

STATISTICS COLLOQUIUM

THURSDAY, APRIL 15, 2010

TALK: 4:00 PM — SCIENCE CENTER, ROOM 705

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

“Dynamic Network Tomography: Model, Algorithm, Theory, and Application”

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ABSTRACT

Across the sciences, a fundamental setting for representing and interpreting information about entities, the structure and organization of communities, and changes in these over time, is a stochastic network that is topologically rewiring and semantically evolving over time, or over a genealogy. While there is a rich literature in modeling invariant networks, until recently, little has been done toward modeling the dynamic processes underlying rewiring networks, and on recovering such networks when they are not observable.

In this talk, I will present a number of recent developments on analyzing what we refer to as the *dynamic tomography* of evolving networks. I will first present new formalisms for modeling network evolution over time; and then, new algorithms for estimating the structure of evolving networks underlying nonstationary time-series or tree-series of nodal attributes, along with theoretical results on the asymptotic sparsistency of the proposed methods; and finally, Bayesian methods for estimating and visualizing the trajectories of latent multi-functionality of nodal states in the evolving networks.

I will show some promising empirical results on recovering and analyzing the latent evolving social networks in the US Senate based voting history, the evolving gene network of fruit fly while aging, and the gene network evolving along cell lineage during breast cancer progression and reversal, at a time resolution only limited by sample frequency. In all cases, our methods reveal interesting dynamic patterns in the networks.