# The role of external and endogenous noise in neural network dynamics and statistics

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Noise can play a major role in driving the dynamics of neural networks towards quite different statistical features of their dynamics. For instance, quasi-synchronous events, characterizing the spontaneous activity of "in vivo" and "in vitro" neural systems, exhibit clear signatures of Levy-like statistics, that can be hardly reproduced without including in the model strongly correlated noise in the external current fluctuations. On the other hand, one can reasonably raise the question about the origin in a real neural structure of such correlated noise. A reasonable conjecture is that correlated noise could be endogenous, i.e. spontaneously produced by the overall brain activity.

In this project we want to investigate such a problem by studying the dynamics of multiple coupled networks driven by a global flux of information flowing through the systems and eventually dissipated by the action of heat baths. In fact, it is well known that stationary non equilibrium conditions are characterized by dynamical regimes, whose fluctuations are correlated in space and time. So far, we have been focusing our investigation on the Cowan-Wilson model. Using tools from stochastic physics we have been able to investigate on the role and the source of noise.

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