

DESCRIPTION OF SPECIAL SESSIONS PROPOSALS

SS1: NEW APPLICATIONS OF BRAIN-COMPUTER INTERFACES

A Brain-computer Interfaces (BCI) is based on the analysis of brain activity to provide a non – muscular channel for sending messages and commands to the external world. A BCI emerged few decades ago as a new communication procedure allowing subjects with severe neuromuscular disorders, who may be completely paralyzed or locked-in, to communicate and to interact with the outer world. However, recently BCI applications have been also used in totally different areas (e. g. entertainment). In the future, it is expected a qualitative improvement in performance, in terms of information transfer rate and reliability with potential uses in emerging areas of interest, such as Ambient Assisted Living (AAL) or security.

The main goal of this special session is to show the last advances in research of applications or use of devices and prosthetic in the field of the BCIs, as well as innovative signal processing algorithms, training techniques or paradigms that make them possible.

Besides, we also propose a special demo session, where participants of the IWANN will be welcome to experiment with this technology by themselves.

SS2: OPTIMIZATION ALGORITHMS IN GRAPHIC PROCESSING UNITS

The use of Graphics Processing Units (GPUs) in scientific computing is becoming increasingly common in recent years, so the soft computing community has started to develop for the GPU platform.

GPUs are low-cost parallel processors that may readily be exploited for many types of general purpose computation.

Considering the advances of modern consumer-level GPUs, parallel approaches (for EAs, ANNs, PSOs or ACOs for instance) can be designed, by fitting on Single Instruction and Multiple Data (SIMD)-based GPU.

The low-cost GPU equipped on user PCs, makes it possible to implement parallel algorithms to solve huge optimization problems (most of them are included in real world applications).

This special session mainly focuses on the description, designing and implementation of soft computing techniques which can exploit and profit the parallelism power provided by GPUs.

Moreover, the introduction of applications or approaches to solve real-world, huge or extremely difficult problems, would be also welcomed.

In addition, this session would cover multi-disciplinary and transversal aspects, since a variety of soft computing algorithms, approaches or methods can be adapted to use GPUs.

This way, the topics considered in the session include, but are not limited to:

- Bioinspired Metaheuristics (such as Evolutionary Algorithms,
- Artificial Neural Networks, Ant Colony Optimization or Swarm Algorithms)
- Self-Organizing Systems
- Agent-based Systems
- Parallel Algorithms
- Distribution or Parallelization Methods
- Real World Problems solving
- GPU-based Applications

SS3: COMPUTING LANGUAGES WITH BIO-INSPIRED DEVICES AND MULTI-AGENT SYSTEMS

Natural Computing (NC) is an emerging field in formal language theory, which is mainly focused on the computing capabilities of formal devices that abstract some natural complex phenomena. These bio-inspired models include both, classic computing devices (such as cellular automata, Lindenmayer systems, DNA computing, evolutionary computation, Multi-agent systems or artificial neural networks) and the latest and most innovative models of computation such as Membrane Computing or Networks of Evolutionary Processors.

Regarding MAS, the concept of agent can be found in a range of disciplines as, for example, computer networks, software engineering, artificial intelligence, human-computer interaction, distributed and concurrent systems, mobile systems, telematics, information retrieval, etc.

NC and hence MAS offer strong models for representing complex and dynamic real-world environment. We are convinced that a field where those technologies can offer good solutions and alternative frameworks to classic models in the area of processing natural and formal languages. This is why we propose a special session on language(s) applications of MAS and bio-inspired computing devices.

The aim of this special session is to bring together researchers from different areas that have in common the use of multi-agent and bio-inspired systems to approach different aspects of natural/formal language. We aim to bring together researchers that are developing models for dealing with languages in both, theoretical and applied lines of research.

We are interested in bio-inspired models themselves (different from artificial neural networks), that is, in (but not only) their:

1. Simulation

2. Analysis

3. Programming/developing tools and in their application to (but not only):

1. Theoretical descriptions of languages based on multi-agent systems
2. Natural language generation and recognition
3. Dialogue modelling
4. Speech recognition
5. Semantics and ontologies
6. Parsing technologies
7. Simulation of Natural Language Evolution

In general, contributions on any interaction between multi-agent and bio- inspired computing systems and natural/ formal languages will be welcome.

SS4: COMPUTATIONAL INTELLIGENCE IN MULTIMEDIA PROCESSING

The aim of this special session is to create a forum for scientific debate, allowing the participants both to share experiences and present new results on application to multimedia processing of systems inspired on nature (neural networks, fuzzy logic, machine learning tools, evolutionary systems, etc.), as well as related emerging areas. Topics include, but are not limited to:

- Image/Speech/Audio/Video processing
- Image/Speech/Audio/Video coding
- Image/Speech/Audio/Video transmission
- Multimedia networking and systems support
- Multimedia tools, end-systems, and applications
- Human-centered multimedia

This special session is organized by RTCTCM (Red Temática en Codificación y Transmisión de Contenidos Multimedia). RTCTCM is a research thematic network created in 2007 and supported by the Spanish Ministry of Science and Technology. One of the RTCTCM aims is to participate in technical-scientific events that facilitate the dissemination of leading works in the area of multimedia processing.

SS5: BIOLOGICALLY PLAUSIBLE SPIKING NEURAL PROCESSING

SS6: VIDEO AND IMAGE PROCESSING

Computer vision is one of the major challenges in computer science. Video and image processing is an essential field in this area. Moreover, it is well known that neural networks and bio-inspired algorithms are used to be applied in the video and image processing.

Artificial neural networks are proved to be successful in performing several cognitive, industrial and scientific tasks. This special session is aimed to cover a wide range of works and projects on video and image processing using neural networks or other bio-

inspired models. We hope that this session can provide a common forum to exchange ideas and the latest discovery in the area.

SS7: HYBRID ARTIFICIAL NEURAL NETWORKS: MODELS, ALGORITHMS AND DATA

Supervised, unsupervised or reinforcement learning in Artificial Neural Networks (ANNs) has been usually achieved by adjusting the connection weights iteratively using a gradient descent-based optimization algorithm such as BackPropagation. The main problems associated with this kind of algorithms are the necessity of a previously defined architecture for the neural net, their sensitivity to the initial conditions of training, their local character and their restriction to only differentiable surfaces. Much recent research has been done for obtaining neural network algorithms by combining different soft-computing paradigms, resulting in hybrid approaches with the advantages of the different paradigms considered. Bio-inspired optimization algorithms, particle swarm optimization, ensemble training or fuzzy logic together with traditional local search algorithms can provide the basic components for better performing algorithms. Heterogenous datasets can also be considered, as an interesting alternative to improve the accuracy of ANNs. This special session is aimed to cover a wide range of works on hybrid ANNs: combinations of ANNs with other other kind of (logistic regression, self-organizing maps, support vector machines...), fusions of learning **algorithms** and heterogenous **data** structures.

Topics of the special session include (but are not limited to):

- Combination of meta-heuristics (evolutionary algorithms, particle swarm optimization...) and local learning approaches (gradient-based methods, hillclimbing...).
- Simultaneous optimization of neural network weights and architectures.
- Memetic and hybrid algorithms.
- Multi-objective optimization of the structure and/or the performance of artificial neural networks.
- Ensembles or mixture of classifiers based on evolutionary artificial neural networks.
- Hybridization of neural network models using different types of basis functions (kernel or projection functions) or other statistical models.
- Learning ANNs using heterogeneous datasets, e.g. using privileged information during the training phase.
- ANNs applied to other challenging classification frameworks: Ordinal Regression, Multi-label Classification...
- Support vector machines and kernel methods combined with ANNs.
- Evolving transfer functions or learning rules.
- Recurrent neural networks optimization, Hopfield nets, probabilistic neural nets or self organizing maps optimized using hybrid learning algorithms.
- Applications of neural networks to science and real-world problems.
- Comparison of these kind of methods and models to standard neural network training techniques: statistical tests, comparative experimental design, critical analysis of comparison methods...

SS8: ADVANCES IN MACHINE LEARNING FOR BIOINFORMATICS AND COMPUTATIONAL BIOMEDICINE

We are experiencing today a huge growth of research in the areas of Bioinformatics and Biomedicine, areas in which computational intelligence techniques play an important and fundamental role. The objective of the proposed session is to gather specialists and new researchers on the list of topics mentioned below to present and discussed their latest developments in these fields.

This special session will focus on research in Pattern Recognition, Computational Intelligence, Machine Learning and Data Mining methods applied to:

- Personalized and preventive health care.
- Diagnosis, prognosis and survival analysis.
- Bioinformatics, including sequence analysis, genomics, proteomics, drug design and discovery, etc.
- Medical decision support systems
- Biomedical data visualization

SS9: BIOMETRIC SYSTEMS FOR HUMAN-MACHINE INTERACTION

Aims:

Biometric systems open up new ways of interactions between human and machines through the use of various peripherals for the recognition and identification of individuals. Over the last decades there has been an increasing interest in using artificial neural networks (ANN) to perform biometric and human-computer interaction tasks. Tasks such as individuals' system verification and identification in different environments provide a range of problems with variant difficulty to test and evaluate. The use of Multivariate Processing can reach specialized systems to provide possible best conditions for biometric applications.

This special session aims to offer a meeting opportunity for academics and industry-related researchers, belonging to the various communities of Computational Intelligence, Machine Learning, Biometrics, Human-machine Interaction and Vision systems to discuss new areas of application of ANN, and to bridge the gap between these fields.

Topics of interest to the workshop include (but are not limited to):

- Face detection and recognition
- Speech and Gesture Recognition
- Fingerprint
- Iris
- Cognition
- Computer Vision

- Affective computing
- Active Learning
- Unsupervised and Semi –Supervised Learning
- Autonomous Intelligent Systems
- Bioelectric Interfaces
- With Applications to:
 - robotics
 - surveillance, privacy, security
 - age detection
 - industry
 - ambient intelligence medical

Chairs:

Alexandra Psarrou (psarroa@westminster.ac.uk)

Dept. of Computer Science and Software Engineering (CSSE), University of Westminster, UK

Anastassia Angelopoulou (agelopa@westminster.ac.uk)

Dept. of Computer Science and Software Engineering (CSSE), University of Westminster, UK

Carlos Manuel Travieso-González (ctravieso@dsc.ulpgc.es)

Signals and Communications Department, University of Las Palmas de Gran Canaria, Spain

Jordi Solé-Casals (jordi.sole@uvic.cat)

Department of Digital Technologies and Information, University of Vic, Spain

Organizing committee:

Jose Garcia Rodriguez (University of Alicante, Spain)

Jorge Azorín (University of Alicante, Spain)

Emilio Corchado (University of Salamanca, Spain)

Juan Manuel Corchado (University of Salamanca, Spain)

Lourdes de Agapito (Queen Mary, University of London, UK)

Manuel Graña (Basque Country University, Spain)

Isabelle Guyon (Clopinet, USA)

Vincent Lemaire (Orange, France)

Peter Roth (Graz University, Austria)

Sergio Velastín (Kingston University, UK)

Sponsors:

INNS Special Interest Group on Autonomous Machine Learning (SIG AML)

Important dates:

Paper submission: 21st January 2011

Notification of acceptance: 25th February 2011

Camera-ready: 11th March 2011

IWANN 2011 Conference: 8-10th June 2011

Submission Guidelines:

Original manuscripts should not exceed 8 pages in the [LNCS Springer-Verlag format](#). Please follow the regular [submission guidelines](#) of IWANN 2011 and submit your paper to the paper submission system. Indicate the correct special session AND notify the chairs of your submission by sending email to: psarroa@westminster.ac.uk, agelopa@westminster.ac.uk, ctravieso@dsc.ulpgc.es and jordi.sole@uvic.cat.

All presented communications will be included in the proceedings of IWANN'11, which will be published in the Lecture Notes on Computer Science (LNCS) series.

SS10: DATA MINING IN BIOMEDICINE

Data mining can be defined as the set of computational techniques that, given a complex problem, allow the transformation of the original data into information which can be easily assimilated. For this purpose, a series of techniques can be applied, such as data transformation (calculus), classification (contextualisation or categorisation), cluster analysis (categorisation), anomaly detection (correction), etc. These techniques allow understanding the data more easily (condensing or summarising the data).

One of the fields in which data mining is mostly being applied may be Biomedicine. Since the sequencing of the human genome in 2001, a larger amount of data has been generated and this amount is being increased every day. The improvements made in the existing technology (such as Genome-Wide Association Studies (GWAS), microarrays, mass spectrometry...) generate a large amount of data from different organisms at different levels, starting from genomic or proteomic levels to epidemiological levels. The analysis of this data requires a change of paradigm. Thus, new computational data mining techniques are essential to analyse at a full extent all of these new information sources.

In this special session, efforts in Data Mining in the biomedical field will be published as an attempt to approach this field from different perspectives. Thus, the papers contained in this special session will be a representation of the latest Data Mining techniques or of the application of previously existing techniques to this field.

We welcome theoretical, empirical papers, and interesting case studies that are within the scope of this special session.

The best papers of this special session will be published in the "International Journal of Data Mining, Modelling and Management (IJDMMM)" in the special issue: "Data Mining in Biomedicine".

SS11: ARTIFICIAL NEURAL NETWORKS APPLICATIONS IN REMOTE SENSING AND GEOMATICS ENGINEERING

Recently artificial intelligence and use of Artificial Neural Networks have given a lot of considerations in remote sensing research community and Geomatics Engineering world wide. Artificial Neural Networks have been applied in different remote sensing fields such as: road extraction, lidar data processing, building extraction from satellite images, edge detection, object recognition from satellite images, classification and land use production, pollution detection from RS data or deformation modelling from InSAR.

SS12: BIO-INSPIRED COMBINATORIAL OPTIMIZATION

Combinatorial optimization is ubiquitous and comprises an enormous range of practical applications. Problems arising in this area are typically hard to solve - due to both the size of the associated search spaces and the intrinsic complexity of efficiently traversing them in order to find the optimal solution - and thus require the use of powerful solving methodologies. Among these, bio-inspired algorithms emerge as cutting-edge tools, due to their search power and flexibility to be adjusted to different problem domains. This session will cover recent developments in the area of combinatorial problem solving using bio-inspired algorithms, including evolutionary algorithms and swarm intelligence among others.

SS13: APPLYING EVOLUTIONARY COMPUTATION AND NATURE-INSPIRED ALGORITHMS TO FORMAL METHODS

The community of Formal Methods (FM) has aimed for decades at constructing mathematically founded methods for analyzing the correctness of systems. These methods include model checking, formal testing techniques, verification, formal specification, etc. Though formal methods have been successfully applied to many industrial problems, these methods typically find the practical problem that the number of states to be systematically analyzed grows exponentially with the size of the system to be analyzed. Thus, exhaustive techniques to find system faults are typically substituted by heuristic strategies allowing to focalize the search for potential faults in some suspicious or critical configurations. Recently, some FM research groups have acknowledged the potential of Evolutionary Computation (EC) methods to provide the heuristics they require. In fact, EC methods provide efficient generic strategies to search for good solutions in big solution spaces, which fits into the kind of problems appearing in FM. The IWANN 2011 special session on "Applying Evolutionary Computation and Nature-inspired Algorithms to Formal Methods" aims at providing a suitable meeting point for researchers working on applying EC to FM, giving them an opportunity to discuss their work from both the EC and the FM perspectives (not just one of them) in a cross-fertilization atmosphere.

The session welcomes works on the application of evolutionary computation and nature-inspired algorithms (genetic algorithms, ant colony optimization, particle swarm optimization, simulated annealing, neural networks, river formation dynamics, neural networks, etc) to formal methods (model checking, formal testing techniques, verification, formal specification, etc) and viceversa.

More information about the special session:

<http://antares.sip.ucm.es/aecnafm2011/index.html#dates>

SS14: RECENT ADVANCES ON FUZZY LOGIC AND SOFT COMPUTING APPLICATIONS

Fuzzy logic and fuzzy methods have proved to be an important tool in the development of several real-world problems. The recent trends concerning Soft Computing or, more generally, Computational Intelligence, have fostered the integration of tools from different research lines (such as fuzzy logic, neural networks, evolutionary computing).

The aim of this special session is to bring researchers in the field of Mathematical Methods in Computational Intelligence, with a special focus on Fuzzy Logic and Soft Computing Applications, to exchange their ideas and approaches, to discuss and to present latest results on this field.

SS15: NEW ADVANCES IN THEORY AND APPLICATIONS OF ICA-BASED ALGORITHMS

Independent component analysis (ICA) is a technique that has evolved along the two last decades. This has been framed in a natural evolution of statistical signal processing, in connection with the progressive increasing in computational power, for exploiting higher-order information. During this progression, the attention of many researchers was attracted by ICA principally for solving blind source separation (BSS) problems. Recently, ICA and its extension to several models, which is called ICA mixture modelling (ICAMM) have been introduced as formal signal processing tools in the pattern analysis and recognition field. As in any already developed techniques, we are in the phase of applying well-established theory in challenging problems meanwhile new theoretical advances are still expected. Therefore, this special session is focused in new advances in theory and applications of ICA-based methods.

The objectives of the special session are the following: to discuss and share on new applications of ICA-based methods mainly focusing in patten recognition problems; to discuss and share on new algorithmic enhancements of the ICA-based methods; and to discuss and share on new trends and challenges for the ICA-based methods.