The Role of Synaptic Dynamics in the Dynamical Behavior of Mean-Field Models of Neural Populations

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In recent years, the study of neural populations is of increasing interest. Mean-field models are widely used to study the macroscopic dynamics of large neural populations. In the literature, we can find two recent mean-field models that describe the dynamics of heterogeneous all-to-all coupled Quadratic Integrate-and-Fire spiking neural networks with synaptic dynamics [1] and without it [2]. In this presentation, we show how these models are linked through a parameter related to the synapsis, as well as the different dynamical regimes they exhibit [3]. Furthermore, we analyze in depth the dynamical changes induced when this parameter varies, and the bifurcations underlying these changes [4]. To perform these analyses, different techniques as Lyapunov exponents, spike-counting sweeping and numerical continuation are applied.

This is joint work with Roberto Barrio, Jorge A. Jover-Galtier, Carmen Mayora-Cebollero, Sergio Serrano (Universidad de Zaragoza, Spain), and Lucía Pérez (Universidad de Oviedo, Spain)

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