RECENT RESEARCHES in ARTIFICIAL INTELLIGENCE and DATABASE MANAGEMENT

Proceedings of the 11th WSEAS International Conference on ARTIFICIAL INTELLIGENCE, KNOWLEDGE ENGINEERING and DATA BASES (AIKED '12)

Cambridge, UK
February 22-24, 2012
Editors:
Prof. Imre J. Rudas, Obuda University, Hungary
Prof. Azami Zaharim, Universiti Kebangsaan, Malaysia
Prof. Kamaruzzaman Sopian, Universiti Kebangsaan, Malaysia
Prof. Jiri Strouhal, University of Economics Prague, Czech Republic

International Program Committee Members:
Lotfi A. Zadeh
Charles Long
Miguel Angel Gomez-Nieto
Akshai Aggarwal
Janusz Kacprzyk
Angel Fernando Kuri Morales
Arie Maharshak
Fumiaki Imado
Toly Chen
Shivanand Hiremath
Pierre Borne
Bogdan Gabrys
F.-K. Benra
Dana Simian
Calin Ciufudean
Yang Li-Shang
Urszula Ledzewicz
Ioannis Pountourakis
M. Isabel Garcia-Planas
Fathi M. Allan
Andris Buiks
Nikos C. Tsourveloudis
Ioannis Gion
A. Andreatos
G. R. Dattatreya
C.W. Solomon
Demetrios Kazakos
Nikos E. Mastorakis
Sesh Commuri
Pelin Yildiz
Dalibor Biolek
Metin Demiralp
Aydin Akan
Valeri Mladenov
Zoran S. Bojkovic
G. Stavarakakis
Weilian Su
Elena Niculescu
Kuo-hung Tseng
H.T. Duru
Nabil Moussa
Irina Zheliaizkova
Vir Brslica
Anping Xu
Victor-Emil Neagoe
Katia Sycara
Olga Martin
Marketa Mazalkova
Lina Vasiliauskiene
Javier Bilbao
Maria Boile
Naim Sidek
Roberto Revetria
Andrzej W. Ordys
Vincenzo Niola
Jurij Kropf
George Stavarakakis
Simona Lache
Blagovest Shishkov
S.A. Selouani
Vir Brslica
Isak Taksa
Milan Stork
Preface
This year the 11th WSEAS International Conference on Artificial Intelligence, Knowledge Engineering and Data Bases (AIKED '12) was held in Cambridge, UK, in February 22-24, 2012. The conference provided a platform to discuss neural networks, algorithms, fuzzy systems, information and knowledge engineering, information retrieval systems, image processing, knowledge and information management techniques, data mining techniques, software tools and support, performance evaluation techniques etc. with participants from all over the world, both from academia and from industry.

Its success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of this conference are published in this Book that will be sent to international indexes. They will be also available in the E-Library of the WSEAS. Extended versions of the best papers will be promoted to many Journals for further evaluation.

A conference such as this can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors
## Table of Contents

Plenary Lecture 1: New Approaches in Information Aggregation  
*Imre J. Rudas*  
12

Plenary Lecture 2: Fuzzy Multicriteria analysis for Optimal Choice of Oil/NG Pipelines Routing – A Knowledge Based Approach  
*Fragiskos Batzias*  
13

Plenary Lecture 3: Artificial intelligence in Supervised learning  
*Danimir Mandic*  
14

On Informational Coefficient of Correlation for Possibility Distributions  
*Robert Fuller, Istvan A. Harmati, Peter Varlaki, Imre J. Rudas*  
15

Optimized Cascade PI Controllers of Buck Converters Using Particle Swarm Optimization Algorithm  
*S. Chonsatidjamroen, K-N. Areerak, K-L. Areerak, A. Srikaew*  
21

Application of Quantum-Inspired Binary Gravitational Search Algorithm for Optimal Power Quality Monitor Placement  
*Ahmad Asrul Ibrahim, Azah Mohamed, Hussain Shareef*  
27

Measuring Expressivity between Ontology Models  
*Khalid Albarrak, Edgar H. Sibley*  
33

Intrinsic Coordinatability of Agent-Based Systems  
*Wynn Stirling*  
42

A Neural Network (NN) and Response Surface Methodology (RSM) based Prediction Model for Sintered Aluminium Performs  
*M. Joseph Davidson, N. Selvakumar*  
48

Modified Blame-Based Noise Reduction for Concept Drift  
*Ning Lu, Guangquan Zhang, Jie Lu*  
55

Some Questions of Consensus Building using Co-Association  
*Vitaliy Tayanov*  
61

Knowledge Base Learning Control System - Part 1: Generic Architecture  
*Aboubekeur Hamdi-Cherif*  
67

Knowledge Base Learning Control System - Part 2: Intelligent Controller  
*Aboubekeur Hamdi-Cherif*  
72

M-FMCN: Modified Fuzzy Min-Max Classifier Using Compensatory Neurons  
*Reza Davtalab, Mostafa Parchami, Mir Hossein Dezfoolian, Muharram Mansourizade, Bahareh Akhtar*  
77
A Method for Enhancing Image Retrieval based on Annotation using Modified WUP Similarity in WordNet
Dongjin Choi, Jungin Kim, Hayoung Kim, Myunggwon Hwang, Pankoo Kim

Educational WEB portals and Data Bases in Physical Education
Danimir Mandic, Dragan Martinovic, Nenad Lalic

Artificial Intelligence in Programmed Teaching and Learning
Danimir Mandic, Mirko Dejic, Ezzadeen Kamuka

Adding Fault Tree Analysis (FTA) into a Knowledge – Based Problem Solver
F. A. Batzias, A. Bountri

On the Development of a Knowledge Base for Recommended Practices in Biomaterials and Bioproducts Selection – A CBR Approach
F. A. Batzias, C. G. Siontorou

Evaluation of Banks Insolvency Using Artificial Neural Networks
Qeethara Kadhim Al-Shayea, Ghaleb Awad El-Refae

Inversion the Chlorophyll Content based on the Ground Hyper-Spectral Image Data
Fang Xinwei

A Novel Meta-Heuristic Optimization Algorithm: Current Search
Anusorn Sakulin, Deacha Puangdownreong

Control Synthesis for Unstable Systems via Current Search
Anusorn Sakulin, Deacha Puangdownreong

Solving Traveling Salesman Problems via Artificial Intelligent Search Techniques
Supaporn Suwannarongsri, Deacha Puangdownreong

A Generalized 3-Component Portfolio Selection Model
Irina Georgescu, Jani Kinnunen

Optimal Placement and Sizing of FACTS Devices for Loadability Enhancement in Deregulated Power Systems
Mahmoud Mohammadi, Alireza Rezazadeh, Mostafa Sedighizadeh

Congestion Management Technique Using Fuzzy Logic Based on Security and Economy Criteria
G. Yesuratnam, N. Srilatha, P. Lokender Reddy

An Approach to Conceptual Ontology Integration with an Ontology Repository and a Rule Base
Dan Wu, Anne Hakansson

Design of an Ontological Interface for Chemical and Biotechnological Knowledge Acquisition by Means of an Intelligent Agent
F. A. Batzias, C. G. Siontorou

Intelligent Knowledge-Based System for the Automated Screwing Process Control
Yuliya Lebedynska, Ulrich Berger
<table>
<thead>
<tr>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prediction of Influence of Doping of NaNO3 on the Solid Phase Thermal Decomposition of Bitumen using Neural Networks</td>
<td>181</td>
</tr>
<tr>
<td>Foad Qassemi, Ali Reza Ahmadi, Mostafa Alizadeh, Ahmad Qassemi</td>
<td></td>
</tr>
<tr>
<td>Incorporating the Principle of Simplicity into Model Based Reasoning (MBR) used for Computer Aided Simulation of Industrial Processes</td>
<td>189</td>
</tr>
<tr>
<td>F. A. Batzias, D. K. Sidiras</td>
<td></td>
</tr>
<tr>
<td>Mapping DB to RDF with Additional Discovered Relations</td>
<td>195</td>
</tr>
<tr>
<td>Mamdouh Farouk, Mitsuru Ishizuka</td>
<td></td>
</tr>
<tr>
<td>Nonlinear Function Approximation Using Fuzzy Functional SIRMs Inference Model</td>
<td>201</td>
</tr>
<tr>
<td>Hirosato Seki</td>
<td></td>
</tr>
<tr>
<td>Linguistic Classification Pattern Extraction for Numeric Data</td>
<td>207</td>
</tr>
<tr>
<td>Kyung Mi Lee, Keon Myung Lee, Chan Hee Lee</td>
<td></td>
</tr>
<tr>
<td>Artificial Intelligence in Supervised Learning</td>
<td>213</td>
</tr>
<tr>
<td>Danimir Mandic</td>
<td></td>
</tr>
<tr>
<td>PsycheTagger – Using Hidden Markov Model to Annotate English Text with Semantic Tags based on Emotive Content</td>
<td>219</td>
</tr>
<tr>
<td>Liaquat Majeed Sheikh, Sumaira Sarfraz, Ahsan Nabi Khan</td>
<td></td>
</tr>
<tr>
<td>Recreation of Spontaneous Non-Verbal Behavior on a Synthetic Agent EVA</td>
<td>225</td>
</tr>
<tr>
<td>Izidor Mlakar, Matej Rojc</td>
<td></td>
</tr>
<tr>
<td>Computer-based Information System in Education</td>
<td>231</td>
</tr>
<tr>
<td>Danimir Mandic, Momcilo Pelemis, Stevo Pasalic, Nenad Lalic</td>
<td></td>
</tr>
<tr>
<td>Advances in Fuzzy Rough Set Theory for Temporal Databases</td>
<td>237</td>
</tr>
<tr>
<td>Aqil Burney, Nadeem Mahmood, Zain Abbas</td>
<td></td>
</tr>
<tr>
<td>Bayesian-Based Instance Weighting Techniques for Instance-Based Learners</td>
<td>243</td>
</tr>
<tr>
<td>Khalil El Hindi, Bayan Abu Shawar</td>
<td></td>
</tr>
<tr>
<td>Authors Index</td>
<td>250</td>
</tr>
</tbody>
</table>
Plenary Lecture 1

New Approaches in Information Aggregation

Professor Imre J. Rudas
Rector
Fellow of IEEE
Obuda University
Budapest, Hungary
E-mail: rudas@uni-obuda.hu

Abstract: The problem of aggregating information represented by fuzzy sets in a meaningful way has been of central interest since the late 1970s. In most cases, the aggregation operators are defined on a pure axiomatic basis and are interpreted either as logical connectives (such as t-norms and t-conorms) or as averaging operators allowing a compensation effect (such as the arithmetic mean).

On the other hand, it can be observed by some empirical tests that the above-mentioned classes of operators differ from those ones that people use in practice. Therefore, it is important to find operators that are, in a sense, mixtures of the previous ones, and allow some degree of compensation.

This talk summarizes the research results of the author and his co-workers that have been carried out in recent years on generalization of conventional aggregation operators. This includes, but is not limited to, the class of uninorms and nullnorms, absorbing norms, distance- and entropy-based operators.

Brief Biography of the Speaker: Imre J. Rudas graduated from Banki Donat Polytechnic, Budapest in 1971, received the Master Degree in Mathematics from the Eotvos Lorand University, Budapest, the Ph.D. in Robotics from the Hungarian Academy of Sciences in 1987, while the Doctor of Science degree from the Hungarian Academy of Sciences in 2004. He received his first Doctor Honoris Causa degree from the Technical University of Kosice, Slovakia and the second one from “Polytechnica” University of Timisoara, Romania.

He is active as a full university professor. He served as the Rector of Budapest Tech from August 1, 2003 for a period of four years, and was reelected for three years in 2007. From 2010 Budapest Tech is changed to Obuda University and he was elected as the rector for five years.

He is a Fellow of IEEE, Senior Administrative Committee member of IEEE Industrial Electronics Society, member of Board of Governors of IEEE SMC Society, Chair of IEEE Hungary Section and Vice-President of the Hungarian Academy of Engineering.

He is the treasurer of IFSAS (International Fuzzy System Association), he had been the President of Hungarian Fuzzy Association for ten years.

He serves as an associate editor of some scientific journals, including IEEE Transactions on Industrial Electronics, member of editorial board of Journal of Advanced Computational Intelligence, member of various national and international scientific committees. He is the founder of the IEEE International Conference Series on Intelligent Engineering Systems (INES) and IEEE International Conference on Computational Cybernetics (ICCC), and some international symposia. He has served as General Chairman and Program Chairman of numerous scientific international conferences.

His present areas of research activity are Computational Cybernetics, Robotics with special emphasis on Robot Control, Soft Computing, Computed-aided Process Planning, Fuzzy Control and Fuzzy Sets. He has published books, more than 500 papers in books, various scientific journals and international conference proceedings. He received more than 750 citations for his publications.
Abstract: Numerous projects of oil and natural gas (NG) supply chain are under construction worldwide for the establishment of new networks and facilities or for the extension of existing ones. From these projects, each one maintains its own design philosophy and technological concept. However, for managers and engineers, the selection of an optimum supply route demonstrates an essential techno-economical decision making problem associated with security of supply, environmental acceptance, investment cost and future networking. In practice, this problem is managed in pre-construction initiations, when feasibility and planning of projects are elaborated. This presentation considers a framework, under the form of an algorithmic procedure, for the evaluation of supply routes and decision-making. Problems of the framework, related with low availability of critical technical information and deficiencies of engineering companies to manage their corporate knowledge, are reported. A multicriteria analysis methodology, based on a Delphi technique for experts’ knowledge elicitation and quantification, is proposed as a practical solution to face the problems and to support the decision making process. A case study demonstrating applicability of the proposed methodology by using a fuzzy PROMETHEE version is also presented, examining several alternative solutions associated with the expansion of the inland natural gas supply chain in Greece. It is proved that the methodology suggested (i) allows elicitation and transforming of experts’ tacit knowledge to explicit (quantitative), by using questionnaires for scoring of criteria and alternative solutions, (ii) overcomes problems of experts’ unavailability through submission and recollection of questionnaires over long distances (by applying Delphi method techniques), (iii) reduces utilization of improper know-how from poorly maintained technical archives, (iv) enables less dependence on know-how and technology transfer collaborations, as mainly focused in utilizing captured tacit knowledge of experts; (v) anticipates limitation in economic and technological collaborations, since, at pre-construction phases, the budgets are limited and the time constraints pressing; (vi) allows incorporation of knowledge intensive criteria like know-how acquisition requirements and know-how diffusion perspectives.

Brief Biography of the Speaker: Prof. Fragiskos Batzias holds a 5years Diploma and a PhD degree in Chemical Engineering, and a BSc in Economics. He has also studied Mathematics and Philosophy. He is Director of the Laboratory of Simulation of Industrial Processes and Head of the Research Group on Systems Analysis at the Department of Industrial Management and Technology of the University of Piraeus, Greece. He is teaching at the interdepartmental postgraduate courses (i) Systems of Energy Management and Protection of the Environment, running by the University of Piraeus in cooperation with the Chem. Eng. Dept. of the Nat. Tech. Univ. of Athens, and (ii) Techno-Economic Systems, running by the Electr. & Comp. Eng. Dept. of the Nat. Tech. Univ. of Athens in cooperation with the University of Athens and the University of Piraeus. His research interests are in chemical engineering systems analysis and knowledge based decision making. He has >100 publications in highly ranked journals and conference proceedings, including 29 research monographs in collective volumes, with 171 citations and an h-index of 8 (for the period 2004-2011, source: ISI Web of Science, Thompson Scientific; self-citations have been excluded). He has participated (and chaired after invitation from the organizers) in prestigious international conferences, such as those organized periodically by the IEEE, the European Federation of Chemical Engineering (EFCE), the DECHEMA, CHISA, WSEAS Organizations. He organizes the annual Symposium on Industrial and Environmental Case Studies running successfully since 2004 within the International Conference of Computational Methods in Sciences and Engineering (ICCMSE).
Abstract: Supervised learning is based on principles of programmed learning powered by artificial intelligence. Supervised learning is created to define precisely learning content, to fix activities which will enable success, provide conditions and means for that, create favorable psychological climate for acquiring knowledge, its control and development of human capabilities. On the other hand, supervised learning results from teacher's need to know how much and how pupils learns, what are their difficulties and how it is possible, to eliminate them. New educational technology, powered by artificial intelligence, has influence on introducing important changes in organization of educational institutions, contents and methods of teaching activity as well as in relations in institutions that are conducting teaching and education. Here we shall talk about supervised learning and intelligent software in order to indicate their place and role in modern teaching. Conditions are made for raising maximum success with minimum efforts and there are instruments and possibilities for adequate evaluation of young people work. It is also achieved therewith that learning becomes entertaining to a certain degree and it engages pupils attention more strongly. The fact that programmed teaching takes care about intelligence, knowledge, level of reading skill of pupils, results of diagnostic tests and teacher grade, also contributes to its quality. In supervised teaching information is usually given, a problem stated that pupil should solve, after that pupil gives his solution, does the operation (in case it is not automatically solved) to see the solution given by programmer, does comparison, eventual corrections and completions, gets a grade and instructions for further work. Thus dynamized learning is suitable to psychological characteristics of child and for that reason he is tireless in work in his first contacts with supervised teaching. Supervised learning is sometimes called autoinstruction, automatic instruction or selfinstruction because function of teacher in giving information is reduced to minimum or, in some cases, it is not evident at all. It is the reason why „pedagogical fashionable persons“ give brave statement that modern computers will replace teacher. However, researches have shown that “learning machines” are only one (truly very improved) teaching aid, but they do not replace teacher but influence gradual change of his function, to create new possibilities for learning and advancement of teaching. Therefore, it is a false dilemma „machines or man“, and real solution is „intelligent machines in hands of man“. 

Brief Biography of the Speaker: Danimir Mandic graduated at the Faculty of Mechanical engineering in Sarajevo, in the area of Information systems. Masters degree got at the University of Belgrade in the area of Information systems in traffic engineering. At the Faculty of technical sciences in Novi Sad he got a DSc in the area of Information systems in traffic engineering, and he got PhD at the University of East Sarajevo in the area of Educational technology. He was a postgraduate student at the Michigan State University at the department of Computer Sciences. He is a full professor of Informatics and educational technology at the University of Belgrade in Serbia (from 2002) and a chief of Department of Didactics and Educational Technology. From 1987. up to 1992 he was assistant at the Faculty of Traffic Engineering in Sarajevo (Bosnia and Herzegovina), from 1992. he is professor at the Faculty of Teacher Training in Belgrade (Serbia).

Danimir Mandic published more than 70 scientific papers and 18 books in the area of Informatics and Educational Technology. He was a leader in three scientific projects: Educational software for students, Interactive multimedia classroom and Distance education systems for high education. Currently he is the leader in scientific project: Evaluation of the Curriculum at the Teacher Training faculties in Serbia using modern technologies and distance education. He is the author of several innovations in education. He created multimedia software for learning informatics, and Distance learning software for students. His area of interest is modern educational technology, artificial intelligence and computer science.

Danimir Mandic is advanced tester and coordinator for European Computer Driving Licence in Serbia.
## Authors Index

<table>
<thead>
<tr>
<th>Authors</th>
<th>Page(s)</th>
<th>Authors</th>
<th>Page(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbas, Z.</td>
<td>237</td>
<td>Hwang, M.</td>
<td>83</td>
</tr>
<tr>
<td>Abu Shawar, B.</td>
<td>243</td>
<td>Ibrahim, A. A.</td>
<td>27</td>
</tr>
<tr>
<td>Ahmadi, A. R.</td>
<td>181</td>
<td>Ishizuka, M.</td>
<td>195</td>
</tr>
<tr>
<td>Akhtar, B.</td>
<td>77</td>
<td>Kamuka, E.</td>
<td>95</td>
</tr>
<tr>
<td>Albarrak, K.</td>
<td>33</td>
<td>Khan, A. N.</td>
<td>219</td>
</tr>
<tr>
<td>Alizadeh, M.</td>
<td>181</td>
<td>Kim, H.</td>
<td>83</td>
</tr>
<tr>
<td>Al-Shayea, Q. K.</td>
<td>113</td>
<td>Kim, J.</td>
<td>83</td>
</tr>
<tr>
<td>Areerak, K.-L.</td>
<td>21</td>
<td>Kim, P.</td>
<td>83</td>
</tr>
<tr>
<td>Areerak, K.-N.</td>
<td>21</td>
<td>Kinnunen, J.</td>
<td>142</td>
</tr>
<tr>
<td>Batzias, F. A.</td>
<td>101, 107</td>
<td>Lalic, N.</td>
<td>88, 231</td>
</tr>
<tr>
<td>Batzias, F. A.</td>
<td>169, 189</td>
<td>Lebedynska, Y.</td>
<td>175</td>
</tr>
<tr>
<td>Berger, U.</td>
<td>175</td>
<td>Lee, C. H.</td>
<td>207</td>
</tr>
<tr>
<td>Bountri, A.</td>
<td>101</td>
<td>Lee, Ke. M.</td>
<td>207</td>
</tr>
<tr>
<td>Burney, A.</td>
<td>237</td>
<td>Lee, Ky. M.</td>
<td>207</td>
</tr>
<tr>
<td>Choi, D.</td>
<td>83</td>
<td>Lu, J.</td>
<td>55</td>
</tr>
<tr>
<td>Chonsatidjamroen, S.</td>
<td>21</td>
<td>Lu, N.</td>
<td>55</td>
</tr>
<tr>
<td>Davidson, M. J.</td>
<td>48</td>
<td>Mahmood, N.</td>
<td>237</td>
</tr>
<tr>
<td>Davtalab, R.</td>
<td>77</td>
<td>Mandic, D.</td>
<td>213, 231</td>
</tr>
<tr>
<td>Dejic, M.</td>
<td>95</td>
<td>Mandic, D.</td>
<td>88, 95</td>
</tr>
<tr>
<td>Dezfoulian, M. H.</td>
<td>77</td>
<td>Mansourizade, M.</td>
<td>77</td>
</tr>
<tr>
<td>El Hindi, K.</td>
<td>243</td>
<td>Martinovic, D.</td>
<td>88</td>
</tr>
<tr>
<td>El-Refae, G. A.</td>
<td>113</td>
<td>Mlakar, I.</td>
<td>225</td>
</tr>
<tr>
<td>Fang, X.</td>
<td>119</td>
<td>Mohamed, A.</td>
<td>27</td>
</tr>
<tr>
<td>Farouk, M.</td>
<td>195</td>
<td>Mohammadi, M.</td>
<td>148</td>
</tr>
<tr>
<td>Fuller, R.</td>
<td>15</td>
<td>Parchami, M.</td>
<td>77</td>
</tr>
<tr>
<td>Georgescu, I.</td>
<td>142</td>
<td>Pasalic, S.</td>
<td>231</td>
</tr>
<tr>
<td>Hakansson, A.</td>
<td>163</td>
<td>Pelemis, M.</td>
<td>231</td>
</tr>
<tr>
<td>Hamdi-Cherif, A.</td>
<td>67, 72</td>
<td>Puangdownreong, D.</td>
<td>125, 131, 137</td>
</tr>
<tr>
<td>Harmati, I. A.</td>
<td>15</td>
<td>Qassemi, A.</td>
<td>181</td>
</tr>
</tbody>
</table>