GEOS-ANTH 4863
Quantitative Methods in Geosciences

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Overview

An introduction to the techniques and concepts of quantitative analysis – primarily but not exclusively statistics – applied to human and physical geography and anthropology, the course begins with descriptive spatial statistics and moves quickly to inferential statistics using both parametric and non-parametric methods. Spatial point processes, spatial regression and geostatistical models will be covered with a focus on applications using the R statistical computing language.

Goals

Students should develop an understanding of the principles of quantitative methods sufficient to begin using a high level programming language to implement conventional and spatial statistics in their own research and to evaluate the work of others. Specially, students should:

- Understand the elementary principals of descriptive and inferential statistics and their applications to spatial problems;
- Understand the applications and limitations of regression to spatial problems;
- Be able to solve complex spatial problems and implement solutions using a high level programming language, R (www.R-project.org)
- Be able to apply one or more appropriate quantitative techniques to their current and future research.

Requirements and Evaluation

Evaluations will be based on the following:

1. Weekly graded work due (20%)
2. Two mid-course exams (20% each, 40% total)
3. Capstone project (20%)
4. Final exam (20%)

Datasets and digital materials used in weekly graded work and/or exams will be available through Blackboard.

Materials

- Quantitative Geography: Perspectives on Data Analysis, 2000. Fotheringham, Brunsdon, & Charlton
- Geographic Information Analysis, 2rd Edition, 2010. O'Sullivan & Unwin.
- Applied Spatial Data Analysis with R, 2008. Roger S. Bivand, Edzer J. Pebesma, Virgilio Gómez-Rubio.

Milestones

Feb 12, 201 5
First mid-term exam

Mar 19, 2015
Second mid-term exam

Mar 31, 2015
Project Proposal Due

Apr 16, 2015
Final Project Due

May 4, 2015 (week of)
Final Exam (date TBD)

	Date	Topic	Readings (completed before class)	Assignment
1	Jan 13	Overview and Introduction		
	Jan 15	Establishing the Boundaries: How do spatial considerations alter statistics?	Fotheringham, Chapter 1	
2	Jan 20	Spatial Data	Fotheringham, Chapter 2	
	Jan 22	Exploring Spatial Data Visually	Fotheringham, Chapter 4 Bivand, TBD	
3	Jan 27	Exploring Spatial Data Visually in R	Bivand, TBD	
	Jan 29	Exploring Spatial Data Visually in R	Bivand, TBD	
4	Feb 3	Local Analysis I	Fotheringham, Chapter 5	
	Feb 5	Local Analysis II		
5	Feb 10	Review		
	Feb 12	Exam		First Mid-term Exam
6	Feb 17	Point Pattern Analysis I	Fotheringham, Chapter 6	
	Feb 19	Point Pattern Analysis II		
7	Feb 24	Point Pattern Analysis II		
	Feb 26			
8	Mar 3	Spatial Regression I	Fotheringham, Chapter 7	
	Mar 5	Spatial Regression II		
9	Mar 10	Geostatistical Models I		
	Mar 12	Geostatistical Models I		
10	Mar 17	Review		
	Mar 19	Exam II		Second Mid-term Exam
11	Mar 24	Spring Break		
	Mar 26	Spring Break		
12	Mar 31	Statistical Inference for Spatial Data I		Project Proposal Due
	Apr 2	Statistical Inference for Spatial Data II		

	Date	Topic	Readings (completed before class)	Assignment
13	Apr 7	Bayesian Inference I		
	Apr 9	Bayesian Inference II		
14	Apr 14	Spatial Modeling and the Evolution of Spatial Theory	Fotheringham, Chapter 9	
	Apr 16	Challenges in Spatial Data Analysis	Fotheringham, Chapter 10	Final Projects Due
15	Apr 21	Project Presentations		
	Apr 23	Project Presentations		
16	Apr 28	Project Presentations		
	Apr 30	Project Presentations		
	May 1	Dead Day		
	May 4-8	Final Exam		Final Exam (Date TBD)

EMERGENCY PROCEDURES

Many types of emergencies can occur on campus; instructions for specific emergencies such as severe weather, active shooter, or fire can be found at **emergency.uark.edu**.

Severe Weather (Tornado Warning):

- Follow the directions of the instructor or emergency personnel.
- Seek shelter in the basement or interior room or hallway on the lowest floor, putting as many walls as possible between you and the outside.
- If you are in a multi-story building, and you cannot get to the lowest floor, pick a hallway in the center of the building.
- Stay in the center of the room, away from exterior walls, windows, and doors.

Violence / Active Shooter (CADD):

- **CALL** 9-1-1
- **AVOID** If possible, self-evacuate to a safe area outside the building. Follow directions of police officers.
- **DENY** Barricade the door with desk, chairs, bookcases or any items. Move to a place inside the room where you are not visible. Turn off the lights and remain quiet. Remain there until told by police its safe.
- **DEFEND** Use chairs, desks, cell phones or whatever is immediately available to distract and/or defend yourself and others from attack.