University of California, Irvine
Statistics Seminar

Multivariate Temporal Point Process Regression

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Join via Zoom: https://uci.zoom.us/j/700695554
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Point process modeling is gaining increasing attention, as point process data are widely emerging in various scientific applications. Motivated by a neuronal spike trains study, we propose a novel point process regression model for multivariate response and predictor processes in this article. Our key idea is to incorporate the predictor effects into the conditional intensity functions using a set of basis transferring functions in a convolutional fashion. We further impose low-rank, sparsity and subgrouping structures on the transferring coefficients that are organized in the form of a three-way tensor. We develop a highly scalable optimization algorithm for parameter estimation, and establish the large sample error bound for the recovered transferring coefficient tensor and the subgroup identification consistency. Unlike most existing point process modeling approaches, our proposal allows the dimensions of both the response and predictor processes to diverge, and does not require the stationary condition. It permits a general class of link functions and multiple basis functions. Moreover, multiple point processes are modeled in a joint fashion, rather than one at a time. The estimator is shown asymptotically to benefit not only from increasing length of observation time, but also from increasing dimensions of the response and predictor processes. We illustrate the empirical performance of our method through simulations and a cross-area neuronal spike trains analysis in a sensory cortex study.