Analysis of Areal Data: Should a Model with (Spatial) Dependence be Considered?

Ellison 5824
12:00 p.m. Tuesday, 26 October 2010

Abstract. The application of Markov random fields to problems involving spatial data on lattice systems (as often desirable in the environmental and ecological sciences, agriculture, and other areas of biology) requires decisions regarding a number of important aspects of model structure. Existing exploratory techniques appropriate for spatial data do not provide direct guidance to an investigator about these decisions. We introduce a diagnostic quantity useful in situations for which one is contemplating the application of a Markov random field model based on conditional one-parameter exponential family distributions. This exploratory diagnostic is shown to be a meaningful statistic that can inform decisions involved in modeling spatial structure with statistical dependence terms. We illustrate its use in guiding modeling decisions with simulated examples and demonstrate that these properties have use in applications.

Petrutza Caragea is Associate Professor of Statistics in the Department of Statistics at Iowa State University. She received her BS in Applied Mathematics from University of Bucharest, Romania and earned her MS and PhD from the University of North Carolina at Chapel Hill. Her areas of research are the methodology and applications of spatial statistics and time series to environmental, ecological, meteorological and agricultural applications. Recently, she has proposed an approximation method for estimating parameters of spatial models for large spatial data sets; proposed and alternative parametrization of one-parameter conditionally specified spatial models, which allow for interpretable covariate manipulations; worked on developing wind forecasting models that use meteorological model outputs; and participated in interdisciplinary research groups analyzing dispersal of genetically modified pollen flow. Currently she is working on developing methodologies for analyzing soil moisture output from satellite data (specifically, SMOS).