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Recent Advances in Computer Science and Applications

- ◆ Proceedings of the 14th International Conference on Neural Networks (NN '13)
- ◆ Proceedings of the 14th International Conference on Fuzzy Systems (FS '13)
- ◆ Proceedings of the 14th International Conference on Evolutionary Computing (EC '13)
- ◆ Proceedings of the 4th International Conference on Applied Informatics and Computing Theory (AICT '13)

Valencia, Spain, August 6-8, 2013

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Plenary Lecture 1

Computational Intelligence Techniques for Pattern Recognition from Remote Sensing Imagery



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Abstract: 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). The main chapters of CI are: Artificial Neural Networks (ANN), Fuzzy Systems (FS), Evolutionary Computation (EC), Swarm Intelligence (SI), and Artificial Immune Systems (AIS). On the other side, modern environmental remote sensing imagery, owing to their large volume of high-resolution data, offer greater challenges for automated multispectral/hyperspectral 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 and as well as to detect and monitor land-cover and land-use changes. Last years, several computational intelligence approaches have been used with promising degrees of success in remote sensing image analysis.

This lecture presents our approach dedicated to the improvement, experimentation and evaluation of several computational intelligence techniques for pattern recognition in remote sensing imagery. One considers three main directions and corresponding applications.

First section corresponds to neural networks for earth observation and it uses Concurrent Self-Organizing Maps, Multilayer Perceptron and Radial Basis Function neural networks in order to improve and evaluate multispectral and hyperspectral image classification performances. We have experimented these techniques both for LANDSAT 7ETM+ multispectral images and for several typical hyperspectral images (Indian Pines, Pavia University and Salinas). The neural networks for automated land-cover change detection have been also considered.

Second section is dedicated to Artificial Immune Systems (AIS) for supervised and unsupervised classification of multispectral images. These techniques are inspired from the vertebrate immune system, having strong capabilities of pattern recognition. We have implemented some improved AIS techniques for multispectral pixel classification from a LANDSAT 7ETM+ image.

Third section presents Ant Colony Optimization (ACO) model to develop and improve methods for feature selection and classification of remote sensing images. These techniques are inspired from the coordinated behavior of ant swarms. The considered ACO techniques are experimented for a Landsat 7ETM+ image dataset.

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). He also obtained the Ph.D. degree in the same field from the same institution in 1976 as well as the Postgraduate Master degree in Applied Mathematics and Informatics from the Faculty of Mathematics, University of Bucharest in 1981. 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; digital signal processing; computational intelligence; data mining. He has been a Ph.D. supervisor since 1990. Prof. Neagoe has published more than 120 papers; his research interest includes pattern recognition, nature inspired intelligent techniques (computational intelligence), classification of multispectral and hyperspectral remote sensing imagery, emotion recognition from facial images, biometrics, sampling theory, image compression. He has been a Member of IEEE 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 and 2012 (28th and 29th Editions) as well as in Who's Who in Science and Engineering 2011-2012 (11th Edition).

Plenary Lecture 2

Neuro-Controller Using Simultaneous Perturbation



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Abstract: The simultaneous perturbation optimization method is a stochastic gradient method which uses only values of an objective function to find a optimal point of the function. The optimization method was introduced by J. C. Spall. Y. Maeda also independently proposed a learning rule using the simultaneous perturbation for artificial neural networks and reported a feasibility of the learning rule. At the same time, the merit of the learning rule was demonstrated in the hardware implementation of neural networks.

The important advantage of the simultaneous perturbation method is its simplicity. The simultaneous perturbation can estimate the gradient of a function using only the two values of the function. Therefore, it is relatively easy to implement even for recurrent neural networks, compared with the back-propagation learning rule. Moreover, when we use a neural network as a controller, without using Jacobian of an objective plant, it is possible to apply the learning scheme directly.

This paper presents a trajectory control for a SCARA robot using a recurrent neural network. We adopt the simultaneous perturbation optimization method as a learning rule of the recurrent neural network. This neuro-controller learns the inverse dynamics of the SCARA robot. We described details of the control scheme. Moreover, we consider an example for the circular path control. Some results for an actual SCARA robot are shown.

Brief Biography of the Speaker: Yutaka Maeda received the B.E., M.E. and D.E. (Doctor of Engineer) degrees in Electronic Engineering from Osaka Prefecture University in 1979, 1981 and 1990, respectively. He joined KANSAI University, Faculty of Engineering in 1987, where he is a Professor of the Faculty of Engineering Science, and a Vice president of Kansai University.

He was a Visiting Researcher in Electrical and Computer Engineering Department, University of California at Irvine, USA in 1995. He has established the Electronic Control Laboratory in Kansai University. The laboratory is producing promising graduates for many industrial fields. Recent research interests in this laboratory are in the areas of soft computing; artificial neural networks, fuzzy theory for robot control, moreover, he is also interesting in the control theory and signal processing related to the simultaneous perturbation optimization. He is also author of about 80 papers in international journals and conference proceedings, and book chapters.

Plenary Lecture 3

Today's Challenges in Text Mining



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Abstract: Application of data mining methods is expanding. A huge amount of data is available in a variety of structured and unstructured forms. Available are also a variety of methods, algorithms and data mining tools that are useful for the specific analysis while not for the others. As part of this session methods for data mining with special attention to the text and web mining will be discussed. Text mining is using text documents as data in order to resolve problems such as: fast text search, text extraction and analysis for more languages, pattern recognitions in the books and papers in order to discover piracy, machine learning etc. The application and efficiency of data mining methods for different types of data mining will be illustrated through particular case studies. It will be identified and discussed problems related to different operations to transform text into the next step, which includes lexical analysis, stemming, identification of key terms and phrases and elimination of functional words.

Brief Biography of the Speaker: Dzenana Donko received M.Sc. degree in Computer Science from the University of Sarajevo, BiH at the Faculty of Electrical Engineering in 1991 and Ph.D. degree in Computer Science at the same University in 2004. She is currently an associated professor at the University of Sarajevo where she teaches various subjects on computer science. Besides being an author and co-author of numerous papers with special aspect of business intelligence and published book "Object Oriented Analysis and Design", she is also member of the organizing committee and review of several international conferences. She was consultant on several projects for United Nations Development Project for digital government processes. Her research interest includes object oriented analysis and design, web architectures and web programming, workflow management, data mining, system analysis and design, and service management.

Plenary Lecture 4

Quality Management Tools Embedded Software Development Lifecycles



Professors Monica Leba & Andreea Ionica

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Abstract: There are first presented the software development lifecycle models, their evolution, representations and components. Each newly developed model at its time integrated several new elements or concepts, contributing to the conceptual, methodological and evolution of software life cycle approaches. In the existing software lifecycles, the quality management tools have always been used, but somewhat overlooked although the ultimate goal has always been enunciated as the development of qualitative software products.

Analyzing the lifecycles used in software development emphasizes the main advantages and disadvantages of each of them. This led to a new approach on software lifecycle from the quality point of view. In order to make the quality component “visible” during the lifecycle there was introduced a third dimension in the classical spiral software development model.

Brief Biography of the Speaker: Monica Leba: Received a BSc in System Control and Applied Informatics Engineering in 1998, a MSc in Information Systems and Technologies in 2007 and gained a PhD in System Control in 2002. She joined in 1999 the University of Petrosani. In 2008 became Associated Professor of System Control Engineering. She is member of IFAC (International Federation of Automatic Control), Technical Committee 3.1. Computers for Control. She was Invited Lecturer at the University of Clausthal – Germany, University of Nancy – France and University of Malaga – Spain. She was a Leonardo da Vinci researcher at the Biosensors Department from the University of Florence, Italy. Her general research interests are in applied informatics, algorithms design, modelling and simulation, computer and system control engineering. She took part and coordinated about 20 national and international research projects and grants, three of them having eLearning related theme. She published about 80 papers, part of them in WSEAS conferences. She also presented three plenary lectures in WSEAS conferences in Corfu, Greece, October, 2008, in Istanbul, Turkey, June, 2009, in Malta, September, 2012 and in Athens, Greece in May 2013. Recently, she participated at the Creativity Workshop in Florence.

Andreea Ionica: Graduated the University of Petrosani as engineer (1992), as economist (2002) and PhD in Industrial Engineering (2004). She got a postgraduate degree in Enterprises’ Economy and Administration from Institut National Polytechnique de Lorraine, France (1998). She also graduated the course of Human Resources Management (1999). She is currently Associated Professor in the Management Department at University of Petrosani where she teaches mainly in the areas of Management and Quality Management. Her research interests include: Quality Management Systems (QMS), TQM implementation, the study of customer - supplier relationship in the context of the QMS implementation. She activates in the field of quality management systems, being auditor and Quality Management Representative at the University of Petrosani. In the period 2010-2012 she coordinated a Grundtvig project with partners from Turkey, Romania, Nederland, Belgium and Germany. She participated as coordinator or member in about 10 national and international research projects, two of them having eLearning related theme, and grants and published about 100 papers. She also presented a plenary lecture in WSEAS conferences in Malta, September, 2012 and in Athens, Greece in May 2013. Recently, she participated at the Creativity Workshop in Florence.