RUTGERS UNIVERSITY
DEPARTMENT OF STATISTICS AND BIOSTATISTICS
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Seminar

Speaker: Veronica Berrocal, SAMSI, Research Triangle Park, North Carolina,

Title: Downscaling outputs from numerical models

Date: Wednesday, February 17, 2010

Time: 3:20 p.m.

Place: 552 Hill Center

Abstract

In many environmental disciplines, data often arise from two sources: numerical models and monitoring networks. The first source provides predictions at the level of grid cells and is characterized by full spatial coverage of the region of interest, high temporal resolution, no missing data, but consequential calibration concerns. The second gives measurements at points, tends to be sparsely collected in space with coarse temporal resolution, often with missing data but, where recorded, provides, essentially, the true value. Integrating the two sources of data has been a widely investigated topic among several communities: from atmospheric scientists (a notable example is the data assimilation literature) to statisticians. In this talk, I will first briefly review common approaches for integrating monitoring data and computer model output, then I will propose an attractive, fully model-based strategy to combine the two sources of data, focusing mostly on the change of support problem with the goal of downscaling the output from numerical models to point level. I will present the downscaler model in both a univariate and bivariate setting, introducing the models first in a purely spatial setting, and then showing how they can be easily extended to accommodate for the temporal dimension. Using an application on air quality, I will show how our downscaler model, that employs underlying correlated Gaussian processes, provides a better predictive performance than traditional geostatistical techniques and Bayesian Melding (Fuentes and Raftery, 2005). I will conclude by discussing further avenues to extend the approach to incorporate Dirichlet Processes and Markov Random Fields as well as to develop a process-driven spatially-varying weighted downscaler.