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Non-sequential Spike Adding in Cerebellar Stellate Cells

Cerebellar Stellate Cells are spontaneously spiking. Recently, our colleagues have recorded bursting activities in these cells by applying pharmacological agents known for blocking certain ion currents. Such activities are usually modelled in the form of systems with different time scales. When the slow variables are treated as parameters, the fast subsystem can provide good insights into the dynamics of the full model. Using slow-fast analysis, we explain the underlying mechanisms responsible for generating types of bursting emerging in the model. Also, a bifurcation analysis of the full model reveals the effect of different doses of the pharmacological agents on the system dynamics. Moreover, our investigations show that the number of spikes in an active phase of bursting changes when parameters of the system fluctuate. However, in contrast to former studies, adding new spikes does not happen sequentially. In this talk, we will discuss such phenomena and try to shed light on their underlying dynamics.

This is joint work with Ryan Alexander, Derek Bowie and Anmar Khadra.