Recognition and Image Processing. He received an Honorable Mention Award in ACM KDD Cup 2002, IEEE Transactions on Neural Networks Outstanding Paper Award in 1996, and Honorable Mention Award from the International Pattern Recognition Society in 1993. Dr. Mao served as an associate editor of the IEEE Transactions on Neural Networks, 1999-2000. He received his Ph.D. degree in Computer Science from Michigan State University in 1994.

**Speech Title:** Scientific Challenges in Contextual Advertising

**ABSTRACT:** Online advertising has been fueling the rapid growth of the Web that offers a plethora of free web services, ranging from search, email, news, sports, finance, and video, to various social network services. Such free services have accelerated the shift in people's media time spend from offline to online. As a result, advertisers are spending more and more advertising budget online. This phenomenon is a powerful ecosystem play of users, publishers, advertisers, and ad networks. The rapid growth of online advertising has created enormous opportunities as well as technical challenges that demand computational intelligence. Computational Advertising has emerged as a new interdisciplinary field that studies the dynamics of the advertising ecosystem to solve challenging problems that rise in online advertising.

In this talk, I will provide a brief introduction to various forms of online advertising, including search advertising, contextual advertising, guaranteed and non-guaranteed display advertising. Then I will focus on the problem of contextual advertising, which is to find the best matching ads from a large ad inventory to a user in a given context (e.g., page view) to optimize the utilities of the participants in the ecosystem under certain business constraints (blocking, targeting, etc). I

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will present a problem formulation and describe scientific challenges in several key technical areas involved in solving this problem, including user understanding, semantic analysis of page content, user response prediction, online learning, ranking, and yield optimization.

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Sankar K. Pal. Sankar K. Pal is a *Distinguished Scientist* of the Indian Statistical Institute. Currently, he is also a J.C. Bose Fellow of the Govt. of India. He founded the Machine Intelligence Unit and the Center for Soft Computing Research: A National Facility in the Institute in Calcutta. He received a Ph.D. in Radio Physics and Electronics from the University of Calcutta in 1979, and another Ph.D. in Electrical Engineering along with DIC from Imperial College, University of London in 1982.

Prof. Pal is a *Fellow* of the IEEE, USA, the Academy of Sciences for the Developing World (TWAS), Italy, International Association for Pattern recognition, USA, International Association of Fuzzy Systems, USA, and all the four National Academies for Science/Engineering in India. He is a co-author of fifteen books and more than three hundred research publications in the areas of Pattern Recognition and Machine Learning, Image Processing, Data Mining and Web Intelligence, Soft Computing, Neural Nets, Genetic Algorithms, Fuzzy Sets, Rough Sets and Bioinformatics.

Prof. Pal is/ was an *Associate Editor* of IEEE Trans. Pattern Analysis and Machine Intelligence (2002-06), IEEE Trans. Neural Networks [1994-98 & 2003-06], Neurocomputing (1995-2005), Pattern Recognition Letters, Int. J. Pattern Recognition & Artificial Intelligence, Applied Intelligence, Information Sciences, Fuzzy Sets and Systems, Fundamenta Informaticae, LNCS Trans. On Rough Sets, Int. J. Computational Intelligence and Applications, IET Image Processing, J. Intelligent Information Systems, and Proc. INSA-A; *Editor-in-Chief*, Int. J. Signal Processing, Image Processing and Pattern Recognition; a *Book Series Editor*, Frontiers in Artificial Intelligence and Applications, IOS Press, and Statistical Science and Interdisciplinary Research, World Scientific; a *Member, Executive Advisory Editorial Board*, IEEE Trans. Fuzzy Systems, Int. Journal on Image and Graphics, and Int. Journal of Approximate Reasoning; and a *Guest Editor* of IEEE Computer.

**Speech Title:** F-granulation, Generalized Rough Entropy and Pattern Recognition

**ABSTRACT:** The role of rough sets in uncertainty handling and granular computing is described. The significance of its integration with other soft computing tools and the relevance of rough-fuzzy computing, as a stronger paradigm for uncertainty handling, are explained. Different applications of rough granules and certain important issues in their implementations are stated. Three tasks such as class-dependent rough-fuzzy granulation for classification, rough-fuzzy clustering and defining generalized rough sets for image ambiguity measures and analysis are then addressed in this regard, explaining the nature and characteristics of granules used therein.

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Merits of class dependent granulation together with neighborhood rough sets for feature selection are demonstrated in terms of different classification indices. Significance of a new measure, called "dispersion" of classification performance, which focuses on confused classes for higher level analysis, is explained in this regard. Superiority of rough-fuzzy clustering is illustrated for determining bio-bases (c-medoids) in encoding protein sequence for analysis. Generalized rough sets using the concept of fuzziness in granules and sets are defined both for equivalence and tolerance relations. These are followed by the definitions of entropy and different image ambiguities. Image ambiguity measures, which take into account both the fuzziness in boundary regions, and the rough resemblance among nearby gray levels and nearby pixels, have been found to be useful for various image analysis operations

The talk concludes with stating the future directions of research and challenges.

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**Roman Slowinski.** Roman Slowinski was born in 1952 in Poznan, Poland. He earned his PhD in 1977 in Computer Science from the Poznan University of Technology and Dr. Habil. in Decision Sciences, also from Poznan University of Technology in 1981. Roman Slowinski is Professor since 1989 and Founding Head of the Laboratory of Intelligent Decision Support Systems within the Institute of Computing Science, Poznan University of Technology, Poland. Since 2002 he also holds a Professor's position at the Systems Research Institute of the Polish Academy of Sciences in Warsaw. He has been professor on European Chair at the University of Paris Dauphine, and invited professor at the Swiss Federal Institute of Technology in Lausanne, at the University of Catania and at Polytech'Tours. Roman Slowinski has conducted extensive research on the methodology and techniques of decision aiding, including multiple criteria decision making, preference modeling, modeling of uncertainty in decision problems, and knowledge-based decision support. This methodology cleverly combines Operations Research and Computational Intelligence. Today Roman Slowinski is perhaps best known for his seminal work on using rough sets in decision analysis. He started this work with the founder of the rough set concept, the late Zdzislaw Pawlak in 1983, and continued with Salvatore Greco and Benedetto Matarazzo since the beginning of the 90's. He organized the First International Workshop on Rough Set Theory and Applications in Poznan, in 1992. In 2010, he has been elected President of the International Rough Set Society (IRSS). His record of publications includes 14 monographs, and over 380 scientific articles in international journals and edited volumes. He has supervised 24 Ph.D. theses in Operations Research and Computer Science. Roman Slowinski is the Editor-in-Chief of the *European Journal of Operational Research* (EJOR) since 1999. He is recipient of the EURO Gold Medal (1991) and the MCDM Society's Edgeworth-Pareto Award (1997). In 2004, he was elected member of the Polish Academy of Sciences, a corporation of 350 outstanding Polish scholars. In 2005, he received the Annual Prize of the Foundation for Polish Science, regarded as the most prestigious scientific award in Poland. Additional recognitions include Doctor Honoris Causa of Polytechnic Faculty of Mons (2000), University of Paris Dauphine (2001) and Technical University of Crete (2008).

**Speech Title:** Knowledge Discovery about Preferences using the Dominance-based Rough Set Approach

**ABSTRACT:** The aim of scientific decision aiding is to give the decision maker a recommendation concerning a set of objects (also called alternatives, solutions, acts, actions, . . . ) evaluated from multiple points of view considered relevant for the problem at hand and called attributes (also

called features, variables, criteria, . . . ). On the other hand, a rational decision maker acts with respect to his/her value system so as to make the best decision. Confrontation of the value system of the decision maker with characteristics of the objects results in expression of preferences of the decision maker on the set of objects. In order to recommend the most-preferred decisions with respect to classification, choice or ranking, one must identify decision maker's preferences. In this presentation, we review multi-attribute preference models, and we focus on preference discovery from data describing some past decisions of the decision maker. The considered preference model has the form of a set of "if..., then..." decision rules induced from the data. In case of multi-attribute classification the syntax of rules is: "**if** performance of action *a* is better (or worse) than given values of some attributes, **then** *a* belongs to at least (at most) given class", and in case of multi-attribute choice or ranking: "**if** action *a* is preferred to action *b* in at least (at most) given degrees with respect to some attributes, **then** *a* is preferred to *b* in at least (at most) given degree". To structure the data prior to induction of such rules, we use the Dominance-based Rough Set Approach (DRSA). DRSA is a methodology for reasoning about ordinal data, which extends the classical rough set approach by handling background knowledge about ordinal evaluations of objects and about monotonic relationships between these evaluations. We present DRSA to preference discovery in case of multi-attribute classification, choice and ranking, in the case of single and multiple decision makers, and in the case of decision under uncertainty and time preference. The presentation is mainly based on publications [1,2,3].

## References

- [1] S.Greco, B.Matarazzo, R.Slowinski: Dominance-based rough set approach to decision involving multiple decision makers. [In]: *Rough Sets and Current Trends in Computing (RSCTC 2006)*. LNAI 4259, Springer, Berlin, 2006, pp. 306-317.
- [2] S.Greco, B.Matarazzo, R.Slowinski: Dominance-based rough set approach to decision under uncertainty and time preference. *Annals of Operations Research*, 176 (2010) 41-75.
- [3] R.Slowinski, S.Greco, B.Matarazzo: Rough Sets in Decision Making. [In]: R.A.Meyers (ed.): *Encyclopedia of Complexity and Systems Science*, Springer, New York, 2009, pp. 7753-7786.



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**Ian H. Witten.** Ian H. Witten is Professor of Computer Science at the University of Waikato in New Zealand where he directs the New Zealand Digital Library research project. His research interests include language learning, information retrieval, and machine learning. He has published widely, including several books, such as *Managing Gigabytes* (1999), *How to build a digital library* (2003), *Data Mining* (2005) and *Web Dragons* (2007). He is a Fellow of the ACM and of the Royal Society of New Zealand. He received the 2004 IFIP Namur Award, a biennial honour accorded for “outstanding contribution with international impact to the awareness of social implications of information and communication technology” and (with the rest of the Weka team) the 2005 SIGKDD Service Award for “an outstanding contribution to the data mining field” and in 2006 the Royal Society of New Zealand Hector Medal for “an outstanding contribution to the advancement of the mathematical and information sciences.”

**Speech Title:** Wikipedia and how to use it for semantic document representation

**ABSTRACT:** Wikipedia is a goldmine of information; not just for its many readers, but also for the growing community of researchers who recognize it as a resource of exceptional scale and utility. It represents a vast investment of manual effort and judgment: a huge, constantly evolving tapestry of concepts and relations that is being applied to a host of tasks.

This talk focuses on the process of "wikification"; that is, automatically and judiciously augmenting a plain-text document with pertinent hyperlinks to Wikipedia articles—as though the document were itself a Wikipedia article. I first describe how Wikipedia can be used to determine semantic relatedness between concepts. Then I explain how to wikify documents by exploiting Wikipedia's internal hyperlinks for relational information and their anchor texts as lexical information. Data mining techniques are used throughout to optimize the models involved.

I will discuss applications to knowledge-based information retrieval, topic indexing, document tagging, and document clustering. Some of these perform at human levels. For example, on CiteULike data, automatically extracted tags are competitive with tag sets assigned by the best human taggers, according to a measure of consistency with other human taggers. All this work uses English, but involves no syntactic parsing, so the techniques are language independent.

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Bo Zhang . Professor Bo Zhang is now a professor of Computer Science and Technology Department of Tsinghua University, the fellow of Chinese Academy of Sciences. In 1958 he graduated from Automatic Control Department of Tsinghua University, and became a faculty member since then. From 1980/02 to 1982/02 he visited University of Illinois at Urbana-Champaign, USA as a scholar. He is now the chairman of steering committee of Research Institute of Information Technology, Tsinghua University, the technical advisor of Fujian government, and the member of Technical Advisory Board of Microsoft Research Asia.

He is engaged in the research on artificial intelligence, artificial neural networks, genetic algorithms, intelligent robotics, pattern recognition and intelligent control. In these fields, he has published over 150 papers and 4 monographs, where 2 are English versions.

Speech Title: Granular Computing and Computational Complexity

**ABSTRACT:** Granular computing is to imitate human's multi-granular computing strategy to problem solving in order to endow computers with the same capability. Its final goal is to reduce the computational complexity. To the end, based on the simplicity principle the problem at hand should be represented as simpler as possible. From structural information theory, it's known that if a problem is represented at different granularities, the hierarchical description of the problem will be a simpler one. The simpler the representation the lower the computational complexity of problem solving should be.

We presented a quotient space theory to multi-granular computing. Based on the theory a problem represented by quotient spaces will have a hierarchical structure. Therefore, the quotient space based multi-granular computing can reduce the computational complexity in problem solving. In the talk, we'll discuss how the hierarchical representation can reduce the computational complexity in problem solving by using some examples.

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