

Massimo De Gregorio
Vito Di Maio
Maria Frucci
Carlo Musio (Eds.)

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First International Symposium, BVAI 2005
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Preface

The 1st International Symposium on “Brain, Vision & Artificial Intelligence” (BVAI, Naples, Italy, October 19–21, 2005) was a multidisciplinary symposium aimed at gathering scientists involved in study of the Brain, Vision and Intelligence, from both the natural and artificial points of view. The underlying idea was that to advance in each of the above research topics, integration with and attention to others is necessary. The overall rationale of the BVAI symposium was based on a multidisciplinary approach of biophysics and neurobiology, visual and cognitive sciences and cybernetics, dealing with the interactions of natural and artificial systems.

BVAI was conceived and organized by a group of researchers — active in the BVAI topics — of the Institute of Cybernetics “E. Caianiello” of the Italian National Research Council, Pozzuoli, Naples (ICIB-CNR), with the support of the Italian Institute for Philosophical Studies (IISF), and the help of the Macroscopic Quantum Coherence and Computing Association (MQC2). BVAI was sponsored by the EBSA (European Biophysics’ Societies’ Association) which in particular provided travel grants for deserving young participants from outside Italy. The symposium was held under the auspices of the AI*IA (Italian Association of Artificial Intelligence), GIRPR (Italian Group of Researchers in Pattern Recognition), SIBPA (Italian Society of Pure and Applied Biophysics) and SINS (Italian Society for Neurosciences). BVAI addressed the following main topics and subtopics:

Brain Basics: neuroanatomy and physiology; development, plasticity and learning; synaptic, neuron and neural network modelling.

Natural Vision: visual neurosciences; mechanisms and model systems, visual perception, visual cognition.

Artificial Vision: shape perception, shape analysis and recognition, shape understanding.

Artificial Intelligence: hybrid intelligent systems, agents, cognitive models.

The scientific program included the participation of six invited speakers, selected among international leading scientists in the above mentioned fields: Igor Aleksander, Imperial College, UK; Dana Ballard, University of Rochester, USA; Cristiano Castelfranchi, Institute of Cognitive Sciences and Technologies — CNR, Italy; Péter Érdi, Kalamazoo College, USA; Kevan A.C. Martin, Institute of Neuroinformatics, ETH/UNIZ, Switzerland; and Enrica Strettoi, Institute of Neurosciences — CNR, Italy. Furthermore, the program included about 50 contributions from worldwide participants, presented in plenary sessions. The peer-reviewing process for the papers was performed by the members of the Scientific Committee of the symposium, including distinguished persons of the

scientific community, together with a number of additional reviewers, appointed by the Scientific Committee members. The accepted contributions were selected among more than 80 papers submitted to BVAI.

We believe that the papers in this volume and the discussions during the symposium will provide new insights and constructive thoughts. In particular we are confident that young researchers will usefully benefit in their work from their attendance at the symposium and from reading these contributions. We hope that we made BVAI an enjoyable event both from the scientific point of view and through the social activities that are also a way to provide new research stimuli in a more relaxed atmosphere.

We would like to thank the contributors who responded to the Call for Papers in a very positive way, the invited speakers, the members of the Scientific Committee as well as the additional reviewers and, of course, all the participants. A grateful acknowledgement is due to EBSA, to the Regione Campania, to IISF, and to ICIB-CNR for their financial contribution that helped us to make BVAI successful. Finally, we would warmly acknowledge the symposium's Steering Committee and the Scientific Secretariat members: without their advice and constant support, BVAI could not have been realized. A special thanks goes to the symposium's Local Committee and Secretariat members for their precious work.

August 2005

Massimo De Gregorio and Vito Di Maio
Maria Frucci and Carlo Musio

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BVAI was organized by ICIB-CNR, with the support of IISF, and the help of MQC2.

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Table of Contents

Brain Basics

Towards a Dynamic Neuropharmacology: Integrating Network and Receptor Levels <i>Péter Érdi, János Tóth</i>	1
Cortical Architecture <i>Tom Binzegger, Rodney J. Douglas, Kevan A.C. Martin</i>	15
Unsupervised Recognition of Neuronal Discharge Waveforms for On-line Real-Time Operation <i>Yoshiyuki Asai, Tetyana I. Aksenova, Alessandro E.P. Villa</i>	29
Neural Connectivity and Dynamical Regimes of Neural Activity in a Network of Interactive Populations <i>Roman Borisyuk</i>	39
Signal Transmission and Synchrony Detection in a Network of Inhibitory Interneurons <i>Angelo Di Garbo, Alessandro Panarese, Michele Barbi, Santi Chillemi</i>	49
Stimulus-Driven Unsupervised Synaptic Pruning in Large Neural Networks <i>Javier Iglesias, Jan Eriksson, Beatriz Pardo, Marco Tomassini, Alessandro E.P. Villa</i>	59
Inverse First Passage Time Method in the Analysis of Neuronal Interspike Intervals of Neurons Characterized by Time Varying Dynamics <i>Laura Sacerdote, Cristina Zucca</i>	69
Coding by Neural Population Oscillations? <i>Francesco Ventriglia</i>	78
Neural Code and Irregular Spike Trains <i>Francesco Ventriglia, Vito Di Maio</i>	89

Natural Vision

Basic Retinal Circuitry in Health and Disease <i>Enrica Strettoi, Vincenzo Pignatelli</i>	99
Does a Plane Imitate a Bird? Does Computer Vision Have to Follow Biological Paradigms? <i>Emanuel Diamant</i>	108
A Neural Model of Human Object Recognition Development <i>Rosaria Grazia Domenella, Alessio Plebe</i>	116
Photoelectric Response of Bacteriorhodopsin in Thin PVA Films and Its Model <i>M. Frydrych, L. Lensu, S. Parkkinen, J. Parkkinen, T. Jaaskelainen</i>	126
Non-image Forming Function of the Extraocular Photoreceptors in the Ganglion of the Sea Slug <i>Onchidium</i> <i>Tsukasa Gotow, Kyoko Shimotsu, Takako Nishi</i>	136
A Population-Based Inference Framework for Feature-Based Attention in Natural Scenes <i>Fred H. Hamker</i>	147
Multi-modal Primitives as Functional Models of Hyper-columns and Their Use for Contextual Integration <i>Norbert Krüger, Florentin Wörgötter</i>	157
Three Dilemmas of Signal- and Symbol-Based Representations in Computer Vision <i>Norbert Krüger</i>	167
An LGN Inspired Detect/Transmit Framework for High Fidelity Relay of Visual Information with Limited Bandwidth <i>Nicholas A. Lesica, Garrett B. Stanley</i>	177
On Cognitive Dynamic Map and Its Use for Navigation in Space <i>Flavien Maingreud, Edwige Pissaloux, Ramiro Velazquez</i>	187
Visual Selection in Human Frontal Eye Fields <i>Jacinta O'Shea, Neil G. Muggleton, Alan Cowey, Vincent Walsh</i>	195
Multi-scale Keypoints in V1 and Face Detection <i>João Rodrigues, J.M. Hans du Buf</i>	205

Limitation of Maintenance of Feature-Bound Objects in Visual Working Memory <i>Jun Saiki, Hirofumi Miyatsuji</i>	215
Molecular and Functional Diversity of Visual Pigments: Clues from the Photosensitive Opsin-Like Proteins of the Animal Model <i>Hydra</i> <i>Silvia Santillo, Pierangelo Orlando, Luciano De Petrocellis, Luigia Cristino, Vittorio Guglielmotti, Carlo Musio</i>	225
Learning Location Invariance for Object Recognition and Localization <i>Gwendid T. van der Voort van der Kleij, Frank van der Velde, Marc de Kamps</i>	235
Artificial Intelligence	
Enacted Theories of Visual Awareness: A Neuromodelling Analysis <i>Igor Aleksander, Helen Morton</i>	245
Mind as an Anticipatory Device: For a Theory of Expectations <i>Cristiano Castelfranchi</i>	258
A Cognitive Model for Autonomous Agents Based on Bayesian Programming <i>F. Aznar, M. Sempere, M. Pujol, R. Rizo</i>	277
A Structural Learning Algorithm and Its Application to Predictive Toxicology Evaluation <i>Pasquale Foggia, Michele Petretta, Francesco Tufano, Mario Vento</i> ...	288
Combining Rule-Based and Sample-Based Classifiers - Probabilistic Approach <i>Marek Kurzynski</i>	298
Mapping and Combining Combinatorial Problems into Energy Landscapes via Pseudo-Boolean Constraints <i>Priscila M.V. Lima, Glaucia C. Pereira, M. Mariela M. Morveli-Espinoza, Felipe M.G. França</i>	308
Robust Ellipse-Specific Fitting for Real-Time Machine Vision <i>Eliseo Stefano Maini</i>	318
A Feature-Based Model of Semantic Memory: The Importance of Being Chaotic <i>A. Morelli, R. Lauro Grotto, F.T. Arecchi</i>	328

Semantic Web Services with SOUL <i>Mladen Stanojević, Sanja Vranes</i>	338
---	-----

Artificial Vision

Modeling the Brain's Operating System <i>Dana Ballard, Nathan Sprague</i>	347
A Bayesian Approach to Situated Vision <i>Giuseppe Boccignone, Vittorio Caggiano, Gianluca Di Fiore, Angelo Marcelli, Paolo Napoletano</i>	367
A Fuzzy Scale-Space Approach to Feature-Based Image Representation and Retrieval <i>M. Ceccarelli, F. Musacchia, A. Petrosino</i>	377
Active Acquisition of 3D Map in Robot Brain by Combining Motion and Perceived Images <i>Koichiro Deguchi, Tomohiro Nakagawa</i>	386
Lateral Interaction in Accumulative Computation: Motion-Based Grouping Method <i>Antonio Fernández-Caballero, Jose Mira, Ana E. Delgado, Miguel A. Fernández, Maria T. López</i>	396
Detecting and Ranking Foreground Regions in Gray-Level Images <i>Maria Frucci, Carlo Arcelli, Gabriella Sanniti di Baja</i>	406
Incomplete Contour Representations and Shape Descriptors: ICR Test Studies <i>Anarta Ghosh, Nicolai Petkov</i>	416
Rotation and Scale Invariant Shape Description Using the Contour Segment Curvature <i>Min-Ki Kim</i>	426
A Study on Enhanced Dynamic Signature Verification for the Embedded System <i>Jin Whan Kim, Hyuk Gyu Cho, Eui Young Cha</i>	436
Spatio-temporal Attention Mechanism for More Complex Analysis to Track Multiple Objects <i>Heungkyu Lee, Hanseok Ko</i>	447

Stereovision Disparity Analysis by Two-Dimensional Motion Charge Map Inspired in Neurobiology <i>José M. López-Valles, Miguel A. Fernández, Antonio Fernández-Caballero, Francisco J. Gómez</i>	457
Image Analysis and Automatic Surface Identification by a Bi-level Multi-classifier <i>J.M. Martínez-Otzeta, B. Sierra, E. Lazkano</i>	467
Real Time Virtualized Real Object Manipulation in an Augmented Reality Environment <i>Brahim Nini, Mohamed Batouche</i>	477
Dominant Plane Detection Using Optical Flow and Independent Component Analysis <i>Naoya Ohnishi, Atsushi Imiya</i>	487
Algorithm That Mimics Human Perceptual Grouping of Dot Patterns <i>G. Papari, N. Petkov</i>	497
Heuristic Algorithms for Fast and Accurate Tracking of Moving Objects in Unrestricted Environments <i>Elena Sánchez-Nielsen, Mario Hernández-Tejera</i>	507
Single Image Estimation of Facial Albedo Maps <i>William A.P. Smith, Edwin R. Hancock</i>	517
Optical Flow Computation for Compound Eyes: Variational Analysis of Omni-Directional Views <i>Akihiko Torii, Atsushi Imiya, Hironobu Sugaya, Yoshihiko Mochizuki</i>	527
Latent Semantic Description of Iconic Scenes <i>Filippo Vella, Giovanni Pilato, Giorgio Vassallo, Salvatore Gaglio</i>	537
Pose-Invariant Face Recognition Using Deformation Analysis <i>Taeg-Keun Whangbo, Jae-Young Choi, Murlikrishna Viswanathan, Nak-Bin Kim, Young-Gyu Yang</i>	545
Author Index	555

Towards a Dynamic Neuropharmacology: Integrating Network and Receptor Levels

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Abstract. Computational modeling by integrating compartmental neural technique and detailed kinetic description of pharmacological modulation of transmitter - receptor interaction is offered as a method to test the electrophysiological and behavioral effects of putative drugs. Even more, an inverse method is suggested as a method for controlling a neural system to realize a prescribed temporal pattern. Generation and pharmacological modulation of theta rhythm related to anxiety is analyzed. Integrative modeling might help to find positive allosteric modulators of GABA_A α_1 subunits as potential candidates for being selective anxiolytics.

Systems Biology is an emergent movement to combine system level description with microscopic details. It might be interpreted as the renaissance of cybernetics [3] and of system theory [4], materialized in the works of Robert Rosen [5]. (For an excellent review on applying the system theoretical tradition to the new systems biology see [6]).

To have a system-level understanding of biological systems [1,2] we should get information from five key features:

- function,
- architecture,
- dynamics,
- control,
- design.

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