

Complexity Science Seminars

Tuesday, April 10th 2012, 4:00 PM

Science B Room SB142

Competing Synapses with Two Timescales: A Basis for Learning and Forgetting



Talk by

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Statistical Mechanics of
Complex Systems

Dr. Anita Mehta is a Full Professor at the S. N. Bose National Centre for Basic Sciences, Calcutta (India). A Rhodes scholar to Oxford where she completed her undergraduate and graduate studies, she was a postdoc at IBM, Cambridge University and Birmingham University before her return to India. She has held visiting positions at many institutions, including an EPSERC Fellowship to Oxford and a Radcliffe Fellowship to Harvard. Her current research interests concern complexity in natural (with a focus on granular media) and intelligent (with a focus on adaptive learning, and models of plasticity for optimal memory storage) systems.

Abstract:

Competition between synapses arises in some forms of correlation-based plasticity.

We have proposed a game theory-inspired (A. Mehta and J. M. Luck, Phys Rev E 1999) model of synaptic interactions (G. Mahajan and A. Mehta, EPL 2011); the dynamics is driven by competition between synapses in their weak and strong states, which are characterized by different timescales.

The learning of inputs and memory are meaningfully definable in an effective description of networked synaptic populations.

We study, numerically and analytically, the dynamic responses of the effective system to various signal types (A. A. Bhat, G. Mahajan and A. Mehta, PLoS One 2011), particularly with reference to an existing empirical motor adaptation model (M. A. Smith et al, PLoS Biol 2006).

Among the main results of our work is the prediction that memory is optimized if the weak synapses are really weak, and the strong synapses are really strong.



Everyone is welcome!

