GPH 373 Geographic Information Science I — Fall 2012

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COURSE DESCRIPTION: The purpose of this course is to introduce you to advanced methods of exploratory spatial data analysis (ESDA). The focus is on both conceptual and applied aspects of ESDA methods. We will place particular emphasis on the computational aspects of ESDA methods for three different types of spatial data: point processes, lattice, and geostatistical. Throughout the course you will gain valuable hands-on experience with several specialized software packages for ESDA. The overriding goal of the course is for you to acquire familiarity with the fundamental methodological and operational issues in ESDA and the ability to extend these methods in your own research.

PREREQUISITES: All participants are expected to have working knowledge of spatial analysis concepts and to be familiar with multivariate statistics. No extensive GIS background beyond ArcGIS basics is needed.

READINGS: *Geographic Information Analysis*, David O'Sullivan and David J Unwin (required).
Supplementary Texts: (not required):
Geospatial Analysis, Michael De Smith, Michael F. Goodchild, Paul A. Longley
Applied Spatial Data Analysis with R, Roger S. Bivand, Edzer J. Pebesma, and Virgilio Gómez-Rubio.

GRADING: Grading will be assinged on the following scale: A: 90-100, B: 80-89, C:70-79, D: 60-69, F below 60. There will be no curves and no extra credit. I will assign +/- on an individual basis. Points are assigned as follows:

	Points	
Component	Undergraduate	Graduate
Exercises	40	30
Project	40	40
Quizzes	20	40
Presentations		10
TOTAL	100	100

Exercises: A series of graded class assignments will be given for each of the major topics (point patterns, lattice, geostatistics) which focus on the mechanics of carrying out an analysis. Your exercises will be introduced in the second half of a class meeting and are to be completed on your own time outside of class. You are welcome to collaborate with other students on these exercise but the work that you hand in must be your own.

Project: The final project will consist of a data analysis and writeup for 40% of the grade. You will have to select a spatial data set and carry out an in-depth analysis of spatial pattern. Your selection will need to be approved before you can proceed with the project. Graduate students must find their own data, while undergraduate students have the option of finding their own data or having data assigned by me. Graduate students will also be required to give a presentation of their project at the end of the course.

Quizzes: Starting the second week of the semester, a short quiz will be given during the first half of the class meeting. These will be based on material from the previous lectures and are graded on a pass-fail basis. Absence on the day of a quiz results in a 0 for that quiz. One quiz will be dropped in determining your final quiz average.

Article Presentations: Each graduate student will be assigned additional readings on a particular type of spatial analysis and will present a synopsis of these articles to the course.

ORGANIZATION: The course will meet in CoorL 1-18. The first part of each weekly meeting will focus on background and theoretical material related to the particular type of spatial data analysis. Following a short break, the attention will shift to introduce various software packages for the analysis of spatial data.

Classroom etiquette: To ensure a productive learning environment, all participants are expected to abide by the following rules:

- Because we are meeting in a computer laboratory, food is strictly forbidden in the class meetings.
- Use of the classroom computers should only be in support of the course. Extracurricular use (i.e., browsing noncourse materials, using social networks, checking email, chat sessions, etc) during class meetings is disruptive for your colleagues and disrespectful. Individuals violating this rule will be asked to leave for that course session.

SOFTWARE: While this course does not have a formal lab unit, in the sense that you would get an additional credit unit, the course material lends itself rather nicely to computationally based instruction. We will utilize a set of freely available software packages[1] that you can put on your own (or a friend's) computer to work on the examples and exercises in support of the course material. We will set aside part of the lectures to demonstrate various capabilities of these software packages to support spatial analysis. You will have additional opportunity to apply these methods both in the individual exercises as well as in your project. We will primarily rely on the package R for which is freely available and runs on a number of platforms, including Linux, Unix, Mac OS X, and Windows (all flavors). It is a very powerful mathematical programming language with many data analysis, graphical and computational functions.

SCHEDULE: The proposed topics and their sequence are as follows:

[1]The majority of the packages recommended can be classified as open source software. This means, among other things, you are free to use this software without having to pay any licensing fee, so long as you respect the copyright of the author who wrote the package. For more details on the concept of open source see http://www.opensource.org .

Month	Date	Topic	Out	Due
Jan	20	Intro, Spatial Data		
	27	Representation of Spatial Structure	Exercise 1	
Feb	3	Point Pattern Basics		
	10	Centrography	Exercise 2	Exercise 1
	17	Advanced Point Patterns		
	24	WRSA		Exercise 2
Mar	3	Lattice Data Basics	Exercise 3	
	10	Spatial Weights		
	17	Spring Break		
	24	Global Autocorrelation	Exercise 4	Exercise 3
	31	Local Autocorrelation		
Apr	7	Space-Time Autocorrelation		Exercise 4
	14	Geostatistics Basics	Exercise 5	
	21	Variography		
	28	Kriging		Exercise 5
May	5			Projects
	12			Presentations