

# STATISTICS SEMINAR

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Refreshments at 3:30pm ~ Dickens 108



“Statistical Methods for Analyzing Data with Complex Dependence Structure.”

Rapid advances in technology have dramatically increased the amounts of data with high structural complexity. Accordingly, developing statistical methodology for such data has become a very active area of research in recent years. In this talk, I will discuss novel statistical techniques I developed for two types of data with complex dependence structures (1) spatial-temporal data and (2) network data. In the first part of the talk, spatial-temporal lattice models are considered for the analysis of spatial lattice data repeatedly measured over time, I will describe new methodology developed for simultaneous model selection and parameter estimation via penalized maximum likelihood. A computationally efficient algorithm is devised for obtaining approximate penalized maximum likelihood estimates.

The new method is applied to analyze landscape-level spatial-temporal lattice data in ecology. In particular, the impact of temperature, precipitation, and elevation on the tree-killing ability of an eruptive species of bark beetle in pine forests of British Columbia, Canada is evaluated. In the second part, a novel class of stochastic blockmodels using Bayesian nonparametric mixtures is constructed to model networks. These models capture some of the network's realistic properties. They also provide the possibility to jointly estimate the structure of multiple networks and explicitly compare underlying community structures. The models are illustrated using both simulated and real-life examples.