

MICHIGAN STATE UNIVERSITY
Department of Statistics and Probability

COLLOQUIUM

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Multi-resolution spatial methods for large data sets

Tuesday, November 4, 2014

10:20 a.m. - 11:10 am

Refreshments 10:00 am

C405 Wells Hall

Abstract

Spatial data is ubiquitous arising in numerous areas in the geophysical and environmental sciences. A basic problem for statisticians is to estimate complete surfaces from irregular observations or measurements and to quantify the uncertainty in the result. However, standard statistical methods break when applied to large data sets and so alternative approaches are needed that balance shortcuts in the statistical models for increases in computational efficiency. A useful method expands the surface in a set of compact basis functions and places a Markov random field model on the basis coefficients. The impact is that evaluating the model likelihood and computing spatial predictions is feasible even for tens of thousands of spatial observations on a single computational core (e.g. a laptop). Moreover, by varying the support of the basic functions and the correlations among basis coefficients it is possible to entertain multi-resolution and non-stationary spatial models that mirror the rich covariance structure often found in large geophysical data sets.

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