ACMS Applied Math Seminar

Ashok Litwin-Kumar

Thursday, September 18, 2017
154 Hurley Hall
3:30 – 4:30 PM

Optimal Degrees of Synaptic Connectivity

Synaptic connectivity varies widely across neuronal types. In the cerebellar cortex, granule cells receive five orders of magnitude fewer inputs than the Purkinje cells they innervate. A large divergence in synaptic connectivity is also seen in other circuits with cerebellum-like architectures, including the insect mushroom body. In the cerebral cortex, on the other hand, the number of inputs per neuron is more uniform and large. In this talk, I will discuss recent work that addresses what determines the optimal number of connections for a given neuronal type, and what these different degrees of connectivity mean for neural computation. The theory I will describe predicts optimal values for the number of inputs to cerebellar granule cells and Kenyon cells of the Drosophila mushroom body, and it also provides a functional explanation for why the degrees of connectivity in cerebellum-like and cerebrocortical systems are so different. I will also describe an analysis of a complete electron-microscopy reconstruction of a learning and memory center in Drosophila which we have used to validate the theory.

The Department of Applied and Computational Mathematics and Statistics

Please visit acms.nd.edu to view the full list of speakers.