University of California, Irvine
Statistics Seminar

Time-varying ℓ_0 Optimization for Spike Inference from Multi-trial Calcium Recordings

Zhaoxia Yu
Associate Professor
UCI

4 p.m., Thursday, November 19, 2020
Join via Zoom: https://uci.zoom.us/s/99193076115

Optical imaging of genetically encoded calcium indicators is a powerful tool to record the activity of a large number of neurons simultaneously over a long period of time from behaving animals. However, determining the exact time at which a neuron spikes and estimating the underlying firing rate from calcium fluorescence data is still a challenging task. We propose a multi-trial time-varying ℓ_0 penalized algorithm to iteratively detect spikes and estimate firing rates. Our simulation study shows that the proposed method improves the performance of both spike detection and firing rate estimation with or without the presence of dynamic firing rate. We demonstrate the usefulness of our method on calcium trace data from both one- and two-photon imaging studies.