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Recent Advances in Neural Networks, Fuzzy Systems & Evolutionary Computing

- Proceedings of the 11th WSEAS International Conference on Neural Networks (NN '10)
- Proceedings of the 11th WSEAS International Conference on Evolutionary Computing (EC '10)
- Proceedings of the 11th WSEAS International Conference on Fuzzy Systems (FS '10)

"G. Enescu" University, Iasi, Romania, June 13-15, 2010

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Preface

This year the 11th WSEAS International Conference on NEURAL NETWORKS (NN '10), 11th WSEAS International Conference on EVOLUTIONARY COMPUTING (EC '10) & 11th WSEAS International Conference on FUZZY SYSTEMS (FS '10) were held at "G. Enescu" University, Iasi, Romania, June 13-15, 2010. The conferences remain faithful to their original idea of providing a platform to discuss mathematical foundation of neural networks, hybrid and knowledge based networks, neural network software, neuro-fuzzy systems, neural networks training via genetic algorithms, machine learning, neural networks and neuroscience, neurobiology and neurosciences, evolution strategies, metaheuristic optimization algorithms, differential evolution, artificial life, digital organisms, mathematical foundation of fuzzy logic, propositional fuzzy logic, predicate fuzzy logics, fuzzy algebra, fuzzy analysis, fuzzy geometry, fuzzy internet computing, software engineering for fuzzy systems, fuzzy systems in robotics and mechatronics etc. with participants from all over the world, both from academia and from industry.

Their 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 these conferences are published in this Book that will be indexed by ISI. Please, check it: www.worldses.org/indexes as well as in the CD-ROM Proceedings. They will be also available in the E-Library of the WSEAS. The best papers will be also promoted in many Journals for further evaluation.

Conference such as these 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

A Mathematical Approach to Psychological Insight

Professor Alin Gilbert Sumedrea
Lucian Blaga University of Sibiu
Faculty of Science
ROMANIA
E-mail: alin.sumedrea@gmail.com

Abstract: The psychological dynamics is governed by the "observable-unobservable" systemic ratio. The psychological insight represented by the (unobservable) psychological soft component obeys the functional models which define the psychological system. The functionality of the psychological system depends on the functionality of psychological instances.
What is essential and what is variable in transactional "challenge-response"? The pointing out of the essential feature presupposes the coming into play of an equivalence class of a ratio in which the engaged resources oppose a certain destructive potential. Technically speaking, in this ratio a certain tolerance of the entropy of psychological measures and a certain capacity to adjust this entropy are involved. This means that different situations could be treated in an equivalent manner. But this fact proves the myth of psychological invincibility! At the conscious level, a new structure is needed, which has to bring out the problematic situations. This structure should have the behaviour of a special consciousness which has to distinguish between the potentials of using its products. The interpretive potential of the conscious instance is recorded by the tensional effort – a weak structure which preserves the equivalence class – mentioned above – specific to a person. The reason for preserving it is to assure the simultaneous functioning of strong and weak psychological structures and, of course, of psychological instances. At the psychological level, the entropy and the adjustment of entropy are assembled in different structures. The structures must be compatible, meaning that these are acting on the basis of certain formulae which have to assure the accurate functioning of the psychological system. The variability of the psychological energy suggests for the unconscious instance equivalence class type structures, functioning on the basis of a constant "anti-entropy/entropy" ratio and for the conscious instance and its peripheral instance, the special type structures functioning on the basis of the "anti-entropy + entropy" formula. The functioning of the psychological system presupposes the existence of a certain control structure of the functioning of psychological instances along predefined formulae.
The approach based on the mathematical theory of invariants clarifies the problem of the nature of the tensional habituation process, the behaviour of the need for psychological stimulation in conditions of psychological equilibrium and the relation between the subjective perception of the psychological tension and the amplitude of the tensional states.
Trying to find a similitude between the physical and the psychological world of the attraction laws, the theory of the germination processes of tensional states is posited.
The future purpose of the mathematical approach is to create an unifying theory between the functionality of the psychological soft and of the physiological hard.

Brief Biography of the Speaker:
Alin Gilbert SUMEDREA, Ph.D in Psychology (1993), Ph.D in Statistics (1993), is Professor and Head of the Department of Psychology, Faculty of Science, Lucian Blaga University of Sibiu, ROMANIA. He is also Head of the Psychological Research Centre, Sibiu, ROMANIA.
The scientific activity is represented by 60 published scientific papers and 9 books. Research activity: 17 finalized research projects. He was director for 5 research projects.
Current research interests include: Applications of differential geometry in psychology; Mathematical modeling of psychological processes.

Plenary Lecture 2

A Heuristic Algorithm for the Network Design Problem

Professor Milan Tuba
Megatrend University Belgrade
Faculty of Computer Science
Serbia
E-mail: tuba@ieee.org

Abstract: The network design problem (NDP) is a well known problem which can be applied to many different types of networks. It was well investigated applied to computer communications networks during the time of Internet development. Today it is again very actual applied mostly to the dynamic wireless networks (MANET – mobile ad hoc networks). The network design problem is an NP-hard problem which involves topology selection (subset of possible links) and routing determination (paths for the offered traffic). Capacity assignment is usually treated as a 0-1 problem and as such included it in the topology problem. This does not make the network design problem easier, just the opposite, it moves optimization from continuous to integer. The goal is to minimize the cost which can be a combination of the link costs and delay penalties, under possible additional constraints. Such hard combinatorial graph problems are often treated by evolutionary metaheuristics. In many cases better results and faster convergence are achieved by hybrid algorithms where some local searcher that utilizes particular knowledge about the corresponding problem is included. Here we propose and analyze a computationally feasible heuristic algorithm which excludes underutilized links by a version of flow-deviation method. A simplified queuing model is developed for cost function estimate. Some theoretical results are also established that direct initial approximation. Proposed algorithm can dynamically be adjusted for faster or better results. It is implemented and computes a good solution that is robust with respect to often required dynamic changes of the cost function.

Brief Biography of the Speaker:
Milan Tuba received B. S. in Mathematics, M. S. in Mathematics, M. S. in Computer Science, M. Ph. in Computer Science, Ph. D. in Computer Science from University of Belgrade and New York University. From 1983 to 1994 he was in the U.S.A. first as a graduate student and teaching and research assistant at Vanderbilt University in Nashville and Courant Institute of Mathematical Sciences, New York University and later as an Assistant Professor of Electrical Engineering at Cooper Union Graduate School of Engineering, New York. During that time he was the founder and director of Microprocessor Lab and VLSI Lab, leader of scientific projects and supervisor of many theses. From 1994 he was Associate professor of Computer Science and Director of Computer Center at University of Belgrade, Faculty of Mathematics, and from 2004 also a Professor of Computer Science and Dean of the College of Computer Science, Megatrend University Belgrade. He was teaching more than 20 graduate and undergraduate courses, from VLSI Design and Computer Architecture to Computer Networks, Operating Systems, Image Processing, Calculus and Queuing Theory. His research interest includes mathematical, queuing theory and heuristic optimizations applied to computer networks, image processing and combinatorial problems. He is the author of more than 90 scientific papers and a monograph. He is coeditor or member of the editorial board or scientific committee of number of scientific journals and conferences. Member of the ACM since 1983, IEEE 1984, New York Academy of Sciences 1987, AMS 1995, SIAM 2009. Participated in many WSEAS Conferences with plenary lectures and articles in Proceedings and Transactions.

Plenary Lecture 3

Mixed Techniques in Evolutionary Computing

Professor Dana Simian
Faculty of Sciences
University Lucian Blaga of Sibiu
Romania
E-mail: dana.simian@ulbsibiu.ro

Abstract: Our aim is to analyze and compare how different evolutionary computing techniques can be combined to improve the performances in complex optimization problems. We focus on three types of evolutionary techniques: genetic algorithms, wasp's behavior based algorithms and machine learning.

Brief Biography of the Speaker:
Dana Simian received the diploma. in engineering from the University of Sibiu, Romania, the diploma. in Mathematics - Informatics from the University Babes-Bolyai of Cluj-Napoca, Romania and the Ph.D. from Babes-Bolyai University of Cluj- Napoca, Romania. She graduated many courses in Computer Science. She is the head of the Department of Computer Science from the Faculty of Sciences, University Lucian Blaga of Sibiu, Romania. She has a great experience in algorithms and numerical methods for modelling and optimization. She published 16 books, more than 60 articles and participated in the editorial board of more than 22 scientific publications (proceedings of international conferences).
She organized 7 special sessions within WSEAS conferences, 2 international workshops and an international conference on topics related to algorithms and computational techniques in modeling, approximation and optimization. She was a member of many scientific committees of international conferences. She was plenary speakers in 6 international conferences. She is reviewer of many scientific publications. She was involved as director of many research grants. She has been included in "Who is Who in the World" in 2006-2009 and in the "IBC Foremost Engineers of the World", 2008.

Plenary Lecture 4

On Robust Fuzzy Clustering and Validity Indexes

Professor Miin-Shen Yang
Department of Applied Mathematics
Chung Yuan Christian University
Chung-Li 32023, Taiwan
E-mail: msyang@math.cycu.edu.tw

Abstract: Cluster analysis 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 unsupervised learning in pattern recognition. Since Zadeh [1] proposed fuzzy sets that introduced the idea of partial memberships described by the membership functions, fuzzy clustering has been widely studied and applied in a variety of substantive areas (see [2-5]). In fuzzy clustering, the FCM algorithm and its variations are well known and the most used in various applications. We know that the robustness is important for clustering (see [6]) However, the robustness for these FCM and various extended fuzzy clustering algorithms still needs for further study. In this talk, we shall focus the robustness for these fuzzy clustering algorithms. We use the o function of M-estimate to analyze the robustness for fuzzy clustering algorithms and then propose their improvements. On the other hand, cluster validity indexes can be used to evaluate the fitness of data partitions produced by a fuzzy clustering algorithm (see [7-9]). However, the values of validity indexes may be heavily influenced by noise and outliers. In the literature, there is little discussion about the robustness of cluster validity indexes. In this talk, we also analyze the robustness of a validity index using the o function of M-estimate. We then improve most fuzzy cluster validity indexes so that they will be more robust for noise and outliers. Some comparative examples with numerical and real data sets will be presented.

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 current 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 recently awarded with 2008 Outstanding Associate Editor of IEEE Transactions on Fuzzy Systems, IEEE, and 2009 Outstanding Research Professor of Chung Yuan Christian University.

Plenary Lecture 5

Atoms and Pseudo-Atoms of Fuzzy Set Multifunctions

Professor Anca Croitoru
Faculty of Mathematics
"Al.I. Cuza" University of Iasi
ROMANIA
E-mail: croitoru@uaic.ro

Abstract: Non-additive (multi)measure theory has been intensively studied by many authors thanks to its applications in different domains. For example, fuzzy measures (introduced by Sugeno in 1976) are used in statistics (as imprecise probabilities), economics (as games with transferable utility in cooperative game theory), mathematical finances (as risk measures), medicine (in prediction of osteoporotic fractures). Our aim is to present properties of atoms and pseudo-atoms of fuzzy set multifunctions.

Brief Biography of the Speaker:
Anca Croitoru graduated the Faculty of Mathematics at "Al.I. Cuza" University of Iasi, Romania and received the Doctoral Degree in Mathematics in 2000 at the same university with a thesis in Romanian: Multifunctii aditive si neaditive de multime (Non-additive and additive set multifunctions), supervisor: prof. dr. Anca-Maria Precupanu. In present she is lecturer at the Faculty of Mathematics, "Al.I. Cuza" University of Iasi, Romania.
She is member of AMS, WSEAS, ROMAI, "Al. Myller" Mathematical Seminary Foundation of "Al.I. Cuza" University of Iasi. She is author or co-author of 4 books (in Romanian), over 30 papers in national or international refereed journals and conference proceedings, co-editor of 7 conference proceedings. She is participant at over 40 national or international conferences and participant or coordinator of 4 national and 2 international research projects respectively.
Her research interest includes: continuity, measurability, fuzzyness, (pseudo)atoms, non-atomicity, Darboux property in set-valued analysis, non-additive set multifunctions, convergences of measurable functions, set-valued integrals of different types: Dunford, Gould, fuzzy.