ACIIDS 2013 was the fifth event of the series of international scientific conferences for research and applications in the field of intelligent information and database systems. The aim of ACIIDS 2013 was to provide an internationally respected forum for scientific research in the technologies and applications of intelligent information and database systems. ACIIDS 2013 was co-organized by Universiti Teknologi Malaysia (Malaysia) and Wroclaw University of Technology Poland (Poland) in co-operation with Nguyen Tat Thanh University (Vietnam) and took place in Kuala Lumpur (Malaysia) during March 18–20, 2013. The first two events, ACIIDS 2009 and ACIIDS 2010, took place in Dong Hoi City and Hue City in Vietnam, respectively. The third event, ACIIDS 2011, took place in Daegu (Korea), while the fourth event, ACIIDS 2012, took place in Kaohsiung (Taiwan).

Submissions came from 20 countries from all over the world. Each paper was peer reviewed by at least two members of the International Program Committee and International Reviewer Board. Only 108 papers with the highest quality were selected for oral presentation and publication in the two-volumes proceedings of ACIIDS 2013.

The papers included in the proceedings cover the following topics: intelligent database systems, data warehouses and data mining, natural language processing and computational linguistics, Semantic Web, social networks and recommendation systems, collaborative systems and applications, e-business and e-commerce systems, e-learning systems, information modeling and requirements engineering, information retrieval systems, intelligent agents and multi-agent systems, intelligent information systems, intelligent Internet systems, intelligent optimization techniques, object-relational DBMS, ontologies and knowledge sharing, semi-structured and XML database systems, unified modeling language and unified processes, Web services and Semantic Web, computer networks and communication systems.

Accepted and presented papers highlight new trends and challenges of intelligent information and database systems. The presenters showed how new research could lead to new and innovative applications. We hope you will find these results useful and inspiring for your future research.

We would like to express our sincere thanks to the Honorary Chairs, Zaini Ujang (Universiti Teknologi Malaysia, Malaysia) and Tadeusz Wieckowski (Rector of Wroclaw University of Technology, Poland) for their support.

Our special thanks go to the General Co-chair, Program Co-chairs, all Program and Reviewer Committee members, and all the additional reviewers for their valuable efforts in the review process that helped us to guarantee the highest quality of the selected papers for the conference. We cordially thank the
organizers and chairs of special sessions, who essentially contributed to the success of the conference.

We also would like to express our thanks to the Keynote Speakers (Hoang Pham, Naomie Salim, Mong-Fong Horng, Sigeru Omatu) for their interesting and informative talks of world-class standard.

We cordially thank our main sponsors, Universiti Teknologi Malaysia (Malaysia), Wroclaw University of Technology (Poland), and Nguyen Tat Thanh University (Vietnam). Our special thanks are due also to Springer for publishing the proceedings, and to the other sponsors for their kind support.

We wish to thank the members of the Organizing Committee for their very substantial work, especially those who played essential roles: Habibollah Haron (Organizing Chair) and the members of the Local Organizing Committee for their excellent work.

We cordially thank all the authors for their valuable contributions and other participants of this conference. The conference would not have been possible without them.

Thanks are also due to many experts who contributed to making the event a success.

March 2013

Ngoc Thanh Nguyen
Ali Selamat
Conference Organization

Honorary Chairs

Zaini Ujang  
Vice Chancellor of Universiti Teknologi Malaysia, Malaysia

Tadeusz Wieckowski  
President of Wroclaw University of Technology, Poland

General Co-chairs

Ngoc Thanh Nguyen  
Wroclaw University of Technology, Poland

Mohd Aizaini Maarof  
Universiti Teknologi Malaysia, Malaysia

Program Chairs

Ali Selamat  
Universiti Teknologi Malaysia, Malaysia

Shyi-Ming Chen  
National Taiwan University of Science and Technology, Taiwan

Organizing Chair

Habibollah Haron  
Universiti Teknologi Malaysia, Malaysia

Session Chairs

Andri Mirzal  
Universiti Teknologi Malaysia, Malaysia

Bogdan Trawinski  
Wroclaw University of Technology, Poland

Jason J. Jung  
Yeungnam University, Republic of Korea

Organizing Committee

Roliana Ibrahim  
Universiti Teknologi Malaysia, Malaysia

Nor Erne Nazira Bazin  
Universiti Teknologi Malaysia, Malaysia

Dewi Nasien  
Universiti Teknologi Malaysia, Malaysia

Mohamad Shukor Talib  
Universiti Teknologi Malaysia, Malaysia
VIII Conference Organization

Steering Committee

Ngoc Thanh Nguyen  Chair, Wroclaw University of Technology, Poland
Longbing Cao  University of Technology Sydney, Australia
Tu Bao Ho  Japan Advanced Institute of Science and Technology, Japan
Tzung-Pei Hong  National University of Kaohsiung, Taiwan
Lakhmi C. Jain  University of South Australia, Australia
Geun-Sik Jo  Inha University, Korea
Jason J. Jung  Yeungnam University, Korea
Hoai An Le-Thi  University Paul Verlaine – Metz, France
Toyoaki Nishida  Kyoto University, Japan
Leszek Rutkowski  Technical University of Czestochowa, Poland
Dickson Lukose  Knowledge Technology Cluster at MIMOS BHD, Malaysia

Keynote Speakers

Hoang Pham  Rutgers, The State University of New Jersey, USA
Naomie Salim  Universiti Teknologi Malaysia, Malaysia
Mong-Fong Horng  National Kaohsiung University of Applied Sciences, Taiwan
Sigeru Omatu  Osaka Institute of Technology, Japan

Special Sessions Organizers

1. *International Workshop on Engineering Knowledge and Semantic Systems (IWEKSS 2013)*
   - Jason J. Jung  Yeungnam University, Korea
   - Dariusz Krol  Wroclaw University of Technology, Poland

   - Le Thi Hoai An  University of Lorraine, France
   - Pham Dinh Tao  INSA-Rouen, France

3. *Intelligent Supply Chains (ISC 2013)*
   - Arkadiusz Kawa  Poznan University of Economics, Poland
   - Paulina Golińska  Poznan University of Technology, Poland
   - Milena Ratajczak-Mrozek  Poznan University of Economics, Poland
4. *Intelligent Systems for Medical Applications (ISMA 2013) Information Systems and Industrial Engineering (MOT-ISIE)*

Uvais Qidwai  
Qatar University, Qatar

5. *Innovations in Intelligent Computation and Applications (ICA 2013)*

Shyi-Ming Chen  
National Taiwan University of Science and Technology, Taiwan

6. *Computational Biology and Bioinformatics (CBB 2013)*

Mohd Saberi Mohamad  
Universiti Teknologi Malaysia, Malaysia

7. *Multiple Model Approach to Machine Learning (MMAML 2013)*

Tomasz Kajdanowicz  
Wroclaw University of Technology, Poland
Tomasz Luczak  
Wroclaw University of Technology, Poland
Grzegorz Matoga  
Wroclaw University of Technology, Poland

8. *Intelligent Recommender Systems (IRS 2013)*

Adrianna Kozierkiewicz-Hetmańska  
Wroclaw University of Technology
Ngoc Thanh Nguyen  
Wroclaw University of Technology

9. *Applied Data Mining for Semantic Web (ADMSW 2013)*

Trong Hai Duong  
Quang Binh University, Vietnam
Bay Vo  
Information Technology College, Vietnam

**International Program Committee**

Abdul Rahim Ahmad  
Universiti Tenaga Nasional, Malaysia
Abdul Samad Ismail  
Universiti Teknologi Malaysia, Malaysia
Abdul Samad Shibghatullah  
Universiti Teknikal Malaysia, Malaysia
Adrianna Kozierkiewicz-Hetmańska  
Wroclaw University of Technology, Poland
Alex Sim  
Universiti Teknologi Malaysia, Malaysia
Alvin Yeo  
Universiti Malaysia Sarawak, Malaysia
Amir Shafie  
International Islamic University Malaysia, Malaysia
Annabel Latham  
The Manchester Metropolitan University, UK
Antoni Wibowo
Arkadiusz Kawa
Aryati Bakri
Azlan Mohd Zain
Azurah Abu Samah
Bay Vo
Behnam Rouzbehani
Bing-Han Tsai
Bjoern Schuller
Bogdan Trawinski
Boguslaw Cyganek
Cheng-Yi Wang
Dariusz Barbucha
Dariusz Frejlichowski
Dariusz Krol
Dongjin Choi
Dragan Simic
El-Houssaine Aghezzaf
Elżbieta Kukla
Eric Pardede
Faisal Zaman
Fan Wang
Geetam Tomar
Gia-An Hong
Gordan Jezic
Hae Young Lee
Halina Kwasnicka
Hoai An Le Thi
Huey-Ming Lee
Huynh Binh
Hyon Hee Kim
Imran Ghani
Ireneusz Czarnowski
Iskandar Ishak
Jafar Razmara

Universiti Teknologi Malaysia, Malaysia
Poznan University of Economics, Poland
Universiti Teknologi Malaysia, Malaysia
Universiti Teknologi Malaysia, Malaysia
Information Technology College, Vietnam
Islamic Azad University, Central Tehran Branch, Iran
National Taiwan University of Science and Technology, Malaysia
Technische Universität München, Germany
Wrocław University of Technology, Poland
AGH University of Science and Technology, Poland
National Taiwan University of Science and Technology, Taiwan
Gdynia Maritime University, Poland
West Pomeranian University of Technology, Poland
Bournemouth University, UK
Chosun University, Korea
University of Novi Sad, Serbia
Ghent University, Belgium
Wrocław University of Technology, Poland
La Trobe University, Australia
Kyushu Institute of Technology, Poland
Microsoft, USA
Malwa Institute of Technology and Management, Gwalior, India
National Taiwan University of Science and Technology, Taiwan
University of Zagreb, Croatia
ETRI, Korea
Wrocław University of Technology, Poland
University of Lorraine, France
Chinese Culture University, Taiwan
University of Science and Technology, Vietnam
Dongduk Women’s University, Korea
Universiti Teknologi Malaysia, Malaysia
Gdynia Maritime University, Poland
Universiti Putra Malaysia, Malaysia
Universiti Teknologi Malaysia, Malaysia
Jarosław Jankowski, West Pomeranian University of Technology in Szczecin, Poland
Jason Jung, Yeungnam University, Korea
Jerome Euzenat, INRIA, France
Jesús Alcalá-Fdez, University of Granada, Spain
Jose Norberto Mazon, University of Alicante, Spain
Kamal Zamli, Universiti Malaysia Pahang, Malaysia
Kang-Hyun Jo, University of Ulsan, Korea
Katarzyna Grzybowska, Poznan University of Technology, Poland
Kazuhiro Kuwabara, Ritsumeikan University, Japan
Khairuddin Omar, Universiti Kebangsaan Malaysia, Malaysia
Lian En Chai, Universiti Teknologi Malaysia, Malaysia
Manh Nguyen Duc, ENSTA Bretagne, France
Marcin Hajdul, Institute of Logistics and Warehousing, Poland
Maria Bielikova, University of Technology in Bratislava, Slovakia
Md. Nazrul Islam, Universiti Teknologi Malaysia, Malaysia
Michał Woźniak, Wroclaw University of Technology, Poland
Milena Ratajczak-Mrozek, Poznan University of Economics, Poland
Minh Le Hoai, University of Lorraine, France
Mohd Helmy Abd Wahab, Universiti Tun Hussein Onn Malaysia, Malaysia
Mohd Murtadha Mohamad, Universiti Teknologi Malaysia, Malaysia
Mohd Ramzi Mohd Hussain, International Islamic University Malaysia, Malaysia
Mohd Saberi Mohamad, Universiti Teknologi Malaysia, Malaysia
Moon II Chul, Korean Institute Science and Technology, Korea
Muhammad Khan, King Saud University, Saudi Arabia
Muhammad Razib Othman, Universiti Teknologi Malaysia, Malaysia
Mohd Salihin Ngadiman, Universiti Teknologi Malaysia, Malaysia
Muhammad Shuaib Karim, Quaid-i-Azam University, Malaysia
Muhammad Suzuki Hitam, Universiti Malaysia Terengganu, Malaysia
Nghi Do Thanh, Telecom-Bretagne, France
Ngoc Thanh Nguyen, Wroclaw University of Technology, Poland
Niels Pinkwart, Clausthal University of Technology, Germany
Nojeong Heo, Dongyang University, Korea
Noorfa Haszlinna Mustaffa, Universiti Teknologi Malaysia, Malaysia
Nor Azizah Ali, Universiti Teknologi Malaysia, Malaysia
Nor Haizan Mohamed Radzi, Universiti Teknologi Malaysia, Malaysia
Nor Hawaniah Zakaria, Universiti Teknologi Malaysia, Malaysia
Norazah Yusof  
Universiti Teknologi Malaysia, Malaysia

Norazman Ismail  
Universiti Teknologi Malaysia, Malaysia

Olgierd Unold  
Wroclaw University of Technology, Poland

Ondrej Krejcar  
University of Hradec Kralove, Czech Republic

Trong Hai Duong  
Inha University, Korea

Bernadetta Mianowska  
Wroclaw University of Technology, Poland

Michal Sajkowski  
Poznan University of Technology, Poland

Robert Susmaga  
Poznan University of Technology, Poland
## Tools and Applications

**Detection of Noise in Digital Images by Using the Averaging Filter**

Name COV .......................................................... 1

*Janusz Pawel Kowalski, Jakub Peksinski, and Grzegorz Mikolajczak*

**k-Means Clustering on Pre-calculated Distance-Based Nearest Neighbor Search for Image Search** ........................................ 9

*Jing Yi Tou and Chun Yee Yong*

**A New Approach for Collaborative Filtering Based on Mining Frequent Itemsets** ........................................................ 19

*Phung Do, Vu Thanh Nguyen, and Tran Nam Dung*

**Reduction of Training Noises for Text Classifiers** ............ 30

*Rey-Long Liu*

**Prediction of Relevance between Requests and Web Services Using ANN and LR Models** .................................................. 40

*Keyvan Mohebbi, Suhaimi Ibrahim, and Norbik Bashah Idris*

**A Ruled-Based Part of Speech (RPOS) Tagger for Malay Text Articles** .......................................................... 50

*Rayner Alfred, Adam Mujat, and Joe Henry Obit*

**Viable System Model in Capturing Iterative Features within Architectural Design Processes** ................................. 60

*Roliana Ibrahim, Khairul Anwar Mohamed Khaidzir, and Fahimeh Zaeri*

**Identifying Same Wavelength Groups from Twitter: A Sentiment Based Approach** .................................................. 70

*Rafeeque Pandarachalil and Selvaraju Sendhilkumar*

**An Improved Evolutionary Algorithm for Extractive Text Summarization** .................................................. 78

*Albaraa Abuobieda, Naomie Salim, Yogan Jaya Kumar, and Ahmed Hamza Osman*

**Hybrid-Learning Based Data Gathering in Wireless Sensor Networks** ... 90

*Mohammad Abdur Razzaque, Ismail Fauzi, and Akhtaruzzaman Adnan*
**Intelligent Recommender Systems**

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orienteering Problem Modeling for Electric Vehicle-Based Tour</td>
<td>100</td>
</tr>
<tr>
<td>Junghoon Lee and Gyung-Leen Park</td>
<td></td>
</tr>
<tr>
<td>Integrating Social Information into Collaborative Filtering for</td>
<td>109</td>
</tr>
<tr>
<td>Celebrities Recommendation</td>
<td></td>
</tr>
<tr>
<td>Qingwen Liu, Yan Xiong, and Wenchao Huang</td>
<td></td>
</tr>
<tr>
<td>A Semantically Enhanced Tag-Based Music Recommendation Using Emotion</td>
<td>119</td>
</tr>
<tr>
<td>Ontology</td>
<td></td>
</tr>
<tr>
<td>Hyon Hee Kim</td>
<td></td>
</tr>
<tr>
<td>A Method for Determination of an Opening Learning Scenario in</td>
<td>129</td>
</tr>
<tr>
<td>Intelligent Tutoring Systems</td>
<td></td>
</tr>
<tr>
<td>Adrianna Kozierkiewicz-Hetmańska and Dariusz Zywśk</td>
<td></td>
</tr>
<tr>
<td>Recommending QA Documents for Communities of Question-Answering</td>
<td>139</td>
</tr>
<tr>
<td>Websites</td>
<td></td>
</tr>
<tr>
<td>Duen-Ren Liu, Chun-Kai Huang, and Yu-Hsuan Chen</td>
<td></td>
</tr>
<tr>
<td>Using Subtree Agreement for Complex Tree Integration Tasks</td>
<td>148</td>
</tr>
<tr>
<td>Marcin Maleszka and Ngoc Thanh Nguyen</td>
<td></td>
</tr>
<tr>
<td>Data Sets for Offline Evaluation of Scholar’s Recommender System</td>
<td>158</td>
</tr>
<tr>
<td>Bahram Amini, Roliana Ibrahim, and Mohd Shahizan Othman</td>
<td></td>
</tr>
<tr>
<td>A Method for Collaborative Recommendation in Document Retrieval</td>
<td>168</td>
</tr>
<tr>
<td>Systems</td>
<td></td>
</tr>
<tr>
<td>Bernadetta Mianowska and Ngoc Thanh Nguyen</td>
<td></td>
</tr>
</tbody>
</table>

**Multiple Model Approach to Machine Learning**

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combining Multiple Clusterings of Chemical Structures Using Cumulative</td>
<td>178</td>
</tr>
<tr>
<td>Voting-Based Aggregation Algorithm</td>
<td></td>
</tr>
<tr>
<td>Faisal Saeed, Naomie Salim, Ammar Abdo, and Hamza Hentabli</td>
<td></td>
</tr>
<tr>
<td>Investigation of Incremental Support Vector Regression Applied to</td>
<td>186</td>
</tr>
<tr>
<td>Real Estate Appraisal</td>
<td></td>
</tr>
<tr>
<td>Tadeusz Lasota, Petru Patrascu, Bogdan Trawiński, and Zbigniew Telec</td>
<td></td>
</tr>
<tr>
<td>A Descriptive Method for Generating siRNA Design Rules</td>
<td>196</td>
</tr>
<tr>
<td>Bui Thang Ngoc, Tu Bao Ho, and Kawasaki Saori</td>
<td></td>
</tr>
<tr>
<td>A Space-Time Trade Off for FUFP-trees Maintenance</td>
<td>206</td>
</tr>
<tr>
<td>Bac Le, Chanh-Truc Tran, Tzung-Pei Hong, and Bay Vo</td>
<td></td>
</tr>
</tbody>
</table>
Adaptive Splitting and Selection Method for Noninvasive Recognition of Liver Fibrosis Stage ................................................................. 215
   Bartosz Krawczyk, Michał Woźniak, Tomasz Orczyk, and Piotr Porwik

Investigation of Mixture of Experts Applied to Residential Premises Valuation ............................................................. 225
   Tadeusz Lasota, Bartosz Londzin, Bogdan Trawiński, and Zbigniew Telec

Competence Region Modelling in Relational Classification .......... 236
   Tomasz Kajdanowicz, Tomasz Filipowski, Przemysław Kazienko, and Piotr Bródkal

Engineering Knowledge and Semantic Systems

Approach to Practical Ontology Design for Supporting COTS Component Selection Processes ..................................................... 245
   Agnieszka Konys, Jarosław Wątróbski, and Przemysław Różewski

Planning of Relocation Staff Operations in Electric Vehicle Sharing Systems .......................................................... 256
   Junghoon Lee and Gyung-Leen Park

Thematic Analysis by Discovering Diffusion Patterns in Social Media: An Exploratory Study with TweetScope .......................... 266
   Duc Nguyen Trung, Jason J. Jung, Namhee Lee, and Jinhwa Kim

A Practical Method for Compatibility Evaluation of Portable Document Formats ............................................................... 275
   Dariusz Król and Michał Lopatka

Sentiment Analysis for Tracking Breaking Events: A Case Study on Twitter ............................................................. 285
   Dongjin Choi and Pankoo Kim

Computational Biology and Bioinformatics

Classification of Plantar Dermatoglyphic Patterns for the Diagnosis of Down’s Syndrome ..................................................... 295
   Hubert Wojtowicz and Wiesław Wajs

Adaptive Cumulative Voting-Based Aggregation Algorithm for Combining Multiple Clusterings of Chemical Structures ............... 305
   Faisal Saeed, Naomie Salim, Ammar Abdo, and Hamza Hentabli

LINGO-DOSM: LINGO for Descriptors of Outline Shape of Molecules .............................................................. 315
   Hamza Hentabli, Naomie Salim, Ammar Abdo, and Faisal Saeed
Prediction of Mouse Senescence from HE-Stain Liver Images Using an Ensemble SVM Classifier ............................................... 325
   Hui-Ling Huang, Ming-Hsin Hsu, Hua-Chin Lee,
   Phasit Charoenkwan, Shinn-Jang Ho, and Shinn-Ying Ho

Computational Intelligence

An Introduction to Yoyo Blind Man Algorithm (YOYO-BMA) ........ 335
   Mohammad Amin Soltani-Sarvestani and Shahriar Lotfi

A New Method for Job Scheduling in Two-Levels Hierarchical Systems ................................................................. 345
   Amin Shokripour, Mohamed Othman, Hamidah Ibrahim, and
   Shamala Subramaniam

Intelligent Water Drops Algorithm for Rough Set Feature Selection .... 356
   Basem O. Alijla, Lim Chee Peng, Ahamad Tajudin Khader, and
   Mohammed Azmi Al-Betar

Information-Based Scale Saliency Methods with Wavelet Sub-band Energy Density Descriptors ........................................ 366
   Anh Cat Le Ngo, Li-Minn Ang, Guoping Qiu, and Kah Phooi Seng

Feature Subset Selection Using Binary Gravitational Search Algorithm for Intrusion Detection System ..................................... 377
   Amir Rajabi Behjat, Aida Mustapha, Hossein Nezamabadi – pour,
   Md. Nasir Sulaiman, and Norwati Mustapha

Modelling and Optimization Techniques in Information Systems, Database Systems and Industrial Systems

Sparse Signal Recovery by Difference of Convex Functions Algorithms ................................................................. 387
   Hoai An Le Thi, Bich Thuy Nguyen Thi, and Hoai Minh Le

DC Programming and DCA Based Cross-Layer Optimization in Multi-hop TDMA Networks ............................................. 398
   Hoai An Le Thi, Quang Thuan Nguyen, Khoa Tran Phan, and
   Tao Pham Dinh

The Multi-flow Necessary Condition for Membership in the Pedigree Polytope Is Not Sufficient- A Counterexample ..................... 409
   Laleh Haerian Ardekani and Tiru S. Arthanari
## Table of Contents – Part II

<table>
<thead>
<tr>
<th>Title</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A Linear Integer Program to Reduce Air Traffic Delay in Enroute Airspace</strong></td>
<td>420</td>
</tr>
<tr>
<td><em>Ihsen Farah, Adnan Yassine, and Thierry Galinho</em></td>
<td></td>
</tr>
<tr>
<td><strong>Intelligent Supply Chains</strong></td>
<td></td>
</tr>
<tr>
<td>Modeling the Structure of Recommending Interfaces with Adjustable Influence on Users</td>
<td>429</td>
</tr>
<tr>
<td><em>Jaroslaw Jankowski</em></td>
<td></td>
</tr>
<tr>
<td>Increasing Website Conversions Using Content Repetitions with Different Levels of Persuasion</td>
<td>439</td>
</tr>
<tr>
<td><em>Jaroslaw Jankowski</em></td>
<td></td>
</tr>
<tr>
<td>Virtual Collaboration in the Supply Chains – T-Scale Platform Case Study</td>
<td>449</td>
</tr>
<tr>
<td><em>Marcin Hajdul</em></td>
<td></td>
</tr>
<tr>
<td>Cooperation between Logistics Service Providers Based on Cloud Computing</td>
<td>458</td>
</tr>
<tr>
<td><em>Arkadiusz Kawa and Milena Ratajczak-Mrozek</em></td>
<td></td>
</tr>
<tr>
<td><strong>Applied Data Mining for Semantic Web</strong></td>
<td></td>
</tr>
<tr>
<td>Discovering Missing Links in Large-Scale Linked Data</td>
<td>468</td>
</tr>
<tr>
<td><em>Nam Hau, Ryutaro Ichise, and Bac Le</em></td>
<td></td>
</tr>
<tr>
<td>Effective Hotspot Removal System Using Neural Network Predictor</td>
<td>478</td>
</tr>
<tr>
<td><em>Sangyoon Oh, Mun-Young Kang, and Sanggil Kang</em></td>
<td></td>
</tr>
<tr>
<td>A Case Study on Trust-Based Automated Blog Recommendation Making</td>
<td>489</td>
</tr>
<tr>
<td><em>Nurul Akhmal Mohd Zulkefl, Hai Trong Duong, and Baharum Baharudin</em></td>
<td></td>
</tr>
<tr>
<td><strong>Semantic Web and Ontology</strong></td>
<td></td>
</tr>
<tr>
<td>Consensus for Collaborative Ontology-Based Vietnamese WordNet Building</td>
<td>499</td>
</tr>
<tr>
<td><em>Tuong Le, Trong Hai Duong, Bay Vo, and Sanggil Kang</em></td>
<td></td>
</tr>
<tr>
<td>An Ontological Context-Aware Approach for a Dynamic Business Process Formulation</td>
<td>509</td>
</tr>
<tr>
<td><em>Hanh Huu Hoang</em></td>
<td></td>
</tr>
</tbody>
</table>
# Table of Contents – Part II

## Integration of Information systems

SMAC - Dataflow and Storage Modeling for Remote Personnel
Identification in Restricted Areas ........................................... 519

*Piotr Czekalski and Krzysztof Tokarz*

Infrastructure vs. Access Competition in NGNs .......................... 529

*João Paulo Ribeiro Pereira*

## Conceptual Modeling in Advanced Database Systems

Modeling and Verifying DML Triggers Using Event-B...................... 539

*Hong Anh Le and Ninh Thuan Truong*

A Conceptual Multi-agent Framework Using Ant Colony Optimization
and Fuzzy Algorithms for Learning Style Detection ....................... 549

*Ghusoon Salim Basheer, Mohd Sharifuddin Ahmad, and Alicia Y.C. Tang*

## Author Index

.................................................. 559
# Table of Contents – Part I

## Innovations in Intelligent Computation and Applications -1

Intelligent Moving Objects Detection via Adaptive Frame Differencing

Chun-Ming Tsai and Zong-Mu Yeh

Global Artificial Bee Colony Algorithm for Boolean Function Classification

Habib Shah, Rozaida Ghazali, and Nazri Mohd Nawi

Fuzzy Decision Making Based on Hesitant Fuzzy Linguistic Term Sets

Li-Wei Lee and Shyi-Ming Chen

Time-Varying Mutation in Particle Swarm Optimization

S. Masrom, Siti. Z.Z. Abidin, N. Omar, and K. Nasir

Extending and Formalizing Bayesian Networks by Strong Relevant Logic

Jianzhe Zhao, Ying Liu, and Jingde Cheng

Mining Multidimensional Frequent Patterns from Relational Database

Yue-Shi Lee and Show-Jane Yen

A Hybrid Cloud for Effective Retrieval from Public Cloud Services

Yi-Hsing Chang and Jheng-Yu Chen

## Innovations in Intelligent Computation and Applications -2

A New Method for Generating the Chinese News Summary Based on Fuzzy Reasoning and Domain Ontology

Shyi-Ming Chen and Ming-Hung Huang

Hybrid PSO and GA for Neural Network Evolutionary in Monthly Rainfall Forecasting

Linli Jiang and Jiansheng Wu

Forecasting the TAIEX Based on Fuzzy Time Series, PSO Techniques and Support Vector Machines

Shyi-Ming Chen and Pei-Yuan Kao
On the Design of Neighboring Fuzzy Median Filter for Removal of Impulse Noises ................................................................. 99  
*Chung-Ming Own and Chi-Shu Huang*

An Elastic Net Clustering Algorithm for Non-linearly Separable Data... 108  
*Chun-Wei Tsai, Chien-Hung Tung, and Ming-Chao Chiang*

Anticipatory Emergency Elevator Evacuation Systems .................... 117  
*Kai Shi, Yuichi Goto, Zhiliang Zhu, and Jingde Cheng*

A Stock Selective System by Using Hybrid Models of Classification ...... 127  
*Shou-Hsiung Cheng*

**Intelligent Database Systems -1**

An Efficient Method for Discovering Motifs in Large Time Series .......... 135  
*Cao Duy Truong and Duong Tuan Anh*

CFTL – Flash Translation Layer for Column Oriented Databases .......... 146  
*Krzysztof Kwiatkowski and Wojciech Macyna*

Parallelizing the Improved Algorithm for Frequent Patterns Mining Problem ................................................................. 156  
*Thanh-Trung Nguyen, Bach-Hien Nguyen, and Phi-Khu Nguyen*

Dimensionality Reduction in Data Summarization Approach to Learning Relational Data .................................................... 166  
*Chung Seng Kheau, Rayner Alfred, and Lau Hui Keng*

Generating Relevant and Diverse Query Suggestions Using Sparse Manifold Ranking with Sink Regions ..................................... 176  
*Van Thanh Nguyen and Kim Anh Nguyen*

Measuring Data Completeness for Microbial Genomics Database ....... 186  
*Nurul A. Emran, Suzanne Embury, Paolo Missier, Mohd Noor Mat Isa, and Azah Kamilah Muda*

**Intelligent Database Systems -2**

Road Traffic Prediction Using Context-Aware Random Forest Based on Volatility Nature of Traffic Flows .................................... 196  
*Narjes Zarei, Mohammad Ali Ghayour, and Sattar Hashemi*

Scoring-Thresholding Pattern Based Text Classifier ........................ 206  
*Moch Arif Bijaksana, Yuefeng Li, and Abdulmohsen Algarni*
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reference Architectures to Measure Data Completeness across</td>
<td>216</td>
</tr>
<tr>
<td>Integrated Databases</td>
<td></td>
</tr>
<tr>
<td><em>Nurul A. Emran, Suzanne Embury, Paolo Missier, and Norashikin Ahmad</em></td>
<td></td>
</tr>
<tr>
<td>Vietnamese Author Name Disambiguation for Integrating Publications</td>
<td>226</td>
</tr>
<tr>
<td>from Heterogeneous Sources</td>
<td></td>
</tr>
<tr>
<td><em>Tin Huynh, Kiem Hoang, Tien Do, and Duc Huynh</em></td>
<td></td>
</tr>
<tr>
<td>Retrieval with Semantic Sieve</td>
<td>236</td>
</tr>
<tr>
<td><em>Julian Szymański, Henryk Krawczyk, and Marcin Deptula</em></td>
<td></td>
</tr>
<tr>
<td>GAB-EPA: A GA Based Ensemble Pruning Approach to Tackle</td>
<td>246</td>
</tr>
<tr>
<td>Multiclass Imbalanced Problems</td>
<td></td>
</tr>
<tr>
<td><em>Lida Abdi and Sattar Hashemi</em></td>
<td></td>
</tr>
<tr>
<td><strong>Intelligent Information Systems</strong></td>
<td></td>
</tr>
<tr>
<td>Performance of Different Techniques Applied in Genetic Algorithm</td>
<td>255</td>
</tr>
<tr>
<td>towards Benchmark Functions</td>
<td></td>
</tr>
<tr>
<td><em>Seng Poh Lim and Habibollah Haron</em></td>
<td></td>
</tr>
<tr>
<td>A Runge-Kutta Method with Lower Function Evaluations for Solving</td>
<td>265</td>
</tr>
<tr>
<td>Hybrid Fuzzy Differential Equations</td>
<td></td>
</tr>
<tr>
<td><em>Ali Ahmadian, Mohamed Suleiman, Fudziah Ismail, Soheil Salahshour, and Ferial Ghaemi</em></td>
<td></td>
</tr>
<tr>
<td>A Hybrid PSO-FSVM Model and Its Application to Imbalanced</td>
<td>275</td>
</tr>
<tr>
<td>Classification of Mammograms</td>
<td></td>
</tr>
<tr>
<td><em>Hussein Samma, Chee Peng Lim, and Umi Kalthum Ngah</em></td>
<td></td>
</tr>
<tr>
<td>QTCP: An Approach for Exploring Inter and Intra Protocols</td>
<td>285</td>
</tr>
<tr>
<td>Fairness</td>
<td></td>
</tr>
<tr>
<td><em>Barkatullah Qureshi, Mohamed Othman, Shamala K. Subramaniam, and Nor Asila Wati</em></td>
<td></td>
</tr>
<tr>
<td>Analyzing Hemagglutinin Genes of Human H5N1 Virus by Linear</td>
<td>295</td>
</tr>
<tr>
<td>Neighborhood Embedding</td>
<td></td>
</tr>
<tr>
<td><em>Wei-Chen Cheng</em></td>
<td></td>
</tr>
<tr>
<td>The VHO Project: A Semantic Solution for Vietnamese History Search</td>
<td>304</td>
</tr>
<tr>
<td>System</td>
<td></td>
</tr>
<tr>
<td><em>Dang-Hung Phan and Tuan-Dung Cao</em></td>
<td></td>
</tr>
<tr>
<td>Spam E-Mail Classification Based on the IFWB Algorithm</td>
<td>314</td>
</tr>
<tr>
<td><em>Chichang Jou</em></td>
<td></td>
</tr>
</tbody>
</table>
### Meta Search Models for Online Forum Thread Retrieval: Research in Progress

_Ameer Tawfik Albaham and Naomie Salim_  
325

### Ensemble of Diversely Trained Support Vector Machines for Protein Fold Recognition

_Abdollah Dehzangi and Abdul Sattar_  
335

### Intelligent Information Systems -2

#### Protein Fold Recognition Using Segmentation-Based Feature Extraction Model

_Abdollah Dehzangi and Abdul Sattar_  
345

#### Realtime Pointing Gesture Recognition and Applications in Multi-user Interaction

_Hoang-An Le, Khoi-Nguyen C. Mac, Truong-An Pham, and Minh-Triet Tran_  
355

#### Multi-domain Public Key Infrastructure for Information Security with Use of a Multi-Agent System

_Nilar Aye, Hlaing Su Khin, Toe Toe Win, Tayzar KoKo, MoMo Zin Than, Fumio Hattori, and Kazuhiro Kuwabara_  
365

#### Using Bees Hill Flux Balance Analysis (BHFBA) for in silico Microbial Strain Optimization

_Yee Wen Choon, Mohd Saberi Bin Mohamad, Safaai Deris, Rosli Md. Illias, Lian En Chai, and Chuii Khim Chong_  
375

#### Multiple Gene Sets for Cancer Classification Using Gene Range Selection Based on Random Forest

_Kohbalan Moorthy, Mohd Saberi Bin Mohamad, and Safaai Deris_  
385

#### Ubiquitous Positioning: Integrated GPS/Wireless LAN Positioning for Wheelchair Navigation System

_Wan Mohd Yaakob Wan Bejuri, Wan Mohd Nasri Wan Muhamad Saidin, Mohd Murtadha Bin Mohamad, Maimunah Sapri, and Kah Seng Lim_  
394

#### Correctness of Solving Query-Answering Problems Using Satisfiability Solvers

_Kiyoshi Akama and Ekawit Nantajeewarawat_  
404

#### Identifying Minimal Genomes and Essential Genes in Metabolic Model Using Flux Balance Analysis

_Abdul Hakim Mohamed Salleh, Mohd Saberi Mohamad, Safaai Deris, and Rosli Md. Illias_  
414
# Intelligent Information Systems -3

<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Runtime Verification of Multi-agent Systems Interaction Quality</td>
<td>435</td>
</tr>
<tr>
<td>Najwa Abu Bakar and Ali Selamat</td>
<td></td>
</tr>
<tr>
<td>Bounds on Lengths of Real Valued Vectors Similar with Regard to the</td>
<td>445</td>
</tr>
<tr>
<td>Tanimoto Similarity</td>
<td></td>
</tr>
<tr>
<td>Marzena Kryszkiewicz</td>
<td></td>
</tr>
<tr>
<td>A Quadratic Algorithm for Testing of Z-Codes</td>
<td>455</td>
</tr>
<tr>
<td>Nguyen Dinh Han, Dang Quyet Thang, and Phan Trung Huy</td>
<td></td>
</tr>
<tr>
<td>Designing an Intelligent Problems Solving System Based on Knowledge</td>
<td>465</td>
</tr>
<tr>
<td>about Sample Problems</td>
<td></td>
</tr>
<tr>
<td>Nhon V. Do, Hien D. Nguyen, and Thanh T. Mai</td>
<td></td>
</tr>
<tr>
<td>Semantic Representation and Search Techniques for Document Retrieval</td>
<td>476</td>
</tr>
<tr>
<td>Systems</td>
<td></td>
</tr>
<tr>
<td>VanNhon Do, ThanhThuong T. Huynh, and TruongAn PhamNguyen</td>
<td></td>
</tr>
<tr>
<td>Opposition Differential Evolution Based Method for Text Summarization</td>
<td>487</td>
</tr>
<tr>
<td>Albaraa Abuobieda, Naomie Salim, Yogan Jaya Kumar, and Ahmed Hamza Osman</td>
<td></td>
</tr>
<tr>
<td>An Introduction to Ontology Based Structured Knowledge Base System: Knowledge Acquisition Module</td>
<td>497</td>
</tr>
<tr>
<td>Marek Krótkiewicz and Krystian Wojtkiewicz</td>
<td></td>
</tr>
<tr>
<td>Comparison of Gene Co-expression Networks and Bayesian Networks</td>
<td>507</td>
</tr>
<tr>
<td>Saurabh Nagrecha, Pawan J. Lingras, and Nitesh V. Chawla</td>
<td></td>
</tr>
<tr>
<td>Author Index</td>
<td>517</td>
</tr>
</tbody>
</table>
Detection of Noise in Digital Images by Using the Averaging Filter Name COV

Janusz Pawel Kowalski¹, Jakub Peksinski², and Grzegorz Mikolajczak²

¹ Pomeranian Medical University, Basic Computer Science, Rybacka 1, 70-204 Szczecin, Poland
janus@pum.edu.pl

² West Pomeranian University of Technology, Faculty of Electrical Engineering, 26 Kwietnia 10, 71-126 Szczecin, Poland
{jpeksinski,grzegorz.mikolajczak}@zut.edu.pl

Abstract. One of the significant problems in digital signal processing is the filtering and reduction of undesired interference. Due to the abundance of methods and algorithms for processing signals characterized by complexity and effectiveness of removing noise from a signal, depending on the character and level of noise, it is difficult to choose the most effective method. So long as there is specific knowledge or grounds for certain assumptions as to the nature and form of the noise, it is possible to select the appropriate filtering method so as to ensure optimum quality. This chapter describes several methods for estimating the level of noise and presents a new method based on the properties of the smoothing filter.

Keywords: noise estimation, smoothing filters.

1 Introduction

The dynamic development of computer techniques that has been observed over the past twenty years and the development of digital algorithms for signal processing accompanying it, allows for significant improvement of the quality of obtained images and purposeful interference in the image structure for bringing out certain qualities. Improvement of image quality makes it possible to obtain a significantly greater amount of useful information and also to create a better aesthetic impression. A significant practical matter is the search for methods of improvement of image quality and removal of distortions being the effect of noise.

Effectiveness of filtering, expressed e.g. by the noise reduction coefficient, is a function of many factors, including: the selected filtering algorithm, certain information with noise qualities, and also certain information about the model image [12]. Of special significance is information on the qualities of noise – random or determined, the distribution of power spectral density, variance, etc. In most cases, it is not possible to obtain full data on the noise and attempts at estimation are undertaken – assessment of the level of noise expressed by variance through analysis of image data. Using the information on the level of noise in the image allows for obtainment of an
optimal filtering quality, especially for realization of problems of image reconstruction, edge detection, and others. It is also among the information necessary for the creation and operation of adaptive filtering algorithms.

The applications of noise level estimation in images are very wide and include, among others: removal of noise from astronomical photographs [8]; image reconstruction [2]; edge detection [3],[10, 13]; image segmenting [11, 13]; image smoothing [1]; reduction of noise in photographs made using magnetic resonance technology (MRI) [4].

One of the significant problems in digital signal processing is the filtering and reduction of undesired interference. Due to the abundance of methods and algorithms for processing signals characterized by complexity and effectiveness of removing noise from a signal, depending on the character and level of noise, it is difficult to choose the most effective method. So long as there is specific knowledge or grounds for certain assumptions as to the nature and form of the noise, it is possible to select the appropriate filtering method so as to ensure optimum quality. E.g. the moving average filter has greater noise reduction coefficient than the medium filter with the same mask size, so it will be more suited to removing “large” noise. However, the median is better for maintaining edges and interferes in the signal structure in a lesser degree, which, with a smaller noise reduction coefficient, is more suitable for filtering signals with “low” noise.

The problem is significantly more complex when the character of a given signal cannot be determined. Without additional information, it is often difficult to assess the level and “type of noise”, and sometimes, it is not possible to state whether a random or deterministic course is being dealt with. Due to this, at this point, a test analysis of the properties of smoothing filters and their influence on noise level in the output signal will be conducted.

2 Noise Level Estimation Using Exponential Smoothing Filter

The values of variances of noise signals for individual smoothing methods are derived below. Exponential smoothing of the signal is given by the formula:

\[ y_m = (1-a) \cdot y_{m-1} + a \cdot x_m \quad \text{where} \quad y_0 = (1-a) \cdot x_0 \] (1)

With the acceptance of the following assumptions:

\[ x = s + n \quad V(N) = \sigma_n^2 \] (2)

where: \( x \) – disrupted signal; \( s \) – useful signal; \( n \) – noise. Taking into account that the noise and useful signal are not correlated, the variance of the input signal is equal to:

\[ V(X) = \sigma_s^2 + \sigma_n^2 \quad \text{where} \quad V(S) = V_s = \sigma_s^2 \] (3)