

QUARTERLY
December 2012



# applied mathematics and computer science

Special section

HYBRID AND ENSEMBLE METHODS IN MACHINE LEARNING

**Editors** 

Oscar CORDÓN Przemysław KAZIENKO





# Indexation

### About

The International Journal of Applied Mathematics and Computer Science is a quarterly published jointly by the University of Zielona Góra and the Lubuskie Scientific Society in Zielona Góra, Poland, since 1991. It strives to meet the demand for the presentation of interdisciplinary research in various fields related to control theory, applied mathematics, scientific computing, and computer science.

In particular, AMCS publishes high quality original research results in the following areas:
modern control theory and practice
artificial intelligence methods and their applications
applied mathematics and mathematical optimisation techniques

mathematical methods in engineering, computer science, and biology.

### Current indexing and abstracting

Science Citation Index Expanded (SciSearch®), Journal Citation Reports/Science Edition, Scopus-Elsevier, Google Scholar, INSPEC, EBSCO, MathSciNet, Mathematical Reviews, Compendex, Zentralblatt MATH, Current Mathematical Publications, Computer Abstracts International Database, Applied Mechanics Reviews, ACM Digital Library, CSA Technology Research Database, CSA High Technology Research Database with Aerospace, Computer and Information Systems Abstracts, Summon by Serials Solutions, VINITI, BazTech, Polish Virtual Library of Science/Mathematical Collection, Digital Library of Zielona Góra

### Impact Factor

0.487 (2011), 0.794 (2010), 0.684 (2009)



### Editor-in-Chief

Józef KORBICZ University of Zielona Góra, Poland

### **Deputy Editor**

Dariusz UCIŃSKI University of Zielona Góra, Poland

### **Associate Editors**

Igor AIZENBERG Texas A&M University-Texarkana, USA Luís GOMES New University of Lisbon, Portugal Adam GRZECH Wrocław University of Technology, Poland Nicholas P. KARAMPETAKIS Aristotle University of Thessaloniki, Greece Jacek KLUSKA Rzeszów University of Technology, Poland Marek KURZYŃSKI Wrocław University of Technology, Poland James LAM University of Hong Kong, China Silvio SIMANI University of Ferrara, Italy Andrzej ŚWIERNIAK Silesian University of Technology, Gliwice, Poland

### **Board Members**

Marian ADAMSKI
University of Zielona Góra, Poland
Sergei AVDONIN
University of Alaska Fairbanks, USA
Stanisław BANKA
West Pomeranian University of Technology in Szczecin, Poland
Andrzej BARTOSZEWICZ
Technical University of Łódź, Poland
Vincent COCQUEMPOT
Lille 1 University, France
Michael A. DEMETRIOU
Worcester Polytechnic Institute, USA
MORITZ DIEHL
KU Leuven, Belgium

Steven X. DING University of Duisburg-Essen, Germany Abdelhaq EL JAI University of Perpignan, France Rolf FINDEISEN University of Magdeburg, Germany Bin JIANG Nanjing University of Aeronautics and Astronautics, China Janusz KACPRZYK Polish Academy of Sciences, Warsaw, Poland László KEVICZKY Hungarian Academy of Sciences, Budapest, Hungary Jerzy KLAMKA Silesian University of Technology, Gliwice, Poland Jan M. KOŚCIELNY Warsaw University of Technology, Poland Zdzisław KOWALCZUK Gdańsk University of Technology, Poland Krzysztof KOZŁOWSKI Poznań University of Technology, Poland Miroslav KRSTIC University of California, San Diego, USA Vyacheslav MAKSIMOV Russian Academy of Sciences, Ural Branch, Ekaterinburg, Russia Krzysztof MALINOWSKI Warsaw University of Technology, Poland

Warsaw University of Technology, Poland
Wojciech MITKOWSKI
AGH University of Science and Technology, Cracow, Poland
Stanisław OSOWSKI
Warsaw University of Technology, Poland
Ronald J. PATTON
University of Hull, UK
Witold PEDRYCZ
University of Alberta, Edmonton, Canada
Marios M. POLYCARPOU
University of Cyprus, Nicosia, Cyprus
Vincenc PUIG

Technical University of Catalonia, Barcelona, Spain Ewaryst RAFAJŁOWICZ Wrocław University of Technology, Poland

Wrocław University of Technology, Polar Eric ROGERS

University of Southampton, UK Leszek RUTKOWSKI Technical University of Częstoch

Technical University of Częstochowa, Poland Jose SÁ da COSTA Technical University of Lisbon, Portugal

Dominique SAUTER
University of Lorraine, Nancy, France

Alexey E. SHUMSKY
Pacific State Economic University, Vladivostok, Russia

Miroslav ŠIMANDL University of West Bohemia in Pilsen, Czech Republic

Roman SŁOWIŃSKI

Poznań University of Technology, Poland

Mircea-Traian SOFONEA University of Perpignan, France Jan SOKÓLOWŠKI University of Lorraine, Nancy, France Ryszard TADEUSIEWICZ AGH University of Science and Technology, Cracow, Poland Yonghong TAN Shanghai Normal University, China Piotr TATJEWSKI Warsaw University of Technology, Poland Krzysztof TCHON Wrocław University of Technology, Poland Guisheng ZHAI Shibaura Institute of Technology, Tokyo, Japan Changshui ZHANG Tsinghua University, Beijing, China Enrique ZUAZUA Basque Center for Applied Mathematics, Bilbao, Spain

### **Editorial Office**

University of Louisville, USA

Jacek M. ZURADA

University of Zielona Góra Institute of Control & Computation Engineering ul. Podgórna 50 65-246 Zielona Góra Poland tel.: +48 683282506

tel.: +48 683282506 fax: +48 683284751

e-mail: amcs@uz·zgora·pl website: www.amcs·uz·zgora·pl

Agnieszka ROŻEWSKA Manager

Agata WIŚNIEWSKA-KUBICKA Technical Editor





### Requirements in brief

Our basic rules include electronic paper submission and processing, the LaTeX format following a special *AMCS* style, copyright transfer, a voluntary page charge.

### Paper submission

Paper proposals may be submitted only through our on-line submission system. If suitable for our journal, the papers will be subject to a full review procedure, and a decision on whether or not to accept the paper will be made based on the reviewers' comments.

### Paper style

The style of papers to be published in AMCS is determined by a special LaTeX class, which is described in detail in our instructions for authors. No other formats are accepted.

### Copyright transfer

All authors must sign the copyright transfer agreement before the article can be published. The agreement allows protecting the copyrighted material, without affecting the authors' proprietary rights, and covers the exclusive rights to reproduce and distribute the article.

### Page charge

Papers published in AMCS are subject to a voluntary page charge, which will be invoiced through the authors to their institutions. Publication is not dependent on the payment of this charge.

### **Provisions**

One sample copy of the journal and the electronic version of the paper are provided for authors once the issue has been published.

### Details, submission and downloads

The complete guide for authors can be found on our website at www.amcs.uz.zgora.pl.

### Present your research with us!



Our subscription is annual and covers four printed issues.

### 2013 Rates

### Domestic

Individuals & scientific institutions: 180 PLN Other customers: 600 PLN

### Foreign

Individuals: 180 EUR Institutions: 200 EUR

Prices exclusive of VAT. Postage free for standard delivery.

### Payment methods

We accept bank transfers and off-line credit card payments.

### Orders

Please contact the Editorial Office for subscription orders.



### Recent special issues and sections

2012, Vol. 22, No. 2: Special section
ANALYSIS AND CONTROL OF SPATIOTEMPORAL DYNAMIC SYSTEMS
Editors: Dariusz UCIŃSKI, Józef KORBICZ
Authors: Z. Emirsajłow, P.J. Mitkowski and W. Mitkowski,
A. Myśliński, E. Niewiadomska-Szynkiewicz, M. Patan,
E. Rafajłowicz et al.

2012, Vol. 22, No. 1: Special issue ADVANCES IN CONTROL AND FAULT-TOLERANT SYSTEMS *Editors*: Józef KORBICZ, Didier MAQUIN, Didier THEILLIOL *Authors*: H. Jamouli *et al.*, D. Uciński, F. Yang *et al.*, M.Ungermann *et al.*, H.H. Niemann, H. Yang *et al.*, X. Olive, C. Edwards *et al.*, T. Jain *et al.*, P. Weber *et al.*, R.J. Patton *et al.*, S. Montes de Oca *et al.*, P. Gáspár *et al.*, D. Xu *et al.*, D. Ichalal *et al.*, A. Yetendje *et al.*, K. Patan and J. Korbicz

2011, Vol. 21, No. 3: Special section ISSUES IN ADVANCED CONTROL AND DIAGNOSIS *Editors*: Vicenç PUIG, Marcin WITCZAK *Authors*: W. Chen *et al.*, A. Khelassi *et al.*, M. Bonfè *et al.*, B. Boussaid *et al.*, S. Fang and M. Blanke, K-U Dettmann and D.Söffker

2011, Vol. 21, No. 2: Special section
EFFICIENT RESOURCE MANAGEMENT FOR
GRID-ENABLED APPLICATIONS
Editors: Joanna KOŁODZIEJ, Fatos XHAFA
Authors: O. Terzo et al., A. Carpen-Amarie et al., J. Kołodziej
and F. Xhafa, M. Hall-May et al., H. González-Vélez and
M. Kontagora, G. Di Modica et al., F.A. López-Fuentes

2011, Vol. 21, No. 1: Special section SEMANTIC KNOWLEDGE ENGINEERING Editors: Grzegorz J. NALEPA, Antoni LIGĘZA Authors: A. Bădică and C. Bădică, J. Baumeister et al., J. Cañadas et al., I. Czarnowski and P. Jędrzejowicz, A. Kozierkiewicz-Hetmańska and N.T. Nguyen, A. Meissner

## CONTENTS

Special :	section
-----------	---------

Li C. and Chiang TW. Intelligent financial time series forecasting: A complex neuro-fuzzy approach wit multi-swarm intelligence	
Colomo-Palacios R., González-Carrasco I., López-Cuadrado J.L. and García-Crespo Á. ReSySTER:  A hybrid recommender system for Scrum team roles based on fuzzy and rough sets	. 801
Qin H., Ma X., Herawan T. and Zain J.M. DFIS: A novel data filling approach for an incomplete soft set.	817
Kajdanowicz T. and Kazienko P. Multi-label classification using error correcting output codes	829
<b>Sumi S.M., Zaman M.F. and Hirose H.</b> A rainfall forecasting method using machine learning models and it application to the Fukuoka city case	
Woźniak M. and Krawczyk B. Combined classifier based on feature space partitioning	. 855
<b>Trawiński B., Smętek M., Telec Z. and Lasota T.</b> Nonparametric statistical analysis for multiple compariso of machine learning regression algorithms	
Regular section	
Albers B., Savidis S.A., Taşan H.E., von Estorff O. and Gehlken M. BEM and FEM results of displacement in a poroelastic column	
<b>Kaczorek T.</b> A modified state variable diagram method for determination of positive realizations of linear continuous-time systems with delays	
Stanisławski R. and Latawiec K.J. Normalized finite fractional differences: Computational and accurace breakthroughs	•
<b>Thuan M.V., Phat V.N. and Trinh H.</b> Observer-based controller design of time-delay systems with an intervatime-varying delay	
Krokavec D. and Filasová A. Novel fault detection criteria based on linear quadratic control performances .	. 929
Nowicki A., Grochowski M. and Duzinkiewicz K. Data-driven models for fault detection using kernel PCA A water distribution system case study	
<b>Karpowicz M.P.</b> Nash equilibrium design and price-based coordination in hierarchical systems	. 951
Schaefer R., Byrski A. and Smołka M. The island model as a Markov dynamic system	971
Witkowska A. and Śmierzchalski R. Designing a ship course controller by applying the adaptive backstepping method	
Szłapczyński R. and Szłapczyńska J. Customized crossover in evolutionary sets of safe ship trajectories	999
Puszyński K., Jaksik R. and Świerniak A. Regulation of p53 by siRNA in radiation treated cells: Simulatio studies	

### **AIMS & SCOPE**

The *International Journal of Applied Mathematics and Computer Science* strives to meet the demand for the presentation of interdisciplinary research in various fields related to control theory, applied mathematics, scientific computing, and computer science. In particular, it publishes high quality original research results in the following areas:

- modern control theory and practice
- artificial intelligence methods and their applications
- applied mathematics and mathematical optimisation techniques
- mathematical methods in engineering, computer science, and biology.

We are primarily interested in presenting theoretical and application-oriented papers dealing with the following topics:

- artificial intelligence, including neural networks, knowledge engineering, reasoning and learning models, expert and decision support systems, fuzzy systems, and search methods
- control theory, including optimal control, system identification, adaptive and robust control, multivariable control, and non-linear systems
- dynamical systems, including spatiotemporal processes, control problems, sensor networks, and state and parameter estimation
- robotics, including modelling and simulation, mobile robots, and optimal trajectory planning
- fault detection and diagnosis, including model-based approaches, observers, and classifiers
- fault-tolerant control, including the control of continuous-variable and quantised systems
- mathematical biology
- mathematical modelling and simulation, including numerical algorithms
- optimisation, including mathematical optimisation techniques, global optimisation, and evolutionary algorithms
- pattern recognition
- · signal processing
- applications in engineering and medicine.

The editors welcome proposals for exchange between similar journals. Also, all persons interested in bringing out special issues of *AMCS* are encouraged to contact the Editor-in-Chief. Such issues may be published on any important and timely subject within the scope of the journal. All papers proposed for specials should be refereed and meet the same criteria for scientific quality as articles presented in regular issues.

The publication of *AMCS* is financially supported by the Ministry of Science and Higher Education in Poland and the University of Zielona Góra.

For more information, visit our website at www.amcs.uz.zgora.pl.