

APPLIED DYNAMICAL SYSTEMS SEMINAR

Mathematical reduction of a spiking neuronal network model of neuromodulation

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Korman 245

Spiking networks have previously been reduced to four- and two-population mean-field models under fixed gain conditions, but most earlier models derived for a fixed set of synaptic gains fail to capture the effects of neuromodulation outside of a region close to the original gains. Drawing on our earlier reward rate studies of neuromodulation in a spiking neuronal network, here we carry out model reduction in a manner that includes norepinephrine modulation of synaptic conductances, so that gain changes at the cellular level are appropriately reflected in the input-output functions of the reduced model. Careful matching of reward rates and analyses of bifurcation diagrams play central roles in this work. The new reduced models are designed to accurately match behavioral changes over a wide range of neuromodulation, and they therefore allow analytic study of system behavior and inexpensive simulation of a speed-accuracy tradeoff.