Institute for Neural Computation and
Temporal Dynamics of Learning
Seminar

Laminar Cortical Dynamics of Visual Perception, Attention, Recognition, and Consciousness

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San Diego Supercomputer Center, East Annex
South Wing, Level B1, EB-129
http://inc.ucsd.edu/contactus.html

Abstract: There has been a great deal of theoretical progress in clarifying how brains give rise to minds. This progress is illustrated by two new computational paradigms: Complementary Computing clarifies the nature of global brain specialization, whereas Laminar Computing clarifies why all neocortical circuits use variants of a shared layered architecture. Recent models of 3D vision and figure-ground separation, speech perception, and cognitive working memory and unitization all use variants of this laminar design. The talk will outline function roles of identified cells in visual cortex that help the brain to see. It will propose functional links that occur during category learning between brain processes of consciousness, learning, expectation, attention, resonance, and synchrony, and supportive behavioral and neurobiological data. The talk will suggest how a hierarchy of laminar cortical regions interact with specific and nonspecific thalamic regions during category learning using spiking dynamics, STDP, local field potentials, and synchronous oscillations. It will then propose how the brain learns to bind multiple views of an object into a view-invariant object category while scanning a scene with eye movements. In particular, how does the brain avoid the problem of erroneously binding views of different objects together during unsupervised learning conditions, and how do the eyes scan multiple object views even before we know what it is? This analysis predicts how processes of spatial attention, object attention, category learning, figure-ground separation, and predictive remapping in cortical areas V1, V2, V3A, V4, ITp, ITa, PPC, LIP, and PFC interact during invariant object category learning.