

A Critical Firing Rate in Synchronous Transitions of Coupled Neurons

In this presentation we discuss transitions taking place in dynamical states of distinct neurons coupled electrically. Our numerical simulations indicate that for strong enough coupling, and depending of the dynamics of the individual neurons, they synchronize either in a tonic or in a bursting regime. In some cases, synchronous neurons initially tonic evolve to a synchronous bursting state via a period-doubling cascade and chaos transition. Interestingly, certain properties intrinsic to the individual neurons, such its critical firing rate, happen to be carried over to the collective behavior of the coupled neurons. We point out that a few aspects observed in our computational model results are also encountered in certain neurological disorders associated with abnormal neuronal bursting regimes, as for example in Parkinson's disease.