

## Preface

Underlying most of the IWANN calls for papers is the aim to reassume some of the motivations of the groundwork stages of biocybernetics and the later bionics formulations and to try to reconsider the present value of two basic questions. The first one is: “What does neuroscience bring into computation (the new bionics)?” That is to say, how can we seek inspiration in biology? Titles such as “computational intelligence”, “artificial neural nets”, “genetic algorithms”, “evolutionary hardware”, “evolutive architectures”, “embryonics”, “sensory neuromorphic systems”, and “emotional robotics” are representatives of the present interest in “biological electronics” (bionics).

The second question is: “What can return computation to neuroscience (the new neurocybernetics)?” That is to say, how can mathematics, electronics, computer science, and artificial intelligence help the neurobiologists to improve their experimental data modeling and to move a step forward towards the understanding of the nervous system?

Relevant here are the general philosophy of the IWANN conferences, the sustained interdisciplinary approach, and the global strategy, again and again to bring together physiologists and computer experts to consider the common and pertinent questions and the shared methods to answer these questions.

Unfortunately, we have not always been successful in the six biennial meetings from 1991. Frequently the well-known computational models of the past have been repeated and our understanding about the neural functioning of real brains is still scarce. Also the biological influence on computation has not always been used with the necessary methodological care. However IWANN 2001 constituted a new attempt to formulate new models of bio-inspired neural computation with the deeply-held conviction that the interdisciplinary way is, possibly, the most useful one.

IWANN 2001, the 6th International Work-Conference in Artificial and Natural Neural Networks, took place in Granada (Spain) June 13-15, 2001, and addressed the following topics:

1. ***Foundations of connectionism.*** Brain organization principles. Connectionist versus symbolic representations.
2. ***Biophysical models of neurons.*** Ionic channels, synaptic level, neurons, and circuits.
3. ***Structural and functional models of neurons.*** Analogue, digital, probabilistic, Bayesian, fuzzy, object oriented, and energy related formulations.
4. ***Learning and other plasticity phenomena.*** Supervised, non-supervised, and reinforcement algorithms. Biological mechanisms of adaptation and plasticity.
5. ***Complex systems dynamics.*** Optimization, self-organization, and cooperative processes. Evolutionary and genetic algorithms. Large scale neural models.

6. ***Artificial intelligence and cognitive processes.*** Knowledge modeling. Natural language understanding. Intelligent multi-agent systems. Distributed AI.
7. ***Methodology for nets design.*** Data analysis, task identification, and recursive hierarchical design.
8. ***Nets simulation and implementation.*** Development environments and editing tools. Implementation. Evolving hardware.
9. ***Bio-inspired systems and engineering.*** Signal processing, neural prostheses, retinomorph systems, and other neural adaptive prosthetic devices. Molecular computing.
10. ***Other applications.*** Artificial vision, speech recognition, spatio-temporal planning, and scheduling. Data mining. Sources separation. Applications of ANNs in robotics, economy, internet, medicine, education, and industry.

IWANN 2001 was organized by the Universidad Nacional de Educación a Distancia, UNED (Madrid), and the Universidad de Granada, UGR (Granada), also in cooperation with IFIP (Working Group in Neural Computer Systems, WG10.6), and the Spanish RIG IEEE Neural Networks Council.

Sponsorship was obtained from the Spanish CICYT and the organizing universities (UNED and UGR).

The papers presented here correspond to talks delivered at the conference. After the evaluation process, 200 papers were accepted for oral or poster presentation, according to the recommendations of reviewers and the authors' preferences. We have organized these papers in two volumes arranged basically following the topics list included in the call for papers. The first volume, entitled "Connectionist Models of Neurons, Learning Processes, and Artificial Intelligence" is divided into four main parts and includes the contributions on:

- I. Foundations of connectionism and biophysical models of neurons.
- II. Structural and functional models of neurons.
- III. Learning and other plasticity phenomena, and complex systems dynamics.
- IV. Artificial intelligence and cognitive processes.

In the second volume, with the title, "Bio-inspired Applications of Connectionism", we have included the contributions dealing with applications. These contributions are grouped into three parts:

- I. Bio-inspired systems and engineering.
- II. Methodology for nets design, and nets simulation and implementation.
- III. Other applications (including image processing, medical applications, robotics, data analysis, etc.).

We would like to express our sincere gratitude to the members of the organizing and program committees, in particular to F. de la Paz and J. R. Álvarez-Sánchez, to the reviewers, and to the organizers of preorganized sessions for their invaluable effort in helping with the preparation of this conference. Thanks also to the invited speakers for their effort in preparing the plenary lectures.

Last, but not least, the editors would like to thank Springer-Verlag, in particular Alfred Hofmann, for the continuous and excellent cooperative collaboration

from the first IWANN in Granada (1991, LNCS 540), the successive meetings in Sitges (1993, LNCS 686), Torremolinos (1995, LNCS 930), Lanzarote (1997, LNCS 1240), Alicante (1999, LNCS 1606 and 1607), and now again in Granada.

June 2001

José Mira  
Alberto Prieto

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# Table of Contents, Part I

## Foundations of Connectionism and Biophysical Models of Neurons

|   |    |
|---|----|
| Dendrites: The Last-Generation Computers . . . . .  | 1  |
| <i>O. Herreras, J.M. Ibarz, L. López-Aguado, and P. Varona</i>  |    |
| Homogeneity in the Electrical Activity Pattern as a Function<br>of Intercellular Coupling in Cell Networks . . . . .                    | 14 |
| <i>E. Andreu, R. Pomares, B. Soria, and J.V. Sanchez-Andres</i>   |    |
| A Realistic Computational Model of the Local Circuitry<br>of the Cuneate Nucleus . . . . .  | 21 |
| <i>E. Sánchez, S. Barro, J. Mariño, and A. Canedo</i>   |    |
| Algorithmic Extraction of Morphological Statistics<br>from Electronic Archives of Neuroanatomy . . . . .                                | 30 |
| <i>R. Scorcioni and G.A. Ascoli</i>   |    |
| What Can We Compute with Lateral Inhibition Circuits? . . . . .   | 38 |
| <i>J. Mira and A.E. Delgado</i>   |    |
| Neuronal Models with Current Inputs . . . . .   | 47 |
| <i>J. Feng</i>  |    |
| Decoding the Population Responses of Retinal Ganglions Cells<br>Using Information Theory . . . . .                                      | 55 |
| <i>J.M. Ferrández, M. Bongard, F. García de Quirós, J.A. Bolea,<br/>J. Ammermüller, R.A. Normann, and E. Fernández</i>                  |    |
| Numerical Study of Effects of Co-transmission by Substance P<br>and Acetylcholine on Synaptic Plasticity in Myenteric Neurons . . . . . | 63 |
| <i>R. Miftakov and J. Christensen</i>   |    |
| Neurobiological Modeling of Bursting Response During Visual Attention . .   | 72 |
| <i>R. Rajimehr and L. Montaser Kouhsari</i>   |    |
| Sensitivity of Simulated Striate Neurons to Cross-Like Stimuli Based<br>on Disinhibitory Mechanism . . . . .                            | 81 |
| <i>K.A. Saltykov and I.A. Shevelev</i>  |    |
| Synchronisation Mechanisms in Neuronal Networks . . . . .   | 87 |
| <i>S. Chillemi, M. Barbi, and A. Di Garbo</i>   |    |

XII Table of Contents, Part I

Detection of Oriented Repetitive Alternating Patterns in Color Images  
(A Computational Model of Monkey Grating Cells) ..... 95  
*T. Lourens, H.G. Okuno, and H. Kitano*

Synchronization in Brain – Assessment by Electroencephalographic Signals 108  
*E. Pereda and J. Bhattacharya*

Strategies for the Optimization of Large Scale Networks of Integrate  
and Fire Neurons ..... 117  
*M.A. Sánchez-Montañés*

**Structural and Functional Models of Neurons**

A Neural Network Model of Working Memory  
(Processing of “What” and “Where” Information)..... 126  
*T. Minami and T. Inui*

Orientation Selectivity of Intracortical Inhibitory Cells in the Striate  
Visual Cortex: A Computational Theory and a Neural Circuitry ..... 134  
*M.N. Shirazi*

Interpreting Neural Networks in the Frame of the Logic of Lukasiewicz ... 142  
*C. Moraga and L. Salinas*

Time-Dispersive Effects in the J. Gonzalo’s Research  
on Cerebral Dynamics ..... 150  
*I. Gonzalo and M.A. Porras*

Verifying Properties of Neural Networks ..... 158  
*P. Rodrigues, J.F. Costa, and H.T. Siegelmann*

Algorithms and Implementation Architectures  
for Hebbian Neural Networks ..... 166  
*J.A. Berzal and P.J. Zufiria*

The Hierarchical Neuro-Fuzzy BSP Model: An Application  
in Electric Load Forecasting ..... 174  
*F.J. de Souza, M.M.R. Vellasco, and M.A.C. Pacheco*

The Chemical Metaphor in Neural Computation ..... 184  
*J. Barahona da Fonseca, I. Barahona da Fonseca,  
C.P. Suárez Araujo, and J. Simões da Fonseca*

The General Neural-Network Paradigm for Visual Cryptography ..... 196  
*T.-W. Yue and S. Chiang*

|   |     |
|---|-----|
| II-DTB, Discrete Time Backpropagation with Product Units . . . . .  | 207 |
| <i>J. Santos and R.J. Duro</i>  |     |
| Neocognitron-Type Network for Recognizing Rotated and Shifted Patterns<br>with Reduction of Resources . . . . . | 215 |
| <i>S. Satoh, S. Miyake, and H. Aso</i>  |     |
| Classification with Synaptic Radial Basis Units . . . . .   | 223 |
| <i>J.D. Buldain</i>   |     |
| A Randomized Hypercolumn Model and Gesture Recognition . . . . .  | 235 |
| <i>N. Tsuruta, Y. Yoshiki, and T. El. Tobely</i>  |     |
| Heterogeneous Kohonen Networks . . . . .  | 243 |
| <i>S. Negri, L.A. Belanche</i>  |     |
| Divided-Data Analysis in a Financial Case Classification<br>with Multi-dendritic Neural Networks . . . . .      | 253 |
| <i>J.D. Buldain</i>   |     |
| Neuro Fuzzy Systems: State-of-the-Art Modeling Techniques . . . . .   | 269 |
| <i>A. Abraham</i>   |     |
| Generating Linear Regression Rules from Neural Networks<br>Using Local Least Squares Approximation . . . . .    | 277 |
| <i>R. Setiono</i>   |     |
| Speech Recognition Using Fuzzy Second-Order<br>Recurrent Neural Networks . . . . .                              | 285 |
| <i>A. Blanco, M. Delgado, M.C. Pegalajar, and I. Requena</i>  |     |
| A Measure of Noise Immunity for Functional Networks . . . . .   | 293 |
| <i>E. Castillo, O. Fontenla-Romero, B. Guijarro-Berdiñas,<br/>and A. Alonso-Betanzos</i>                        |     |
| A Functional-Neural Network<br>for Post-Nonlinear Independent Component Analysis . . . . .                      | 301 |
| <i>O. Fontenla Romero, B. Guijarro Berdiñas,<br/>and A. Alonso Betanzos</i>                                     |     |
| Optimal Modular Feedforward Neural Nets Based<br>on Functional Network Architectures . . . . .                  | 308 |
| <i>A.S. Cofiño, J.M. Gutiérrez</i>  |     |
| Optimal Transformations in Multiple Linear Regression<br>Using Functional Networks . . . . .                    | 316 |
| <i>E. Castillo, A.S. Hadi, and B. Lacruz</i>  |     |

## Learning and Other Plasticity Phenomena, and Complex Systems Dynamics

|  |     |
|--|-----|
| Generalization Error and Training Error at Singularities<br>of Multilayer Perceptrons . . . . .                                    | 325 |
| <i>S.-I. Amari, T. Ozeki, and H. Park</i>  |     |
| Bistable Gradient Neural Networks: Their Computational Properties . . . . .  | 333 |
| <i>V. Chinarov and M. Menzinger</i>  |     |
| Inductive Bias in Recurrent Neural Networks . . . . .  | 339 |
| <i>S. Snyders and C.W. Omlin</i>   |     |
| Accelerating the Convergence of EM-Based Training Algorithms<br>for RBF Networks . . . . .   | 347 |
| <i>M. Lázaro, I. Santamaría, and C. Pantaleón</i>  |     |
| Expansive and Competitive Neural Networks . . . . .  | 355 |
| <i>J.A. Gomez-Ruiz, J. Muñoz-Perez, E. Lopez-Rubio,<br/>and M.A. Garcia-Bernal</i>   |     |
| Fast Function Approximation with Hierarchical Neural Networks<br>and Their Application to a Reinforcement Learning Agent . . . . . | 363 |
| <i>J. Fischer, R. Breithaupt, and M. Bode</i>  |     |
| Two Dimensional Evaluation Reinforcement Learning . . . . .  | 370 |
| <i>H. Okada, H. Yamakawa, and T. Omori</i>   |     |
| Comparing the Learning Processes of Cognitive Distance Learning<br>and Search Based Agent . . . . .                                | 378 |
| <i>H. Yamakawa, Y. Miyamoto, and H. Okada</i>  |     |
| Selective Learning for Multilayer Feedforward Neural Networks . . . . .  | 386 |
| <i>A.P. Engelbrecht</i>  |     |
| Connectionist Models of Cortico-Basal Ganglia Adaptive Neural Networks<br>During Learning of Motor Sequential Procedures . . . . . | 394 |
| <i>J. Molina Vilaplana, J. Feliú Batlle, and J. López Coronado</i>   |     |
| Practical Consideration on Generalization Property<br>of Natural Gradient Learning . . . . .                                       | 402 |
| <i>H. Park</i>   |     |
| Novel Training Algorithm Based on Quadratic Optimisation<br>Using Neural Networks . . . . .  | 410 |
| <i>G. Arulampalam and A. Bouzerdoun</i>  |     |
| Non-symmetric Support Vector Machines . . . . .  | 418 |
| <i>J. Feng</i>   |     |

|   |     |
|---|-----|
| Natural Gradient Learning in NLDA Networks . . . . .  | 427 |
| <i>J.R. Dorronsoro, A. González, and C. Santa Cruz</i>  |     |
| AUTOWISARD: Unsupervised Modes for the WISARD . . . . .   | 435 |
| <i>I. Wickert and F.M.G. França</i>   |     |
| Neural Steering: Difficult and Impossible Sequential Problems<br>for Gradient Descent . . . . .                 | 442 |
| <i>G. Milligan, M.K. Weir, and J.P. Lewis</i>   |     |
| Analysis of Scaling Exponents of Waken and Sleeping Stage in EEG . . . . .                                      | 450 |
| <i>J.-M. Lee, D.-J. Kim, I.-Y. Kim, and S.I. Kim</i>  |     |
| Model Based Predictive Control Using Genetic Algorithms.<br>Application to Greenhouses Climate Control. . . . . | 457 |
| <i>X. Blasco, M. Martínez, J. Senent, and J. Sanchis</i>  |     |
| Nonlinear Parametric Model Identification with Genetic Algorithms.<br>Application to a Thermal Process. . . . . | 466 |
| <i>X. Blasco, J.M. Herrero, M. Martínez, and J. Senent</i>  |     |
| A Comparison of Several Evolutionary Heuristics<br>for the Frequency Assignment Problem . . . . .               | 474 |
| <i>C. Cotta and J.M. Troya</i>  |     |
| GA Techniques Applied to Contour Search in Images of Bovine Livestock .   | 482 |
| <i>H.M. González Velasco, C.J. García Orellana,<br/>M. Macías Macías, and M.I. Acevedo Sotoca</i>               |     |
| Richer Network Dynamics of Intrinsically Non-regular Neurons Measured<br>through Mutual Information. . . . .    | 490 |
| <i>F. Rodríguez, P. Varona, R. Huerta, M.I. Rabinovich,<br/>and H.D.I. Abarbanel</i>                            |     |
| RBF Neural Networks, Multiobjective Optimization<br>and Time Series Forecasting . . . . .                       | 498 |
| <i>J. González, I. Rojas, H. Pomares, and J. Ortega</i>   |     |
| Evolving RBF Neural Networks . . . . .  | 506 |
| <i>V.M. Rivas, P.A. Castillo, and J.J. Merelo</i>   |     |
| Evolutionary Cellular Configurations<br>for Designing Feed-Forward Neural Networks Architectures . . . . .      | 514 |
| <i>G. Gutiérrez, P. Isasi, J.M. Molina, A. Sanchis, and I.M. Galván</i>   |     |
| A Recurrent Multivalued Neural Network for the N-Queens Problem. . . . .  | 522 |
| <i>E. Mérida, J. Muñoz, and R. Benítez</i>  |     |

|   |     |
|---|-----|
| A Novel Approach to Self-Adaptation of Neuro-Fuzzy Controllers<br>in Real Time .....  | 530 |
| <i>H. Pomares, I. Rojas, J. González, and M. Damas</i>  |     |
| Expert Mutation Operators for the Evolution<br>of Radial Basis Function Neural Networks .....   | 538 |
| <i>J. González, I. Rojas, H. Pomares, and M. Salmerón</i>   |     |
| Studying Neural Networks of Bifurcating Recursive Processing Elements<br>– Quantitative Methods for Architecture Design<br>and Performance Analysis ..... | 546 |
| <i>E. Del Moral Hernandez</i>   |     |
| Topology-Preserving Elastic Nets .....  | 554 |
| <i>V. Tereshko</i>  |     |
| Optimization with Linear Constraints in the Neural Network .....  | 561 |
| <i>M. Oota, N. Ishii, K. Yamauchi, and M. Nakamura</i>  |     |
| Optimizing RBF Networks with Cooperative/Competitive Evolution<br>of Units and Fuzzy Rules .....  | 570 |
| <i>A.J. Rivera, J. Ortega, I. Rojas, and A. Prieto</i>  |     |
| Study of Chaos in a Simple Discrete Recurrence Neural Network .....   | 579 |
| <i>J.D. Piñeiro, R.L. Marichal, L. Moreno, J.F. Sigut,<br/>and E.J. González</i>  |     |
| Genetic Algorithm versus Scatter Search<br>and Solving Hard MAX-W-SAT Problems .....  | 586 |
| <i>H. Drias</i>   |     |
| A New Approach to Evolutionary Computation:<br>Segregative Genetic Algorithms (SEGA) .....  | 594 |
| <i>M. Affenzeller</i>   |     |
| Evolution of Firms in Complex Worlds: Generalized <i>NK</i> Model .....   | 602 |
| <i>N. Jacoby</i>  |     |
| Learning Adaptive Parameters<br>with Restricted Genetic Optimization Method .....   | 612 |
| <i>S. Garrido and L. Moreno</i>   |     |
| Solving NP-Complete Problems with Networks<br>of Evolutionary Processors .....  | 621 |
| <i>J. Castellanos, C. Martín-Vide, V. Mitrana, and J.M. Sempere</i>   |     |
| Using SOM for Neural Network Visualization .....  | 629 |
| <i>G. Romero, P.A. Castillo, J.J. Merelo, and A. Prieto</i>   |     |

|   |     |
|---|-----|
| Comparison of Supervised Self-Organizing Maps Using Euclidian or Mahalanobis Distance in Classification Context . . . . .           | 637 |
| <i>F. Fessant, P. Aknin, L. Oukhellou, and S. Midenet</i>   |     |
| Introducing Multi-objective Optimization in Cooperative Coevolution of Neural Networks . . . . .                                    | 645 |
| <i>N. García-Pedrajas, E. Sanz-Tapia, D. Ortiz-Boyer, and C. Hervás-Martínez</i>  |     |
| STAR - Sparsity through Automated Rejection . . . . .   | 653 |
| <i>R. Burbidge, M. Trotter, B. Buxton, and S. Holden</i>  |     |
| Ordinal Regression with $K$ -SVCR Machines . . . . .  | 661 |
| <i>C. Angulo and A. Català</i>  |     |
| Large Margin Nearest Neighbor Classifiers . . . . .   | 669 |
| <i>S. Bermejo and J. Cabestany</i>  |     |
| Reduced Support Vector Selection by Linear Programs . . . . .   | 677 |
| <i>W.A. Fellenz</i>   |     |
| Edge Detection in Noisy Images Using the Support Vector Machines . . . . .  | 685 |
| <i>H. Gómez-Moreno, S. Maldonado-Bascón, and F. López Ferreras</i>  |     |
| Initialization in Genetic Algorithms for Constraint Satisfaction Problems . . . . .   | 693 |
| <i>C.R. Vela, R. Varela, and J. Puente</i>  |     |
| Evolving High-Posterior Self-Organizing Maps . . . . .  | 701 |
| <i>J. Muruzábal</i>   |     |
| Using Statistical Techniques to Predict GA Performance . . . . .  | 709 |
| <i>R. Nogueras and C. Cotta</i>   |     |
| Multilevel Genetic Algorithm for the Complete Development of ANN . . . . .  | 717 |
| <i>J. Dorado, A. Santos, and J.R. Rabuñal</i>   |     |
| Graph Based GP Applied to Dynamical Systems Modeling . . . . .  | 725 |
| <i>A.M. López, H. López, and L. Sánchez</i>   |     |
| Nonlinear System Dynamics in the Normalisation Process of a Self-Organising Neural Network for Combinatorial Optimisation . . . . . | 733 |
| <i>T. Kwok and K.A. Smith</i>   |     |
| Continuous Function Optimisation via Gradient Descent on a Neural Network Approximation Function . . . . .                          | 741 |
| <i>K.A. Smith and J.N.D. Gupta</i>  |     |
| An Evolutionary Algorithm for the Design of Hybrid Fiber Optic-Coaxial Cable Networks in Small Urban Areas . . . . .                | 749 |
| <i>P. Cortés, F. Guerrero, D. Canca, and J.M. García</i>  |     |

Channel Assignment for Mobile Communications  
Using Stochastic Chaotic Simulated Annealing . . . . . 757  
*S. Li and L. Wang*

**Artificial Intelligence and Cognitive Processes**

Seeing is Believing: Depictive Neuromodelling of Visual Awareness . . . . . 765  
*I. Aleksander, H. Morton, and B. Dunmall*

DIAGEN-WebDB: A Connectionist Approach  
to Medical Knowledge Representation and Inference . . . . . 772  
*J. Mira, R. Martínez, J.R. Álvarez, and A.E. Delgado*

Conceptual Spaces as Voltage Maps . . . . . 783  
*J. Aisbett and G. Gibbon*

Determining Hyper-planes to Generate Symbolic Rules . . . . . 791  
*G. Bologna*

Automatic Symbolic Modelling of Co-evolutionarily Learned Robot Skills . 799  
*A. Ledezma, A. Berlanga, and R. Aler*

ANNs and the Neural Basis for General Intelligence . . . . . 807  
*J.G. Wallace and K. Bluff*

Knowledge and Intelligence . . . . . 814  
*J.C. Herrero*

Conjecturing the Cognitive Plausibility of an ANN Theorem-Prover . . . . . 822  
*I.M.O. Vilela and P.M.V. Lima*

**Author Index** . . . . . 831

## Table of Contents, Part II

### Bio-inspired Systems and Engineering

|  |    |
|--|----|
| From Embryonics to POEtic Machines . . . . .   | 1  |
| <i>D. Mange, A. Stauffer, G. Tempesti, and C. Teuscher</i>   |    |
| Design and Codesign of Neuro-Fuzzy Hardware . . . . .  | 14 |
| <i>L.M. Reyneri</i>  |    |
| A Field-Programmable Conductance Array IC<br>for Biological Neurons Modeling . . . . .   | 31 |
| <i>V. Douence, S. Renaud-Le Masson, S. Saïghi, and G. Le Masson</i>  |    |
| A 2-by-n Hybrid Cellular Automaton Implementation<br>Using a Bio-Inspired FPGA . . . . .   | 39 |
| <i>H.F. Restrepo and D. Mange</i>  |    |
| Parametric Neurocontroller for Positioning of an Anthropomorphic Finger<br>Based on an Oponent Driven-Tendon Transmission System . . . . . | 47 |
| <i>J.I. Mulero, J. Feliú Batlle, and J. López Coronado</i>   |    |
| An Integration Principle for Multimodal Sensor Data Based<br>on Temporal Coherence of Self-Organized Patterns. . . . .                     | 55 |
| <i>E.I. Barakova</i>   |    |
| Simultaneous Parallel Processing of Object and Position<br>by Temporal Correlation . . . . .   | 64 |
| <i>L.F. Lago-Fernández and G. Deco</i>   |    |

### Methodology for Nets Design, Nets Simulation and Implementation

|   |    |
|---|----|
| NeuSim: A Modular Neural Networks Simulator for Beowulf Clusters . . . . .                                  | 72 |
| <i>C.J. García Orellana, R. Gallardo Caballero,<br/>H.M. González Velasco, F.J. López Aligüé</i>            |    |
| Curved Kernel Neural Network for Functions Approximation . . . . .  | 80 |
| <i>P. Bourret and B. Pelletier</i>  |    |
| Repeated Measures Multiple Comparison Procedures Applied<br>to Model Selection in Neural Networks . . . . . | 88 |
| <i>E. Guerrero Vázquez, A. Yañez Escolano, P. Galindo Riaño,<br/>J. Pizarro Junquera</i>                    |    |

|  |     |
|--|-----|
| Extension of HUMANN for Dealing with Noise and with Classes<br>of Different Shape and Size: A Parametric Study . . . . . | 96  |
| <i>P. García Báez, C.P. Suárez Araujo, and P. Fernández López</i>  |     |
| Evenet 2000: Designing and Training Arbitrary Neural Networks in Java . .  | 104 |
| <i>E.J. González, A.F. Hamilton, L. Moreno, J.F. Sigut,<br/>and R.L. Marichal</i>  |     |
| Neyman-Pearson Neural Detectors . . . . .  | 111 |
| <i>D. Andina and J.L. Sanz-González</i>  |     |
| Distance between Kohonen Classes Visualization Tool to Use SOM<br>in Data Set Analysis and Representation . . . . .      | 119 |
| <i>P. Rousset and C. Guinot</i>  |     |
| Optimal Genetic Representation<br>of Complete Strictly-Layered Feedforward Neural Networks . . . . .                     | 127 |
| <i>S. Raptis, S. Tzafestas, and H. Karagianni</i>  |     |
| Assessing the Noise Immunity of Radial Basis Function Neural Networks . .  | 136 |
| <i>J.L. Bernier, J. González, A. Cañas, and J. Ortega</i>  |     |
| Analyzing Boltzmann Machine Parameters for Fast Convergence . . . . .  | 144 |
| <i>F.J. Salcedo, J. Ortega, and A. Prieto</i>  |     |
| A Penalization Criterion Based on Noise Behaviour for Model Selection . .  | 152 |
| <i>J. Pizarro Junquera, P. Galindo Riaño, E. Guerrero Vázquez,<br/>and A. Yañez Escolano</i>                             |     |
| <b>Image Processing</b>  |     |
| Wood Texture Analysis by Combining the Connected Elements Histogram<br>and Artificial Neural Networks . . . . .          | 160 |
| <i>M.A. Patricio Guisado and D. Maravall Gómez-Allende</i>   |     |
| Dynamic Topology Networks for Colour Image Compression . . . . .   | 168 |
| <i>E. López-Rubio, J. Muñoz-Pérez, and J.A. Gómez-Ruiz</i>   |     |
| Analysis on the Viewpoint Dependency in 3-D Object Recognition<br>by Support Vector Machines . . . . .                   | 176 |
| <i>T. Hayasaka, E. Ohnishi, S. Nakauchi, and S. Usui</i>   |     |
| A Comparative Study of Two Neural Models for Cloud Screening<br>of Iberian Peninsula Meteosat Images . . . . .           | 184 |
| <i>M. Macías Macías, F.J. López Aliqué, A. Serrano Pérez,<br/>and A. Astilleros Vivas</i>                                |     |

|   |     |
|---|-----|
| A Growing Cell Neural Network Structure<br>for Off-Line Signature Recognition .....   | 192 |
| <i>K. Toscano-Medina, G. Sanchez-Perez, M. Nakano-Miyatake,<br/>and H. Perez-Meana</i>  |     |
| ZISC-036 Neuro-processor Based Image Processing .....   | 200 |
| <i>K. Madani, G. de Trémiolles, and P. Tannhof</i>  |     |
| Self-Organizing Map for Hyperspectral Image Analysis .....  | 208 |
| <i>P. Martínez, P.L. Aguilar, R.M. Pérez, M. Linaje, J.C. Preciado,<br/>and A. Plaza</i>  |     |
| Classification of the Images of Gene Expression Patterns<br>Using Neural Networks Based on Multi-valued Neurons .....                 | 219 |
| <i>I. Aizenberg, E. Myasnikova, and M. Samsonova</i>  |     |
| Image Restoration Using Neural Networks .....   | 227 |
| <i>S. Ghennam and K. Benmahammed</i>  |     |
| Automatic Generation of Digital Filters by NN Based Learning:<br>An Application on Paper Pulp Inspection .....                        | 235 |
| <i>P. Campoy-Cervera, D.F. Muñoz García, D. Peña,<br/>and J.A. Calderón-Martínez</i>  |     |
| Image Quality Enhancement for Liquid Bridge Parameter Estimation<br>with DTCNN .....  | 246 |
| <i>M.A. Jaramillo, J. Álvaro Fernández, J.M. Montanero, and F. Zayas</i>  |     |
| Neural Network Based on Multi-valued Neurons: Application<br>in Image Recognition, Type of Blur and Blur Parameters Identification .. | 254 |
| <i>I. Aizenberg, N. Aizenberg, and C. Butakoff</i>  |     |
| Analyzing Wavelets Components to Perform Face Recognition .....   | 262 |
| <i>P. Isasi, M. Velasco, and J. Segovia</i>   |     |
| Man-Machine Voice Interface<br>Using a Commercially Available Neural Chip .....   | 271 |
| <i>N.J. Medraño-Marqués and B. Martín-del-Brío</i>  |     |
| Partial Classification in Speech Recognition Verification .....   | 279 |
| <i>G. Hernández Ábrego and I. Torres Sánchez</i>  |     |
| Speaker Recognition Using Gaussian Mixtures Model .....   | 287 |
| <i>E. Simancas-Acevedo, A. Kurematsu, M. Nakano Miyatake,<br/>and H. Perez-Meana</i>  |     |
| A Comparative Study of ICA Filter Structures Learnt from Natural<br>and Urban Images .....  | 295 |
| <i>C. Ziegauß and E.W. Lang</i>   |     |

Neural Edge Detector –  
A Good Mimic of Conventional One Yet Robuster against Noise . . . . . 303  
*K. Suzuki, I. Horiba, and N. Sugie*

Neural Networks for Image Restoration from the Magnitude  
of Its Fourier Transform . . . . . 311  
*A. Burian, J. Saarinen, and P. Kuosmanen*

## Medical Applications

An Automatic System for the Location of the Optic Nerve Head  
from 2D Images . . . . . 319  
*M. Bachiller, M. Rincón, J. Mira, and J. García-Feijó*

Can ICA Help Classify Skin Cancer and Benign Lesions? . . . . . 328  
*C. Mies, C. Bauer, G. Ackermann, W. Bäumlér, C. Abels,  
C.G. Puntonet, M. Rodríguez-Alvarez, and E.W. Lang*

An Approach Fractal and Analysis of Variogram for Edge Detection  
of Biomedical Images . . . . . 336  
*L. Hamami and N. Lassouaoui*

Some Examples for Solving Clinical Problems Using Neural Networks. . . . . 345  
*A.J. Serrano, E. Soria, G. Camps, J.D. Martín, and N.V. Jiménez*

Medical Images Analysis: An Application of Artificial Neural Networks  
in the Diagnosis of Human Tissues . . . . . 353  
*E. Restum Antonio, L. Biondi Neto, V. De Roberto Junior,  
and F. Hideo Fukuda*

Feature Selection, Ranking of Each Feature and Classification  
for the Diagnosis of Community Acquired Legionella Pneumonia . . . . . 361  
*E. Monte, J. Solé i Casals, J.A. Fiz, and N. Sopena*

Rotation-Invariant Image Association for Endoscopic Positional  
Identification Using Complex-Valued Associative Memories . . . . . 369  
*H. Aoki, E. Watanabe, A. Nagata, and Y. Kosugi*

A Multi Layer Perceptron Approach for Predicting and Modeling  
the Dynamical Behavior of Cardiac Ventricular Repolarisation . . . . . 377  
*R. El Dajani, M. Miquel, and P. Rubel*

Detection of Microcalcifications in Mammograms by the Combination  
of a Neural Detector and Multiscale Feature Enhancement . . . . . 385  
*D. Andina and A. Vega-Corona*

|  |     |
|--|-----|
| An Auto-learning System for the Classification<br>of Fetal Heart Rate Decelerative Patterns .....                | 393 |
| <i>B. Guijarro Berdiñas, A. Alonso-Betanzos, O. Fontenla-Romero,<br/>O. García-Dans, and N. Sánchez Maroño</i>   |     |
| Neuro-Fuzzy Nets in Medical Diagnosis: The DIAGEN Case Study<br>of Glaucoma .....                                | 401 |
| <i>E. Carmona, J. Mira, J. García Feijó, and M.G. de la Rosa</i>   |     |
| <b>Robotics</b>  |     |
| Evolving Brain Structures for Robot Control .....  | 410 |
| <i>F. Pasemann, U. Steinmetz, M. Hülse, and B. Lara</i>  |     |
| A Cuneate-Based Network and Its Application as a Spatio-Temporal Filter<br>in Mobile Robotics .....              | 418 |
| <i>E. Sánchez, M. Mucientes, and S. Barro</i>  |     |
| An Application of Fuzzy State Automata: Motion Control<br>of an Hexapod Walking Machine .....                    | 426 |
| <i>D. Morano and L.M. Reyneri</i>  |     |
| Neural Adaptive Force Control for Compliant Robots .....   | 436 |
| <i>N. Saadia, Y. Amirat, J. Pontnaut, and A. Ramdane-Cherif</i>  |     |
| Reactive Navigation Using Reinforcement Learning Techniques<br>in Situations of POMDPs .....                     | 444 |
| <i>P. Puliti, G. Tascini, and A. Montesanto</i>  |     |
| Landmark Recognition for Autonomous Navigation<br>Using Odometric Information and a Network of Perceptrons ..... | 451 |
| <i>J. de Lope Asiaín and D. Maravall Gómez-Allende</i>   |     |
| Topological Maps for Robot's Navigation: A Conceptual Approach .....   | 459 |
| <i>F. de la Paz López, and J.R. Álvarez-Sánchez</i>  |     |
| Information Integration for Robot Learning Using Neural Fuzzy Systems ..   | 468 |
| <i>C. Zhou, Y. Yang, and J. Kanniah</i>  |     |
| Incorporating Perception-Based Information<br>in Reinforcement Learning Using Computing with Words .....         | 476 |
| <i>C. Zhou, Y. Yang, and X. Jia</i>  |     |
| Cellular Neural Networks for Mobile Robot Vision .....   | 484 |
| <i>M. Balsi, A. Maraschini, G. Apicella, S. Luengo, J. Solsona,<br/>and X. Vilasís-Cardona</i>                   |     |
| Learning to Predict Variable-Delay Rewards and Its Role<br>in Autonomous Developmental Robotics .....            | 492 |
| <i>A. Pérez-Uribe and M. Courant</i>   |     |

|   |     |
|---|-----|
| Robust Chromatic Identification and Tracking . . . . .  | 500 |
| <i>J. Ramírez and G. Grittani</i>   |     |
| Sequence Learning in Mobile Robots Using Avalanche Neural Networks . . .  | 508 |
| <i>G. Quero and C. Chang</i>  |     |
| Investigating Active Pattern Recognition in an Imitative Game . . . . .   | 516 |
| <i>S. Moga, P. Gaussier, and M. Quoy</i>  |     |
| Towards an On-Line Neural Conditioning Model for Mobile Robots . . . . .  | 524 |
| <i>E. Şahin</i>   |     |
| <b>General Applications</b>   |     |
| A Thermocouple Model Based on Neural Networks . . . . .   | 531 |
| <i>N. Medraño-Marqués, R. del-Hoyo-Alonso, and B. Martín-del-Brío</i>   |     |
| Improving Biological Sequence Property Distances<br>Using a Genetic Algorithm . . . . .   | 539 |
| <i>O.M. Perez, F.J. Marin, and O. Trelles</i>   |     |
| Data Mining Applied to Irrigation Water Management . . . . .  | 547 |
| <i>J.A. Botía, A.F. Gómez Skarmeta, M. Valdés, and A. Padilla</i>   |     |
| Classification of Specular Object Based on Statistical Learning Theory . . .  | 555 |
| <i>T.S. Yun</i>   |     |
| On the Application of Heteroassociative Morphological Memories<br>to Face Localization . . . . .                                    | 563 |
| <i>B. Raducanu and M. Graña</i>   |     |
| Early Detection and Diagnosis of Faults in an AC Motor<br>Using Neuro Fuzzy Techniques: FasArt+ Fuzzy k Nearest Neighbors . . . . . | 571 |
| <i>J. Juez, G.I. Sainz, E.J. Moya, and J.R. Perán</i>   |     |
| Knowledge-Based Neural Networks for Modelling Time Series . . . . .   | 579 |
| <i>J. van Zyl and C.W. Omlin</i>  |     |
| Using Artificial Neural Network to Define Fuzzy Comparators<br>in FSQl with the Criterion of Some Decision-Maker . . . . .          | 587 |
| <i>R. Carrasco, J. Galindo, and A. Vila</i>   |     |
| Predictive Classification for Integrated Pest Management by Clustering<br>in NN Output Space . . . . .                              | 595 |
| <i>M. Salmerón, D. Guidotti, R. Petacchi, and L.M. Reyneri</i>  |     |
| Blind Source Separation in the Frequency Domain: A Novel Solution<br>to the Amplitude and the Permutation Indeterminacies . . . . . | 603 |
| <i>A. Dapena and L. Castedo</i>   |     |

|  |     |
|--|-----|
| Evaluation, Classification and Clustering with Neuro-Fuzzy Techniques<br>in Integrate Pest Management .....              | 611 |
| <i>E. Bellei, D. Guidotti, R. Petacchi, L.M. Reyneri, and I. Rizzi</i>   |     |
| Inaccessible Parameters Monitoring in Industrial Environment:<br>A Neural Based Approach.....                            | 619 |
| <i>K. Madani and I. Berechet</i>   |     |
| Autoorganized Structures for Extraction of Perceptual Primitives .....   | 628 |
| <i>M. Penas, M.J. Carreira, and M.G. Penedo</i>  |     |
| Real-Time Wavelet Transform for Image Processing<br>on the Cellular Neural Network Universal Machine .....               | 636 |
| <i>V.M. Preciado</i>   |     |
| OBLIC: Classification System Using Evolutionary Algorithm .....  | 644 |
| <i>J.L. Alvarez, J. Mata, and J.C. Riquelme</i>  |     |
| Design of a Pre-processing Stage for Avoiding the Dependence<br>on TSNR of a Neural Radar Detector.....                  | 652 |
| <i>P. Jarabo Amores, M. Rosa Zurera, and F. López Ferreras</i>   |     |
| Foetal Age and Weight Determination<br>Using a Lateral Interaction Inspired Net .....                                    | 660 |
| <i>A. Fernández-Caballero, J. Mira, F.J. Gómez, and M.A. Fernández</i>   |     |
| Inference of Stochastic Regular Languages<br>through Simple Recurrent Networks with Time Dealys.....                     | 671 |
| <i>G.A. Casañ and M.A. Castaño</i>   |     |
| Is Neural Network a Reliable Forecaster on Earth? A MARS Query! .....  | 679 |
| <i>A. Abraham and D. Steinberg</i>   |     |
| Character Feature Extraction Using Polygonal Projection Sweep<br>(Contour Detection).....                                | 687 |
| <i>R.J. Rodrigues, G.K. Vianna, and A.C.G. Thomé</i>   |     |
| Using Contextual Information<br>to Selectively Adjust Preprocessing Parameters .....                                     | 696 |
| <i>P. Neskovic and L.N. Cooper</i>   |     |
| Electric Power System's Stability Assessment and Online-Provision<br>of Control Actions Using Self-Organizing Maps ..... | 704 |
| <i>C. Leder and C. Rehtanz</i>   |     |
| Neural Networks for Contingency Evaluation and Monitoring<br>in Power Systems .....                                      | 711 |
| <i>F. García-Lagos, G. Joya, F.J. Marín, and F. Sandoval</i>   |     |

|   |     |
|---|-----|
| Hybrid Framework for Neuro-dynamic Programming Application<br>to Water Supply Networks .....                    | 719 |
| <i>M. Damas, M. Salmerón, J. Ortega, and G. Olivares</i>  |     |
| Classification of Disturbances in Electrical Signals<br>Using Neural Networks .....                             | 728 |
| <i>C. León, A. López, J.C. Montaña, and Í. Monedero</i>   |     |
| Neural Classification and “Traditional” Data Analysis: An Application<br>to Households’ Living Conditions ..... | 738 |
| <i>S. Ponthieux and M. Cottrell</i>   |     |
| Nonlinear Synthesis of Vowels in the LP Residual Domain<br>with a Regularized RBF Network .....                 | 746 |
| <i>E. Rank and G. Kubin</i>   |     |
| Nonlinear Vectorial Prediction with Neural Nets .....   | 754 |
| <i>M. Faúndez-Zanuy</i>   |     |
| Separation of Sources Based on the Partitioning of the Space<br>of Observations .....                           | 762 |
| <i>M. Rodríguez-Álvarez, C.G. Puntonet, and I. Rojas</i>  |     |
| Adaptive ICA with Order Statistics in Multidimensional Scenarios .....  | 770 |
| <i>Y. Blanco, S. Zazo, and J.M. Paez-Borralló</i>   |     |
| Pattern Repulsion Revisited .....   | 778 |
| <i>Fabian J. Theis, C. Bauer, C. Puntonet, and E.W. Lang</i>  |     |
| The Minimum Entropy and Cumulants Based Contrast Functions<br>for Blind Source Extraction .....                 | 786 |
| <i>S. Cruces, A. Cichocki, and S.-I. Amari</i>  |     |
| Feature Extraction in Digital Mammography:<br>An Independent Component Analysis Approach .....                  | 794 |
| <i>A. Koutras, I. Christoyianni, E. Dermatas, and G. Kokkinakis</i>   |     |
| Blind Source Separation in Convolutional Mixtures:<br>A Hybrid Approach for Colored Sources .....               | 802 |
| <i>F. Abrard and Y. Deville</i>   |     |
| A Conjugate Gradient Method and Simulated Annealing<br>for Blind Separation of Sources .....                    | 810 |
| <i>R. Martín-Clemente, C.G. Puntonet, and J.I. Acha</i>   |     |
| The Problem of Overlearning in High-Order ICA Approaches:<br>Analysis and Solutions .....                       | 818 |
| <i>J. Särelä and R. Vigário</i>   |     |

|  |     |
|--|-----|
| Equi-convergence Algorithm for Blind Separation of Sources<br>with Arbitrary Distributions . . . . . | 826 |
| <i>L.-Q. Zhang, S. Amari, and A. Cichocki</i>  |     |
| Separating Convulsive Mixtures by Mutual Information Minimization . . . .                            | 834 |
| <i>M. Babaie-Zadeh, C. Jutten, and K. Nayebi</i>   |     |
| <b>Author Index</b> . . . . .  | 843 |