THE DEPARTMENT OF MATHEMATICAL SCIENCES presents a **SPECIAL EVENT**

Tuesday, March 29, 2016 in Rm 220 WCharlton Hall

3 – 3:50 pm

Marc G. Genton, King Abdullah University of Science and Technology

Tukey g-and-h Random Fields

We propose a new class of trans-Gaussian random fields named Tukey g-and-h (TGH) random fields to model non- Gaussian spatial data. The proposed TGH random fields have extremely flexible marginal distributions, possibly skewed and/or heavy-tailed, and, therefore, have a wide range of applications. The special formulation of the TGH random field enables an automatic search for the most suitable transformation for the dataset of interest while estimating model parameters. An efficient estimation procedure, based on maximum approximated likelihood, is proposed and an extreme spatial outlier detection algorithm is formulated. The probabilistic properties of the TGH random fields, such as second-order moments, are investigated. Kriging and probabilistic prediction with TGH random fields are developed long with prediction confidence intervals. The predictive performance of TGH random fields is demonstrated through extensive simulation studies and an application to a dataset of total precipitation in the south east of the United States.
The talk is based on joint work with Ganggang Xu.

4 – 4:50 pm

Ying Sun, King Abdullah University of Science and Technology

Approximating Likelihoods for Large Environmental Datasets

For Gaussian process models, likelihood based methods are often difficult to use with large irregularly spaced spatial datasets due to the prohibitive computational burden and substantial storage requirements. Although various approximation methods have been developed to address the computational difficulties, retaining the statistical efficiency remains an issue. This talk focuses on statistical methods for approximating likelihoods and score equations. The proposed new unbiased estimating equations are both computationally and statistically efficient, where the covariance matrix inverse is approximated by a sparse inverse Cholesky approach.

A unified framework based on composite likelihood methods is also introduced, which allows for constructing different types of hierarchical low rank approximations. The performance of the proposed methods is investigated by numerical and simulation studies, and parallel computing techniques are explored for very large datasets. Our methods are applied to nearly 90,000 satellite-based measurements of water vapor levels over a region in the Southeast Pacific Ocean, and nearly 1 million numerical model generated soil moisture data in the area of Mississippi River basin. The fitted models facilitate a better understanding of the spatial variability of the climate variables.

Refreshments will be served
in Rm 220 WCharlton Hall
2:15 – 2:50 pm

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