Thursday, November 28th, 2013

University of Zurich, Irchel Campus, room Y15 G19

Swiss Computational Neuroscience Seminar

Dmitri B. CHKLOVSKII

Janelia Farm Research Campus, Howard Hughes Medical Institute

16h15 – 18h00

Towards a holistic view of single-neuron computation

We attempt to understand the physiology of neurons from a functional, or computational, perspective. By postulating that a neuron aims to represent its high-dimensional input by the synaptic weight vector scaled by its output, we account for several salient physiological properties as the steps of computational algorithms. Specifically, if synaptic weights evolve according to Hebbian-like learning rules in the presence of spiking non-linearity the summed synaptic current follows non-Gaussian statistics. In turn, leaky integration in dendrites and spiking non-linearity in the axon can be interpreted as the steps for online estimation of time-varying non-Gaussian signals. We capture the real-time and robust nature of neuronal function by modeling the neuron using online algorithms with rigorous performance bounds, not on average, but for any possible inputs. We make several predictions, some of which can be verified with existing data, others are in need of experimental verification. Our results should help simulate computations in neural circuits and build neuromorphic electronics.

Hosted by:

Prof. Alexandre Pouget	Prof. Walter Senn	Prof. Wulfram Gerstner	Prof. Richard Hahnloser
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