STAT 696 Spring 2011
Spatial Statistics Professor Bailey

Syllabus

Course Web Page: `http://rohan.sdsu.edu/~babailey/stat696`
and `blackboard.sdsu.edu`

Meeting Time: Lectures: TTh 5:30 - 6:45 p.m. in GMCS 307

Instructor: Professor Barbara Bailey
GMCS 513
email: babailey@sciences.sdsu.edu
Office Hours: Tu 12:30 - 2:00 p.m., Th 2:30 - 4:00 p.m; by appointment

Reference: The textbook for the course is

Bivand, R. S., Pebesma, E. J., and Gomez-Rubio, V. (2008). *Applied Spatial Data Analysis with R*, Springer-Verlag.

Catalog Description: Graphical and quantitative description of spatial data. Kriging with common variogram models applied to geostatistical data. Models for lattice data and spatial point patterns. Use of existing software, with the emphasis on the methodology needed to conduct research in spatial statistics and to analyze real data from the environment, geological, and agricultural sciences.

Objectives: This course covers a wide range of statistical models and methods for data that are collected at different spatial locations. These data are called spatial data, which arise in many areas such as environmental, health, natural resources, climatological, geological, and agricultural sciences. This course will provide you with the basic theory and tools for the statistical analysis and interpretation of spatial processes. This course will cover classical methods such as kriging, as well as well as some newly developed ones. The programming language R and a few packages for analyzing spatial data will be used in applications. Spatial statistics is currently one of the most active research areas in statistics and there has been tremendous advancement in methodological and computational research in spatial statistics that enables us to analyze spatial data from many scientific disciplines.

Learning Outcomes:

- Summarize data using both graphical and numerical methods for use in spatial statistical methods.
- Characterize, compare, and contrast spatial data by variograms.
- Perform variogram estimation and kriging for spatial prediction, including measures of uncertainty.
- Produce and interpret statistics and graphs, using spatial point process estimation techniques.
- Present and communicate, both orally and in written-form, the results of statistical analyses of spatial data.

Homework: Homework assignments will be regularly available on the course web page as announced in class. The homework will contain a series of practice problems of which *selected problems* **will** be graded. The homework serves as a tool to review and practice the material covered in class. All material covered on the assignments can be questioned on the exams. Some problems may require computing and must include concise computer output with a clearly presented version of your code.

Late homework will not be accepted. You may drop your lowest percentage score.

Exams: There will be one in-class midterm Thursday, March 10, with a take-home portion due approximately the same week. The in-class part of the exam will be closed book. A hand calculator is necessary for all exams. *No collaboration of any kind is allowed on the take-home part of the exam.*

No makeup exams are given - no exceptions.

The final exam will be given Thursday, May 19 from 3:30 p.m. to 5:30 p.m. in GMCS 307. The final will be cumulative and comprehensive.

Project: As part of the course you will be asked to do an individual data analysis project. The project grade will be based in part on a brief 5-10 minute presentation (depending on the size of the class) during the last full week of classes and a brief 3-5 page written report in journal style format (i.e., 12 *pt* font, one inch margins, single-spaced, figures and tables clearly presented and labeled at the end of the abstract, page limit does not include figures, tables, nor bibliography).

You are required to attend *all* project presentations. Attendance at the presentations will be a part of your project grade.

The project will be done individually. You will illustrate and present data analysis concepts from the class and literature. In consultation with me, you may may choose a project of interest to you. As part of the project, expect to read the appropriate literature, write a report, and give an oral presentation to demonstrate a thorough understanding of and to illustrate the techniques/methods used in the class and article.

Grading: The grade for the class is based on a score composed of the following.

Homework	25 %
Midterm Exam	25 %
Project	25 %
Final Exam	25 %

Topics to be covered: basic outline; topics may be added and/or dropped as the semester proceeds.

1. Introduction to Spatial Statistics
2. Spatial Statistics from the Geostatistical Approach
   a. Variograms
3. Estimation and Prediction of Spatial Processes
   a. Kriging
   b. Cokriging
4. Nonstationary Spatial Processes
5. Design of Spatial Networks
6. Lattice Models
7. Spatial Point Patterns
8. Spatial-Temporal Processes

Prerequisites: A calculus-based statistics course (STAT 551B or 670B).

Tardiness and Early exits: The class time is from 5:00 - 6:45 p.m. As common courtesy to your fellow students, we would appreciate if you show up to class on time and leave when dismissed at 6:45. If you must leave early, please inform me and sit on the aisle near an exit so as not to disturb students listening to and trying to learn from the lectures.

Code of Academic Conduct on Examinations and Assignments: "At San Diego State University, students are invited to be active members of the educational community. As with any community, its members serve a vital role in determining acceptable standards of conduct, which includes academic conduct that reflects the highest level of honesty and integrity." The "Statement of Student Rights and Responsibilities clarifies for students their role as members of the campus community, setting forth what is expected of them in terms of behavior and contributions to the success of our university." "Inappropriate conduct by Students . . . is subject to discipline on all San Diego State University Campuses. The Center for Student Rights and Responsibilities coordinates the discipline process and establishes standards and procedures in accordance with regulations contained in Sections 41301-41304 of Title 5 of The California Code of Regulations, and procedures contained in Executive Order 628, Student Disciplinary Procedures for The California State University." See http://www.sa.sdsu.edu/srr/judicial for more information.

Other information: See course web page: http://rohan.sdsu.edu/∼babailey/stat696