PIMS / AMI Seminar

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CAB 657

"Multiple firing events in spiking neural network models"

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Abstract

The multiple firing event (MFE) is an emergent dynamical behavior appearing in many neural network models, in which neuronal spikes are partially synchronized. It is believed that such partial synchronization is related to gamma oscillations. In this talk I will report some recent progress based on the stochastic neural field model developed in my joint paper with Chariker and Young. First, we introduce a class of models of interacting neurons which encodes a reasonable degree of biological realism and exhibits emergent dynamics as seen in cortex while remaining mathematically tractable. This helps us to rigorously prove the well-definedness and computability of various quantities related to multiple firing events. Approximate mean firing rates can also be explicitly calculated from model parameters. Then we mathematically justify the mechanisms of a number of phenomena, including the formulation of MFEs, the spatial correlation of MFEs, and the decay of spatial correlations. Our result is consistent with experimental results that the gamma oscillation is a relative local phenomenon.