

Application of the State-Space Model Paradigm to Neuroscience Data Analysis

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The state-space paradigm has been widely used to analyze a broad range of stochastic dynamical systems problems in engineering, computer science, statistics and the social sciences. We have used the paradigm to construct signal processing algorithms to analyze several neural systems. In this talk, we will review our work on the use of state-space modeling paradigm to study three problems in neuroscience data analysis: tracking on millisecond time-scale the dynamics of the spatial receptive fields of rat hippocampal neurons during learning; decoding how ensembles of pyramidal neurons in the rat hippocampus maintain a dynamic representation of the animal's position in its environment; and devising a dynamic solution to the source localization for magnetoencephalography.