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Vincenzo Niola
Zoran Bojkovic
M. Isabel Garcia-Planas

Recent Researches in Applied Computers & Computational Science

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Proceedings of the 11th WSEAS International Conference on Applied Computer and Applied Computational Science (ACACOS '12)

Rovaniemi, Finland, April 18-20, 2012

Recent Advances in Computer Engineering Series | 1

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Preface

This year the 11th WSEAS International Conference on Applied Computer and Applied Computational Science (ACACOS '12) was held in Rovaniemi, Finland, April 18-20, 2012. The conference provided a platform to discuss programming languages, software engineering, educational software, databases, web engineering, mobile networks, intelligent systems, digital speech processing, wireless communications, remote sensing, network modelling, bluetooth technologies, computer applications in science and engineering 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.

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

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Plenary Lecture 1

On Robust Possibilistic C-Means Clustering Algorithm

Professor Miin-Shen Yang
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Abstract: Clustering is a method for finding clusters of a data set with the most similarity within the same cluster and the most dissimilarity between different clusters. It is a branch in multivariate statistical analysis and an unsupervised learning in pattern recognition. Since 1970, the fuzzy c-means (FCM) clustering algorithm has been well used in various applications. It is known that the robustness is important for clustering. However, the robustness for FCM is not enough. A first extension of FCM based on possibilistic c-partitions was the possibilistic c-means (PCM) clustering algorithm proposed by Krishnapuram and Keller in 1993. In this lecture, I will introduce a robust type of PCM. Since a merit of PCM is as a good mode-seeking algorithm if initials and parameters are suitably chosen, however, the performance of PCM heavily depends on initializations and parameters selection. In the robust PCM, we propose a mechanism of robust automatic merging. The proposed robust PCM algorithm first uses all data points as initial cluster centers and then automatically merges these surrounding points around each cluster mode such that it can self-organize data groups according to the original data structure. The robust PCM can exhibit the robustness to parameter, noise, cluster number, different volumes and initializations. Some numerical data and real data sets are used to show these good aspects of the robust PCM. Experimental results and comparisons actually demonstrate that the proposed robust PCM is an effective and parameter-free robust clustering algorithm.

Brief Biography of the Speaker: Miin-Shen Yang received the BS degree in mathematics from the Chung Yuan Christian University, Chungli, Taiwan, in 1977, the MS degree in applied mathematics from the National Chiao-Tung University, Hsinchu, Taiwan, in 1980, and the PhD degree in statistics from the University of South Carolina, Columbia, USA, in 1989.

In 1989, he joined the faculty of the Department of Mathematics in the Chung Yuan Christian University as an Associate Professor, where, since 1994, he has been a Professor. From 1997 to 1998, he was a Visiting Professor with the Department of Industrial Engineering, University of Washington, Seattle. During 2001-2005, he was the Chairman of the Department of Applied Mathematics in the Chung Yuan Christian University. His research interests include applications of statistics, fuzzy clustering, neural fuzzy systems, pattern recognition and machine learning.

Dr. Yang is an Associate Editor of the IEEE Transactions on Fuzzy Systems, and an Associate Editor of the Applied Computational Intelligence and Soft Computing. He was awarded with 2008 Outstanding Associate Editor of IEEE Transactions on Fuzzy Systems, IEEE; 2009 Outstanding Research Professor of Chung Yuan Christian University; 2010 Top Cited Article Award 2005-2010, Pattern Recognition Letters.

Plenary Lecture 2

Current Communications Networks Status for Smart Grid

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Abstract: With increasing interest from both the academic and industrial communities, this work is planned to keep the communities up to date about the developments in communication technology in the smart grid.
Smart grid can be defined as an electric system that uses information two-way cyber-secure communication technologies and computational intelligence in an integrated fashion across the entire spectrum of the energy system from the generation to the end points of consumption of the electricity. Some of the key requirements of the smart grid from the aspects of global multimedia communication include: integration of renewable energy resources, active customer participation to enable energy conservation, secure communications, better utilization of existing assets to address long term sustainability, management of distributed generation and information storage, integration of communication and control across the information system to provide interoperability and open systems as well as to increase safety and operational flexibility. Three fundamental functionalities are desirable for the communication infrastructure of the smart grid : sensing, transmission, and control. Embeded sensing is carried out by a large number of smart meters or sensors to detect the states of the various points of the grid in a real-time manner. Two-way transmission links should be established for data transport between sensors and control centers. Control instructions are delivered from the smart meters or sensors located in different places to support efficient operations of the smart grid and reliable access to grid components. To fulfill these purposes, the smart grid infrastructure has to integrate enabling networking technologies. The communication infrastructure of the smart grid has to cover the entire region with the intention to connect a large set of nodes. Thus, the communication infrastructure is envisioned to be a multilayer structure that extends across the whole smart grid from the home area to the neighborhood area and the wide area. Home area networks (HANs) communicate with various smart devices to provide energy efficient management and demand response. Neighborhood area networks (NANs) connect multiple HANs to local access points. Wide area networks (WANs) provide communication links between the NANs and the utility systems to transfer information. This three-layered structure of the communications networks provides a potential operation of the smart grid to work economically,efficiently, reliably and securely. The design of the communication network associated with the smart grid involves detailed analysis of its communication requirements, a proposal of the appropriate protocol architecture, the choice of the most suitable technologies for each case study, and a scheme for the resultant heterogeneous network management system.
This work presents key issues to current communications networks status for smart grid. At first, te focus is on components and communication requirements. The main component of the smart grid is the sensor network with a system of distributed sensor nodes that interact among themselves with processing and routing capabilities using either wireless or wired medium. Smart grid networks will manage real-time information and will collect information from established intelligent electronic devices for control and automation process. In the second part, issues related to smart grid communication architecture will be discussed. Next, mesh network architecture using IEEE802.11s as its core technology is described. Finally, the mesh routing on a hybrid tree-based routing protocol in a multiple gateway environment, will be performed. Further research issues conclude this presentation.

Brief Biography of the Speaker: Prof. Dr. Zoran Bojkovic (http://www.zoranbojkovic.com) is a Full Professor of Electrical Engeenering at the University of Belgrade, Serbia, and a permanent visiting professor at the University of Texas at Arlington, TX, USA, EE Department, Multimedia System Lab. He was a visiting professor in more than 20 Universities worldwide and has taught a number of courses in the field of digital signal processing, computer networks and multimedia communications. Prof. Bojkovic is the co-author of 6 international books/monographies (Publishers: Prentice-Hall, Wiley, CRC Press, WSEAS Press, Editura Politechnica). Some of them have been published in Canada, Japan, China, Singapore, India and Romania. He is co-editor in 68 International Books and

Conference Proceedings. He has published more than 430 papers in peer-reviewed journals, conference proceedings and publications. His activities included serving as Editor-in-Chief in 2 International Journals and Associate Editor in 3 International Journals. Prof. Bojkovic was co-chair for more than 10 International Symposium and Conferences and has served of more than 50 International Symposiums and Conferences. He has conducted many keynote/plenary lectures, workshops/tutorials as well as seminars and participated in many international scientific and industrial prjects. He has been and is yet a consultant to industry, research institutes and academia. He is a Senior Member of IEEE and WSEAS, Member of EURASIP and IASTED, Member of SERSC, Korea, expert of IAMSET, full member of Engineering Academy of Serbia and a member of Serbian Scientific Society.

Plenary Lecture 3

Computational Methods In Real Life Problem

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Abstract: The time series analysis is an ample domain of study, implying multiple approaches, in time and in frequency domain. The difficulties that appear in the modeling of the non - stationary time series are, essentially: the noise presence, the elaboration of the techniques of noise estimation and removal, the perturbations detection and measurement, the long dependence in the data series and the errors propagation. There is also the question on the accuracy of the entrance data.
Generally, the models from the nature sciences have a deterministic a stochastic component. The pure stochastic models are used if the causality relations of the phenomena are not known. The pure deterministic ones are developed especially in meteorology and try to reproduce the dynamic of the rainfall field, based on Navier-Stokes equations, blunted, approximated and then numerical integrated (in the hypothesis of scale homogeneity). In spite of simplifying, the resulted equations remain complex, the calculation is difficult and the scales are independently studied one to others. So, the algorithm and the calculus methodology must be improved.
There is the tendency to work in restrictive hypotheses on the data (stationarity, homoscedasticity, independence etc.) or one tries to bring them in standard form, by different transformations. But, in majority, the in nature sciences, the series are not stationary and heteroscedastic, needing decomposition procedures, to be modeled. In plus, they follow varied statistical laws and the data are not independent, presenting usually a long or short dependence in time.
In our article we shall discuss this problems and their computational solution in modeling the time series, from classical ones (decomposition methods, deterministic models and stochastic models), to modern ones (GEP, AdaGEP and nonparametric), with concrete case study from meteorological time series.

Brief Biography of the Speaker: Alina Barbulescu graduated from the University of Craiova, Romania (Mathematics) and from Petre Andrei University of Iasi, Romania (Faculty of Law). After a PhD in Mathematics, from Al I Cuza University of Iasi and one in Cybernetics and Economic Statistics, from Academy of Economic Studies Bucharest, Romania, she worked in the field of mathematice and applied statistics. Nowadays she is associate professor at Ovidius University of Constanta, faculty of mathematics and Computer Science. She is author of 18 books and over 90 articles, published in peer rewieved international journal, being also a member of editorial boards of International Journal of Mathematics and Computation and International Journal of Applied Mathematics and Statistics.

Plenary Lecture 4

A Safer Future: Reducing the Impacts of Earthquake Disasters through Soft Computing

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Abstract: Each year natural disasters kill thousands of people and inflict billions of dollars in economic losses. No nation or community is immune to their damage. In 2010, the Chilean quake would cost the insurance industry between 4 and 7 billion dollars and the earthquake's losses to economy of Chile are estimated at US$15-30 billion. On 11 March 2011, Japan suffered the worst earthquake in its history (and one of the worst in world history). The 2011 Tohoku earthquake measured produced a tsunami approximately 10 meters (33 feet) high and despite the warning systems, thousands were killed by the quake and tsunami. Over 100,000 buildings were damaged with several towns essentially completely destroyed. Hundreds of aftershocks, including some over 7 MW, continued after the first earthquake. As a result of the Fukushima I nuclear accidents that followed the tsunami, attention has been drawn attention to ongoing concerns over Japanese nuclear seismic design standards.
The scientific and technological advances of the last half century provide unprecedented opportunities for responding to the urgent need to mitigate the impacts of earthquakes hazards. Good predictions and warnings save lives. Proper data analysis methods for the extraction of the temporal-frequency-energy distribution of motion recordings (ground acceleration) can help to explain earthquake phenomena, to understand important seismic issues (source mechanism, directivity influence, and soil dynamic nonlinearity) and to improve our knowledge of the underlying physical process the data expose. In this paper some features associated with soft computing for modeling complex natural systems will be described through a review for some of their successful geoseismic applications. The paper starts with a brief overview of the structure and operations of the neurofuzzy assessment of dynamic properties and spatial variation of soft-clays, the neural estimation of site response using an adaptative characterization of the seismic time series through the Hilbert-Huang Transform and the nonlinear definition of vibration on soils during earthquakes using labels and concepts from Chaos Theory. It is hoped that this work may attract more geotechnical, seismological and computers engineers to pay better attention to this promising field.

Brief Biography of the Speaker: Prof. Silvia Garcia holds a PhD degree in Geotechnical Engineering, a MEng in Soil Dynamics and Earthquake Engineering and a BSc in Civil Engineering, her more recent Postdoctoral course was on Emerging Computing. She has also studied Mathematics and Physics. She is the Head of the Geoseismic Soft Computing of the Institute of Engineering in the National University of Mexico, Mexico. She is teaching the postgraduate courses (i) Natural Systems Modeling, running by the National University of Mexico in cooperation with the Computing Investigation Center of the Polytechnic Institute of Mexico, and (ii) Advances in Geotechnical Designs, (iii) Soil properties Soft Determination, and (iv) New Technologies in Analysis of Earthquake Data. Her research interests are in 4D-embankments seismic design, soils engineering systems non-linear analysis, ground motions monitoring, study and prediction under extreme environments and knowledge-based estimation of static and dynamic properties of heterogeneous soils. She has >110 publications in highly ranked journals and conference proceedings, including research articles in collective volumes, chapters in specialized engineering books and citations in civil and computing engineering fields.
She has participated (and chaired after invitation from the organizers) in prestigious international conferences, such as those organized periodically by the ECCOMAS, The European Community on Computational Methods in Applied Sciences, the ISSMG, The International Society for Soil Mechanics and Geotechnical Engineering, IAEE, The International Association of Earthquake Engineering, and the WSEAS Organizations. She is organizing the Student and Young Engineers Congresses over the world for the ISSMG running successfully every two years since 2009 within the International Conference of Geotechnical Engineering.