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

Wednesday, January 16th, 2013
10h30, Room SV 2715

Computational Neuroscience Seminar

Guillaume LAJOIE,
Dept of Applied Mathematics,
University of Washington

Chaos and reliability in fluctuation-driven, balanced spiking networks

The question of reliability arises for any dynamical system driven by an input signal: if the same signal is presented many times with different initial conditions, will the system entrain to the signal in a repeatable way? Reliability is of particular interest in large, randomly coupled networks of excitatory and inhibitory units. Such networks are ubiquitous in neuroscience, but are known to autonomously produce strongly chaotic dynamics – an obvious threat to reliability. Here, we show that such chaos also occurs in the presence of weak and strong stimuli. However, even in the chaotic regime, intermittent periods of highly reliable spiking often coexist with unreliable activity. We propose a framework to better understand these complex dynamics, leveraging results from random dynamical systems (RDS) theory, by establishing the effect of the underlying chaotic attractor's geometry on output spike trains.