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Title: Multivariate sparse dynamic process modeling and inference

Abstract:

The central challenge behind this talk is the identification of a dynamic point process model of so-called spike trains for multiple neurons. We consider a class of phenomenological models referred to as generalized linear point process models where the intensity of a spike is a linear filter of the history of the spike trains.

With $p$ neurons there are $p^2$ filters, and in a sparse model many of the filter functions are zero. The pattern of zeroes for this matrix of filter functions determines the local independence graph for the dynamic process. We are interested in non-parametric estimation of the filter functions and the identification of the local independence graph, which we accomplish by penalized maximum-likelihood estimation. The methods are implemented in the R-package *ppstat*.

To conclude the talk we put the concrete problem above into a larger framework of dynamic models, where one natural concept of sparseness is given in terms of local independence. One important point is that sparseness is generally not preserved by any standard means for the resulting model of discretely observed data. We illustrate this using a class of Gaussian processes.