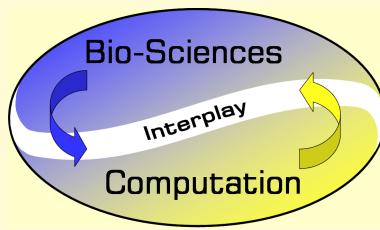


# IWINAC 2007



**2nd INTERNATIONAL WORK-CONFERENCE on the INTERPLAY  
between NATURAL and ARTIFICIAL COMPUTATION**



**HOTEL SOL GALÚA  
La Manga del Mar Menor, Murcia (Spain)**

**June 18-21, 2007**

Organized by:  
**Universidad Nacional de Educación a Distancia (UNED)**

In cooperation with:  
**Universidad Politécnica de Cartagena**  
**Universidad de Murcia**  
**Cartagena UNED Associated Center**

With the collaboration of:  
**NiSIS (Nature-inspired Smart Information Systems) project**

IWINAC 2007 official web:

**<http://www.iwinac.uned.es/>**

# Final Call for Papers

The second "International Work-conference on the Interplay between Natural and Artificial Computation" (IWINAC-2007) will take place in "La Manga del Mar Menor" beach, Murcia (Spain) June, 18-21, 2007.

All accepted papers will be published in the proceedings by Springer-Verlag in Lecture Notes on Computer Science series.

## Scope

This interdisciplinary meeting, with focus on the interplay between Nature and Computation, expands the scope of neural computation at the physical level to cope with symbols and knowledge level models of cognitive and social processes. The global purpose is to offer a forum for discussion and exchange of ideas between scientists and engineers from fields such as Electronic Engineering, Artificial Intelligence, Knowledge Engineering, Physics, Mathematics, Computation, Artificial Vision, Situated Robotics, Neurophysiology, Cognitive Science, Linguistics and Phylosophy, trying to contribute to the answer of two basic questions:

### I:      **From Computation to Sciences of Natural.**

What can Physics, Mathematics, Engineering, Computation, Artificial Intelligence (AI) and Knowledge Engineering (KE) contribute to the understanding of Nervous System, Cognitive Processes and Social Behavior? This is the scope of Computational Neuroscience and Cognition, which uses computation to model and improve our understanding of natural phenomena.

### II:      **From Sciences of Natural to Computation.**

How can Engineering, Mathematics, Computation, AI and KE find inspiration in the behavior and internal functioning of physical, biological and social systems to conceive, develop and build-up new concepts, materials, mechanisms and algorithms of potential value in real world applications? This is the scope of the new Bionics, known as Bioinspired Engineering and Computation, as well as of Natural Computing.

## Topics

To address these two questions, we will make use of a wide and comprehensive view of the Computational Paradigm (CP) that first consider three levels of description for each calculus (physical mechanisms, symbols and knowledge) and then distinguish between two domains of description (the level "own" domain and the domain of the external observer).

This wider view of the CP allows us more elbow room to accommodate the results of the interplay between Nature and Computation. The IWINAC forum becomes thus a methodological approximation (set of intentions, questions, experiments, models, algorithms, mechanisms, explanation procedures, and engineering and computational methods) to the natural and artificial perspectives of the mind embodiments problem, both in humans and in artifacts.

# 1 Interplay at the Physical Level

▷ From Artificial to Natural

## 1.1 Computational Neuroscience

### 1.1.1 Tools

Conceptual, formal, and computational tools and methods in the modeling of neuronal processes and neural nets: individual and collective dynamics.

### 1.1.2 Mechanisms

Computational modeling of neural mechanisms at the architectural level: oscillatory/regulatory feedback loops, lateral inhibition, reflex arches, connectivity and signal routing networks, distributed central-patterns generators. Contributions to a library of neural circuitry.

### 1.1.3 Plasticity

Models of memory, adaptation, learning and other plasticity phenomena. Mechanisms of reinforcement, self-organization, anatomo-physiological coordination and structural coupling.

▷ From Natural to Artificial

## 1.2 Bioinspired Circuits and Mechanisms

### 1.2.1 Electronics

Bioinspired electronics and computer architectures. Advanced models for ANN. Evolvable hardware (CPLDs, FPGAs, ...). Adaptive cellular automata. Redundancy, parallelism and fault-tolerant computation. Retinotopic organizations. Nanotechnology.

### 1.2.2 Non-conventional approaches to Computation

Biomaterials. DNA, cellular and membrane computing, P. Systems, Chemical and Quantum Computing.

### 1.2.3 Sensory and motor prostheses

Signal processing, artificial cochlea, audio-tactile vision substitution. Artificial sensory and motor systems for handicapped people. Inter-sensory transfer and sensory plasticity.

# 2 Interplay at the Symbol Level

▷ From Artificial to Natural

## 2.1 Neural Coding and Neuro-informatics

### 2.1.1 Symbols

Kinds of Neural Coding. Anatomical Basis (regularities, synchronization, resonance, dynamics binding and other potential mechanisms underlying neural coding). Grounded Symbols and Sensorimotor categories.

### 2.1.2 Brain databases

Neural data analysis, integration and sharing. Standardization, construction and use of databases in neuroscience and cognition.

### 2.1.3 Neurosimulators

Development and use of biologically oriented Neurosimulators. Contributions to the understanding of the relationships between structure and function in Biology.

▷ From Natural to Artificial

## 2.2 Bioinspired Programming Strategies

### 2.2.1 Behavior based computational methods

Reactive mechanisms. Self-organizing optimization. Collective emergent behavior (ant colonies). Ethology and Artificial Life.

### 2.2.2 Evolutionary computation

Genetic algorithms, evolutionary strategies, evolutionary programming and genetic programming. Macro-evolution and the interplay between evolution and learning. Meta-heuristics.

### 2.2.3 Hybrid approaches

Neuro-symbolic integration. Knowledge-based ANN and connectionist KBS. Neuro-fuzzy systems. Hybrid adaptation and learning at the symbol level.

### 3 Interplay at the Knowledge Level

- ▷ From Artificial to Natural

#### 3.1 Computational Foundations and approaches to the study of Cognition

##### 3.1.1 AI&KE

Use of AI&KE concepts, tools, and methods in the modeling of cognitive processes, and of individual and social behavior. Contribution to the debate on AI paradigms: symbolic (representational), connectionist, situated, and hybrid (soft computing).

##### 3.1.2 Controversies on the Philosophical Foundations of AI

Open questions and controversies in AI&Cognition (mechanicist physicalism, emergentist thought...). Minsky, Simon, Newell, Marr, Searle, Maturana, Varela, Dreyfus, Edelman, Clancey, Brooks, Pylyshyn, Fodor, Zubiri and more.

##### 3.1.3 Computational Modeling of Cognitive Tasks

Learning (associative, reinforcement, insight), Memory (short and long term, Semantic, Episodic...), Perception of different modalities and action (reactive, goal-directed, adaptive and intentional), Attention, Natural Language and Consciousness. Use of AI and KE tools and techniques in cognitive models (rules, frames, logic and causal networks).

- ▷ From Natural to Artificial

#### 3.2 Bioinspired Engineering AI&KE

##### 3.2.1 Knowledge Modeling and Formalization

Bioinspired Knowledge representation Methods, Artificial Immune Systems. Reusability of Components. Ontologies. Symbolic, Neuronal and Bayesian Problem Solving Methods. Modeling and Formalization languages. Distributed AI and Multi-agent systems.

##### 3.2.2 Applications

Bioinspired solutions to engineering, computational and social problems in different application domains:

1. Biology & Medicine: Image understanding. KBS and ANN for diagnoses, therapy planning, and patient follow-up. Telemedicine.
2. Robotic paradigms: Dynamic vision. Stereoscopic Vision. Path planning, map building, and behavior based navigation methods. Anthropomorphic robots.
3. Health biotechnology: Bioinspired solutions for sustainable growth and development.
4. Other domains: Surveillance and security systems, biometrics, distance education, web, data mining and information retrieval...

## Call for pre-organized sessions

The Program Committee is requesting proposals for pre-organized sessions in one of the above areas or related to the global scope presented above. Also, new sessions in the interdisciplinary spirit of the interplay between natural and artificial computation are welcome. Prospective organizers should contact organization staff at [iwinac@dia.uned.es](mailto:iwinac@dia.uned.es) as soon as possible. Information about current pre-organized sessions and further details for prospective organizers can be found at web: <http://www.iwinac.uned.es/>. The organizers of effective pre-organized sessions will benefit of a discount on registration fees.

# Invited Speakers

- GHEORGE PAUN. Univ. de Sevilla (Spain):  
“Spiking neural P systems: power and efficiency”.
- JAVIER MONSERRAT. Univ. Autónoma de Madrid (Spain):  
“Neural networks and quantum neurology: a speculative heuristic towards the psychism architecture”.
- ÁLVARO PASCUAL-LEONE. Harvard Medical School (USA):  
“The metamodal organization of the brain”.

## Paper Submission

The Program Committee request original papers on the above mentioned topics. Authors (no more than five for each paper) must submit the camera-ready **final version** of papers written in English (official language of the conference), of **up to 10 pages** (including figures, tables and references) in electronic format through either of the following two channels:

- Through a pre-organized session (refereed at least by session organizer and one external referee): Please, first send 1 copy to the session organizer (some time before submission deadline) and then, after session organizer agrees, register the paper in the submission web form.
- Or directly to the general program (at least two external referees): Please, register the paper directly in the submission web form.

The contributions must use only the L<sup>A</sup>T<sub>E</sub>X 2<sub>&</sub> style file available in the Springer instructions web page: <http://www.springer.de/comp/lncs/authors.html> (follow “Information for LNCS Authors” link). Other formats or draft versions cannot be accepted at all (see hints for L<sup>A</sup>T<sub>E</sub>X on MS-Windows in our web pages). Please, use gray scale (not color) for all the figures.

Authors must send their papers (L<sup>A</sup>T<sub>E</sub>X sources plus camera ready in PDF/Postscript, see web page for details), **before February 15th** (23:59h. UTC), through the *submission web form* found in a link from the main web site: <http://www.iwinac.uned.es/>.

Please, do not send printed copies or email attachments (except when required by the organization staff). All authors must fill in (themselves or the contact author) the required data for the program database form as specified in the submission web form.

The proceedings will be published in the "Lecture Notes in Computer Science" series from Springer-Verlag.

All papers received will be refereed by the Program Committee. Accepted papers must be presented either orally (overhead, slide, data projectors and a PC with standard presentation software will be available) or as poster panels (size 90 cm. width  $\times$  150 cm. height), however all accepted contributions will be published at full length using directly the camera ready electronic file sent by the authors. At least one author registration is required for each accepted paper.

Also, authors must fill in and sign the copyright form required by Springer. It can be found through a link in the Author's instructions web page. After paper acceptance, send the signed copyright form through postal (snail) mail or fax (+34-91-398-8895).

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# Congress venue

## HOTEL SOL GALÚA ★★★★

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## Registration fees

The registration fee includes attending to the sessions, coffee breaks, lunches, social events, gala dinner and the Proceedings of the Work-Conference.

Type	Before April 30	After April 30
Standard	€ 450	€ 550
Session Organizer	€ 350	€ 450
Accompanying person (*)	€ 250	€ 250

(\*) Accompanying person registration fee only includes lunches, social events and gala dinner.

Registration fees of at least one author for each accepted paper should be paid in full before submission to press (April 30, 2007).

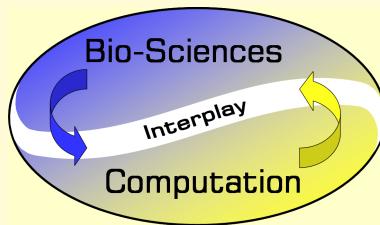
## IWINAC 2007 important deadlines

Full papers submission due	February 15, 2007
Acceptance notification and start of registration	April 1, 2007
End of reduction fee for <i>early</i> registration	April 30, 2007
Congress date	June 18-21, 2007

IWINAC 2007 official web site:

<http://www.iwinac.uned.es/>

# IWINAC 2007



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