CRP 6290: Advanced topics in GIS

Semester: Spring 2016
Location: Barclay Gibbs Jones Lab, Sibley Hall (3rd floor)
Day/time: Mondays and Wednesdays, 11:40 – 12:55 pm
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Teaching Assistant: Melanie Sand
Instructor Office Hours: Thursdays 9:30 – 12:30 and by appointment

Course Description

This course is designed to engage graduate level planning students in some more advanced topics using GIS. The course, as offered in spring 2016, will involve an introduction to spatial statistics. Topics to be addressed include exploratory spatial data analysis, spatial autocorrelation, point pattern analysis, spatial interpolation techniques, spatial regression (including geographically weighted regression), and both spatial lag and spatial error models. We will utilize both ArcGIS v.10.3 and GeoDa in this course.

The course is offered for 2 credits and will run through the middle of March.

Prerequisites: The course takes as its point of departure CRP 5080 (Introduction to GIS for planners), but in any case, some introductory GIS class is recommended, as I will assume prior knowledge of GIS. In addition, some background in statistics is also highly recommended, as I will assume a working knowledge of some basic statistical concepts.

Course format

The overall course format will be very similar to CRP 5080 and will include lectures, associated problem sets and a final project. Both a TA and myself will be available during the lab sessions to assist students. The goals and learning outcomes of this course are as follows:
Quantitative skill acquisition: The student should feel comfortable utilizing spatial statistics in analyzing and interpreting spatial data.

Research: The student should understand and be capable of employing spatial statistical methods for conducting research, and make use of such research evidence in arguments.

Effective oral, written, and visual communication: The student should be able to present an argument orally, in writing, and visually.

Course Grading

1. Problem sets (60%)
   There will be 5 lab assignments (worth 12% each). These generally (though not exclusively) consist of a scripted lab component followed by a homework assignment, meant to be done “on your own.” Computer skills vary widely, so students should be aware they may have to spend time outside of class working on labs and homework assignments. Labs will be due the following Monday after they are handed out by the beginning of class. Students should upload each lab to Blackboard via the ‘Assignments’ link. Labs should be saved as a single word document (with any maps embedded as image files) as last name_lab #.doc. LATE lab assignments will automatically be downgraded unless there is a medical or family emergency:
   - 3%: if turned in after the start of class on the day they are due
   - 5%: if turned in the following day
   - 10%: if turned in within 1 week
   - 25%: after 1 week

2. Project/presentation (30%)
   The course will culminate in a final research project and presentation, using a research question and subsequent dataset of the students own choosing. The purpose of the project is to provide additional experience in conducting analysis. I expect you to be able to conceive of and execute a spatial data analysis, using at least one or more of the techniques and methods reviewed in class and be able to tell us something about your data. It is my hope that the presentations will be done as if you were presenting research at a conference, with discussion of the presentation and critical feedback from your peers, time permitting. Further requirements and guidelines for the final project will be elaborated on during class.

3. Attendance/Participation/Effort (10%)
   This grade consists of the following components:
Attendance: Students must be in class in order to reap the full benefits of the course. Material is presented in a cumulative fashion, so if you miss one week, you will be at a disadvantage the following week. It is extremely important that you keep up!

Participation: You are expected to pay attention during the lectures and work on the labs or homework during the appropriate times. Working on the labs during the lectures will not be tolerated (plus they are already late by that point!) Emailing, googling, twittering, facebooking, surfing the web is not permitted at any time (unless directly applicable to the assignment at hand). A present and engaged student body will contribute greatly to the ‘peer-learning’ effect that is crucial to learning a complex software package.

Effort: Computers are extremely frustrating. However, losing it or taking it out on the TAs or instructor is not an acceptable response! This portion of the grade is not so much to punish students as it is to reward students who are patient, have a good attitude, are entrepreneurial, and use creative and innovative ways to problem solve, particularly when faced with a situation they are unfamiliar with.

Student Code of conduct: "Each student in this course is expected to abide by the Cornell University Code of Academic Integrity. Any work submitted by a student in this course for academic credit will be the student’s own work. For this course, collaboration is allowed for group projects ”- Academic Integrity, Letter to the University Faculty, Aug. 20, 2012. For more information, please refer to the Cornell University Code of Academic Integrity, located online at http://cuinfo.cornell.edu/Academic/AIC.html.

READINGS


Plus additional readings will be placed on Blackboard
**Course outline:** This is a tentative schedule, which is subject to revision

<table>
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<tr>
<th>Dates</th>
<th>Lecture Topics</th>
<th>Lab Assignments</th>
<th>Readings, other activities</th>
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| Week 1  | What is special about spatial data? Introduction to spatial statistics | Mitchell, Chap 1 | Mitchell : Chap 2: pp21-50, Chap 3 : 121-126 (Global Moran’s I), Chap 4 : 165-174 (Local Moran’s I)  
*Blackboard:*  
Baller and Richardson (2002)  
*ESRI: Extend Crime Analysis with ArcGIS Spatial Statistics*  
*Blackboard:*  
Baller and Richardson (2002)  
| Week 3  | Point Pattern Analysis                               | Lab #2: Point Pattern Analysis  
*ESRI: Extend Crime Analysis with ArcGIS Spatial Statistics*  
*Blackboard:*  
Baller and Richardson (2002)  
| Week 4  | Spatial Interpolation                                 | Lab #3: Spatial Interpolation  
Lab #2 due Wednesday, 2/17 | *Blackboard:*  
Interpolating surfaces in ArcGIS, by Colin Childs  
Spatial Interpolation techniques |
| Week 5  | Spatial Regression and Geographically weighted regression | Lab #4: Spatial Regression  
Lab #3 due Wednesday, 2/24 | Mitchell, Chapter 5 : pp 210-226  
*Blackboard:*  
Voss, White, and Hammer “Explorations in spatial demography”  
Tolnay and Deane (1996)  
O’Loughlin et (1994) |
| Week 6  | Spatial Lag and Spatial error models                  | Lab #5: Spatial lag/Spatial error models  
Lab #4 due Wednesday, 3/2 | *Blackboard:*  
Ward and Gleditsch (2007), Chapter 2 and Chapter 3  
Voss et al |
| Week 7  | Final Project work session                           | Lab #5 due Wednesday, 3/9 | Final project due by Friday March 19 |
| Week 8  | Student presentations                                |                 |                             |