



**Editors: Gregoire Thomas, Cyril Fleurant, Thomas Panagopoulos,
Emmanuele Chevassus-Lozza**



Recent Researches in Mathematical Methods in Electrical Engineering & Computer Science

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- © **Proceedings of the Applied Computing Conference 2011 (ACC '11)**
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Mathematical Methods and Computational Techniques in Electrical Engineering
(MMACTEE '11)**

Angers, France, November 17-19, 2011

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Preface

This year the Applied Computing Conference 2011 (ACC '11) and the 13th IASME/WSEAS International Conference on Mathematical Methods and Computational Techniques in Electrical Engineering (MMACTEE '11) were held in Angers, France, November 17-19, 2011. The conferences provided a platform to discuss programming languages, software engineering, computer graphics, computer networks, artificial intelligence, security and privacy, signal processing, quantum computing, circuits, power systems, automation, systems theory, artificial intelligence, nanoelectronics, speech processing, image processing, biomedical physics and engineering 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.

Conferences 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

Considering Commonsense Causal Imperfection Reasoning



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Abstract: A commonsense understanding of causal relationships is the key element of day-to-day decision making. Generally, commonsense causal relationships are drawn from non-experimental or observational data. Commonsense causal understanding accepts that causal relationships can be formed on incomplete or imprecise data. A complete definition of causality may not be possible or recognizing any particular causal relationship may be either obscure or overly complex. Commonsense causality is necessarily imprecise. Causal relationships may be in complexes that can be simplified at the price of increasing imprecision.

Commonsense understanding of the world tells us that we have to deal with imprecision, uncertainty and imperfect knowledge. This is also the case with scientific knowledge of the world. A difficulty is striking a good balance between precise formalism and commonsense imprecise reality.

Perhaps, complete knowledge of all possible factors might lead to a crisp understanding of whether an effect will occur. However, it is unlikely that all possible factors can be known for most situations, as the knowledge of at least some causal effects is imprecise for both positive and negative descriptions. Consequently, causal reasoning must accommodate inherent ambiguity and imprecision.

Brief Biography of the Speaker:

Professor Mazlack studied computer science and applied mathematics at Washington University (St. Louis) and electrical engineering at both SDSM&T and Marquette University. He received his Doctorate of Science from Washington University. He also studied philosophy at both Washington University and at Marquette University. Along the way to his degrees, he did research in computer science, electrical engineering, and biomedical engineering. At Marquette both a Bacon Scholarship and an athletic scholarship (football) supported him. He is a member of the Omega Rho honorary. He has been a visiting scholar at the University of California, Berkeley (imprecise reasoning) and at the University of Geneva (computational linguistics). He is on the editorial board of several journals and has served on the program committee of many conferences. Dr. Mazlack currently is at the University of Cincinnati where he is the head of the Applied Artificial Intelligence Laboratory and the chair of the Data and Knowledge Management research group. Beyond academia, at a large computer company, he was responsible for database software development. He has been closely involved with several small company startups. Away from technology, he has been professionally active in the visual, written, and dramatic arts. Dr. Mazlack's current research is directed toward three areas:

- Causality, both theoretical and applied to observational data.
- Unsupervised data mining and the closely associated topic of autonomous recognition of web page ontologies in the context of the Semantic Web.
- Clustering multi-modal computational objects. These interests are in the context of broader interests in: soft computing, natural language understanding, artificial intelligence, and databases.

Plenary Lecture 2

Nature-Inspired Intelligent Models for Pattern Recognition in Environmental Remote Sensing Imagery



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Abstract: Man has learned much from studies of natural systems, to develop new algorithmic models able to solve increasingly complex problems. Enormous successes have been achieved through modeling of biological and natural intelligence, resulting so-called „intelligent systems”. These nature-inspired intelligent technological paradigms are grouped under the umbrella called computational intelligence (CI).

On the other side, modern environmental remote sensing satellite imagery, owing to their large volume of high-resolution data, offer greater challenges for automated image analysis. The algorithms are based on the fact that each class of materials, in accordance to its molecular composition, has its own spectral signature. Applications are needed both for remote sensing of urban/suburban infrastructure and socio-economic attributes as well as to detect and monitor land-cover and land-use changes. Conventionally, pattern recognition in remote sensing imagery has been mainly based on classical statistical methods and decision theory. Last years, several computational intelligence approaches have been used with promising degrees of success in remote sensing image analysis.

This lecture is an approach dedicated to the improvement and experimentation of several nature-inspired intelligent models for pattern recognition in remote sensing imagery. One considers three main models and corresponding applications.

First model is an Unsupervised Artificial Immune System (UAIS), inspired from the vertebrate immune system, having strong capabilities of pattern recognition. We have implemented this model for a LANDSAT 7 ETM+ multispectral image from the region of Bucharest (Romania) with four pixel categories (agricultural fields, artificial surfaces, forest, and water) ; using UAIS, one leads to the correct clustering multispectral pixel score better than performances obtained by applying K-Means and Fuzzy K-Means algorithms. Second model uses pixel classification by Ant Colony Optimization (ACO) algorithm which takes inspiration from the coordinated behavior of ant swarms. Using the ACO algorithm to remote sensing image classification does not assume an underlying statistical distribution for the pixel data, the contextual information can be taken into account, and it has strong robustness. The results of ACO classification for a Landsat 7 ETM+ image dataset (the same as that used in the first model) leads to very good results. Third model corresponds to change detection using neural network techniques: (a) Multilayer Perceptron (MLP); (b) Radial Basis Function Neural Network (RBF) ; (c) Supervised Self-Organizing Map (SOM). For comparison, one has tested change detection with statistical techniques (Bayes, Nearest Neighbor). The data used for the experiments of neural change detection are selections from a sequence of two LANDSAT 7 ETM+ multispectral images corresponding to the region Markaryd (Sweden), acquisitions from 2002 and 2006. Change detection by neural classifiers have led to better results than those obtained using statistical techniques.

Brief Biography of the Speaker:

Victor-Emil I. Neagoe was born in Pitesti (Arges county, Romania) on May 31, 1947.

From 1965 till 1970 he attended the courses of the Faculty of Electronics and Telecommunications, Polytechnic Institute of Bucharest, Romania. In 1970 he received the M.S. degree of diplomat engineer in electronics and telecommunications as a head of his series (with Honor Diploma, average of marks 9.97 out of 10). He also obtained the Ph.D. degree in the same field from the same institution in 1976 (thesis supervisor Professor Gheorghe Cartianu) as well as the Postgraduate Master degree in Applied Mathematics and Informatics from the Faculty of Mathematics, University of Bucharest in 1981 (average of marks 10).

From 1970 till 1976 he has been an Assistant Professor at the Faculty of Electronics and Telecommunications, Polytechnic Institute of Bucharest, branches: Information Transmission Theory, Television, and Applied Electronics.

From 1978 till 1991 he has been a Lecturer at the same Institute and Faculty, courses: Information Transmission Theory and Applied Electronics.

Since 1991 he has been a Professor of the Polytechnic University of Bucharest, Romania, where he teaches the following courses: pattern recognition and artificial intelligence; detection and estimation for information processing; digital signal processing; computational intelligence; data mining. He has been a Ph.D. supervisor since 1990; he coordinates now ten Ph.D. candidates. He has published more than 120 papers; his research interest includes pattern recognition, nature inspired intelligent techniques (computational intelligence), multispectral and hyperspectral satellite/aerial image analysis, image compression and recognition, biometrics, sampling theory.

He has been a Member of IEEE (Institute of Electrical and Electronics Eng., New York) since 1978 and a Senior Member IEEE since 1984. Prof. Neagoe has been included in Who's Who in the World and Europe 500 . Particularly, he has been recently included in Who's Who in the World 2011 (28th Edition) as well as in Who's Who in Science and Engineering 2011-2012 (11th Edition).

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