Department of MATHEMATICS & STATISTICS

UMBC AN HONORS UNIVERSITY IN MARYLAND

12th ANNUAL PROBABILITY & STATISTICS DAY AT UMBC

Workshop on

Hierarchical Bayesian Modeling and Analysis for Spatial BIG Data

presented by

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Friday, April 20, 2018. 2:00 PM – 6:30 PM

Information Technology/Engineering (ITE) Building, Lecture Hall 7 (Room 104)

Registration is FREE but required.

Registration Deadline: Friday, April 6, 2018

Registration Information: Coming Soon!

Abstract

The course will include hierarchical modeling and related Markov chain Monte Carlo (MCMC) methods for spatial statistics, with special emphasis on methods for analyzing very large or "BIG" spatial datasets. Both exploratory data analysis tools and traditional modeling approaches for different types of spatial data will be described. The approach will be fully model-based through the use of Gaussian processes. Therefore, the basics of spatial Gaussian process models will be developed. Approaches from traditional geostatistics (variogram fitting, kriging, etc.) will be briefly covered here. Areal data models will be taken up next, again starting with exploratory displays and progressing towards more formal model specifications, e.g., Markov random fields that underlie the conditional, intrinsic, and simultaneous autoregressive (CAR, IAR, and SAR) models widely used in areal data settings. The remainder of the presentation will cover hierarchical modeling for both univariate and multivariate spatial response data, including Bayesian kriging and lattice modeling, as well as more advanced issues pertaining to BIG data sets. Modern computational approaches for very large spatial and spatiotemporal data sets will also be covered. Short course participants should have an M.S. understanding of mathematical statistics at, say, the Hogg/Craig/Tanis or

Casella/Berger levels, as well as basic familiarity with Bayesian modeling and computing at the Carlin/Louis or Gelman et al. levels. Significant previous exposure to spatial or spatiotemporal methods is not required.

Lecture 1: ***Modeling and analysis for point-referenced data (Geostatistics)***

Lecture 2: ***Modeling and analysis for high-dimensional spatial and spatiotemporal data***

Lecture 3: ***Modeling and analysis for areally-referenced data***