GEO 6166: Advanced Statistical Methods
Spring 2003

Time: 6 to 8:50 PM Tuesday
Place: SOC 304/303

Instructor: Dr. Jayajit (Jay) Chakraborty
Office: SOC 311 (Tampa campus)
E-mail: jchakrab@chuma1.cas.usf.edu
Phone: 813-974-8188
Office Hours: 3- 5 PM Wed. (or by appointment)

Teaching Assistant: Michael Mena
E-Mail: mikie_7@yahoo.com
Phone: 813-975-1877

Course Objectives

This course is designed to provide statistical knowledge, skills, and expertise required to carry out advanced analyses in geographic information systems (GIS), remote sensing, and spatial statistics. Students will be introduced to theories and applications of several statistical methodologies that have a practical significance, ranging from basic inferential statistics to multivariate regression analysis. A specific focus will be on the use of regression as an important tool for investigating, analyzing, and modeling relationships between variables. With far-reaching applications in almost every field, regression models are used in engineering, the physical and chemical sciences, economics, management, biological sciences, and the social sciences, including geography and spatial analysis. Consequently, a key goal of this course is to ensure that students understand the basic principles of model building and develop skills for using regression analysis in a wide variety of application environments.

The course will emphasize the use of statistical modeling as a tool that can be applied to examine various real-world issues and research questions. The specific objectives are as follows:

- to expose students to theories, methods, and practice of inferential statistics and linear statistical modeling;
- to provide the experience required to design and conduct studies based on regression modeling;
- to provide the knowledge required to understand and evaluate studies that use regression models;
- to familiarize students with a widely used statistical software package (*S-Plus® for Windows*); and
- to ensure that students are prepared adequately for more advanced courses on spatial statistics, remote sensing, and/or GIS applications.

Course Requirements

In order to meet the above objectives, students are required to perform a significant amount of work outside of class. The first area of additional work consists of homework assignments involving numerical calculations. Despite the numerical nature of these problems, our focus is on

the interpretation and presentation of the computational results.

The second component of required work for this course consists of a series of computer-based assignments. These exercises would involve using the *S-Plus* software program to perform numerical calculations for a particular problem. The emphasis of these efforts, however, is on analyzing and discussing the results of these computations, and not just demonstrating computer prowess by performing the computations.

Due dates and times for completing assignments and exercises will be announced when they are distributed. *These dates and times will be adhered to rigidly!!* Work submitted late will receive reduced credit, except in highly unusual circumstances. Statistical knowledge is cumulative, and gaps in the early material will have negative consequences later on. Students who miss classes will be at a significant disadvantage.

Two examinations will be given at the end of two sections of the course. Exams in this course are open-book, open-note and emphasize understanding concepts, rather than speed of calculation or memorization of formulae.

A term project is required of all students. Students are expected to work individually on projects of their choosing. These projects should provide a complete experience in regression model selection, building, and application. You pose a meaningful question that interests you, state the question in terms of measurable traits, collect data, formulate the appropriate statistical model, interpret the results, and make policy or decision recommendations. You are also required to make a formal (conference-style) presentation of your project results to the class, before submitting the written version at the end of the semester.

Grading

The +/- grading system will be used to assign student grades. The final course grade will be computed on the basis of:

- homework assignments and lab exercises (35%),
- exam I (15%)
- exam II (25%),
- final paper/project (20%), and
- class attendance and participation (5%).

Course Text

The textbook for this course is: Mendenhall W. and Sincich, T. 1996. *A Second Course in Statistics: Regression Analysis* (Sixth Edition); New Jersey: Prentice Hall. This title will be available at the USF bookstore only after January 29, 2003.

Some useful additional books:

Kahane, L. H. 2001. *Regression Basics*; Sage Publications.

Kachigan, S. K. 1991. *Multivariate Statistical Analysis: A Conceptual Introduction* (Second Edition); Radius Press.

Pedhazur, E. J. 1997. *Mutiple Regression in Behavioral Research: Explanation and Prediction*

(Third Edition); Hardcourt Brace College Publishers.

Course Content

Any course on regression/statistical modeling must assume a working knowledge of elementary statistical concepts. Students are expected to be familiar with descriptive statistics, probability distributions, inferential statistics, and hypothesis testing, before moving on to the more complex concepts that will comprise the majority of the course material. The first section of the course, therefore, will focus on reviewing the basic mathematical and statistical concepts that are essential to the study of regression. We will then examine simple correlation analysis, the nature of the basic regression model, and the development of regression estimators. The second section of the course will extend these concepts and focus on multivariate regression and model building. You will find that the regression model depends very heavily on several assumptions. In the final section of the course, we will also analyze some of these assumptions, consider why they are necessary, whether they are valid in practical situations, and the consequences of violating them in particular applications of regression. These theoretical and analytic treatments will be supported by case studies and substantive examples.

Most course materials (e.g., lecture outlines, assignments, and important announcements) will be made available through a website on the *Blackboard* platform. Students will need to log in at https://my.usf.edu to access the USF Web Portal (*myUSF*) and then access their courses. To access the portal, you will need to activate your USF NetID at https://una.acomp.usf.edu. Students are responsible for familiarizing themselves with the contents of the course website. The posting of lecture outlines (MS Powerpoint files) on the website, however, is not intended to be a substitute for class attendance.

Tentative Course Outline

Jan 7	Course introduction and review of basic concepts (Chapter 1)
Jan 14	Inferential statistics (Chapter 1)
Jan 21	Inferential statistics (Chapter 1)
Jan 28	Introduction to *S-Plus* and regression basics (Chapter 2)
Feb 4	Test I
Feb 11	Two-variable regression analysis (Chapter 3)
Feb 18	Multiple regression analysis (Chapter 4)
Feb 25	Multiple regression analysis (Chapter 4)
Mar 4	*No class (AAG Conference)*
Mar 11	*Spring Break!!*
Mar 18	Model building and specification (Chapter 5)
Mar 25	Regression assumptions and treatment (Chapter 6)
Apr 1	Analysis of residuals (Chapter 7)
Apr 8	Regression case studies and review
Apr 15	Open: Project work
Apr 22	Project presentations
Apr 29	Test II

Supplementary Course Information

Class Environment
It is important to recognize that the classroom is an environment that requires respect for all participants. Therefore, students are expected to conduct themselves in a considerate manner. All participants in the class must respect the classroom environment by being on time, turning off cell phones, pagers, and headphones, avoiding extraneous talking and chat, refraining from reading non-class material, and by not eating during classroom time.

Special Facilities
Individuals who have any disability, either permanent or temporary, which might affect their ability to perform in this class are encouraged to inform the instructor at the start of the semester. Adaptations of methods, materials, or testing may be made as required for equitable participation.

Make-up Exams
The Department of Geography does not allow make-up exams except for students in special circumstances and at the discretion of the faculty member teaching this course. These circumstances include: (1) death or illness in the student's family or friends; (2) illness of the student; (3) three or more final examinations on the same day; (4) participation in a university sponsored activity at the time of a regularly scheduled examination. Make-up examinations will be granted only if circumstances are documented, and advanced arrangements are made for the situations described in 3 and 4. This should be arranged with the faculty member teaching the course and generally by the sixth week of the semester.

Incomplete Grades
Incomplete grades (I) will not be given in the course except under exceptional circumstances, based on written documentation, and at the discretion of the instructor.

Religious Preference Absence
Students who anticipate being absent from class due to the observation of a major religious activity must provide written notice of the dates to the instructor by the second week of the semester.

Tapes and Notes
It is not permitted to sell notes or tapes from this class without the expressed written consent of the instructor.

Academic Dishonesty
Cheating is defined as follows: (a) the unauthorized granting or receiving of aid during the prescribed period of a course-graded exercise: students may not consult written materials such as notes or books, may not look at the paper of another student nor consult orally with any other student taking the same test; (b) asking another person to take an examination in his/her place; (c) taking an examination for or in place of another student; (d) stealing visual concepts, such as drawings, sketches, diagrams, musical programs and scores, graphs, maps, etc., and presenting them as one's own; (e) stealing, borrowing, buying, downloading from the Internet, or disseminating tests, answer keys, or other examination material except as officially authorized, research papers, creative papers, speeches, etc.; (f) stealing or copying of computer programs and presenting them as one's own. Such stealing includes the use of another student's program as obtained from the magnetic media or interactive terminals or form cards, print-out paper, etc.