The University of Montana

Course Announcement

The University of Montana
Department of Mathematical Sciences
Spring 2012
Stat 544 - Applied Spatial Statistics
Prerequisites: STAT452, or consent of instructor
Text: *None, assigned readings*
Monday, Wednesday, Friday 2:10-3:00pm in MATH 306

Applied Spatial Statistics

Instructor: Jon Graham (Math 204 jgraham@mso.umt.edu 243-2561)

This announcement is to make graduate students interested in spatial statistical methods aware of a special topics course being offered this coming spring semester in the mathematical sciences department. The course will emphasize both the theory and applications of statistical methods for analyzing spatial data. Students taking this course should have a firm background in statistical methods (such as regression analysis and ANOVA designs), and some probability and linear algebra, although it is recognized that students enter this course with a variety of backgrounds.

The motivation for teaching spatial statistics as our topics in probability and statistics course is the lack of exposure most researchers have to statistical methods for spatial data. Often, data are assumed to be independent in order to make use of standard statistical (often normal-based) methods of analysis. Unfortunately, data collected over a geographical region are generally not independent, so methods of accounting for this spatial dependence are necessary. Many of the ideas used to model spatial data are borrowed from methods of analyzing temporal data. However, in a spatial setting, the data cannot be ordered as they are in time, preventing a straightforward extension of time series methods to spatial problems.

This course will attempt to give a broad overview to the analysis of three types of spatial data, known as geostatistical data, spatial lattice data, and spatial point patterns. The course will focus on geostatistical data, covering such topics as spatial autocorrelation, semivariograms, isotropy, anisotropy, kriging methodology, modeling variograms, cross-validation, and regression with spatially correlated errors. Topics within the analysis of spatial lattice data include common autocorrelation statistics (Moran's I, Geary's C), Markov random fields, and the use of conditionally autoregressive (CAR) models. Finally, an introduction to spatial point processes and the notion of complete spatial randomness using quadrat methods and Ripley's K function will be given.

The purpose of this course is both to gain exposure to spatial statistical applications and to understand the theory behind the methods studied. The free software package **R** will be used throughout the course both for homework and to help demonstrate the tools discussed. Some class time will be devoted to the discussion of papers using spatial methods and on applied problems from participating students.

If you have any questions concerning this course, feel free to contact me by E-mail or phone as given above.