Elsc seminar: Prof. Ido Kanter
March 3, 2016

On the topic of: Low-firing rates, cortical oscillations and neuronal ?s precision stem from neuronal plasticity: Experiment and theory

ELSC cordially invites you to the lecture given by:

Prof. Ido Kanter
Physics and Gonda and Brain Center, Bar-Ilan University

On the topic of:

Low-firing rates, cortical oscillations and neuronal ?s precision stem from neuronal plasticity: Experiment and theory

The lecture will be held on Thursday March 3 at 17:00, at ELSC: Silverman Bldg., 3rd Wing, 6th Floor, Edmond J. Safra Campus.

Light refreshments at 16:45

Abstract:

Realizations of low firing rates in neural networks usually require globally balanced distributions among excitatory and inhibitory synapses, while feasibility of temporal coding is limited by neuronal millisecond precision. We show, experimentally and theoretically, that low firing rates as well as cortical oscillations stem from neuronal plasticity in the form of neuronal stochastic neuronal response failures emerge, as exemplified both in in-vitro and in-vivo experiments. Those failures appear in such a way that the neuron functions similar to a low pass filter, saturating its average inter-spike-interval. This intrinsic neuronal plasticity leads to cooperation on a network level, which suppresses the firing rates towards the lowest neuronal critical frequency simultaneously with the stabilization of the neuronal response timings to ms precision. In addition, this neuronal plasticity counterintuitively leads to the simultaneous emergence of macroscopic d and g oscillations in excitatory networks. A quantitative interplay between the statistical network properties and the emerging oscillations is supported by simulations of large networks that are based on single-neuron in-vitro experiments and a Langevin equation which describes the network.
dynamics. It is also supported by an experimental scheme where long-term stimulation and recording of a single neuron is used to mimic simultaneous activity measurements from thousands of neurons in a recurrent network.

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