

# **Advances in Intelligent Systems and Computing**

Volume 223

*Series editor*

Janusz Kacprzyk, Polish Academy of Sciences, Warsaw, Poland  
e-mail: kacprzyk@ibspan.waw.pl

For further volumes:  
<http://www.springer.com/series/11156>

## *About this Series*

The series “Advances in Intelligent Systems and Computing” contains publications on theory, applications, and design methods of Intelligent Systems and Intelligent Computing. Virtually all disciplines such as engineering, natural sciences, computer and information science, ICT, economics, business, e-commerce, environment, healthcare, life science are covered. The list of topics spans all the areas of modern intelligent systems and computing.

The publications within “Advances in Intelligent Systems and Computing” are primarily textbooks and proceedings of important conferences, symposia and congresses. They cover significant recent developments in the field, both of a foundational and applicable character. An important characteristic feature of the series is the short publication time and world-wide distribution. This permits a rapid and broad dissemination of research results.

## *Advisory Board*

### Chairman

Nikhil R. Pal, Indian Statistical Institute, Kolkata, India  
e-mail: [nikhil@isical.ac.in](mailto:nikhil@isical.ac.in)

### Members

Emilio S. Corchado, University of Salamanca, Salamanca, Spain  
e-mail: [escorchado@usal.es](mailto:escorchado@usal.es)

Hani Hagras, University of Essex, Colchester, UK  
e-mail: [hani@essex.ac.uk](mailto:hani@essex.ac.uk)

László T. Kóczy, Széchenyi István University, Győr, Hungary  
e-mail: [koczy@sze.hu](mailto:koczy@sze.hu)

Vladik Kreinovich, University of Texas at El Paso, El Paso, USA  
e-mail: [vladik@utep.edu](mailto:vladik@utep.edu)

Chin-Teng Lin, National Chiao Tung University, Hsinchu, Taiwan  
e-mail: [ctlm@mail.nctu.edu.tw](mailto:ctlm@mail.nctu.edu.tw)

Jie Lu, University of Technology, Sydney, Australia  
e-mail: [Jie.Lu@uts.edu.au](mailto:Jie.Lu@uts.edu.au)

Patricia Melin, Tijuana Institute of Technology, Tijuana, Mexico  
e-mail: [epmelin@hafsamx.org](mailto:epmelin@hafsamx.org)

Nadia Nedjah, State University of Rio de Janeiro, Rio de Janeiro, Brazil  
e-mail: [nadia@eng.uerj.br](mailto:nadia@eng.uerj.br)

Ngoc Thanh Nguyen, Wroclaw University of Technology, Wroclaw, Poland  
e-mail: [Ngoc-Thanh.Nguyen@pwr.edu.pl](mailto:Ngoc-Thanh.Nguyen@pwr.edu.pl)

Jun Wang, The Chinese University of Hong Kong, Shatin, Hong Kong  
e-mail: [jwang@mae.cuhk.edu.hk](mailto:jwang@mae.cuhk.edu.hk)

Václav Snášel · Pavel Krömer  
Mario Köppen · Gerald Schaefer  
Editors

# Soft Computing in Industrial Applications

Proceedings of the 17th Online World  
Conference on Soft Computing  
in Industrial Applications

 Springer

*Editors*

Václav Snášel  
Pavel Krömer  
Faculty of Electrical Engineering  
and Computer Science  
Department of Computer Science  
VŠB-TUO  
Ostrava-Poruba  
Czech Republic

Gerald Schaefer  
Department of Computer Science  
Loughborough University  
Loughborough  
UK

Mario Köppen  
Network Design and Research Center  
Kyushu Institute of Technology  
Fukuoka  
Japan

ISSN 2194-5357

ISBN 978-3-319-00929-2

DOI 10.1007/978-3-319-00930-8

Springer Cham Heidelberg New York Dordrecht London

ISSN 2194-5365 (electronic)

ISBN 978-3-319-00930-8 (eBook)

Library of Congress Control Number: 2013953229

© Springer International Publishing Switzerland 2014

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed. Exempted from this legal reservation are brief excerpts in connection with reviews or scholarly analysis or material supplied specifically for the purpose of being entered and executed on a computer system, for exclusive use by the purchaser of the work. Duplication of this publication or parts thereof is permitted only under the provisions of the Copyright Law of the Publisher's location, in its current version, and permission for use must always be obtained from Springer. Permissions for use may be obtained through RightsLink at the Copyright Clearance Center. Violations are liable to prosecution under the respective Copyright Law. The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

While the advice and information in this book are believed to be true and accurate at the date of publication, neither the authors nor the editors nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Printed on acid-free paper

Springer is part of Springer Science+Business Media ([www.springer.com](http://www.springer.com))

# Preface

This volume of Advances in Intelligent Systems and Computing contains accepted papers presented at WSC17, the 17th Online World Conference on Soft Computing in Industrial Applications, held from December 2012 to January 2013 on the Internet. A tradition started over a decade ago by the World Federation of Soft Computing (<http://www.softcomputing.org/>) again brought together researchers from over the world interested in the ever advancing state of the art in the field. Continuous technological improvements make this online forum a viable gathering format for a world class conference.

The 2012 edition of the Online World Conference on Soft Computing in Industrial Applications consisted of general track and two special sessions, namely special session on Continuous Features Discretization for Anomaly Intrusion Detectors Generation and special session on Emerging Theories and Applications in Transportation Science. The program committee received a total of 70 submissions from 25 countries, which reflects the worldwide nature of this event. Each paper was peer reviewed by typically 3 referees, culminating in the acceptance of 33 papers for publication. The organization of the WSC17 conference is entirely voluntary. The review process required an enormous effort from the members of the International Technical Program Committee, and we would therefore like to thank all its members for their contribution to the success of this conference. We would like to express our sincere thanks to the special session organizers, to the host of WSC17, VŠB-Technical University of Ostrava, and to the publisher, Springer, for their hard work and support in organizing the conference. Finally, we would like to thank all the authors for their high quality contributions. The friendly and welcoming attitude of conference supporters and contributors made this event a success!

February 2013

Václav Snášel  
Pavel Krömer  
Mario Köppen  
Gerald Schaefer

# Organization

## General Chair

Václav Snášel                      VŠB-Technical University of Ostrava

## Program Chair

Pavel Krömer                      VŠB-Technical University of Ostrava

## Special Event Chair

Gerald Schaefer                      Loughborough University, UK

## International Advisory Board

Kalyanmoy Deb	Indian Institute of Technology Kanpur, India
Carlos M. Fonseca	University of Algarve, Portugal
Thomas Stütze	University Libre de Bruxelles, Belgium
Jörn Mehnert	Cranfield University, UK
Mario Köppen	Kyushu Institute of Technology, Japan
Xiao-Zhi Gao	Aalto University, Finland
Gerald Schaefer	Loughborough University, UK

## International Technical Program Committee

Janos Abonyi	University of Pannonia, Hungary
Mohanad Alfiras	Gulf University, Bahrain
Sudhirkumar V Barai	IIT Kharagpur, India

Helio Barbosa	Laboratório Nacional de Computação Científica, Brazil
Özgür Başkan	Pamukkale University, Turkey
Miloš Besta	Google Inc., USA
Gennaro Nicola Bifulco	Università di Napoli Federico II, Italy
Leonardo Caggiani	DVT-Technical University of Bari, Italy
Piotr Cal	Wrocław University of Technology, Poland
Rodrigo T. N. Cardoso	CEFET-MG, Brazil
M. Emre Celebi	Louisiana State University in Shreveport, USA
Hilmi Berk Celikoglu	Technical University of Istanbul, Turkey
Lino Costa	University of Minho, Portugal
Keshav Dahal	University of Bradford, UK
Justin Dauwels	Nanyang Technological University, Singapore
Guy De Tre	Ghent University, Belgium
Alexandre Delbem	University of Sao Paulo, Brazil
Viviane G. Da Fonseca	INUAF-Instituto Superior D. Afonso III, Portugal
Gregorio Gecchele	University of Padova, Italy
Carlos Henggeler Antunes	University of Coimbra, Portugal
Francisco Herrera	University of Granada, Spain
Dušan Húsek	Academy of Sciences of the Czech Republic, Czech Republic
Konrad Jackowski	Wrocław University of Technology, Poland
Milica Kalić	University of Belgrade, Republic of Serbia
Petra Kersting	Technische Universität Dortmund, Germany
Frank Klawonn	University of Applied Sciences Braunschweig-Wolfenbuettel, Germany
Andrew Koh	University of Leeds, UK
Bartosz Krawczyk	Wrocław University of Technology, Poland
Renato Krohling	Federal University of Espirito Santo, Brazil
Pavel Krömer	VŠB-Technical University of Ostrava, Czech Republic
Miloš Kudělka	VŠB-Technical University of Ostrava, Czech Republic
Jouni Lampinen	University of Vaasa, Finland
Celina Leao	University of Minho, Portugal
Gabriella Mazzulla	University of Calabria, Italy
Yetis Sazi Murat	Pamukkale University, Turkey
Santosh Nanda	Eastern Academy of Science and Technology, India
Eliška Ochodková	VŠB-Technical University of Ostrava, Czech Republic
Jae Oh	Syracuse University, USA
Michele Ottomanelli	Politecnico di Bari, Italy

Suhail Owais	Applied Science University, Jordan
Ana Pereira	Polytechnic Institute of Bragança, Portugal
Jan Platoš	VŠB-Technical University of Ostrava, Czech Republic
Sebastian Polak	Jagiellonian University Medical College, Poland
Sg Ponnambalam	Monash University Sunway Campus, Malaysia
Petrica Claudiu Pop	North University of Baia Mare, Romania
Radu-Emil Precup	Politehnica University of Timisoara, Romania
Ana Maria A. C. Rocha	University of Minho, Portugal
Riccardo Rossi	University of Padova, Italy
Nicola Sacco	DIME-University of Genoa, Italy
Gerald Schaefer	Loughborough University, UK
Giovanni Semeraro	University of Bari, Italy
Sara Silva	INESC-ID, Portugal
Piotr Sobolewski	Wrocław University of Technology, Poland
Marcone Souza	Universidade Federal de Ouro Preto, Brazil
Thomas Stützel	IRIDIA, ULB, Belgium
Eiji Uchino	Yamaguchi University, Japan
Juan Velasquez	University of Chile, Chile
Milorad Vidovic	University of Belgrade, Serbia
Michał Woźniak	Wrocław University of Technology, Poland

## **Sponsoring Institutions**

World Federation on Soft Computing  
VŠB Technical University of Ostrava



# Contents

## Part I Soft Computing in Industrial Applications

<b>Advanced Methods for 3D Magnetic Localization in Industrial Process Distributed Data-Logging with a Sparse Distance Matrix</b> . . . . .	3
Abhaya Chandra Kammara and Andreas König	
<b>Neural Network Ensemble Based on Feature Selection for Non-Invasive Recognition of Liver Fibrosis Stage</b> . . . . .	15
Bartosz Krawczyk, Michał Woźniak, Tomasz Orczyk, Piotr Porwik, Joanna Musialik and Barbara Błońska-Fajfrowska	
<b>Cooperative and Non-cooperative Equilibrium Problems with Equilibrium Constraints: Applications in Economics and Transportation</b> . . . . .	25
Andrew Koh	
<b>Statistical Genetic Programming: The Role of Diversity</b> . . . . .	37
Maryam Amir Haeri, Mohammad Mehdi Ebadzadeh and Gianluigi Folino	
<b>Breast MRI Tumour Segmentation Using Modified Automatic Seeded Region Growing Based on Particle Swarm Optimization Image Clustering</b> . . . . .	49
Ali Qusay Al-Faris, Umi Kalthum Ngah, Nor Ashidi Mat Isa and Ibrahim Lutfi Shuaib	
<b>Differential Evolution and Tabu Search to Find Multiple Solutions of Multimodal Optimization Problems</b> . . . . .	61
Erick R. F. A. Schneider and Renato A. Krohling	

**A New RBFNDDA-KNN Network and Its Application to Medical Pattern Classification** . . . . . 71  
 Shing Chiang Tan, Chee Peng Lim, Robert F. Harrison and R. Lee Kennedy

**An Approach to Fuzzy Modeling of Anti-lock Braking Systems** . . . . . 83  
 Radu-Codruț David, Ramona-Bianca Grad, Radu-Emil Precup, Mircea-Bogdan Rădac, Claudia-Adina Dragoș and Emil M. Petriu

**An Improved Evolutionary Algorithm to Sequence Operations on an ASRS Warehouse** . . . . . 95  
 José A. Oliveira, João Ferreira, Guilherme A. B. Pereira and Luis S. Dias

**Fuzzy Reliability Analysis of Washing Unit in a Paper Plant Using Soft-Computing Based Hybridized Techniques** . . . . . 105  
 Komal and S. P. Sharma

**Multi-objective Algorithms for the Single Machine Scheduling Problem with Sequence-dependent Family Setups** . . . . . 117  
 Marcelo Ferreira Rego, Marcone Jamilson Freitas Souza, Igor Machado Coelho and José Elias Claudio Arroyo

**Multi-Sensor Soft-Computing System for Driver Drowsiness Detection** . . . . . 129  
 Li Li, Klaudius Werber, Carlos F. Calvillo, Khac Dong Dinh, Ander Guardie and Andreas König

**A New Evolving Tree for Text Document Clustering and Visualization** . . . . . 141  
 Wui Lee Chang, Kai Meng Tay and Chee Peng Lim

**Brain-Computer Interface Based on Motor Imagery: The Most Relevant Sources of Electrical Brain Activity** . . . . . 153  
 Alexander A. Frolov, Dušan Húsek, Václav Snášel, Pavel Bobrov, Olesya Mokienko, Jaroslav Tintěra and Jan Rydlo

**A Single Input Rule Modules Connected Fuzzy FMEA Methodology for Edible Bird Nest Processing** . . . . . 165  
 Chian Haur Jong, Kai Meng Tay and Chee Peng Lim

**A Novel Energy-Efficient and Distance-Based Clustering Approach for Wireless Sensor Networks . . . . .** 177  
 M. Mehdi Afsar and Mohammad-H. Tayarani-N.

**Characterization of Coronary Plaque by Using 2D Frequency Histogram of RF Signal. . . . .** 187  
 Satoshi Nakao, Kazuhiro Tokunaga, Noriaki Suetake and Eiji Uchino

**Face Recognition Using Convolutional Neural Network and Simple Logistic Classifier . . . . .** 197  
 Hurieh Khalajzadeh, Mohammad Mansouri and Mohammad Teshnehlab

**Continuous Features Discretization for Anomaly Intrusion Detectors Generation. . . . .** 209  
 Amira Sayed A. Aziz, Ahmad Taher Azar, Aboul Ella Hassanien and Sanaa El-Ola Hanafy

**Visualisation of High Dimensional Data by Use of Genetic Programming: Application to On-line Infrared Spectroscopy Based Process Monitoring. . . . .** 223  
 Tibor Kulcsar, Gabor Bereznai, Gabor Sarossy, Robert Auer and Janos Abonyi

**Radial Basis Artificial Neural Network Models for Predicting Solubility Index of Roller Dried Goat Whole Milk Powder . . . . .** 233  
 Sumit Goyal and Gyanendra Kumar Goyal

**Online Prediction of Wear on Rolls of a Bar Rolling Mill Based on Semi-Analytical Equations and Artificial Neural Networks . . . . .** 243  
 Yukio Shigaki and Marcos Antonio Cunha

**Part II Hybrid Machine Learning for Non-stationary and Complex Data**

**Real-Time Analysis of Non-stationary and Complex Network Related Data for Injection Attempts Detection . . . . .** 257  
 Michał Choraś and Rafał Kozik

**Recommending People to Follow Using Asymmetric Factor Models with Social Graphs . . . . .** 265  
 Tianle Ma, Yujiu Yang, Liangwei Wang and Bo Yuan

### **Part III Emerging Theories and Applications in Transportation Science**

<b>Air Travel Demand Fuzzy Modelling: Trip Generation and Trip Distribution . . . . .</b>	<b>279</b>
Milica Kalić, Jovana Kuljanin and Slavica Dožić	
<b>Design of Priority Transportation Corridor Under Uncertainty . . . . .</b>	<b>291</b>
Leonardo Caggiani and Michele Ottomanelli	
<b>Application of Data Fusion for Route Choice Modelling by Route Choice Driving Simulator . . . . .</b>	<b>305</b>
Mauro Dell’Orco, Roberta Di Pace, Mario Marinelli and Francesco Galante	
<b>Sustainability Evaluation of Transportation Policies: A Fuzzy-Based Method in a “What to” Analysis . . . . .</b>	<b>315</b>
Riccardo Rossi, Massimiliano Gastaldi and Gregorio Gecchele	
<b>Artificial Bee Colony-Based Algorithm for Optimising Traffic Signal Timings . . . . .</b>	<b>327</b>
Mauro Dell’Orco, Özgür Başkan and Mario Marinelli	
<b>Use of Fuzzy Logic Traffic Signal Control Approach as Dual Lane Ramp Metering Model for Freeways . . . . .</b>	<b>339</b>
Yetis Sazi Murat, Ziya Cakici and Gokce Yaslan	
<b>The Variable Neighborhood Search Heuristic for the Containers Drayage Problem with Time Windows . . . . .</b>	<b>351</b>
D. Popović, M. Vidović and M. Nikolić	
<b>Solving the Team Orienteering Problem: Developing a Solution Tool Using a Genetic Algorithm Approach . . . . .</b>	<b>365</b>
João Ferreira, Artur Quintas, José A. Oliveira, Guilherme A. B. Pereira and Luis Dias	
<b>Use of Fuzzy Optimization and Linear Goal Programming Approaches in Urban Bus Lines Organization . . . . .</b>	<b>377</b>
Yetis Sazi Murat, Sabit Kutluhan and Nurcan Uludag	
<b>Index . . . . .</b>	<b>389</b>