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BMSR Workshop @ EMBC 2012

Multi-Scale Modeling in the Nervous System

NIBIB

Bayfront Hilton Hotel, San Diego, Room: Indigo 206
Tuesday – August 28, 2012 (8:30 a.m. to 5:30 p.m.)

Workshop Program

8:30 a.m.	**Introductory Remarks**	**Vasilis Z. Marmarelis,** *Organizer* University of Southern California
8:40 a.m.	***Multi-Scale Modeling of the Visual System***	**Jack Gallant** UC Berkeley
9:15 a.m.	***Multi-Scale Modeling in the Brain: Embedding Strategies***	**Bill Lytton** SUNY Brooklyn
9:50 a.m.	***Multi-Scale Modeling of the Autonomic Nervous System***	**Jim Schwaber** Jefferson University
10:25 a.m.	*Coffee Break*	
10:35 a.m.	***Multi-Scale Cortical Simulations Using Neuromorphic Chips***	**Kwabena Boahen** Stanford University
11:10 a.m.	***From Neural Ensemble Activity to Behavior***	**Sam Deadwyler & Rob Hampson** Wake Forest University
11:45 a.m.	***Multi-Scale Modeling of the Hippocampus***	**Ted Berger** University of Southern California
12:20 p.m	*Lunch Break*	
1:20 p.m.	***Multi-Scale Modeling in the Cerebral Cortex***	**Terry Sejnowski** Salk Institute
1:55 p.m.	***Multi-Scale Modeling and Real-Time Simulation of Dynamics in Neuromuscular Control***	**Terry Sanger** University of Southern California
2:30 p.m.	*Coffee Break*	
2:40 p.m.	***Multi-Scale Modeling in the Auditory System***	**Chris Schreiner & Craig Atencio** University of California, San Francisco
3:15 p.m.	***Multi-Scale Modeling of Auditory Processing in Complex Acoustic Environments***	**Mounya Elhilali** Johns Hopkins University

3:50 p.m.	*Coffee Break*	
4:00 p.m.	***Multi-Scale Modeling reveals novel biophysical learning rules***	**Mayank Mehta** University of California, Los Angeles
4:35 p.m.	***Multi-Scale Modeling of Neuronal Dynamics***	**Vasilis Marmarelis** University of Southern California
5:10 p.m.	**Open Discussion** *Vasilis. Marmarelis , Moderator*	

About the BMSR Workshop on "Multi-Scale Modeling in the Nervous System"

This Workshop will bring together experts on the subject of "Multi-Scale Modeling in the Nervous System", which is attracting increasing attention worldwide because of its fundamental importance in understanding the hierarchical functional organization of the nervous system. This scientific discovery process has been accelerated by the recent availability of vast amounts of data from multi-electrode recordings and newly developed methodologies for the analysis/modeling of such data. Vast amounts of data are also currently accumulating from numerous molecular and behavioral/psychophysical studies of the nervous system conducted worldwide. Multi-electrode arrays are now chronically implanted in various parts of the brain by several research groups and provide a wealth of electrophysiological data previously unavailable. This has given impetus to the development of effective methodologies for the analysis of these vast databases in a manner that leads to increased scientific understanding of brain function at multiple levels without simplifying the inherent complexity of the problem. Additional advances in data-collection techniques of molecular studies of neuronal function provide data and knowledge for a lower, finer-grain, "scale" in the hierarchical organization of the nervous system. Finally, advances at the behavioral/psychophysical level provide growing amounts of data and knowledge for a higher, coarser-grain, "scale" in the hierarchical organization of the nervous system. Obviously, the integration of these three levels of neural functional organization is a formidable task that is likely to occupy the rest of this century. However, the foundations of this effort are being laid at the present time and this Workshop aspires to contribute to this process. The Workshop speakers will be asked to address the relations between at least two of these three levels and present their summary thoughts that pertain to the fundamental issues of multi-scale modeling of the nervous system (neuronal structure/function, interconnectivity, emerging properties of neuronal ensembles, behavior etc.).

About the BMSR: The Biomedical Simulations Resource (BMSR) at the University of Southern California was established in 1985 by NIH funding in order to advance the state of the art in modeling and simulation of physiological systems through Core and Collaborative Research, as well as through various Service, Training and Dissemination activities. This Workshop is part of the Dissemination activities. Service and Training is focused primarily on specialized software development and distribution. Neural information processing and modeling of neuronal ensemble activity represent key research interests at the BMSR. Other research interests include the modeling of pharmacokinetics/pharmacodynamics, metabolic-endocrine and cardiovascular systems. Detailed information can be found at the BMSR website: http://bmsr.usc.edu/

Multiscale Modeling of the Nervous System

Organizer: Vasilis Marmarelis (University of Southern California)

Type: Full-Day Workshop. Registration required.

Date & Time: August 28, 2012 (Tuesday), 8:30 - 17:30.

Location: Indigo 206

Collapse

Abstract:

This Workshop will bring together experts on the subject of "Multi-Scale Modeling in the Nervous System", which is attracting increasing attention worldwide because of its fundamental importance in understanding the hierarchical functional organization of the nervous system. This scientific discovery process has been accelerated by the recent availability of data from multi-electrode recordings and newly developed methodologies for the analysis/modeling of such data. Vast amounts of data are also currently accumulating from numerous molecular and behavioral/psychophysical studies of the nervous system conducted worldwide. Multi-electrode arrays are now chronically implanted in various parts of the brain by several research groups and provide a wealth of electrophysiological data previously unavailable. This has given impetus for the development of effective methodologies for the analysis of these vast databases in a manner that leads to increased scientific understanding of brain function at the multi-cellular level without simplifying the inherent complexity of the problem. Additional advances in data-collection techniques of molecular studies of neuronal function provide data and knowledge for a lower, finer-grain, "scale" in the hierarchical organization of the nervous system. Finally, advances at the behavioral/psychophysical level provide growing amounts of data and knowledge for a higher, coarser-grain, "scale" in the hierarchical organization of the nervous system. Obviously, the integration of these three levels of neural functional organization is a formidable task that is likely to occupy the rest of this century. However, the foundations of this effort are being laid at the present time and this Workshop aspires to contribute to this process.

The Workshop speakers will be asked to address the relations between at least two of these three levels and present their summary thoughts that pertain to the fundamental issues of multi-scale modeling of the nervous system (neuronal interconnectivity, emerging properties of neuronal ensembles etc.).

List of Speakers and Titles of Presentations:

1. **Theodore W. Berger (University of Southern California):** Modeling of the Hippocampus
2. **Kwabena Boahen (Stanford University):** Large-Scale Neuromorphic Systems Simulation
3. **Sam A. Deadwyler (Wake-Forest University):** From Neural Ensemble Activity to Behavior
4. **Mounya Elhilali (Johns Hopkins University):** Multi-Scale Modeling of the Human Auditory System
5. **Steven Fox (SUNY, New York):** Modeling of the Theta Rhythm in the Hippocampus
6. **Jack Gallant (University of California, Berkeley):** Multi-Scale Modeling of the Human Visual System
7. **Bill Lytton (SUNY Downstate Medical Center):** Multi-Scale Modeling in the Brain: Embedding Strategies
8. **Vasilis Z. Marmarelis (University of Southern California):** Multi-Scale Neural Modeling
9. **Mayank R. Mehta (University of California, Los Angeles):** Multi-Scale Modeling and Representation of Neural Rhythms
10. **Christoph E. Schreiner (University of California, San Francisco):** Multi-Scale Modeling of the Auditory Cortex
11. **James Schwaber (Jefferson University):** Multi-Scale Modeling of the Autonomic Nervous System
12. **Terry Sejnowski (Salk Institute):** Multi-Scale Modeling in the Cerebral Cortex