

STATISTICS COLLOQUIUM

FRIDAY, FEBRUARY 12, 2010

TALK: 4:00 P.M. — SCIENCE CENTER ROOM 705

RECEPTION: 5:15 PM — SCIENCE CENTER, 7TH FLOOR

“Extending spike-time distance and point pattern prototype methods with an application to neuronal responses in conditioned cats”

**David Diez
Ph.D. Student
UCLA**

ABSTRACT

The spike-time distance metric and related point pattern prototype provide useful and easily interpretable results in analyzing and summarizing collections of repeated observations of point processes. However, previous work has been limited to single dimensional or small data sets due to complexities in higher dimensions. We develop novel methods for computing both spike-time distance and prototypes that are suitable for larger data sets and extend to multidimensional spaces and marked processes. Identifying the spike-time distance between two patterns relies on finding an optimal transformation between the patterns. Because the set of transformations grows geometrically, identifying spike-time distance is computationally intensive. The first method identifies a small set of transformations, and we prove that one of these is optimal and corresponds to the spike-time distance. The second technique employs kernel smoothing as an approximation of spike-time distance and is used in a novel algorithm for prototype construction. We apply these methods to neuronal spike data from cats in different behavioral states. We find evidence for short latency responses to the stimulus, which are sensitive to behavioral state. Furthermore, these results appear to hold across individual animals and can be easily interpreted using the proposed methods.