LABORATORY OF COMPUTATIONAL NEUROSCIENCE (LCN)

Prof. Wulfram Gerstner
EPFL – IC & SV– LCN
SG –AAB119 (Bâtiment SG-AAB)
Station 15
CH - 1015 LAUSANNE, Switzerland

ÉCOLE POLYTECHNIQUE
FÉDÉRALE DE LAUSANNE

Thursday, January 8th, 2015
14h00, Room AAC 132

Computational Neuroscience Seminar

Lars BUESING
Department of Statistics, Columbia University

Probabilistic State-Space Models for Analyzing Neural Population Recordings

Progress on experimental techniques, such as multi-electrode recording and calcium imaging, has made it possible to observe the activity of up to thousands of neurons simultaneously. This promises unprecedented insights into how computations are implemented in the activity dynamics of neural circuits.

However, extracting reliable and interpretable information from such high-dimensional recordings requires appropriate statistical tools.

In this talk, I will present results on analyzing neural activity data with probabilistic state-space models.

I will provide evidence that this model class is able to faithfully capture the statistics of simultaneously recorded spike trains, in particular dependencies across neurons and across time, and I will show that it is a valuable tool for exploratory analysis of multi-neuronal activity data.
The successful application of state-space models is enabled by recent advances on methods for state and parameter estimation from spike count observations, which I will briefly review.

I will conclude by arguing that state-space models have great potential beyond exploratory ''black-box'' modelling: Structured state-space models can identify subpopulations of neurons and can serve as a platform for integrating data on different spatial and temporal scales.