

Hujun Yin Peter Tino  
Emilio Corchado Will Byrne  
Xin Yao (Eds.)

LNCS 4881

# Intelligent Data Engineering and Automated Learning – IDEAL 2007

8th International Conference  
Birmingham, UK, December 2007  
Proceedings



Springer

TP311.13-53  
I19  
2007

Hujun Yin Peter Tino Emilio Corchado  
Will Byrne Xin Yao (Eds.)

# Intelligent Data Engineering and Automated Learning – IDEAL 2007

8th International Conference  
Birmingham, UK, December 16-19, 2007  
Proceedings



 Springer



## Volume Editors

Hujun Yin  
The University of Manchester  
Manchester, M60 1QD, UK  
E-mail: hujun.yin@manchester.ac.uk

Peter Tino  
Will Byrne  
Xin Yao  
University of Birmingham  
Birmingham B15 2TT, UK  
E-mail: {p.tino, w.f.byrne, x.yao}@cs.bham.ac.uk

Emilio Corchado  
University of Burgos  
09001 Burgos, Spain  
E-mail: escorchado@ubu.es

Library of Congress Control Number: 2007941157

CR Subject Classification (1998): H.2.8, F.2.2, I.2, F.4, K.4.4, H.3, H.4

LNCS Sublibrary: SL 3 – Information Systems and Application, incl. Internet/Web and HCI

ISSN 0302-9743  
ISBN-10 3-540-77225-1 Springer Berlin Heidelberg New York  
ISBN-13 978-3-540-77225-5 Springer Berlin Heidelberg New York

This work is subject to copyright. All rights are reserved, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, re-use of illustrations, recitation, broadcasting, reproduction on microfilms or in any other way, and storage in data banks. Duplication of this publication or parts thereof is permitted only under the provisions of the German Copyright Law of September 9, 1965, in its current version, and permission for use must always be obtained from Springer. Violations are liable to prosecution under the German Copyright Law.

Springer is a part of Springer Science+Business Media  
springer.com

© Springer-Verlag Berlin Heidelberg 2007  
Printed in Germany

Typesetting: Camera-ready by author, data conversion by Scientific Publishing Services, Chennai, India  
Printed on acid-free paper SPIN: 12202126 06/3180 5 4 3 2 1 0

*Commenced Publication in 1973*

Founding and Former Series Editors:

Gerhard Goos, Juris Hartmanis, and Jan van Leeuwen

## Editorial Board

David Hutchison

*Lancaster University, UK*

Takeo Kanade

*Carnegie Mellon University, Pittsburgh, PA, USA*

Josef Kittler

*University of Surrey, Guildford, UK*

Jon M. Kleinberg

*Cornell University, Ithaca, NY, USA*

Friedemann Mattern

*ETH Zurich, Switzerland*

John C. Mitchell

*Stanford University, CA, USA*

Moni Naor

*Weizmann Institute of Science, Rehovot, Israel*

Oscar Nierstrasz

*University of Bern, Switzerland*

C. Pandu Rangan

*Indian Institute of Technology, Madras, India*

Bernhard Steffen

*University of Dortmund, Germany*

Madhu Sudan

*Massachusetts Institute of Technology, MA, USA*

Demetri Terzopoulos

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

Doug Tygar

*University of California, Berkeley, CA, USA*

Moshe Y. Vardi

*Rice University, Houston, TX, USA*

Gerhard Weikum

*Max-Planck Institute of Computer Science, Saarbruecken, Germany*

# Lecture Notes in Computer Science

Sublibrary 3: Information Systems and Application, incl. Internet/Web and HCI

For information about Vols. 1–4519  
please contact your bookseller or Springer

- Vol. 4882: T. Janowski, H. Mohanty (Eds.), *Distributed Computing and Internet Technology*. XIII, 346 pages. 2007.
- Vol. 4881: H. Yin, P. Tino, E. Corchado, W. Byrne, X. Yao (Eds.), *Intelligent Data Engineering and Automated Learning - IDEAL 2007*. XX, 1174 pages. 2007.
- Vol. 4877: C. Thanos, F. Borri, L. Candela (Eds.), *Digital Libraries: Research and Development*. XII, 350 pages. 2007.
- Vol. 4872: D. Mery, L. Rueda (Eds.), *Advances in Image and Video Technology*. XXI, 961 pages. 2007.
- Vol. 4871: M. Cavazza, S. Donikian (Eds.), *Virtual Storytelling*. XIII, 219 pages. 2007.
- Vol. 4858: X. Deng, F.C. Graham (Eds.), *Internet and Network Economics*. XVI, 598 pages. 2007.
- Vol. 4857: J.M. Ware, G.E. Taylor (Eds.), *Web and Wireless Geographical Information Systems*. XI, 293 pages. 2007.
- Vol. 4853: F. Fonseca, M.A. Rodríguez, S. Levashkin (Eds.), *GeoSpatial Semantics*. X, 289 pages. 2007.
- Vol. 4836: H. Ichikawa, W.-D. Cho, I. Satoh, H.Y. Youn (Eds.), *Ubiquitous Computing Systems*. XIII, 307 pages. 2007.
- Vol. 4832: M. Weske, M.-S. Hacid, C. Godart (Eds.), *Web Information Systems Engineering – WISE 2007 Workshops*. XV, 518 pages. 2007.
- Vol. 4831: B. Benatallah, F. Casati, D. Georgakopoulos, C. Bartolini, W. Sadiq, C. Godart (Eds.), *Web Information Systems Engineering – WISE 2007*. XVI, 675 pages. 2007.
- Vol. 4825: K. Aberer, K.-S. Choi, N. Noy, D. Allemang, K.-I. Lee, L. Nixon, J. Golbeck, P. Mika, D. Maynard, R. Mizoguchi, G. Schreiber, P. Cudré-Mauroux (Eds.), *The Semantic Web*. XXVII, 973 pages. 2007.
- Vol. 4822: D.H.-L. Goh, T.H. Cao, I.T. Sølvberg, E. Rasmussen (Eds.), *Asian Digital Libraries*. XVII, 519 pages. 2007.
- Vol. 4816: B. Falcidieno, M. Spagnuolo, Y. Avrithis, I. Kompatsiaris, P. Buitelaar (Eds.), *Semantic Multimedia*. XII, 306 pages. 2007.
- Vol. 4813: I. Oakley, S. Brewster (Eds.), *Haptic and Audio Interaction Design*. XIV, 145 pages. 2007.
- Vol. 4810: H.H.-S. Ip, O.C. Au, H. Leung, M.-T. Sun, W.-Y. Ma, S.-M. Hu (Eds.), *Advances in Multimedia Information Processing – PCM 2007*. XXI, 834 pages. 2007.
- Vol. 4809: M.K. Denko, C.-s. Shih, K.-C. Li, S.-L. Tsao, Q.-A. Zeng, S.H. Park, Y.-B. Ko, S.-H. Hung, J.H. Park (Eds.), *Emerging Directions in Embedded and Ubiquitous Computing*. XXXV, 823 pages. 2007.
- Vol. 4808: T.-W. Kuo, E. Sha, M. Guo, L.T. Yang, Z. Shao (Eds.), *Embedded and Ubiquitous Computing*. XXI, 769 pages. 2007.
- Vol. 4806: R. Meersman, Z. Tari, P. Herrero (Eds.), *On the Move to Meaningful Internet Systems 2007: OTM 2007 Workshops, Part II*. XXXIV, 611 pages. 2007.
- Vol. 4805: R. Meersman, Z. Tari, P. Herrero (Eds.), *On the Move to Meaningful Internet Systems 2007: OTM 2007 Workshops, Part I*. XXXIV, 757 pages. 2007.
- Vol. 4804: R. Meersman, Z. Tari (Eds.), *On the Move to Meaningful Internet Systems 2007: CoopIS, DOA, ODBASE, GADA, and IS, Part II*. XXIX, 683 pages. 2007.
- Vol. 4803: R. Meersman, Z. Tari (Eds.), *On the Move to Meaningful Internet Systems 2007: CoopIS, DOA, ODBASE, GADA, and IS, Part I*. XXIX, 1173 pages. 2007.
- Vol. 4802: J.-L. Hainaut, E.A. Rundensteiner, M. Kirchberg, M. Bertolotto, M. Brochhausen, Y.-P.P. Chen, S.S.-S. Cherfi, M. Doerr, H. Han, S. Hartmann, J. Parsons, G. Poels, C. Rolland, J. Trujillo, E. Yu, E. Zimányi (Eds.), *Advances in Conceptual Modeling – Foundations and Applications*. XIX, 420 pages. 2007.
- Vol. 4801: C. Parent, K.-D. Schewe, V.C. Storey, B. Thalheim (Eds.), *Conceptual Modeling – ER 2007*. XVI, 616 pages. 2007.
- Vol. 4797: M. Arenas, M.I. Schwartzbach (Eds.), *Database Programming Languages*. VIII, 261 pages. 2007.
- Vol. 4796: M. Lew, N. Sebe, T.S. Huang, E.M. Bakker (Eds.), *Human-Computer Interaction*. X, 157 pages. 2007.
- Vol. 4794: B. Schiele, A.K. Dey, H. Gellersen, B. de Ruyter, M. Tscheligi, R. Wichert, E. Aarts, A. Buchmann (Eds.), *Ambient Intelligence*. XV, 375 pages. 2007.
- Vol. 4777: S. Bhalla (Ed.), *Databases in Networked Information Systems*. X, 329 pages. 2007.
- Vol. 4761: R. Obermaisser, Y. Nah, P. Puschner, F.J. Rammig (Eds.), *Software Technologies for Embedded and Ubiquitous Systems*. XIV, 563 pages. 2007.
- Vol. 4747: S. Džeroski, J. Struyf (Eds.), *Knowledge Discovery in Inductive Databases*. X, 301 pages. 2007.
- Vol. 4744: Y. de Kort, W. IJsselstein, C. Midden, B. Eggen, B.J. Fogg (Eds.), *Persuasive Technology*. XIV, 316 pages. 2007.
- Vol. 4740: L. Ma, M. Rauterberg, R. Nakatsu (Eds.), *Entertainment Computing – ICEC 2007*. XXX, 480 pages. 2007.

- Vol. 4730: C. Peters, P. Clough, F.C. Gey, J. Karlgren, B. Magnini, D.W. Oard, M. de Rijke, M. Stempfhuber (Eds.), *Evaluation of Multilingual and Multi-modal Information Retrieval*. XXIV, 998 pages. 2007.
- Vol. 4723: M. R. Berthold, J. Shawe-Taylor, N. Lavrač (Eds.), *Advances in Intelligent Data Analysis VII*. XIV, 380 pages. 2007.
- Vol. 4721: W. Jonker, M. Petković (Eds.), *Secure Data Management*. X, 213 pages. 2007.
- Vol. 4718: J. Hightower, B. Schiele, T. Strang (Eds.), *Location- and Context-Awareness*. X, 297 pages. 2007.
- Vol. 4717: J. Krumm, G.D. Abowd, A. Seneviratne, T. Strang (Eds.), *UbiComp 2007: Ubiquitous Computing*. XIX, 520 pages. 2007.
- Vol. 4715: J.M. Haake, S.F. Ochoa, A. Cechich (Eds.), *Groupware: Design, Implementation, and Use*. XIII, 355 pages. 2007.
- Vol. 4714: G. Alonso, P. Dadam, M. Rosemann (Eds.), *Business Process Management*. XIII, 418 pages. 2007.
- Vol. 4704: D. Barbosa, A. Bonifati, Z. Bellahsene, E. Hunt, R. Unland (Eds.), *Database and XML Technologies*. X, 141 pages. 2007.
- Vol. 4690: Y. Ioannidis, B. Novikov, B. Rachev (Eds.), *Advances in Databases and Information Systems*. XIII, 377 pages. 2007.
- Vol. 4675: L. Kovács, N. Fuhr, C. Meghini (Eds.), *Research and Advanced Technology for Digital Libraries*. XVII, 585 pages. 2007.
- Vol. 4674: Y. Luo (Ed.), *Cooperative Design, Visualization, and Engineering*. XIII, 431 pages. 2007.
- Vol. 4663: C. Baranauskas, P. Palanque, J. Abascal, S.D.J. Barbosa (Eds.), *Human-Computer Interaction – INTERACT 2007, Part II*. XXXIII, 735 pages. 2007.
- Vol. 4662: C. Baranauskas, P. Palanque, J. Abascal, S.D.J. Barbosa (Eds.), *Human-Computer Interaction – INTERACT 2007, Part I*. XXXIII, 637 pages. 2007.
- Vol. 4658: T. Enokido, L. Barolli, M. Takizawa (Eds.), *Network-Based Information Systems*. XIII, 544 pages. 2007.
- Vol. 4656: M.A. Wimmer, J. Scholl, Å. Grönlund (Eds.), *Electronic Government*. XIV, 450 pages. 2007.
- Vol. 4655: G. Psaila, R. Wagner (Eds.), *E-Commerce and Web Technologies*. VII, 229 pages. 2007.
- Vol. 4654: I.-Y. Song, J. Eder, T.M. Nguyen (Eds.), *Data Warehousing and Knowledge Discovery*. XVI, 482 pages. 2007.
- Vol. 4653: R. Wagner, N. Revell, G. Pernul (Eds.), *Database and Expert Systems Applications*. XXII, 907 pages. 2007.
- Vol. 4636: G. Antoniou, U. Aßmann, C. Baroglio, S. Decker, N. Henze, P.-L. Patranjan, R. Tolksdorf (Eds.), *Reasoning Web*. IX, 345 pages. 2007.
- Vol. 4611: J. Indulska, J. Ma, L.T. Yang, T. Ungerer, J. Cao (Eds.), *Ubiquitous Intelligence and Computing*. XXIII, 1257 pages. 2007.
- Vol. 4607: L. Baresi, P. Fraternali, G.-J. Houben (Eds.), *Web Engineering*. XVI, 576 pages. 2007.
- Vol. 4606: A. Pras, M. van Sinderen (Eds.), *Dependable and Adaptable Networks and Services*. XIV, 149 pages. 2007.
- Vol. 4605: D. Papadias, D. Zhang, G. Kollios (Eds.), *Advances in Spatial and Temporal Databases*. X, 479 pages. 2007.
- Vol. 4602: S. Barker, G.-J. Ahn (Eds.), *Data and Applications Security XXI*. X, 291 pages. 2007.
- Vol. 4601: S. Spaccapietra, P. Atzeni, F. Fages, M.-S. Hacid, M. Kifer, J. Mylopoulos, B. Pernici, P. Shvaiko, J. Trujillo, I. Zaihrayeu (Eds.), *Journal on Data Semantics IX*. XV, 197 pages. 2007.
- Vol. 4592: Z. Kedad, N. Lammari, E. Métails, F. Meziane, Y. Rezgui (Eds.), *Natural Language Processing and Information Systems*. XIV, 442 pages. 2007.
- Vol. 4587: R. Cooper, J. Kennedy (Eds.), *Data Management*. XIII, 259 pages. 2007.
- Vol. 4577: N. Sebe, Y. Liu, Y.-t. Zhuang, T.S. Huang (Eds.), *Multimedia Content Analysis and Mining*. XIII, 513 pages. 2007.
- Vol. 4568: T. Ishida, S. R. Fussell, P. T. J. M. Vossen (Eds.), *Intercultural Collaboration*. XIII, 395 pages. 2007.
- Vol. 4566: M.J. Dainoff (Ed.), *Ergonomics and Health Aspects of Work with Computers*. XVIII, 390 pages. 2007.
- Vol. 4564: D. Schuler (Ed.), *Online Communities and Social Computing*. XVII, 520 pages. 2007.
- Vol. 4563: R. Shumaker (Ed.), *Virtual Reality*. XXII, 762 pages. 2007.
- Vol. 4561: V.G. Duffy (Ed.), *Digital Human Modeling*. XXIII, 1068 pages. 2007.
- Vol. 4560: N. Aykin (Ed.), *Usability and Internationalization, Part II*. XVIII, 576 pages. 2007.
- Vol. 4559: N. Aykin (Ed.), *Usability and Internationalization, Part I*. XVIII, 661 pages. 2007.
- Vol. 4558: M.J. Smith, G. Salvendy (Eds.), *Human Interface and the Management of Information, Part II*. XXIII, 1162 pages. 2007.
- Vol. 4557: M.J. Smith, G. Salvendy (Eds.), *Human Interface and the Management of Information, Part I*. XXII, 1030 pages. 2007.
- Vol. 4541: T. Okadome, T. Yamazaki, M. Makhtari (Eds.), *Pervasive Computing for Quality of Life Enhancement*. IX, 248 pages. 2007.
- Vol. 4537: K.C.-C. Chang, W. Wang, L. Chen, C.A. Ellis, C.-H. Hsu, A.C. Tsoi, H. Wang (Eds.), *Advances in Web and Network Technologies, and Information Management*. XXIII, 707 pages. 2007.
- Vol. 4531: J. Indulska, K. Raymond (Eds.), *Distributed Applications and Interoperable Systems*. XI, 337 pages. 2007.
- Vol. 4526: M. Malek, M. Reitenspieß, A. van Moorsel (Eds.), *Service Availability*. X, 155 pages. 2007.
- Vol. 4524: M. Marchiori, J.Z. Pan, C.d.S. Marie (Eds.), *Web Reasoning and Rule Systems*. XI, 382 pages. 2007.

¥954.00元

## Preface

After a vibrant and successful event in Burgos, Spain, last year, this year's international conference on Intelligent Data Engineering and Automated Learning—IDEAL 2007 (<http://events.cs.bham.ac.uk/ideal07/>)—was held in the second largest city of the UK, Birmingham. The IDEAL conference has become a unique multidisciplinary forum for researchers in both theoretical and practical aspects of learning and information processing, data mining, retrieval and management, bioinformatics and bio-inspired models, agents and hybrid systems, and financial engineering. A special feature of the IDEAL conferences is the cross-disciplinary exchange of ideas in emerging techniques and applications in these areas. Data engineering and associated learning paradigms are playing increasingly important roles in an increasing number of disciplines and fields. The multidisciplinary nature of contemporary research and modern technology is pushing boundaries and one of the principal aims of the IDEAL conference is to promote interactions and collaborations across disciplines.

This volume of *Lecture Notes in Computer Science* contains accepted papers presented at IDEAL 2007 held at the University of Birmingham, UK, during December 16–19, 2007. This year, the conference received over 270 submissions from around the world, which were subsequently peer-refereed by the Programme Committee comprising leading scholars in the field. Each paper was rigorously reviewed by two reviewers and only papers that had received positive comments from both reviewers were accepted and included in the proceedings in order to maintain the highest quality of the conference. This resulted in about 110 top quality papers for the conference and the proceedings. The acceptance rate was about 40%. The buoyant numbers of submissions in recent years are a clear indication of the importance of the fields related to IDEAL and the popularity of the IDEAL conference and community. This year's conference had five regular themes: Learning and Information Processing, Data Mining and Information Management, Bioinformatics and Neuroinformatics, Agents and Distributed Systems, and Financial Engineering and Modelling. Two special sessions, Agent-based Approach to Service Sciences and Neural-evolutionary Fusion Algorithms and Their Application, were also organized by Akira Namatame and Sancho Salcedo-Sanz, respectively. Many new ideas, novel algorithms and emerging techniques were reported and discussed at the conference.

This 8th IDEAL conference also enjoyed outstanding keynote speeches by distinguished guest speakers: Piero Bonissone, GE Global Research, Kevin Kelly, Carnegie Mellon University, Toby Gibson, European Molecular Biology Laboratory, and Soo-Young Lee of the Korea Advanced Institute of Science and Technology. Their in-depth coverage and work on various challenging topics served as both exceptional examples and inspirations for others.

This year IDEAL also teamed up with two international journals, namely, the *International Journal of Neural Systems* and the *Journal of Mathematical Modelling and Algorithm* for two special issues. The extended papers, together with contributed articles received in response to subsequent open calls, will go through further rounds of peer refereeing in the remits of these two journals.

We would like to thank the International Advisory Committee and the Steering Committee for the guidance and advice. We would particularly like to acknowledge the diligent work of our Programme Committee members, who performed review tasks admirably under tight deadline pressures.

Particular thanks go to CERCIA (The Centre of Excellence for Research in Computational Intelligence and Applications) and the School of Computer Science (especially Ceinwen Cushway) of the University of Birmingham, for their support and organization of IDEAL 2007.

We are also grateful to the publisher, Springer, especially Alfred Hofmann and Anna Kramer at the LNCS Editorial Office, for their continued support and collaboration in this demanding publication project.

Last but not the least we thank all the authors and participants for their contributions that made this conference such a successful and enjoyable event.

October 2007

Hujun Yin  
 Peter Tino  
 Emilio Corchado  
 Will Byrne  
 Xin Yao

# Organization

## General Co-chairs

|              |                                               |
|--------------|-----------------------------------------------|
| Xin Yao      | University of Birmingham, UK                  |
| Benjamin Wah | University of Illinois, Urbana-Champaign, USA |

## International Advisory Committee

|                   |                                            |
|-------------------|--------------------------------------------|
| Lei Xu (Chair)    | Chinese University of Hong Kong            |
| Yaser Abu-Mostafa | CALTECH, USA                               |
| Shun-ichi Amari   | RIKEN, Japan                               |
| Michael Dempster  | University of Cambridge, UK                |
| Sun-Yung Kung     | Princeton University, USA                  |
| Erkki Oja         | Helsinki University of Technology, Finland |
| Latit M. Patnaik  | Indian Institute of Science, India         |

## Steering Committee

|                         |                                            |
|-------------------------|--------------------------------------------|
| Hujun Yin (Co-chair)    | University of Manchester, UK               |
| Lai-Wan Chan (Co-chair) | Chinese University of Hong Kong            |
| Nigel Allinson          | University of Sheffield, UK                |
| Yiu-ming Cheung         | Hong Kong Baptist University, Hong Kong    |
| Emilio Corchado         | University of Burgos, Spain                |
| Marcus Gallagher        | University of Queensland, Australia        |
| Marc van Hulle          | K.U. Leuven, Belgium                       |
| John Keane              | University of Manchester, UK               |
| Jimmy Lee               | Chinese University of Hong Kong, Hong Kong |
| Malik Magdon-Ismail     | Rensselaer Polytechnic Institute, USA      |
| Zheng Rong Yang         | University of Exeter, UK                   |
| Ron Sun                 | Rensselaer Polytechnic Institute, USA      |
| Ning Zhong              | Maebashi Institute of Technology, Japan    |

## Programme Committee Chairs

|                                          |                                       |
|------------------------------------------|---------------------------------------|
| Hujun Yin (Chair)                        | University of Manchester, UK          |
| Peter Tino (Technical Chair)             | University of Birmingham, UK          |
| Emilio Corchado (Technical Co-chair)     | University of Burgos, Spain           |
| Malik Magdon-Ismail (Technical Co-chair) | Rensselaer Polytechnic Institute, USA |
| Zheng Rong Yang (Technical Co-chair)     | University of Exeter, UK              |
| Will Byrne (Organizing Chair)            | University of Birmingham, UK          |

## Programme Committee

Ajith Abraham  
 José Adserias  
 Khurshid Ahmad  
 Nigel Allinson  
 Ángel Alonso  
 Luis Alonso  
 Martyn Amos  
 Davide Anguita  
 Bruno Apolloni  
 Jiyuan An  
 Javier Bajo  
 Federico Barber  
 Bruno Baruque  
 Lubica Benuskova  
 Michael Biehl  
 Alan Blair  
 Mikael Boden  
 Lourdes Borrajo  
 Juan Botía  
 Vicente Botti  
 Teodoro Calonge  
 Carlos Carrascosa  
 Andre de Carvalho  
 Matthew Casey  
 Sheng Chen  
 Songcan Chen  
 Sung-Bae Cho  
 Sungzoon Cho  
 Juan Manuel Corchado  
 Rafael Corchuelo  
 David Corne  
 Ernesto Costa  
 Robert Dale  
 Bernard De Baets  
 Yanira De Paz  
 Ricardo Del Olmo  
 Miguel Delgado  
 Fernando Díaz  
 Zhao Yang Dong  
 José Dorronsoro  
 Richard Everson  
 Igor Farkas  
 Fernando Fernández  
 Florentino Fernández  
 Marcus Freen

Richard Freeman  
 Toshio Fukuda  
 Colin Fyfe  
 Bogdan Gabrys  
 Marcus Gallagher  
 John Qiang Gan  
 Francisco Garijo  
 Mark Girolami  
 Antonio F. Gómez  
 Ana González  
 Angélica González  
 Manuel González  
 Daniel González  
 Francisco Herrera  
 Álvaro Herrero  
 James Hogan  
 Tony Holden  
 Jaakko Hollmen  
 Robert J. Howlett  
 David Hoyle  
 Hisao Ishibuchi  
 Paul Jackway  
 Gareth Jones  
 Vicente Julián  
 Ata Kaban  
 Hoon Kang  
 Juha Karhunen  
 Samuel Kaski  
 Dong Hwa Kim  
 Irwin King  
 Aldebaro Klautau  
 Mario Köppen  
 Kostadin Korutchev  
 Rudolf Kruse  
 Rosalía Laza  
 Kwong S. Leung  
 Carlos Linares  
 Paulo Lisboa  
 Eva Lorenzo  
 Frederic Maire  
 Roque Marín  
 José F. Martínez  
 Aitor Mata  
 José Ramón Méndez  
 Simon Miles

José Mira  
José Manuel Molina  
Carla Möller-Levet  
Joaquín Pacheco  
Juan Pavón  
David Pelta  
David Powers  
José Principe  
José Ramirez  
Omer Rana  
Vic Rayward-Smith  
Perfecto Reguera  
Bernadete Ribeiro  
José Riquelme  
Ramón Rizo  
Roman Rosipal  
Dymitr Ruta  
Shazia Sadiq  
José Santos  
Michael Small

P.N. Suganthan  
David Taniar  
Dante Israel Tapia  
Miguel Toro  
Marcos Valiño  
Marc Van Hulle  
Alfredo Vellido  
José Ramón Villar  
Thomas Villmann  
Lipo Wang  
Dong-Qing Wei  
Ian Wood  
Gordon Wyeth  
Yong Xu  
Nobuyoshi Yabuki  
Ronald R. Yager  
Du Zhang  
Yanqing Zhang  
Ning Zhong  
Rodolfo Zunino

# Table of Contents

## Learning and Information Processing

|                                                                                                            |     |
|------------------------------------------------------------------------------------------------------------|-----|
| Support Function Machines .....                                                                            | 1   |
| <i>Jiuzhen Liang</i>                                                                                       |     |
| Different Bayesian Network Models in the Classification of Remote Sensing Images .....                     | 10  |
| <i>Cristina Solares and Ana Maria Sanz</i>                                                                 |     |
| Group Decision Making with Triangular Fuzzy Linguistic Variables .....                                     | 17  |
| <i>Zeshui Xu</i>                                                                                           |     |
| Sparse Kernel Modelling: A Unified Approach .....                                                          | 27  |
| <i>S. Chen, X. Hong, and C.J. Harris</i>                                                                   |     |
| Advanced Forecasting and Classification Technique for Condition Monitoring of Rotating Machinery .....     | 37  |
| <i>Ilya Mokhov and Alexey Minin</i>                                                                        |     |
| Out of Bootstrap Estimation of Generalization Error Curves in Bagging Ensembles .....                      | 47  |
| <i>Daniel Hernández-Lobato, Gonzalo Martínez-Muñoz, and Alberto Suárez</i>                                 |     |
| An Edit Distance Approach to Shallow Semantic Labeling .....                                               | 57  |
| <i>Samuel W.K. Chan</i>                                                                                    |     |
| A Comparison of One-Class Classifiers for Novelty Detection in Forensic Case Data .....                    | 67  |
| <i>Frédéric Ratle, Mikhail Kanevski, Anne-Laure Terrettaz-Zufferey, Pierre Esseiva, and Olivier Ribaux</i> |     |
| Variational GTM .....                                                                                      | 77  |
| <i>Iván Olier and Alfredo Vellido</i>                                                                      |     |
| Skill Combination for Reinforcement Learning .....                                                         | 87  |
| <i>Zhihui Luo, David Bell, and Barry McCollum</i>                                                          |     |
| A New Recurring Multistage Evolutionary Algorithm for Solving Problems Efficiently .....                   | 97  |
| <i>Md. Monirul Islam, Mohammad Shafiul Alam, and Kazuyuki Murase</i>                                       |     |
| The Effect of Missing Wind Speed Data on Wind Power Estimation ....                                        | 107 |
| <i>Fatih Onur Hoccoğlu and Mehmet Kurban</i>                                                               |     |

|                                                                                                                       |     |
|-----------------------------------------------------------------------------------------------------------------------|-----|
| Exploration of a Text Collection and Identification of Topics by Clustering .....                                     | 115 |
| <i>Antoine Naud and Shiro Usui</i>                                                                                    |     |
| Asynchronous BCI Control of a Robot Simulator with Supervised Online Training .....                                   | 125 |
| <i>Chun Sing Louis Tsui and John Q. Gan</i>                                                                           |     |
| Fuzzy Ridge Regression with Non Symmetric Membership Functions and Quadratic Models .....                             | 135 |
| <i>S. Donoso, N. Marín, and M.A. Vila</i>                                                                             |     |
| A Subjective and Objective Integrated Method for MAGDM Problems with Multiple Types of Exact Preference Formats ..... | 145 |
| <i>Zeshui Xu and Jian Chen</i>                                                                                        |     |
| Energy Saving by Means of Fuzzy Systems .....                                                                         | 155 |
| <i>José R. Villar, Enrique de la Cal, and Javier Sedano</i>                                                           |     |
| A Comparative Study of Local Classifiers Based on Clustering Techniques and One-Layer Neural Networks .....           | 168 |
| <i>Yuridia Gago-Pallares, Oscar Fontenla-Romero, and Amparo Alonso-Betanzos</i>                                       |     |
| Filter Methods for Feature Selection – A Comparative Study .....                                                      | 178 |
| <i>Noelia Sánchez-Marroño, Amparo Alonso-Betanzos, and María Tombilla-Sanromán</i>                                    |     |
| FPGA-Based Architecture for Computing Testors .....                                                                   | 188 |
| <i>Alejandro Rojas, René Cumplido, J. Ariel Carrasco-Ochoa, Claudia Feregrino, and J. Francisco Martínez-Trinidad</i> |     |
| Minimal BSDT Abstract Selectional Machines and Their Selectional and Computational Performance .....                  | 198 |
| <i>Petro Gopych</i>                                                                                                   |     |
| Active Learning for Regression Based on Query by Committee .....                                                      | 209 |
| <i>Robert Burbidge, Jem J. Rowland, and Ross D. King</i>                                                              |     |
| Influence of Wavelet Frequency and Orientation in an SVM-Based Parallel Gabor PCA Face Verification System .....      | 219 |
| <i>Ángel Serrano, Isaac Martín de Diego, Cristina Conde, Enrique Cabello, Linlin Shen, and Li Bai</i>                 |     |
| Wrapping the Naive Bayes Classifier to Relax the Effect of Dependences .....                                          | 229 |
| <i>Jose Carlos Cortizo, Ignacio Giraldez, and Mari Cruz Gaya</i>                                                      |     |

|                                                                                                                                   |     |
|-----------------------------------------------------------------------------------------------------------------------------------|-----|
| Preference Learning from Interval Pairwise Data. A Distance-Based Approach .....                                                  | 240 |
| <i>Esther Dopazo, Mauricio Ruiz-Tagle, and Juan Robles</i>                                                                        |     |
| Psychometric Functions Within the Framework of Binary Signal Detection Theory: Coding the Face Identity .....                     | 248 |
| <i>Petro Gopych and Anna Kolot</i>                                                                                                |     |
| Load Forecasting with Support Vector Machines and Semi-parametric Method .....                                                    | 258 |
| <i>J.A. Jordaán and A. Ukil</i>                                                                                                   |     |
| Reproducing Kernel Hilbert Space Methods to Reduce Pulse Compression Sidelobes .....                                              | 268 |
| <i>J.A. Jordaán, M.A. van Wyk, and B.J. van Wyk</i>                                                                               |     |
| Support Kernel Machine-Based Active Learning to Find Labels and a Proper Kernel Simultaneously .....                              | 277 |
| <i>Yasusi Sinohara and Atsuhiko Takasu</i>                                                                                        |     |
| Making Class Bias Useful: A Strategy of Learning from Imbalanced Data .....                                                       | 287 |
| <i>Jie Gu, Yuanbing Zhou, and Xianqiang Zuo</i>                                                                                   |     |
| Detecting Phishing E-mails by Heterogeneous Classification .....                                                                  | 296 |
| <i>M. Dolores del Castillo, Angel Iglesias, and J. Ignacio Serrano</i>                                                            |     |
| Load Balancing in Fault Tolerant Video Server .....                                                                               | 306 |
| <i>D.N. Sujatha, K. Girish, B. Rashmi, K.R. Venugopal, and L.M. Patnaik</i>                                                       |     |
| Position-Aware String Kernels with Weighted Shifts and a General Framework to Apply String Kernels to Other Structured Data ..... | 316 |
| <i>Kilho Shin</i>                                                                                                                 |     |
| A New Regression Based Software Cost Estimation Model Using Power Values .....                                                    | 326 |
| <i>Oktay Adalier, Aybars Uğur, Serdar Korukoğlu, and Kadir Ertas</i>                                                              |     |
| Visualising and Clustering Video Data .....                                                                                       | 335 |
| <i>Colin Fyfe, Wei Chuang Ooi, and Hanseok Ko</i>                                                                                 |     |
| Neural Network-Based Receiver for Uplink Multiuser Code Division Multiple Access Communication System .....                       | 345 |
| <i>Zi-Wei Zheng</i>                                                                                                               |     |
| Evolving Tree Algorithm Modifications .....                                                                                       | 356 |
| <i>Vincenzo Cannella, Riccardo Rizzo, and Roberto Pirrone</i>                                                                     |     |

|                                                                                                                             |     |
|-----------------------------------------------------------------------------------------------------------------------------|-----|
| A Linear Learning Method for Multilayer Perceptrons Using<br>Least-Squares .....                                            | 365 |
| <i>Bertha Guijarro-Berdiñas, Oscar Fontenla-Romero,<br/>Beatriz Pérez-Sánchez, and Paula Fraguela</i>                       |     |
| A Discriminative Model Corresponding to Hierarchical HMMs .....                                                             | 375 |
| <i>Takaaki Sugiura, Naoto Goto, and Akira Hayashi</i>                                                                       |     |
| Finding Unsatisfiable Subformulas with Stochastic Method .....                                                              | 385 |
| <i>Jianmin Zhang, Shengyu Shen, and Sikun Li</i>                                                                            |     |
| A New Efficient Approach in Clustering Ensembles .....                                                                      | 395 |
| <i>Javad Azimi, Monireh Abdoos, and Morteza Analoui</i>                                                                     |     |
| An Evolutionary Hyperheuristic to Solve Strip-Packing Problems .....                                                        | 406 |
| <i>Pablo Garrido and María-Cristina Riff</i>                                                                                |     |
| Statistical Analysis of Sample-Size Effects in ICA .....                                                                    | 416 |
| <i>J. Michael Herrmann and Fabian J. Theis</i>                                                                              |     |
| HPGP: An Abstraction-Based Framework for Decision-Theoretic<br>Planning .....                                               | 426 |
| <i>Leticia Friske and Carlos Henrique Costa Ribeiro</i>                                                                     |     |
| Correction of Medical Handwriting OCR Based on Semantic<br>Similarity .....                                                 | 437 |
| <i>Bartosz Broda and Maciej Piasecki</i>                                                                                    |     |
| Multiple Classifier Fusion Using $k$ -Nearest Localized Templates .....                                                     | 447 |
| <i>Jun-Ki Min and Sung-Bae Cho</i>                                                                                          |     |
| <b>Data Mining and Information Management</b>                                                                               |     |
| Color Image Segmentation Applied to Medical Domain .....                                                                    | 457 |
| <i>Liana Stancu, Dan Dumitru Burdescu, and Cosmin Stoica</i>                                                                |     |
| Hierarchical Program Representation for Program Element Matching ...                                                        | 467 |
| <i>Fernando Berzal, Juan-Carlos Cubero, and Aída Jiménez</i>                                                                |     |
| A Combination-of-Tools Method for Learning Interpretable Fuzzy<br>Rule-Based Classifiers from Support Vector Machines ..... | 477 |
| <i>Tamas Kenesei, Johannes A. Roubos, and Janos Abonyi</i>                                                                  |     |
| An Effective Content-Based Image Retrieval System by Hierarchical<br>Segmentation .....                                     | 487 |
| <i>Mingxin Zhang, Zhaogan Lu, and Junyi Shen</i>                                                                            |     |
| Knowledge Extraction from Unstructured Surface Meshes .....                                                                 | 497 |
| <i>Lars Graening, Markus Olhofer, and Bernhard Sendhoff</i>                                                                 |     |

|                                                                                                                    |     |
|--------------------------------------------------------------------------------------------------------------------|-----|
| Clustering with Reinforcement Learning .....                                                                       | 507 |
| <i>Wesam Barbakh and Colin Fyfe</i>                                                                                |     |
| Mining Frequent Itemsets in Large Data Warehouses: A Novel<br>Approach Proposed for Sparse Data Sets .....         | 517 |
| <i>S.M. Fakhrahmad, M. Zolghadri Jahromi, and M.H. Sadreddini</i>                                                  |     |
| A Sparse Bayesian Position Weighted Bio-Kernel Network .....                                                       | 527 |
| <i>David C. Trudgian and Zheng Rong Yang</i>                                                                       |     |
| Square Penalty Support Vector Regression .....                                                                     | 537 |
| <i>Álvaro Barbero, Jorge López, and José R. Dorronsoro</i>                                                         |     |
| Constructing Accurate Fuzzy Rule-Based Classification Systems Using<br>Apriori Principles and Rule-Weighting ..... | 547 |
| <i>S.M. Fakhrahmad, A. Zare, and M. Zolghadri Jahromi</i>                                                          |     |
| Visualization of Topology Representing Networks .....                                                              | 557 |
| <i>Agnes Vathy-Fogarassy, Agnes Werner-Stark, Balazs Gal, and<br/>Janos Abonyi</i>                                 |     |
| The Outer Impartation Information Content of Rules and Rule Sets ....                                              | 567 |
| <i>Dan Hu and Yuanfu Feng</i>                                                                                      |     |
| An Engineering Approach to Data Mining Projects .....                                                              | 578 |
| <i>Óscar Marbán, Gonzalo Mariscal, Ernestina Menasalvas, and<br/>Javier Segovia</i>                                |     |
| Classifying Polyphonic Melodies by Chord Estimation Based on Hidden<br>Markov Model .....                          | 589 |
| <i>Yukiteru Yoshihara, Takao Miura, and Isamu Shioya</i>                                                           |     |
| Elastic Non-contiguous Sequence Pattern Detection for Data Stream<br>Monitoring .....                              | 599 |
| <i>Xinqiang Zuo, Yuanbing Zhou, and Chunhui Zhao</i>                                                               |     |
| Joint Cutoff Probabilistic Estimation Using Simulation: A Mailing<br>Campaign Application .....                    | 609 |
| <i>Antonio Bella, Cèsar Ferri, José Hernández-Orallo, and<br/>María José Ramírez-Quintana</i>                      |     |
| Segmentation and Annotation of Audiovisual Recordings Based on<br>Automated Speech Recognition .....               | 620 |
| <i>Stephan Repp, Jörg Waitelonis, Harald Sack, and Christoph Meinel</i>                                            |     |
| Mining Disjunctive Sequential Patterns from News Stream .....                                                      | 630 |
| <i>Kazuhiro Shimizu, Isamu Shioya, and Takao Miura</i>                                                             |     |

|                                                                                                                |     |
|----------------------------------------------------------------------------------------------------------------|-----|
| A New Dissimilarity Measure Between Trees by Decomposition of Unit-Cost Edit Distance .....                    | 643 |
| <i>Hisashi Koga, Hiroaki Saito, Toshinori Watanabe, and Takanori Yokoyama</i>                                  |     |
| Optimizing Web Structures Using Web Mining Techniques .....                                                    | 653 |
| <i>Jonathan Jeffrey, Peter Karski, Björn Lohrmann, Keivan Kianmehr, and Reda Alhajj</i>                        |     |
| A Collaborative Recommender System Based on Asymmetric User Similarity .....                                   | 663 |
| <i>Marta Millan, Maria Trujillo, and Edward Ortiz</i>                                                          |     |
| Stop Wasting Time: On Predicting the Success or Failure of Learning for Industrial Applications .....          | 673 |
| <i>J.E. Smith and M.A. Tahir</i>                                                                               |     |
| Parallel Wavelet Transform for Spatio-temporal Outlier Detection in Large Meteorological Data .....            | 684 |
| <i>Sajib Barua and Reda Alhajj</i>                                                                             |     |
| A Tool for Web Usage Mining .....                                                                              | 695 |
| <i>Jose M. Domenech and Javier Lorenzo</i>                                                                     |     |
| An Algorithm to Mine General Association Rules from Tabular Data ...                                           | 705 |
| <i>Siyamand Ayubi, Maybin Muyeba, and John Keane</i>                                                           |     |
| Intrusion Detection at Packet Level by Unsupervised Architectures .....                                        | 718 |
| <i>Álvaro Herrero, Emilio Corchado, Paolo Gastaldo, Davide Leoncini, Francesco Picasso, and Rodolfo Zunino</i> |     |
| Quality of Adaptation of Fusion ViSOM .....                                                                    | 728 |
| <i>Bruno Baruaque, Emilio Corchado, and Hujun Yin</i>                                                          |     |
| Classification Based on the Trace of Variables over Time .....                                                 | 739 |
| <i>Frank Höppner and Alexander Topp</i>                                                                        |     |
| Extracting Meaningful Contexts from Mobile Life Log .....                                                      | 750 |
| <i>Youngseol Lee and Sung-Bae Cho</i>                                                                          |     |
| Topological Tree Clustering of Social Network Search Results .....                                             | 760 |
| <i>Richard T. Freeman</i>                                                                                      |     |
| <br><b>Bioinformatics and Neuroinformatics</b>                                                                 |     |
| A Framework to Analyze Biclustering Results on Microarray Experiments.....                                     | 770 |
| <i>Rodrigo Santamaría, Roberto Therón, and Luis Quintales</i>                                                  |     |