



Benjamin Lindner
Humboldt University Berlin
Germany

Noise-induced effects and stochastic dynamics in neural systems

Neurons in the brain generate action potentials (spikes) either spontaneously or in response to stimuli that carry information. Both aspects of neural activity can be modeled and studied analytically in the framework of stochastic integrate-and-fire models. In my talk I review recent results on the spike train statistics of the spontaneous activity taking into account various complications such as colored noise (arising from the synaptic filter, stochastic oscillations in the input, short-term synaptic plasticity, presynaptic bursting, etc) or adaptation currents. I will show analytical results for the interspike-interval statistics (distribution and serial correlation coefficient) and discuss their application to experimental data (electro-sensory neurons of paddlefish, auditory receptor cells in locust). Specifically, I will focus on how colored noise and/or (stochastic) adaptation may lead to distinct patterns of interval correlations. I discuss how these analytical results can be used to infer or at least to constrain values of physiological parameters from spike train statistics.