

STATISTICS COLLOQUIUM

TUESDAY, JANUARY 26, 2010

TALK: 5:15 PM — SCIENCE CENTER ROOM 705

“Bayesian Nonparametric Methods for Complex Dynamical Phenomena”

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ABSTRACT

Markov switching processes, such as hidden Markov models (HMMs) and switching linear dynamical systems (SLDSs) are often used to describe rich classes of dynamical phenomena. They describe complex temporal behavior via repeated returns to a set of simpler models: imagine, for example, a person alternating between walking, running and jumping behaviors, or a stock index switching between regimes of high and low volatility.

Traditional modeling approaches for Markov switching processes typically assume a fixed, pre-specified number of dynamical models. Here, in contrast, I develop Bayesian nonparametric approaches that define priors on an unbounded number of potential Markov models. Using stochastic processes including the beta and Dirichlet process, I develop methods that allow the data to define the complexity of inferred classes of models, while permitting efficient computational algorithms for inference. The new methodology also has generalizations for modeling and discovery of dynamic structure shared by multiple related time series. Interleaved throughout the talk are results from studies of the NIST speaker diarization database, stochastic volatility of a stock index, the dances of honeybees, and human motion capture videos.