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ADVANCED TOPICS ON NEURAL NETWORKS

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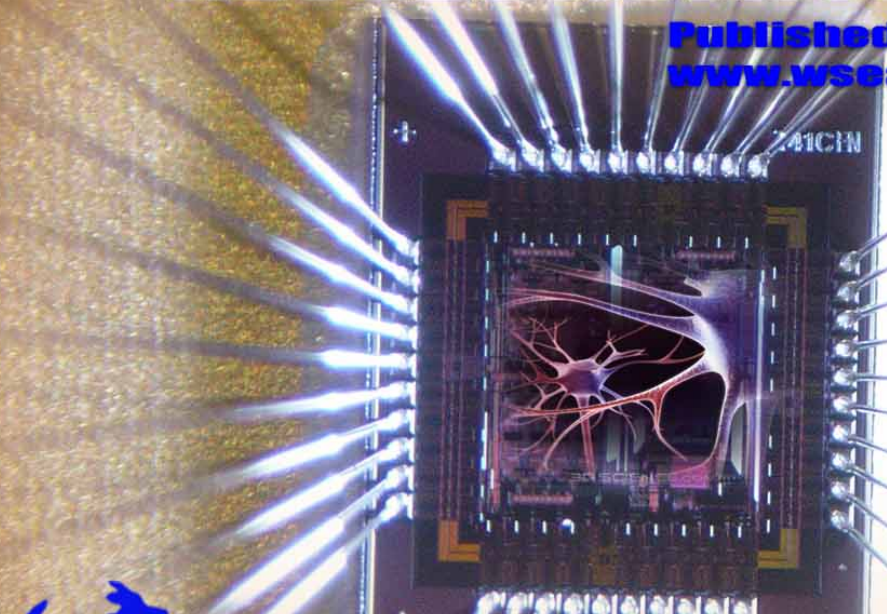

Artificial Intelligence Series
A Series of Reference Books and Textbooks

Proceedings of the 9th WSEAS International Conference on NEURAL NETWORKS (NN'08)

Hosted and Sponsored by Technical University of Sofia

Sofia, Bulgaria, May 2-4, 2008

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Preface

This book contains proceedings of the 9th WSEAS International Conference on NEURAL NETWORKS (NN'08) which was held in Sofia, Bulgaria, May 2-4, 2008.

The reader can read state-of-the-art academic papers, high quality contributions and some breakthrough works on neural networks theory from all over the world. Nice applications related to European and international industrial projects decorate a truly important panorama not only on neural networks, but also on intelligent networks in general.

We thank the Technical University of Sofia for the sponsorship and the support. This conference aims to disseminate the latest research and applications in the Neural Networks. The friendliness and openness of the WSEAS conferences, adds to their ability to grow by constantly attracting young researchers. The WSEAS Conferences attract a large number of well-established and leading researchers in various areas of Science and Engineering as you can see from **http://www.wseas.org/reports**. Your feedback encourages the society to go ahead as you can see in **http://www.worldses.org/feedback.htm**

The contents of this Book are also published in the CD-ROM Proceedings of the Conference. Both will be sent to the WSEAS collaborating indices after the conference: **www.worldses.org/indexes**

In addition, papers of this book are permanently available to all the scientific community via the WSEAS E-Library.

Expanded and enhanced versions of papers published in these conference proceedings are also going to be considered for possible publication in one of the WSEAS journals that participate in the major International Scientific Indices (Elsevier, Scopus, EI, ACM, Compendex, INSPEC, CSA .... see: www.worldses.org/indexes) these papers must be of high-quality (break-through work) and a new round of a very strict review will follow. (No additional fee will be required for the publication of the extended version in a journal). WSEAS has also collaboration with several other international publishers and all these excellent papers of this volume could be further improved, could be extended and could be enhanced for possible additional evaluation in one of the editions of these international publishers.

Finally, we cordially thank all the people of WSEAS for their efforts to maintain the high scientific level of conferences, proceedings and journals.

We are sure that this volume will be source of knowledge and inspiration for other academicians, scholars, advisors and industrial practitioners and will be considered as one more brilliant edition of the WSEAS related with a brilliant conference sponsored by Technical University of Sofia.

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Plenary Lecture I

Quadratic Optimization Models and Algorithms. One Algorithm for Linear Bound Constraints based on Neural Networks

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Abstract:
The topic begins with several quadratic programming (QP) models (1. unconstrained model; 2. QP with linear and symmetric bound constraints; 3. QP with linear bound constraints; 4. QP with one quadratic constraint; 5. QP in standard form). The solving of QP models 2, 3 and 4 is associated with a neural network frame. For QP models 2 and 3 a preconditioning technique is developed. This technique reduces the susceptibility of the system to round off errors. Two algorithms of preconditioning are presented: the preconditioning algorithm 1 is based on one associated matrix and the preconditioning algorithm 2 is based on two associated matrices. Both algorithms are used in several applications. Each application ends by a test of correctitude of computations, which validates the theory. The solving of models 2 and 3 is done by a general neural network algorithm. For model 5 a dual quadratic problem (DQP) is associated. The DQP is studied in two cases: for invertible matrix and for non-invertible matrix. In the first case an iterative algorithm is developed (based on Hildreth and D' Esopo ideas). Numerical examples illustrate the theory.

Brief Biography of the Speaker: Nicolae POPOVICIU is a professor in mathematics and Dean of a faculty of Math-Info at HYPERION University of Bucharest. He has published over 16 book in Romanian Language and over 73 papers in international journals and international conferences in those areas.

Plenary Lecture II

Meta-adaptation: Neurons that change their mode

Professor Dominic Palmer-Brown
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University of East London
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Abstract:
This talk will explore the integration of learning modes into a single neural network structure in which layers of neurons and even individual neurons adopt different modes. There are several reasons to explore modal learning in neural networks. One motivation is to overcome the inherent limitations of any given mode (for example some modes memorise specific features, others average across features, and both approaches may be relevant according to the circumstances); another is inspiration from neuroscience, cognitive science and human learning, where it is impossible to build a serious model without consideration of multiple modes; and a third reason is non-stationary input data, or time-variant learning objectives, where the required mode is a funtion of time. Several modal learning ideas will be presented: The Snap-Drift Neural Network (SDNN) which toggles its learning between two modes, either unsupervised or guided by performance feedback (reinforcement); a general approach to swapping between several learning modes in real-time; and an adaptive function neural network (ADFUNN), in which adaptation applies simultaneously to both the weights and the individual neuron activation functions. Examples will be drawn from a range of applications such as natural language parsing, speech processing, geographical location systems, optical character recognition and virtual learning environments.

Brief Biography of the Speaker: Dominic Palmer-Brown is professor of neural computing and Associate Head, School of Computing and Technology, at the University of East London. He was formerly chair in neurocomputing at Leeds Metropolitan University. His research covers neural network learning methods for processing language, modelling interaction and data mining. He was the neural network specialist on a 5 year UN/NERC/DoE funded crops data analysis project involving 15 countries, ending in 2000, and has supervised 12 phds to completion. He was selected as Editor of the journal Trends in Cognitive Sciences by Elsevier Science London in 2001. He has published about 75 papers overall, and received best paper commendations at The International Conference on Education and Information Systems: Technologies and Applications (EISTA 2004) and the Int. Conf. on Hybrid Intelligent Systems 2003. He was keynote invited speaker at the European Simulation Multiconference 2003, and at The 10th Int. Conference on Engineering Applications of Neural Networks, 2007 and has published in many journals including IEEE Transactions in Neural Networks, Neurocomputing, and Connection Science.

Plenary Lecture III

Towards Narrowing The Gap Between Artificial Intelligence & Its Destination

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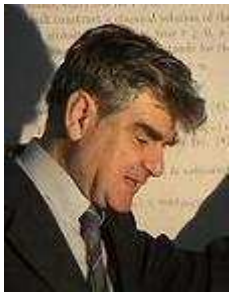
Abstract:
Human brain continues to live with an image as the one which is inscrutable & very poorly understood. Hence theories concerning the same are available in plenty. However, without unraveling the mystery of the self learning process as well as that of the information processing capability of the same, the field of Artificial Intelligence (AI) will continue to reside at a far distance from its ultimate goal. The AI community might, with great optimism, wait for the arrival of enough computing power to fulfill its promise of building truly intelligent machines. However, without getting rid of its confusion vis-a-vis what constitutes intelligence & the associated misinterpretation concerning the functioning of neocortex- the subset of human brain responsible for arming us with intelligence, that wait will never come to an end and instead will acquire an everlasting status. How do the neurons, immensely slow as compared to transistors, but faster and more powerful for majority of the situations? The answer lies in the fact is that unlike computers, the human brain doesn't resort to computation while solving problems. Instead, it relies upon retrieval of answers from its memory. This paper will dwell on the origin of Artificial Intelligence by stating the lessons it can learn from the invention of Artificial Flight. Subsequently the need to modify the concept of "intelligence as computation" will be touched. Based on those the pros-and-cons of the present state-of-the-art of Artificial Neural Networks will be discussed and the scope of building a truly intelligent machine will be explored.

Brief Biography of the Speaker: Prof. Suash Deb did his Bachelor of Engineering (B.E.) in Mechanical Engineering from Jadavpur University, Calcutta, India & Master of Technology (M.Tech.) in Computer Science from the University of Calcutta. He had been to Stanford University, USA as a UN Fellow for advanced study in the field of computer vision. He was also an Asian Expert of the Advanced Research Project Agency (ARPA), Dept. of Defense, Federal Govt. of USA. He has both industrial & academic experience with more emphasis on the later. He worked at the National Centre for Knowledge Based Computing as a Scientist. Currently he is a Professor of the Dept. of Computer Science & Engineering, National Institute of Science & Technology (NIST), Orissa, India. He is also the coordinator of Bioinformatics Research of NIST. He specializes in Soft Computing, Artificial Intelligence, Bioinformatics and the related fields. A Senior Member of the IEEE (USA), Prof. Deb is currently on the editorial board of numerous reputed International Journals like Intl. Journal of Information Technology (Singapore), Intl. Journal of Computer Science & Engineering Systems (Taiwan) , Journal of Convergence Information Technology, Korea, Journal of Automation & systems Engineering etc. He is also the Regional (India & Subcontinent) Editor of Neural Computing & Applications as well as the Advisory Board Members of Intl. Journal of Intelligent Computing in Medical Sciences & Image Processing. Previously he also served the IEEE Robotics & Automation as its Regional editor & also the journal Robotics & Computer Integrated Manufacturing as an Associate Editor. He has traveled widely across the globe and delivered Plenary Talk/ Tutorial Address etc. at various National/International Conferences. He is attached with numerous International conferences as Member-Advisory Board, Program Committee etc & listed on a number of Who's Whos.

Plenary Lecture IV

Travelling waves of the form of compactons, peakons, cuspons and their CNN realization



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Abstract:
This paper deals with the construction of travelling waves of some equations of mathematical physics as generalized Camassa-Holm equation, generalized KdV equation and several others. We construct compactly supported solutions as well as solutions forming singularities of the type peak (angle) and cusp. To do this tools of classical analysis and ODE are used. The CNN realization enables us to obtain numerical results and computer visualization of the corresponding solutions.

Brief Biography of the Speaker: Popivanov Petar is a Prof. in Institute of Mathematics and Informatics, Bulgarian Academy of Sciences. His main specialization field is Partial Differential Equations, Ordinary Differential Equations and Analysis. He is currently working on propagation of singularities to the solutions of nonlinear hyperbolic systems, oblique derivative problem, microlocal analysis. He has 117 papers refereed in journals, 3 monographs, and 2 manual books on Differential Equations. He participated in 30 scientific meetings.

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