Modeling Cerebral Cortex and Plasticity

Overview

To simulate computational cognition, it is necessary to understand the workings of brain and cognitive processes. The study of the development of the cortex and the precise orderly connections within and between cortical areas, which enable the processes that underlie sensation and perception, control of action, learning and memory etc., can lead to simulation of those processes on a computational system. These theoretical studies offer the prospect of connecting diverse research constructs and paradigms, and of providing a new understanding of the algorithms that drive our mental "machinery."

The primary objectives of the course are as follows:

- Exposing participants to the fundamentals of functions and development of cerebral cortex,
- Application of tools and techniques in the field of computational neuroscience.

  Providing exposure to practical problems and their solutions, through demonstration of some computational models of cortex processing.

Modules

- Course Start Date: 07/08/2016; Course End Date:16/08/2016
- Number of Participants (maximum): 50 (Preference will be given to the participants registering against 2 Credits)
- Lecture 1: Cortical Development: Early events

  Development of the cortex, Targeting and innervation of cortex, Interaction between ingrowing thalamic axons and the developing cortex

- Lecture 2: Activity-Dependent Development and Plasticity

  Activity-Dependent development of functions, Hebbian process, Synaptic efficacy during cortical development

- Lecture 3: Development of Interacortical Connections and Cortical Dynamics

  Functional segregation of processing streams,

pattern of thalamocortical and intracortical projections in adults

- Lecture 4: Cortical Circuits and Computations

  Orientation and direction selectivity in visual cortex

- Lecture 5: Information Processing and Transfer in Visual Cortical Areas

  Information processing in the visual system, Vision modulation by voluntary attention

Who can attend...

- Faculties, engineers and researchers from academic, industrial and government organizations including R&D laboratories from India and abroad.

- Students at all levels (BTech/MSc/MTech/PhD) from reputed academic and technical institutions from India and Abroad.

Number of participants for the course will be limited to fifty. Preference will be given to the participants opting against credits.

Fees

The participation fees for taking the course is as follows:

Participants from abroad : US $500
Industry/Research Organizations: INR 10,000
Academic Institutions: INR 2,000 (half for SC/ST students)

The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hours free internet facility. The participants will be provided with accommodation on payment basis.

The Faculty

Dr. Mriganka Sur is the Paul E. and Lilah Newton Professor of Neuroscience and Director of the Simons Center for the Social Brain at MIT. Dr. Sur studies the organization, development and plasticity of the cerebral cortex of the brain using experimental and theoretical approaches. He has discovered fundamental principles by which networks of the cerebral cortex are wired during development and change dynamically during learning. His laboratory has identified gene networks underlying cortical plasticity, and pioneered high resolution imaging methods to study cells, synapses and circuits of the intact brain. Recently, his group has demonstrated novel mechanisms underlying disorders of brain development, and proposed innovative strategies for treating such disorders.

Prof. U.S. Tiwary is a Professor at Indian Institute of Information Technology Allahabad. His research interests are in the field of Image Processing, Computer Vision, Medical Image Processing, Pattern Recognition & Script Analysis, Digital Signal Processing, Speech and Language Processing, Wavelet Transform, Soft Computing & Fuzzy Logic, Neuro–computing and Soft-computers, Speech driven computers, Natural Language Processing, Brain Simulation, Cognitive Science.

Course Coordinator

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