Hamilton Institute

Using Convex Optimization for Nonparametric Statistical Analysis of Point Processes

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Abstract

Point process models have been shown to be useful in characterizing neural spiking activity as a function of extrinsic and intrinsic factors. Most point process models of neural spiking are parametric as they are often efficiently computable. However, if the actual point process does not lie in the assumed parametric class of functions, misleading inferences can arise. Nonparametric methods are attractive due to fewer assumptions, but most methods require excessively complex algorithms. We propose a computationally efficient method for nonparametric maximum likelihood estimation when the conditional intensity function, which characterizes the point process in its entirety, is assumed to satisfy a Lipschitz continuity condition. We show that by exploiting the structure of the likelihood function of a point process, the problem becomes efficiently solvable via Lagrangian duality and we compare our nonparametric estimation method to the most commonly used parametric approaches on goldfish retinal ganglion neural data. In this example, our nonparametric method gives a superior absolute goodness-of-fit measure than all parametric approaches analyzed.

Venue: Seminar Room, Hamilton Institute, Rye Hall, NUI Maynooth

Time: 2.00 - 3.00pm (followed by tea/coffee)

Travel directions are available at www.hamilton.ie

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