

UNIVERSITY OF NEVADA, Department of Geography

Spatial Analysis (GEOG 416/616)

SPRING 2009 Syllabus

Instructor: Dr. Franco Biondi

Course Description

Understanding spatial patterns is at the core of Geography. The objective of this class is to go beyond descriptive mapping, to explore the realms of quantitative modeling, prediction, and explanation. After briefly reviewing introductory statistical methods, we will proceed to the identification of spatial relationships, explain the statistical modeling of georeferenced data, and conclude with principal component analysis of spatial fields. We will investigate point and area patterns, as well as spatial autocorrelation and various methods used to quantify it. It is anticipated that, for majors, this course will provide the ultimate opportunity to apply statistical inference in their curriculum. Special software used in class will be available in the Geography computer laboratory, which is ideally suited for providing on-line, hands-on instruction. Tests and assignments will be aimed at keeping students up-to-date during the semester. Every student will be asked to work on a research project, and various adjustments will be made to differentiate undergraduates from graduates.

Class Hours and Location: M, W, and F, 11-11:50 am. M and W in 227 Mackay Science Hall, F in 222 Mackay Science Hall (Geography Computer Laboratory).

Office Hours: M, W, and F, 12-1 pm or by appointment. Please come and see me to talk about any questions you might have on the class. I am here for you.

Office: 225 Mackay Science Hall Phone: 784-6921 Email: fbiondi@unr.edu

Web site: Selected class material, final grade, etc., will be available through UNR's WebCT system - see details below.

Prerequisite: a course in college-level statistics.

Course Materials

- **Required Textbook:** Verzani, J., 2005. *Using R for Introductory Statistics*. Taylor & Francis/CRC Press. Available at the Campus Bookstore or from web-based sellers.
- **Recommended: A textbook on introductory statistics;** for example one of these two:
 - Salkind, N.J., 2008. *Statistics for People who (think they) Hate Statistics*. SAGE Publications, Los Angeles. Available at the Campus Bookstore or from web-based sellers.
 - Rogerson, P.A., 2006. *Statistical Methods for Geography*. SAGE Publications, London. Available from web-based sellers.
- Additional material during the semester may be distributed as class handouts or posted on the class web site.
- Software used in class (and available on every PC in the Department's computer labs): Microsoft Office, R, GS+, VarioWin, SaTScan.

Special Needs: Students who require special classroom or exam accommodations because of a documented disability need to contact the instructor at the beginning of the semester. The Department of Geography is committed to equal opportunity in education for all students, and University policy states that it is the responsibility of students with documented disabilities to contact instructors during the first week of each semester to discuss appropriate accommodations to ensure equity in grading, classroom experiences, and outside assignments.

Grading

By enrolling in this class, a student agrees to become familiar with the contents of the syllabus and requirements of the course, including the grading system, dates for tests, frequency of quizzes, due dates, and consequences of missing tests or being late for an assignment.

Undergraduate students will be graded according to their score on a midterm Exam, five Quizzes, two Homework assignments, a Research Project, and Participation. All tests count, so make sure you take all of them, and turn in all of your assignments on time. There is no final exam because the research paper is due the day of the final exam.

- *Quizzes* include no more than 5 questions, and should take no longer than 10-15 minutes. Each Quiz covers material presented since the previous test (either Exam or Quiz). If you miss a Quiz without a valid justification, you will receive a 0, which will count towards your final grade.
- The mid-term *Exam* will be a take-home assignment, given on Monday and due on Friday of the same week (see calendar for exact dates).
- *Homework* assignments include (1) laboratory exercises due at a specific time during the semester; (2) statistical and geostatistical analyses of data assigned by the instructor.
- The *Research Project* will ask students to focus on a class topic, collect and analyze data, and discuss the results. The outcome of the project will be a written report (see detailed instructions below); a final presentation can also be done for extra credit.
- *Participation* is essential, and attendance is required in a professional way. Points will be taken out for breaking the Rules of Conduct (see below).

Graduate students are expected to draw upon their experience and knowledge gained elsewhere to enhance the formation of connections between the topics covered in this course as well as related topics not explicitly covered in the course.

Homework assignments and tests include extra questions for students enrolled in Geog 616. Those questions are aimed at the more advanced aspects of the course subjects. Graduate students are expected to demonstrate a deeper understanding of course material; hence they are graded together as a subset of the total course enrollment using higher standards than those employed for undergraduates.

Students enrolled at the 600-level have to prepare a research paper and a class presentation on a topic of interest to them, and approved by the instructor. As explained below, the research project provides an opportunity for investigating course subjects at an advanced level. The outcome of the research project is a paper written according to the *Guide for Authors* of an international, peer-reviewed, scientific journal chosen by the student. The grade assigned to the paper will then depend not only on research quality and text clarity, but also on how closely the student followed the journal's instructions. The graduate students' technical presentation is aimed at improving the ability to speak in front of an audience, and serves as a synthesis experience, combining explicit class material with external, independently researched information to develop a greater understanding of the subject.

Grading breakdown**GEOG 416 GEOG 616**

Quizzes (5 x 10)	50	50
Midterm Exam (50)	50	50
Homework (2 x 25)	50	50
Undergraduate Research Project (100)	100	
Graduate Research Paper (100)		100
Class Presentation (30)	Extra Credit	30
Attendance and Participation (50 undergrad., 20 grad.)	50	20
TOTAL	300	300

Final letter grades may have a plus or minus according to the following scheme:

A = 93% or higher; A- = 90-92.9%; B+ = 87-89.9 %; B = 83-86.9 %; B- = 80-82.9 %;
 C+ = 77-79.9 %; C = 73-76.9 %; C- = 70-72.9 %; D+ = 67-69.9 %; D = 63-66.9 %;
 D- = 60-62.9 %; F = < 60 %.

While this grading scale cannot be changed, the instructor reserves the right to increase letter grades based on class performance.

Rules of Conduct (*the tough stuff*)

- **Attendance.** Attendance is required. At the beginning of the semester I will do a roll call. As soon as I memorize your names, I will remember who attends and who does not. Keep in mind that your grade will improve if you come to class and take notes. Each class meeting builds on the previous one, therefore it is important to keep up with the material. Also, talking with other students or reading materials unrelated to the course during a lecture disturbs the entire class, and will not be tolerated. If you need to know something, ask your instructor.
- **Tardiness.** BE ON TIME. Coming late or leaving early is a sign of disrespect, and it disturbs everybody else in the classroom. If you have a schedule conflict, please come and talk to me *in advance* – maybe we can work out a solution.
- **Digital Devices.** No digital devices are admitted in class. Therefore, you cannot (1) use a cell phone, (2) tap on your laptop, (3) listen to music (remove those earpieces before entering!).
- **Quizzes.** Tests are closed book, closed notes (formulas will be provided). It is YOUR responsibility to be on time for tests, and to contact your instructors well before the test if you absolutely cannot attend. In most cases, it is possible to take a test *before* its scheduled date, but it is not possible to make it up afterwards. Students who arrive after the first person has completed the test will automatically receive a zero. Make-up examinations will be given only with an MD's note requesting permission in the case of illness, or a death certificate in the case of a family death. Medical excuses are invalid if turned in after the test has been graded.

- **Homework.** Make-up homework will be given only for an official excuse (illness, family death) with proper documentation (MD's note, death certificate). Homework typically has a brief turnaround time. If you know you will have to miss a class, make prior arrangements with the instructor for returning assignments in advance.
- **Late Assignments:** Assignments are due when stated — late projects will be marked down at a rate of 10% of the grade per day. Unless otherwise noted, assignments are due by the beginning of class. Given the nature of the course and examination materials, there are no scheduled make-up exams.
- **Academic Dishonesty:** Academic dishonesty is against university policy as well as the system community standards. Academic dishonesty includes, but is not limited to, the following:
 - *Plagiarism:* defined as submitting the language, ideas, thoughts or work of another as one's own. If you need to reference other people's work, give appropriate credit using quotes for exact wording, and always provide complete references.
 - *Cheating:* defined as (1) obtaining or providing unauthorized information during an examination through verbal, visual or unauthorized use of books, notes, text and other materials; (2) obtaining or providing information concerning all or part of an examination prior to that examination; (3) taking an examination for another student, or arranging for another person to take an exam in one's place; (4) altering or changing test answers after submittal for grading, grades after grades have been awarded, or other academic records once these are official.

Sanctions for academic dishonesty may include the following: (1) canceling the student's enrollment in the class without a grade; (2) filing a final grade of "F"; (3) awarding a failing mark on the test or paper in question; (4) requiring the student to retake the test or resubmit the paper. For additional details on academic standards, please consult the University Catalog.

Research Project

Each student will be required to complete an original research project. This will expose students to an unsolved question, and to the challenge of finding the best possible answer by means of creative and critical thinking. A research project implies making new observations, reading the scientific literature, and analyzing data. The outcome of the project will be a written report (undergraduates) or research paper and class presentation (graduates). The research project will include the following components:

Title

Abstract

Dataset identification

----- DUE EARLY TO ALLOW FOR FEEDBACK

Background (Problem analysis and Literature Review)

Objectives

Guide for Authors (graduate students only)

----- FIRST GRADING (30%)

Study plan (Methods and Expected Outcomes)

Literature cited

----- SECOND GRADING (30%)

Results, Discussion and Conclusion
Tables and Figures
----- THIRD GRADING (40%)

Specific deadlines are set in the class calendar for each component of the project. Every time students turn in a new component of the project, they need to attach the previous components as well. Each phase (first, second, and third) is graded individually, but with a possibility of revision. As usually happens in any research project, ideas and plans are refined as work progresses. By revising their previous work, students have an opportunity to improve their previous grades. For example: the title, abstract, and dataset identification are due after the first week of the semester, to allow the instructor to give students early feedback on their ideas. The first score (10% of the whole Research Project grade) will be assigned after students turn in the justification and objectives (at this time, graduate students must also submit the *Guide for Authors* of the journal they'll write the paper for). If the scope of the research is vague and not well justified, the first score will be low. However, this is only an indication that the student needs to work diligently to refine the research question. The second grade (40% of the whole Research Project grade) will be assigned after students submit the literature review and study plan. At this time, if along with the new components students provide a revised research justification and objectives, the instructor will revise the first score as well as assign the second score.

Therefore, with each new phase of the project, students can revise and improve their work, so that they can continue to increase their scores throughout the semester. At the end, undergraduate students are required to provide a class report by joining and 'cleaning up' the individual project components. Graduate students will need to submit their research as a paper suitable for publication in a scientific journal. The length of the paper should not exceed 2000 words (excluding references, tables, and figures). While papers from graduate students need to follow the *Guide for Authors* of a preferred journal, papers from undergraduate students do not. It is recommended to turn in a first draft of the completed project/paper at least ten days before the final deadline. Although the feedback you receive from the instructor will not include a grade, such early comments are likely to improve your grade. The final version of graduate papers and undergraduate reports will be due the last day of class (check the calendar for details).

Final Presentation (required for graduates, extra credit for undergraduates)

Presentation of your research project to the class will need to be in PowerPoint format, which can easily be displayed using the LCD projector. Presentations are scheduled for the last day of class. We will mimic the style of professional meetings, with 10-20 minutes allocated to each speaker.

Speaking in front of an audience is a useful opportunity to sharpen your communication skills. Please try to leave one-two minutes at the end of your talk for questions and comments. Also, you may want to consider the following suggestions:

- (1) Make your figures simple and clear. Labels need to be large and visible from a distance. The smart-classroom equipment is very effective at enlarging viewgraphs, but remember that text needs to be readable from the back of the room.
- (2) You don't have much time, and you need to spend at least one minute on each figure. Therefore, restrict the number of slides to those that are most relevant to your project.
- (3) Organize your talk. Start with the problem: why are you motivated to research this issue?, why should the audience care? Continue with the method: which data will you collect?, what

kind of analysis will you perform? Proceed with the expected results: what will you learn?, what still needs to be done? Finish with the timetable and budget.

- (4) Try to have only one or two conclusion points. If you can summarize your project in one sentence, do that at the end of your talk.

How to succeed in this class

- ✓ Read the assigned materials
- ✓ Ask questions
- ✓ Be aware of deadlines, and prepare in advance
- ✓ Become familiar with the software programs needed for homework and research project
- ✓ Use the web, and follow the links that will be provided on the class web site
- ✓ Think carefully about your research project
- ✓ Make sure you have the resources available to produce your final report/paper

Computer Lab

Each student will be able to use the Department of Geography computer laboratory (MS 222). We have it available during our class meeting time on Fridays, and it can also be accessed when no other courses use it. Printers are available for grayscale and color printing (both single- and double-sided pages). If you experience any problems, please contact Dr. Pat Guiberson, the computer laboratory Director. It is necessary to have a UNR netID to use the computer lab.

Login instructions:

- ✓ Turn on the computer (if it is turned off)
- ✓ Press Ctrl-Alt-Del to log in
- ✓ A window will come up asking for your Username and Password (use your NetID ones)

All of your work needs to be saved inside your folder, which is a subdirectory located on the lab server (check with the lab administrator for the actual path). Anything saved outside of your folder may be lost as soon as you log out. ***Make sure that each program you use will save files to your subdirectory.***

Class web site

The class web site is located on UNR's WebCampus system. In order to log onto the class web site you will need to:

1. Go to <https://webct.unr.edu/>
3. You will need to enter your **Username** and **Password**
***** *These are the same as your UNR NetID and Password* *****

(Your UNR NetID and Password need to be activated **before** trying to access the class web site).

After logging, you will be directed to a main page, which contains a link to all your WebCT courses. For this class, the web site will only be used to post updates to the calendar, class materials, and your mid-semester and final letter grade. Please remember to hit the "Reload" button of your web browser to view the most recent changes.

Skills required and/or developed for this course

This class requires and/or improves students' skills in the following areas:

- ✓ **Writing** (ability to write a complete, well constructed essay or paper using correct vocabulary, grammar, spelling, and punctuation)
- ✓ **Verbal Presentation** (ability to make oral presentations to a group in a clear, understandable, professional manner)
- ✓ **Visual communication** (ability to understand and interpret graphics, posters and presentations that communicate ideas visually, through design, layout, color, symbols and graphic representation)
- ✓ **Comprehensive Reading** (reading for the main ideas in a manuscript and the ability to articulate these ideas in written annotation)
- ✓ **Library research** (ability to use appropriate search methods to find books, articles, maps, photographs, digital data, and other educational materials)
- ✓ **Field and/or lab work** (answer questions through the collection and analysis of data collected in the field or in the lab)
- ✓ **Computing** (basic file management, printing, email, web search, and use of basic software programs including word processing and spreadsheets)
- ✓ **Quantitative analysis** (skills solving problems requiring numerical tools, manipulation of data, and simple models)
- ✓ **Qualitative analysis** (skills interpreting information in the form of observations, texts, and dialogue)
- ✓ **Accountability, efficiency, precision, and accuracy** (development of professional skills including punctuality, meeting deadlines, working efficiently alone and in groups, selecting appropriate methods for work and achieving accuracy in results)
- ✓ **Memorizing** (remembering facts, ideas or methods so they can be repeated in the same or equivalent form)
- ✓ **Analyzing** (investigating in depth the basic elements of an idea, experience or theory, such as a particular case or situation, and consider its components)
- ✓ **Synthesizing** (summarizing and organizing ideas, information or experiences into new, more complex interpretations and relationships)
- ✓ **Judgment** (making informed decisions about the value of knowledge, arguments or methods, such as examining how others have gathered and interpreted data, then assessing the soundness of their conclusions)
- ✓ **Applications** (applying theories or concepts to practical problems or in new situations)
- ✓ **Spatial analysis** (interpreting patterns of distribution and recognizing phenomena and processes as they occur in space)
- ✓ **Perception and geography** (assessing relationships between the experiences and perceptions of individuals/groups and the transformation of places and landscapes)
- ✓ **Regional understandings** (evaluating the organization of space into regions based upon understandings of physical and social environments)
- ✓ **Cultural interpretations of place and landscape** (observing the influence of culture and society in the transformation of places and landscapes)
- ✓ **Physical geographic analysis** (recognizing environmental processes and their spatial patterns as they are associated with changes in landscapes, climatic change, water regimes, and biotic interactions)
- ✓ **Human-environment interactions** (examining dynamics between social actions and the interpretations, use, quality, and change of physical environments)