



ADVANCES on SOFTWARE ENGINEERING, PARALLEL and DISTRIBUTED SYSTEMS

**Proceedings of the 7th WSEAS International Conference on SOFTWARE
ENGINEERING, PARALLEL and DISTRIBUTED SYSTEMS
(SEPADS'08)**

University of Cambridge, Cambridge, UK, February 20-22, 2008

*Electrical and Computer Engineering Series
A Series of Reference Books and Textbooks*

Published by WSEAS Press

www.wseas.org

ISBN: 978-960-6766-42-8

ISSN: 1790-5117

ADVANCES on SOFTWARE ENGINEERING, PARALLEL and DISTRIBUTED SYSTEMS

**Proceedings of the 7th WSEAS International Conference on SOFTWARE
ENGINEERING, PARALLEL and DISTRIBUTED SYSTEMS
(SEPADS'08)**

University of Cambridge, Cambridge, UK, February 20-22, 2008

**Electrical and Computer Engineering Series
A Series of Reference Books and Textbooks**

Published by WSEAS Press
www.wseas.org

Copyright © 2008, by WSEAS Press

All the copyright of the present book belongs to the World Scientific and Engineering Academy and Society Press. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the Editor of World Scientific and Engineering Academy and Society Press.

All papers of the present volume were peer reviewed by two independent reviewers. Acceptance was granted when both reviewers' recommendations were positive.
See also: <http://www.worldses.org/review/index.html>

**ISSN: 1790-5117
ISBN: 978-960-6766-42-8**



World Scientific and Engineering Academy and Society

ADVANCES on SOFTWARE ENGINEERING, PARALLEL and DISTRIBUTED SYSTEMS

**Proceedings of the 7th WSEAS International Conference on SOFTWARE
ENGINEERING, PARALLEL and DISTRIBUTED SYSTEMS
(SEPADS'08)**

University of Cambridge, Cambridge, UK, February 20-22, 2008

Honorary Editors:

Lotfi A. Zadeh, University of Berkeley, USA

Janusz Kacprzyk, International Fuzzy Systems Association, Poland

Editors:

Leonid Kazovsky, Stanford University, USA

Pierre Borne, Ecole Centrale de Lille, France

Nikos Mastorakis, Military Institutes of University Education, HNA, Greece

Angel Kuri-Morales, Instituto Tecnológico Autónomo de México, México

Ioannis Sakellaris, National Technical University of Athens, Greece

International Program Committee Members:

Cuauhtemoc Rodriguez, University of Cambridge, UK

Gehan A.J. Amaratunga, University of Cambridge, UK

Pierre Borne, Ecole Centrale de Lille, FRANCE

Bogdan Gabrys, Bournemouth University, UK

Demterios Kazakos, Texas Southern University, USA

Nikos E. Mastorakis, Military Inst.of Univ.Education, GREECE

F.-K. Benra, University of Duisburg-Essen, Germany

Dana Simian, University "Lucian Blaga" of Sibiu, ROMANIA

Calin Ciufudean, Faculty of Electrical Engineering Suceava, ROMANIA

Yang Li-Shang, St.John's University, TAIWAN

Urszula Ledzewicz, University Edwardsville, USA

Ioannis Pountourakis, National Technical University of Athens, GREECE

M. Isabel Garcia-Planas, Univ. of Barcelona, SPAIN

Fathi M. Allan, United Arab Emirates University, UAE

Andris Buikis, Latvian Academy of Science, LATVIA

Akshai Aggarwal, University of Windsor, CANADA

Blyden, The College of New Jersey, USA

Octavian Cret, Technical University of Cluj-Napoca, ROMANIA

Valeri Mladenov, Technical University of Sofia, Bulgaria

Zoran S. Bojkovic, University of Belgrade, SERBIA

Nikos C. Tsourveloudis, Technical Univ. of Crete, GREECE

Angel Fernando Kuri Morales, Univ. of Mexico City, MEXICO

Fumiaki Imado, Shinshu University, JAPAN

Ioannis Gonos, National Technical University of Athens, GREECE

Irina Zheliazkova, University of Rousse, BULGARIA

A. Andreatos, Military Inst.of Univ.Education, H Air-Force Acad, GREECE

G. R.Dattatreya, University of Texas at Dallas, USA

Prof. Christos Chalkias, Harokopio University, Dept. of Geography, GREECE

Prof. Yanbin Wang, Department of Geophysics, Peking University, CHINA

Prof. Filippos Vallianatos, Technological Educational Institute of Crete, Dept. of Natural Resources & Environment Geophysics & Seismology Laboratory (GSL), GREECE

Prof. Mustafa Aktar, Dept. of Geophysics, Bogazici University, TURKEY

Prof. Menas Kafatos, Center for Earth Observing and Space Research, George Mason University, USA

Dr. Stelios Zimeras, University of the Aegean, Department of Statistics and Actuarial-Financial Mathematics, GREECE

Dr. Renato Lancellotta, Soil Mechanics and Foundation Engineering, Politecnico Di Torino, ITALY

Dr. Nam H. Tran, The School of Petroleum Engineering, The University of New South Wales, AUSTRALIA

Dr. Daniel E. McNamara, USGS/ANSS/NEIC, U.S. Geological Survey, Denver Federal Center, USA

Dr. Stefan Florin Balan, Engineering Seismology Department, National Institute of Research Development for Earth Physics, ROMANIA

Dr. Mircea Radulian, Scientific Director, National Institute for Earth Physics, ROMANIA

Dr. Vladimir Graizer, California Geological Survey, USA

Dr. Ernst D. Schmitter, University of Applied Sciences, GERMANY

Dr. Constantin Ionescu, National Institute of Research and Development for Earth Physics, ROMANIA

Dr. Andrei Bala, National Institute of Research and Development for Earth Physics, ROMANIA

Dr. J. R. Kayal, Geological Survey of India, INDIA

Dr. Mihaela Popa, National Institute for Earth Physics, ROMANIA

Preface

This book contains proceedings of the 7th WSEAS International Conference on SOFTWARE ENGINEERING, PARALLEL and DISTRIBUTED SYSTEMS (SEPADS '08) which was held in University of Cambridge, Cambridge, UK, February 20-22, 2008. The first WSEAS Software Engineering, Parallel and Distributed Systems Conference was held in Cadiz, Spain in 2002. In 2003 it was held in Rethymno, Greece. After that in 2004 and 2005 it took place in Salzburg, Austria. In 2006 this Conference was organized in Univ. de Alcala, Madrid, Spain. Last year in 2007 it was held in Corfu, Greece. And this year, it will be held in the University of Cambridge, Cambridge, UK. The World Conference of WSEAS on SOFTWARE ENGINEERING, PARALLEL and DISTRIBUTED SYSTEMS is the internationally recognised Forum for the dissemination of the latest advances on Software Engineering, Parallel Computing, Distributed Computing, Algorithms, Computer Networks etc as well as their impact and their interaction with other areas of Electrical Engineering and Computer Science and Engineering. The various WSEAS conferences on Theoretical and Applied Computer Science has been successfully held each year since 1996 and has produced more than 150 volumes of Proceedings while the best papers and the invited papers after extension and after peer review from 4 international referees, are published in WSEAS Journals covered by all the major scientific indexes.

The 7th WSEAS International Conference on SOFTWARE ENGINEERING, PARALLEL and DISTRIBUTED SYSTEMS (SEPADS'08) aims to disseminate the latest research and applications in the afore mentioned fields. The friendliness and openness of the WSEAS conferences, adds to their ability to grow by constantly attracting young researchers.

The WSEAS International Conference on SOFTWARE ENGINEERING, PARALLEL and DISTRIBUTED SYSTEMS attracts each year a large number of well-established and leading researchers in the aforementioned areas as well as Modern and Advanced Applications in Real Life.

The meetings have always had a special appeal to young researchers and are characterized by a friendly atmosphere in which delegates at different stages of their careers can talk to each other. Scientists within all the areas of Information Technologies will benefit from attending the meeting. As a conclusion, the conference offers to the engineers and scientists a unique forum for establishing new collaborations within present or upcoming research projects, exchanging useful ideas, presenting recent research results, participating in discussions and establishing new academic collaborations, linking university with the industry.

See other similar WSEAS conferences on Software Engineering, Parallel and Distributed Computing and Systems, Applied Computer Science etc via:
www.worldses.org/history.htm

The Editors

Table of Contents

Plenary Lecture I: Toward Human-Level Machine Intelligence <i>Lofti A. Zadeh</i>	16
Plenary Lecture II: Decision support systems, human centric/centered computing, and computing with words: a synergistic combination? <i>Janusz Kacprzyk</i>	13
Plenary Lecture III: Clustering with an N-Dimensional Extension of Gielis Superformula <i>Angel Kuri-Morales</i>	14
Plenary Lecture IV: Data Mining through Data Visualisation: Computational Intelligence Approaches <i>Colin Fyfe</i>	15
Plenary Lecture V: Fundamental Theory of Controllability and Observability of First-Order Matrix Difference Systems <i>Yan Wu</i>	16
Plenary Lecture VI: Formalisation and Verification in a Type-Theoretic Framework <i>Zhaohui Luo</i>	17
Plenary Lecture VII: Probability Measures of Fuzzy Events and Linguistic Fuzzy Modelling - Forms Expressing Randomness and Imprecision <i>Anna Walaszek-Babiszewska</i>	18
Part I: Parallel and Distributed Systems and Computing	19
A Novel Technique for Synthesizing Distributed and Concurrent Protocol Specifications <i>Jehad Al Dallal and Kassem Saleh</i>	21
Integration of a Parallel Algorithm with a Cluster Grid for an Industrial Framework <i>Massimo Orazio Spata, Salvatore Rinaudo, Angelo Marotta, Francesco Moschella</i>	27
An Active Distributed Medical Advisory System <i>Kim Le</i>	32
Use of Operation Semantics for Parallel iSCSI Protocol <i>Ranjana Singh, Rekha Singhal</i>	38
Parallel Iterator for Parallelising Object Oriented Applications <i>Nasser Giacaman and Oliver Sinnen</i>	44
Content-Based Search Using Self-Organizing Peer-to-Peer Network <i>Igor Mekterović, Krešimir Križanović, Mirta Baranović</i>	50
Parallelizing an Edge Detection Algorithm for Image Recognition to Classify Paddy and Weeds Leaf on Sun Fire Cluster System <i>Mohd Azam Osman, Muqhtar Yassin Mohamad, Rosni Abdullah</i>	56
Analysis of Autonomic Computing Concepts in Computational Grid Based on the ACLM Model <i>Goran Martinovic, Damir Filko, Miran Karic</i>	61
A Novel Algorithm for Fast Retrieval of Information From a Multiprocessor Server <i>Abdus Samad, M.Q.Rafiq and Omar Farooq</i>	68

Effective Service Replication Mechanisms Exploiting Agent Mobility <i>Jinho Ahn</i>	74
Temporal Dimension for Job Submission Description Language <i>Omar Aldabbas, Mai Alfawair, Hussein Zedan, Antonio Cau</i>	80
A Comparative Study of Parallelization Paradigms <i>Imran Ahmad, Aneel Rahim, Adeel Javed, Khalid Haseeb and G. Qasim</i>	89
Reengineering a Software System Implementing Parallel Methods for Differential Equations <i>Dana Petcu, Andrei Eckstein, Claudiu Giurgiu</i>	95
Part II: Parallel and Distributed Systems and Computing	101
Development of Real-Time Signal Generator Graphical User Interface Using Matlab 6.5 <i>Muhammad Sharfi Najib, Mohd Shawal Jadin, Mohd Razali Daud</i>	103
A Basis Path Testing Framework for WS-BPEL Composite Services <i>Theerapong Lertphumpanya, Twittie Senivongse</i>	107
Online Slant Identification Algorithm for Curved Strokes <i>Mohd Razif Shamsuddin, Azlinah Mohamed</i>	113
Domain Models for Laboratory Integration <i>Anca Daniela Ionita</i>	119
A Software Development Group Exercise Support Environment, EtUDE: The System Overview and the System Evaluation through Applying to Classes <i>Hiroaki Hashiura, Kotaro Yamashita, Tatsuya Ishikawa, Yuka Isozaki, Seiichi Komiya</i>	124
Optimization of Distributed Software <i>Ion Ivan, Catalin Boja, Adrian Visoiu, Mihai Doinea</i>	132
An Extensible and Adaptable Model for System Software <i>Paniti Netinant</i>	138
Introducing Join-Computing <i>Giacomo Cabri</i>	144
A System for Supporting Group Exercise in Software Development with Facilities to Create an Optimal Plan of Student Grouping and Team Formation of Each Group <i>Hiroaki Hashiura, Toru Kuwabara, Yumei Qiu, Koutarou Yamashita, Tatsuya Ishikawa, Kiyomi Shirakawa, Seiichi Komiya</i>	149
A study of evaluation papers and surveys about Learning Content Management Systems <i>Lejla Abazi-Bexheti, Zamir Dika</i>	158
π-ADL.NET: A High Level Architecture Description Language Compiler for the .NET Platform <i>Zawar Qayyum</i>	163
Intelligent Risk Prophecy Using More Quality Attributes Injected ATAM and Design Patterns <i>N. Sankar Ram, Paul Rodrigues</i>	169
Soft Input Decryption using Feedback <i>Natasa Zivic and Christoph Ruland</i>	174
Applying Six-Sigma Concepts to the Software Engineering: Myths and Facts <i>Rafa E. Al-Qutaish and Khalid T. Al-Sarayreh</i>	178

A New Approach to Bucket Sort <i>Burak Takmaz, Murat Akin</i>	184
IT Governance and Performance Measurement – Research Study on Croatian Companies <i>Mario Spremic</i>	187
Service Identification and Modeling for Service Oriented Architecture Applications <i>Min Je Cho, Hyung Rim Choi, Hyun Soo Kim, Soon Goo Hong, Yavuz Keceli, Jae Young Park</i>	193
Derivation of Program Models for Web Application Systems Using Meta-Models <i>Takakazu Kaneko, Nobuoki Mano</i>	200
Database Reverse Engineering Tools <i>Natash Ali Mian, Tauqeer Hussain</i>	206
Solution for Non-Repudiation in GSM WAP Applications <i>Cristian Toma, Marius Popa, Catalin Boja</i>	212
Improving Software Projects Course Work by Enhanced Management <i>Jyhjong Lin</i>	220
Required Level of Motivation to Revitalize the Workforce in Software Industry of Pakistan <i>Muhammad Wasim Bhatti, Ali Ahsan, Ali Sajid</i>	226
Appraisal of Course Learning Outcomes using Rasch Measurement: A Case Study in Information Technology Education <i>Azlinah Mohamed, Azrilah Aziz, Sohaimi Zakaria, Mohd Saidfudin Masodi</i>	232
Author Index	239

Plenary Lecture I

Toward Human-Level Machine Intelligence



Professor Lotfi A. Zadeh

Professor in the Graduate School, Computer Science Division
Department of Electrical Engineering and Computer Sciences
University of California
Berkeley, CA 94720 -1776
Director, Berkeley Initiative in Soft Computing (BISC)

Abstract: Achievement of human-level machine intelligence has profound implications for modern society—a society which is becoming increasingly infocentric in its quest for efficiency, convenience and enhancement of quality of life. Humans have many remarkable capabilities. Among them a capability that stands out in importance is the human ability to perform a wide variety of physical and mental tasks without any measurements and any computations, based on perceptions of distance, speed, direction, intent, likelihood and other attributes of physical and mental objects. A familiar example is driving a car in city traffic. Mechanization of this ability is a challenging objective of machine intelligence. Science deals not with reality but with models of reality. In large measure, models of reality in scientific theories are based on classical, Aristotelian, bivalent logic. The brilliant successes of science are visible to all. But when we take a closer look, what we see is that alongside the brilliant successes there are areas where achievement of human-level machine intelligence is still a distant objective. We cannot write programs that can summarize a book. We cannot automate driving a car in heavy city traffic. And we are far from being able to construct systems which can understand natural language. Why is the achievement of human-level machine intelligence a distant objective? What is widely unrecognized is that one of the principal reasons is the fundamental conflict between the precision of bivalent logic and imprecision of the real world. In the world of bivalent logic, every proposition is either true or false, with no shades of truth allowed. In the real world, as perceived by humans, most propositions are true to a degree. Humans have a remarkable capability to reason and make rational decisions in an environment of imprecision, uncertainty, incompleteness of information and partiality of truth. It is this capability that is beyond the reach of bivalent logic—a logic which is intolerant of imprecision and partial truth.

A much better fit to the real world is fuzzy logic. In fuzzy logic, everything is or is allowed to be graduated, that is, be a matter of degree or, equivalently, fuzzy. Furthermore, in fuzzy logic everything is or is allowed to be granulated, with a granule being a clump of elements drawn together by indistinguishability, similarity, proximity or functionality. Graduation and granulation play key roles in the ways in which humans deal with complexity and imprecision. In this connection, it should be noted that, in large measure, fuzzy logic is inspired by the ways in which humans deal with complexity, imprecision and partiality of truth. It is in this sense that fuzzy logic is human-centric. In coming years, fuzzy logic and fuzzy-logic-based methods are likely to play increasingly important roles in achievement of human-level machine intelligence. In addition, soft computing is certain to grow in visibility and importance. Basically, soft computing is a coalition of methodologies which in one way or another are directed at the development of better models of reality, human reasoning, risk assessment and decision making. This is the primary motivation for soft computing—a coalition of fuzzy logic, neurocomputing, evolutionary computing, probabilistic computing and machine learning. The guiding principle of soft computing is that, in general, better results can be achieved through the use of constituent methodologies of soft computing in combination rather than in a stand-alone mode.

Brief biography of the speaker: LOTFI A. ZADEH is a Professor in the Graduate School, Computer Science Division, Department of EECS, University of California, Berkeley. In addition, he is serving as the Director of BISC (Berkeley Initiative in Soft Computing).

Lotfi Zadeh is an alumnus of the University of Tehran, MIT and Columbia University. He held visiting appointments at the Institute for Advanced Study, Princeton, NJ; MIT, Cambridge, MA; IBM Research Laboratory, San Jose, CA; AI Center, SRI International, Menlo Park, CA; and the Center for the Study of Language and Information, Stanford University. His earlier work was concerned in the main with systems analysis, decision analysis and information systems. His current research is focused on fuzzy logic, computing with words and soft computing, which is a coalition of fuzzy logic, neurocomputing, evolutionary computing, probabilistic computing and parts of machine learning.

Lotfi Zadeh is a Fellow of the IEEE, WSEAS, AAAS, ACM, AAAI, and IFSA. He is a member of the National Academy of Engineering and a Foreign Member of the Russian Academy of Natural Sciences, the Finnish Academy of Sciences, the Polish Academy of Sciences, Korean Academy of Science & Technology and the Bulgarian Academy of Sciences. He is a recipient of the IEEE Education Medal, the IEEE Richard W. Hamming Medal, the IEEE Medal of Honor, the ASME Rufus Oldenburger Medal, the B. Bolzano Medal of the Czech Academy of Sciences, the Kampe de Feriet Medal, the AACC Richard E. Bellman Control Heritage Award, the Grigore Moisil Prize, the Honda Prize, the Okawa Prize, the AIM Information Science Award, the IEEE-SMC J. P. Wohl Career Achievement Award, the SOFT Scientific Contribution Memorial Award of the Japan Society for Fuzzy Theory, the IEEE Millennium Medal, the ACM 2001 Allen Newell Award, the Norbert Wiener Award of the IEEE Systems, Man and Cybernetics Society, Civitate Honoris Causa by Budapest Tech (BT) Polytechnical Institution, Budapest, Hungary, the V. Kaufmann Prize, International Association for Fuzzy-Set Management and Economy (SIGEF), the Nicolaus Copernicus Medal of the Polish Academy of Sciences, the J. Keith Brimacombe IPMM Award, the Silicon Valley Engineering Hall of Fame, the Heinz Nixdorf MuseumsForum Wall of Fame, other awards and twenty-six honorary doctorates. He has published extensively on a wide variety of subjects relating to the conception, design and analysis of information/intelligent systems, and is serving on the editorial boards of over sixty journals.

See also: http://en.wikipedia.org/wiki/Lotfi_Asker_Zadeh

Plenary Lecture II

Decision support systems, human centric/centered computing, and computing with words: a synergistic combination?



Professor Janusz Kacprzyk

Fellow of IEEE, IFSA
Systems Research Institute
Polish Academy of Sciences
Ul. Newelska 6, 01-447 Warsaw, Poland

Abstract: We start with a brief account of complex decision making problems, and advocate the use of modern approaches to real world decision making emphasizing the concept of a decision making process that involves more factors and aspects like: the use of explicit and tacit knowledge, intuition, individual habitual domains, non-trivial rationality, different paradigms, etc. We stress the need for computer based decision support systems that should exhibit some “intelligence” which is meant in an individual and collective perspective, and give an overview of main types of decision support systems.

We present some new so-called computing paradigms that try to attain a synergy, and bridge the gap between the human user and computer systems that is mainly caused by the fact that natural language is the only fully natural means of communication and articulation for a human being but it is “strange” to the computer. We advocate the so-called: human centric computing, human centered computing, human computing, etc. that can help bridge this gap.

Then, we present Zadeh’s paradigm of computing with words (and perceptions) as a tool that may help bring computing closer to the human being by an explicit use of (quasi)natural language in many phases of computing, problem solving, etc.

We indicate relations between the computing with words and human centric computing paradigms, and indicate – first – that the former can be viewed as an attempt at providing proper tools to implement the latter, and that both can play a crucial role in intelligent decision support systems.

We show some implementations of using linguistic data summaries in a business context and show that they can be viewed as extremely human consistent data mining tools, notably for novice users.

Brief biography of the speaker: Janusz Kacprzyk is Professor of Computer Science at the Systems Research Institute, Polish Academy of Sciences, and Honorary Professor at the Department of Mathematics, Yli Normal University, Shanxi, China. He has been a visiting professor at many universities in the USA, England, Italy and Mexico. He is Academician (Member of the Polish Academy of Sciences).

His research interests include intelligent systems, soft computing, fuzzy logic, decision making, decision analysis and decision support, database querying, information retrieval, data analysis, data mining, etc.

He is President of IFSA (International Fuzzy Systems Association), and President of the Polish Society for Operational and Systems Research.

He is Fellow of IEEE and IFSA. He received The 2005 IEEE CIS Fuzzy Pioneer Award for pioneering works on multistage fuzzy control, notably fuzzy dynamic programming, and The Sixth Kaufmann Prize and Gold Medal for pioneering works on the use of fuzzy logic in economy and management.

His publication record is: 5 books, 30 volumes, 300 papers. He is Editor in chief of 3 Springer’s book series, and a co-editor of one Springer book series, is on the editorial boards of ca. 30 journals, and was a member of the IPC at more than 200 conferences.

Plenary Lecture III

Clustering with an N-Dimensional Extension of Gielis Superformula



Professor Angel Kuri-Morales
Instituto Tecnológico Autónomo de México
México

Abstract: One of the most important issues regarding the analysis of raw data is the adequate identification of groups within such data. There have been many attempts to define a measure of what is “adequate” clustering. In all published cases, however, the adequateness of a cluster depends on a measure of distance chosen a priori. A metric or distance function is a function which defines a distance between elements of a set (for instance, one of the L_n family or Mahalanobis’ distances have been utilized). Once a metric has been defined it remains to prove that the resulting clusters do, indeed, correspond to a proper classification. An obvious disadvantage of this methodology is, however, that in the space of the metric all clusters are hyperspherical. The shortcoming is that this fact immediately invalidates the attempt to find irregular shapes in such N-dimensional space. A metric induces a topology on a set but not all topologies can be generated by a metric. Topological unmetrisable spaces correspond, in this case, to a family of formulas developed originally by Gielis which he called a “superformula” (S). By replacing a metric by the elements of the hull defined by S we allow the search for more general shapes for our clusters. We report on the application of Vasconcelos Genetic Algorithm to find the parameters of S whose hulls encompass a large number of observations and the application of this method to data mining.

Brief biography of the speaker: Angel Fernando Kuri-Morales is an Engineer in Electronics by the Universidad Anahuac in Mexico City. He got a M.Sc. degree from the University of Illinois and a Ph.D. from Kennedy-Western University. He is the author of two text books and more than 70 articles published in international magazines and conferences. He is a member of the National System of Researchers (SNI). He won an international prize for the best solution to the "Iterated Prisoner's Dilemma" during the International Congress on Evolutionary Computation in 2000. He has been included in “Who is Who in the World” in 1988, 1998, 2000, 2002, 2003 and 2007. He received the best paper award during the 7th Industrial Conference in Data Mining, Leipzig, Germany. He has been president of several International Congresses, and invited speaker in many national and international scientific events. He belongs to the Evaluating Committee in the Area of Computer Science of CONACYT (the National Council for Science and Technology in Mexico). He was founder partner of Micromex, Inc. and IDET, Inc. and Director of Applied Research in the Center for Research in Computation of the National Polytechnic Institute. He is a Distinguished Lecturer of the Association for Computing Machinery (ACM) and member of the Scientific Committee of the World Scientific and Engineering Academy and Society (WSEAS). Currently he is the member of the Board of IBERAMIA, President of the Mexican Society for Artificial Intelligence and Professor in the Autonomous Technological Institute of Mexico (ITAM).

Plenary Lecture IV

Data Mining through Data Visualisation: Computational Intelligence Approaches



Professor Colin Fyfe
University of the West of Scotland
UK

Abstract: One of the major tasks today is to create information from data. We do not mean to define information in terms of Shannon or indeed any other mathematical definition but information in terms of the subjective experience of a viewer of the data. People (and probably animals) are very good at pattern recognition; we are far more robust pattern matchers than any current computer programs. Increasingly however, we are dealing with high dimensional (and often high volume) data so to gain intuitions about a data set, we often project data onto low dimensional manifolds. One question which arises then, is what projections to low dimensional manifolds are best in order to present the projected data to a human user. We illustrate several projections which have been found by artificial neural network extensions of Hebbian learning.

We then show examples of similar projections found by reinforcement learning; our rationale in this case is that we have agents interacting proactively with a database examining different projections and, without human intervention, getting rewards when the projections reveal some interesting structure. We then give examples of the same projections found by other computational intelligence methods such as the cross entropy method and artificial immune systems.

We then examine projections to nonlinear manifolds and show that with a particular model of an underlying latent space, we may identify clusters in data sets when such clusters are not visible in any low dimensional linear projection.

Finally we review different data representation techniques: we begin with parallel coordinates and point out some difficulties with this method before reviewing Andrews' Curves, a method from the 1970s which has only become truly practicable with the advent of modern desktop computers. An extension to this method came from Wegman and his colleagues in the 1990s. We also discuss a more recent extension and illustrate three dimensional projections of data samples dancing together.

Brief biography of the Speaker: Colin Fyfe completed his PhD in 1995 in artificial neural networks and has since supervised 16 completed PhDs in neural networks, evolutionary computation and probabilistic modelling. He is on the Editorial Board of several neural network and wider computational intelligence journals, and has been Honorary Chair of several international conferences. He has published over 300 refereed conference and journal papers, many book chapters and three books and is Series Co-Editor of the series "Computational Intelligence: Theory and Applications" with IGI International. He has given plenary talks at several international conferences and been visiting professor at universities in Australia, Korea, China, Taiwan and Spain. He is currently a Personal Professor at the University of the West of Scotland.

Plenary Lecture V

Fundamental Theory of Controllability and Observability of First-Order Matrix Difference Systems



Professor Yan Wu

Department of Mathematical Sciences
Georgia Southern University
P.O. Box 8093
Statesboro, GA 30460-8093
USA
E-mail: yan@georgiasouthern.edu

Abstract: The theory of difference equations is much wealthier than its counterpart in differential equations. With the emergence of digital signal processing technology, the theory of difference equations assumes great importance in areas such as digital control, image processing, and digital filter design. In this talk, a first-order matrix Sylvester difference system with a control structure is discussed in view of the existence and uniqueness of its general solution. Results are used in the study of controllability and observability of the matrix difference system coupled with an output structure. More general criteria, such as the one-sided controllability and observability matrices, are obtained for complete controllability and complete observability of time-invariant systems.

Brief Biography of the Speaker: Yan Wu received the B.S. degree in Mathematics from Beijing University of Technology in 1992 and the Ph.D. degree in Applied Mathematics and Electrical Engineering both from University of Akron in 1996 and 2000, respectively. Currently he is an Associate Professor in the Department of Mathematical Sciences at Georgia Southern University. His research interests include numerical linear algebra, nonlinear control, and generalized sampling theory. He has two patents granted by the United States Patent and Trademark Office. One of his papers was ranked 4th place among the top 25 publications in the Journal of Digital Signal Processing in 2006. Dr. Wu serves as an Associate Editor for Instrumentation, Systems, and Automation (ISA) and American Automatic Control Council (AACC).

Plenary Lecture VI

Formalisation and Verification in a Type-theoretic Framework



Professor Zhaohui Luo

Dept. of Computer Science
Royal Holloway, Univ of London
UK

E mail: zhaohui@cs.rhul.ac.uk

Web site: <http://www.cs.rhul.ac.uk/home/zhaohui/>

Abstract: Dependent type theory provides a powerful logical calculus for computer-assisted formal reasoning. The associated technology of theorem proving has produced very useful tools, the so-called “proof assistants”, for formal proof development both in verification of programs and in formalisation of mathematics. After giving an overview of the research field, I shall present a new type-theoretic framework LTT and explain its use in formalisation and verification. The particular features of the LTT framework include:

- LTT is a foundational calculus for formal reasoning with different logical foundations, establishing the basis for wider applications of the type theory based theorem proving technology.

- LTT employs a notion of “typed set”, combining type-theoretical reasoning with set-theoretical reasoning in an effective way and supporting efficient proof development in formalisation and verification. As a promising framework, LTT has been used in several case studies, including the formalisation of Weyl’s predicative mathematics and the analysis of security protocols.

Brief Biography of the Speaker: Zhaohui Luo is Professor of Computer Science at Royal Holloway, University of London. He has obtained the PhD degree in Computer Science at University of Edinburgh and worked as Lecturer, Reader and Professor in University of Durham, before going to Royal Holloway. Luo’s research interests in the last twenty years have focussed on the study of type theory and its applications. His publications include two authored books on type theory and programming methodology.

Plenary Lecture VII

Probability Measures of Fuzzy Events and Linguistic Fuzzy Modelling - Forms Expressing Randomness and Imprecision



Professor Anna Walaszek-Babiszewska

PhD, DSc, prof. at the Opole University of Technology,
Department of Control and Computer Engineering,
Poland

E mail: a.walaszek-babiszewska@po.opole.pl

Abstract: Statistical methods have a long history of applications to data analysis and modelling in many fields of human activities, as financial markets, business, optimal control. Zadeh's theory of fuzzy systems, soft computing and computing with words gave possibilities of utilising many approaches to modelling, taking into account different types of uncertainties, especially, human knowledge and perception expressed imprecisely in linguistic categories. The sets of numerical data, collected in many real systems, and expert's experiences would be very useful to modelling both randomness and imprecision. Starting with the reminding the basic notions of probability of fuzzy events, we define probability distributions of a linguistic variable and a linguistic vector as well as a mean fuzzy value (a mean fuzzy set) of the linguistic variable. We formulate also a stochastic process with fuzzy states. The next, we try to modelling randomness and imprecision, using linguistic fuzzy models with weights of rules. A structure of the fuzzy model is predefined at the beginning of the task. Probability of fuzzy events has been used to formulate probabilities of the occurrence linguistic values of input and output variables in a product-space. Marginal probabilities of linguistic values of input variables are the weights of file rules. Conditional probabilities of linguistic values of the output variable are the weights in the consequence of elementary rules. The inference procedures are proposed and exemplary calculations are presented.

Brief Biography of the Speaker: Anna Walaszek-Babiszewska, at present, is a professor at the Opole University of Technology, Department of Control and Computer Engineering. She has obtained a MSc degree in Control Engineering from the Wroclaw University of Technology and a PhD as well as a DSc (Habilitation) degrees from the Silesian University of Technology in Gliwice, Poland. Her research interests include stochastic modeling, fuzzy systems, data analysis, and applications in technological and managerial situations. She has supervised 3 completed PhDs and reviewed 5 PhDs in technical and economic sciences. She has published 2 monographic books on stochastic and fuzzy modeling and over 80 scientific papers. She is a member of the Editorial Boards of Management (since 2000) and of Lecture Notes in Control and Computer Science (in 2003) of the University of Zielona Gora Press. She is a member of the Section of Cybernetics in Mining, Mining Committee of the Polish Academy of Sciences (since 1999).