Geospatial Multivariate Techniques

Course Description
Research on geospatial problems often requires the application of multivariate statistical methods to produce new insight. Various existing statistic software is available to conduct multivariate statistical analysis, however, the interpretation of the results rely on solid understanding of statistic principles and theories. This course will cover principles of multivariate statistics and applications of the statistical procedures to research geospatial problems.

Course Objectives
1. Understand the principle and use of statistics for spatial analysis
2. Master various multivariate statistic methods for analyzing geospatial data
3. Apply multivariate statistical methods to solve research problems in geospatial applications

Required or Recommended Readings

Textbook

Recommended or Supplemental Reading

Required Software
- Microsoft Office Excel 2007 or higher - for assignments/labs
- ESRI’s ArcGIS 10 or higher – for assignments/labs
- Geoda (available at http://geodacenter.asu.edu/) – for assignments/labs

Class BlackBoard Website
https://iol.tamucc.edu/
Major Course Requirements

**Prerequisites:** Permission of the program coordinator

Course requirements include the following:

1) Have a university email address and join the GSEN email list-serv. To join, visit [http://sci.tamu.edu/mailman/listinfo/gsen-list](http://sci.tamu.edu/mailman/listinfo/gsen-list)

2) The course will be conducted mainly via BlackBoard and e-mail. It is the student’s responsibility to check emails and access BlackBoard concerning courses materials

3) Completion and submission of assignments/article review by the due date.

4) Participation in BlackBoard discussion

**Grade**

The final grade for this course will be made up from the grated marks as follows:

1. Assignments 60% of grade
2. Term project 20% of grade
3. BlackBoard discussion 10% of grade
4. Article review 10% of grade

TOTAL 100%

Grade computation:

A ≥90
B ≥80 and <90
C ≥70 and <80
D ≥60 and <70
E <60

**Assignments**

There are tentatively eight (8) assignments. The assignments will be posted on BlackBoard every other week, normally on Mondays. Some of the assignments may include labs that use ArcGIS or Geoda software to do statistical analysis and lab exercises.

**Term Project**

The term project will allow students to solve a specific statistic-related geospatial question based on what they learned from this class. Students are encouraged to use the data in their own fields.

The length of the final report is 10-15 pages, 12pt Times New Roman font, double-spaced, 1" margins, and 8.5" by 11" paper space. The final report should follow the format of formal journal articles including at least, Introduction/Problem, Methods, Results, Discussion, and Conclusions.
**BlackBoard Discussion**

A weekly discussion topic will be posted on BlackBoard at the beginning of each week and due on the following Sunday. The BlackBoard Discussion takes 10% of the total grade.

**Article Review**

Each student is expected to read five (5) statistic analysis articles that deal with geospatial data and develop a review for each article. The articles should be peer-reviewed publications, published in journal literature (prefer) or conferences. Each article review should be typed in **TWO pages** (double spaced). Each review will be given a maximum of 10 points. The review should include at least the following five components:

1) The purpose of the study and research question(s)
2) Data and statistic analysis methods used for the study
3) The findings of this study
4) General evaluation/critique – your opinions of how well (or poorly) the authors did this study, such as what are the contributions of this study? What are the overall strengths? What might be missing? What are some next steps for this study?
5) The full bibliographic reference of the article.

**Examples for Format of the Full Bibliographic Reference**

**Articles in Journals**

**Conference proceedings**

**Potential Sources for Article Review**

Geographical Analysis
Journal of Geographical Systems
International Journal of Geographical Information Science
Computers, Environment and Urban Systems
Photogrammetric Engineering & Remote Sensing
ISPRS Journal of Photogrammetry and Remote Sensing
GIScience & Remote Sensing
International Journal of Remote Sensing
Remote Sensing of Environment

* Interlibraryloan ([http://rattler.tamucc.edu/](http://rattler.tamucc.edu/), under “services”) provided by our library is a good resource to request articles from other libraries.
Course Policies

Due Date
All assignments/article reviews must be completed on time, which are normally due on Sundays. Check the Section “Course Outline” for the due date for each assignment/article review. Any assignment/article review that is turned in after the due date is considered late. Submission of a late assignment/article review is accepted, but with a penalty of 10% of the grade per day (including weekends). Late assignments/article review will only be accepted up to ONE WEEK after they are due. Exceptions are possible only with prior permission and for exceptional cause (with written documentation). Please work well ahead of the deadlines!

Academic Advising
The College of Science and Technology requires that graduate students meet with their Graduate Advisor for assistance with initial course selection as soon as the students are accepted to a graduate program. By the end of the first year of graduate studies graduate students should meet with their Graduate Committees to set up a degree plan. Graduate students are also encouraged to contact the appropriate College Academic Advisor regarding any questions or problems with their program of study. The College of Science and Technology Academic Advising Center is located in Center for Instruction, Room 350, and can be reached at 825-5797.

Academic Integrity/Plagiarism
University students are expected to conduct themselves in accordance with the highest standards of academic honesty. Academic misconduct for which a student is subject to penalty includes all forms of cheating, such as illicit possession of examinations or examination materials, falsification, forgery, complicity or plagiarism. (Plagiarism is the presentation of the work of another as one’s own work.) In this class, academic misconduct or complicity in an act of academic misconduct on an assignment or exam will result in zero (0) points for the assignment or exam.

Dropping a Class
I hope that you never find it necessary to drop this or any other class. However, events can sometimes occur that make dropping a course necessary or wise. Please consult with me before you decide to drop to be sure it is the best thing to do. Should dropping the course be the best course of action, you must initiate the process to drop the course by going to the Student Services Center and filling out a course drop form. Just stopping attendance and participation WILL NOT automatically result in your being dropped from the class. November 2, Friday, 2012 is the last day to drop a class with an automatic grade of “W” this term.

Grade Appeals
As stated in University Rule 13.02.99.C2, Student Grade Appeals, a student who believes that he or she has not been held to appropriate academic standards as outlined in the class syllabus, equitable evaluation procedures, or appropriate grading, may appeal the final grade given in the course. The burden of proof is upon the student to demonstrate the
appropriateness of the appeal. A student with a complaint about a grade is encouraged to first discuss the matter with the instructor. For complete details, including the responsibilities of the parties involved in the process and the number of days allowed for completing the steps in the process, see University Rule 13.02.99.C2, Student Grade Appeals, and University Procedure 13.02.99.C2.01, Student Grade Appeal Procedures. These documents are accessible through the University Rules Web site at http://www.tamucc.edu/provost/university_rules/index.html. For assistance and/or guidance in the grade appeal process, students may contact the Office of Student Affairs.

Disabilities Accommodations
The Americans with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that provides for reasonable accommodation of their disabilities. If you believe you have a disability requiring an accommodation, please call or visit Disability Services at (361) 825-5816 in Driftwood 101.

If you are a returning veteran and are experiencing cognitive and/or physical access issues in the classroom or on campus, please contact the Disability Services office for assistance at (361) 825-5816.
COURSE OUTLINE (Subject to Change):

<table>
<thead>
<tr>
<th>Week</th>
<th>Topics</th>
<th>Reading</th>
<th>Due Sunday*</th>
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| 1-2    | • Introduction to statistics and its application in geospatial engineering  
| (Aug. 22 - Sep. 1) | • Descriptive statistics                                              | [Rogerson] 1-2 | Assignment 1 |
| 3-4    | • Probability and discrete probability distributions                  |           | Assignment 2 |
| (Sep. 2 - 15)  | • Continuous probability distributions and probability models         | [Rogerson] 3-4 | Article review 1 |
| 5-6    | • Inferential statistics: confidence intervals, hypothesis testing    |           | Assignment 3 |
| (Sep. 16 - 29) | and sampling                                                        | [Rogerson] 5 | Article review 2 |
| 7-8    | • Analysis of variance                                                |           | Assignment 4 |
| (Sep. 30 - Oct. 13) |                                                               | [Rogerson] 6 | Article review 3 |
| 9-10   | • Correlation and spatial autocorrelation                             |           | Assignment 5 |
| (Oct. 14 - 27)  |                                                               | [Rogerson] 7 | Project proposal |
| 11-12  | • Introduction to regression analysis                                 |           | Assignment 6 |
| (Oct. 28 - Nov. 10) |                                                               | [Rogerson] 8, 9 | Article review 4 |
| 13-14  | • Spatial regression                                                 |           | Assignment 7 |
| (Nov. 11-24)  |                                                               | [Rogerson] 11 | Article review 5 |
| 15     | • Spatial patterns                                                   |           | Assignment 8  |
| (Nov. 25-Dec. 1) |                                                               | [Rogerson] 10 | Project Report |
| 16     |                                                                       |           |              |
|        |                                                                       |           |              |

*Each of the assignments will have a due date clearly written under the title of the assignment. Assignments/article reviews are normally due on the following Sunday, for example, Assignment 1 will be due on September 4, Sunday, and Article review 1 will be due on September 18, Sunday.
GENERAL GUIDELINES FOR COURSES AND LABS
IN THE GSEN PROGRAM
CULTURE, REGULATIONS, MODES OF OPERATION AND PROCEDURES

This course will be conducted mainly via the internet and/or e-mail. These guidelines are designed to inform scholars of their responsibilities and of the course requirements in order to make this course a positive experience. The instructor is always available for consultation and discussion with students on any aspect of a course and of these general guidelines.

COURSE CULTURE

1. Consider yourself as a scholar rather than a student. The term “student” may imply some passivity, whereas the term “scholar” implies active participation, understanding and searching. We will use these terms interchangeably with the meaning of “scholar” implied. Osmosis does not work in a learning environment!
2. Further, define yourself as a “thinking explorer”. You are responsible for your education; an instructor can only be a guide and a facilitator. An instructor cannot learn for you. If you come across something that really interests you, explore it further.
3. Your experience at this University should not consist of passing a series of courses to earn a degree. Your experience should rather be a series of activities that will give you an education.
4. Concentrate on “learning to learn”. You will have to be a life-long learner to survive in your chosen career.
5. There is no such thing as a stupid question; there is such a thing as a stupid answer. So ask questions, the instructor is taking all the risks! Ask questions of your instructor and of your fellow scholars. Many times questions are more important than answers.
6. The Internet is a tremendous resource and also a great danger. When you find information on the Internet, you have no idea if it is correct. View such information with caution. But, use the Internet to explore topics that interest you. Do not only prepare for the exam in a course – learn as much as you can on the topics introduced to you by the course material. You are responsible for the extent of your education! READ MINDFULLY !!!!
7. In addition to details of the syllabus given in class, the syllabus for the course includes all the chapters of the required textbook/s unless indicated otherwise by the instructor.

PROCEDURES & REGULATIONS

8. The final letter grade for the class will be based on the raw composite numerical score obtained from the weighted average of the tests, quizzes, exams, labs, etc. as indicated by the instructor. The raw composite numerical score may be adjusted (curved) based on the highest score, the statistical profile of the scores and other academic standards or other considerations. Generally the letter grade of A is 90%
and over of the adjusted score, a B is between 80% and 89% (inclusive) of the adjusted score, a C is between 70% and 79% (inclusive) of the adjusted score, a D is below 70% of the adjusted score and an F is below 60% of the adjusted score. An incomplete (I) will only be given in very unusual circumstances. The University regulations on incomplete grades state: “An incomplete notation may be given to a student who is passing but has not completed a term paper, examination, or other required work for reasons beyond the student’s control other than the lack of time”. Students are expected to take ALL tests, quizzes, exams, etc., and to complete and hand in all labs and other assignments. There is no provision for “extra credit”. No final grades will be given via the telephone, e-mail, etc.

9. All University rules, regulations and expected student conduct apply to this course. Students are held responsible for the information given in the current Catalog and Student Handbook.

10. All labs, assignments, etc. must be handed in on the assigned due date. Scholars having problems must notify the instructor well before the due date. Marks will be deducted for poor and sloppily presented work.

11. Labs, etc. handed in after the due date may be subject to a penalty of loss of marks. Labs, etc. handed in after the graded labs, etc. have been returned to students will get zero marks but must be handed in to the instructor.

12. Scholars are asked to take special note of the penalties, which the University attaches to Academic Dishonesty. Consult the Student Handbook.

13. All work handed in to the instructor must be the student's own work. Extracts, excerpts, etc. from the work of others must be suitably noted, acknowledged and properly referenced. Any Group Work will be judged in the same way. That is, it is the work of the group and the extracts, excerpts, etc. of others must be acknowledged.

14. All written and graphical work handed in must be presented neatly printed. Student’s written work will be judged on written communication skills, critical thinking and problem solving ability.

15. There are NO provisions for making up missed exams except in cases where prior arrangements have been made and agreed to by the instructor.

16. Students must keep their given university e-mail address (i.e. first-letter-of-first-name.lastname@islander.tamucc.edu). This will be the means of the instructor communicating with students.

17. All work submitted to the instructor (via e-mail or other means) must be clearly marked with the student’s name and the name and number of the course – this is especially important when work is submitted as an attachment to an e-mail.

18. The instructor reserves the right to make changes to the above with due notice to the students. These changes will be announced to the class (see 16 above) and each student is responsible for keeping herself/himself informed of such changes.