Thursday, April 2nd, 2015
University of Zurich, Irchel Campus, Y35 F32
Swiss Computational Neuroscience Seminar

Jackob MACKE

Max Planck Institute for Biologial Cybernetics, Tuebingen

14h00 – 15h45

Correlations, criticality and common input

Large-scale recording methods make it possible to measure the statistics of neural population activity, and to describe their joint statistics by fitting statistical models to population spike train data. What can the statistical structure of neural population data tell us about the underlying mechanisms, as well as about the principles that govern the collectivity activity and coding properties of neural ensembles?

One intriguing hypothesis that has emerged from this approach is that the statistics of neural populations resemble those of physical systems which are poised at a thermo-dynamic critical point. Support for this hypothesis has come from studies that computed the `specific heat' (a measure of global population statistics which is effectively the normalized variance of log-probabilities of spike-patterns). These studies have found two effects which—in physical systems—indicate a critical point: First, specific heat diverges with population size N. Second, when manipulating population statistics by introducing a 'temperature' in analogy to statistical mechanics, the maximum heat moves towards unit-temperature for large populations.

What mechanisms can explain these observations? Do they require the neural system to be fine-tuned to be poised at the critical point, or do they robustly emerge in generic circuits? How are signatures of criticality related to the structure of correlations within the neural population? In this talk, I will address these questions, give some answers, and pose more questions.

Hosted by:

Prof. Alexandre Pouget	Prof. Walter Senn	Prof. Wulfram Gerstner	Prof. Richard Hahnloser
UNIVERSITÉ DE GENÈVE	UNIVERSITÄT BERN	ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE	Universität Zürich[UZH]