

Avviso di Seminario

Nell'ambito delle attività del progetto EBRAINS-Italy, il giorno lunedì **19 maggio dalle ore 15:00 alle ore 16:00**, nell'aula **Professori II livello**, la dott.ssa **Simona Olmi** dell'Istituto dei Sistemi Complessi - Consiglio Nazionale delle Ricerche, terrà il seminario:

Relaxation oscillations in next-generation neural masses with spike-frequency adaptation

Abstract: Spike-frequency adaptation (SFA) is a fundamental neuronal mechanism taking into account the fatigue due to spike emissions and the consequent reduction of the firing activity. We have studied the effect of this adaptation mechanism on the macroscopic dynamics of excitatory and inhibitory networks of quadratic integrate-and-fire neurons coupled via exponentially decaying post-synaptic potentials. In particular, we have studied the population activities by employing an exact mean-field reduction, which gives rise to next-generation neural mass models. This low-dimensional reduction allows for the derivation of bifurcation diagrams and the identification of the possible macroscopic regimes emerging both in a single and in two identically coupled neural masses. In single populations SFA favors the emergence of population bursts in excitatory networks, while it hinders tonic population spiking for inhibitory ones. The symmetric coupling of two neural masses, in absence of adaptation, leads to the emergence of macroscopic solutions with broken symmetry, namely, chimera-like solutions in the inhibitory case and antiphase population spikes in the excitatory one. The addition of SFA leads to new collective dynamical regimes exhibiting cross-frequency coupling among the fast synaptic timescale and the slow adaptation one, ranging from antiphase slow-fast nested oscillations to symmetric and asymmetric bursting phenomena. In a PING configuration, where SFA affects the excitatory population only, it is possible to observe the emergence of relaxation oscillations due to the interplay between the nonlinear dynamics of the firing rate and the self-inhibition modulated by SFA. A characterization of Up and Down states, together with that of the spike adding process, is provided in the PING configuration for different parameters.

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