Geography 489/589 Advanced Geospatial Data Analysis Spring 2014

Syllabus

Instructor: Scott Robeson, 202 Student Building, 855-7722, srobeson@indiana.edu

Lectures: MW 11:15-12:30, 140 Student Building

Office Hours: T 1-3 or by appointment

Prerequisite: G488/588 or consent of instructor

Text: Rogerson, P.A. (2006). *Statistical Methods for Geography: A Student's Guide* (2nd ed). Sage Publications: New York. ISBN: 1412907969.

Grading:		
	Exercises (5):	50%
	Mid-term exam:	25%
	Research project	25%

The main objectives of this course are to develop both an understanding of and facility with methods that are frequently used to analyze geospatial data. Numerous examples will be used to illustrate prospects and problems that are inherent in applied analysis of geographic data in spatial, temporal, and frequency domains.

It is assumed that students enrolled in this course have a background in basic descriptive statistics, statistical inference, hypothesis testing, correlation and regression. It is also assumed that students have the ability to work with ArcGIS, Microsoft Excel, and SPSS. We also will develop skills in R. G589 students will be expected to produce a more in-depth research project.

Three major topics in statistical analysis will be covered in this class:

1. Regression
    a. Bivariate
    b. Multivariate
    c. Logistic
    d. Spatial
2. Exploratory Spatial Data Analysis
    a. Nearest Neighbor Analysis
    b. Quadrat Analysis
    c. Spatial Autocorrelation
3. Cluster Analysis
    a. Hierarchical
    b. Non-Hierarchical
    c. Fuzzy
    d. Space-Time

Research Proposal and Project

This is an opportunity for you to select a topic that interests you. A proposal of your project is due on the 5th week of class. The proposal should be written in an outline and should contain:

- A working title
- A brief description of what topic you plan to investigate
- A brief description of how you plan to go about investigating that topic
- A brief hypothesis of what you expect to find in your results
- A bibliography of sources you have already found on this topic
- A data dictionary that includes all relevant information of your variables and their sources.
- A description of the software or hardware needed for the completion of your project.

The final project should adhere to the following guidelines:

- At least 10 pages, typed, double-spaced
- Your paper must be referenced; including complete and specific within-paper citations of all books, articles, and Internet sites consulted. This includes a full description of all the computer software/statistical packages used for analyzing your data.
- You must use at least three of the statistical approaches we cover during the semester (e.g. regression, spatial pattern analysis or cluster analysis).
- You will prepare a 20-minute public presentation of your work, to be given during the final week of class. Details to follow.

Important Course Policies

All students are governed by Indiana University's "Code of Student Rights, Responsibilities, and Conduct" http://www.iu.edu/~code . Students are encouraged to become familiar with all regulations that pertain to conduct and academic integrity. The Student Code of Conduct indicates that all forms of student academic dishonesty, including cheating, fabrication, facilitating dishonesty and plagiarism may lead to disciplinary action.

COURSE OUTLINE

WEEK 1 (Introduction)
Chapter 1 (Rogerson)

WEEK 2 (Statistical Background)
Wolfram, S. (2000). Mathematical Notation: Past and Future.
URL: http://www.stephenwolfram.com/publications/talks/mathml/index.html

WEEK 3 (Bivariate Regression)
Chapter 8 (Rogerson)

Chisick, M.C., Poindexter, F.R. and A.K. York. (1998). Factors influencing perceived need for dental care by United States military recruits. *Clinical Oral Investigations* 2: 47-51.

WEEK 4 (Multivariate Regression)
Chapter 9, pp. 193 – 208 (Rogerson)
Kuby, M., Barranda, A. and C. Upchurch. (2004). Factors influencing light-rail station boardings in the United States. *Transportation Research A*. 38: 223-247.
Riccio, R. (1992). Street Crime Strategies: The Changing Schemata of Streetwalkers. *Environment and Behavior*. 24(4): 555-570.

WEEK 5 (Logistic Regression)
Chapter 9, pp. 209-221 (Rogerson)
Exercise Due
Vowles, T.M. (1999). Predicting the loss of commuter air service in the United States. *Journal of Air Transport Management*. 5: 13-20.
Grubesic, T.H. (2003). Inequities in the broadband revolution. *The Annals of Regional Science*. 37: 263-289.

WEEK 6 (Spatial Patterns)
Chapter 10, pp 222 – 232 (Rogerson)
Getis, A. (1964). Temporal Land-Use Pattern Analysis with the Use of Nearest Neighbor and Quadrat Methods. *Annals of the Association of American Geographers*. 54(3): 391-399.
Wing, M.G. and J. Tynon. (2006). Crime Mapping and Spatial Analysis in National Forests. *Journal of Forestry*. September: 293 - 298.
Pinder, D., Shimada, I. and D. Gregory. (1979). The Nearest-Neighbor Statistic: Archaeological Application and New Developments. *American Antiquity*. 44(3): 430-445.

WEEK 7 (Spatial Autocorrelation)
Chapter 10, pp. 232 – 243 (Rogerson)
Ping, J.L., Green, C.J., Zartman, R.E. and K.F. Bronson. (2004). Exploring spatial dependence of cotton yield using global and local autocorrelation statistics. *Field Crops Research*. 89: 219-236.
Cocu, N., Harrington, R., Hulle, M. and M.S.A. Rounsevell. (2005). Spatial autocorrelation as a tool for identifying the geographical patterns of aphid annual abundance. *Agricultural and Forest Entomology*. 7: 31-43.

WEEK 8 (Midterm)
Exercise Due. Midterm Review
Midterm Exam

WEEK 9 (Spring Break)
NO CLASS

WEEK 10 (Spatial Regression)

Chapter 11 (Rogerson)
Dark, S.J. (2004). The biogeography of invasive alien plants in California: an application of GIS and spatial regression analysis. *Diversity and Distributions*. 10: 1-9.
OhUallachain, B. and T.F. Leslie. (2005). Spatial Convergence and Spillovers in American Invention. *Annals of the Association of American Geographers*. 95(4): 866-886.

WEEK 11 (Cluster Analysis)
Chapter 12 (Rogerson)
Exercise Due
Allik, J. and R.R. McCrae. (2004). Toward a Geography of Personality Traits. *Journal of Cross-Cultural Psychology*. 51: 13-28.
Murray, A.T. and T.H. Grubesic. (2002). Identifying Non-hierarchical Spatial Clusters. *International Journal of Industrial Engineering – Theory Applications and Practice*. 9(1): 86-95.

WEEK 12 (Cluster Analysis)
Grubesic, T.H. (2006). On the application of fuzzy clustering for crime hot spot detection. *Journal of Quantitative Criminology*. 22(1): 77-105.
Theophilides, C.N., Ahearn, S.C., Grady, S. and M. Merlino. (2003). Identifying West Nile Virus Risk Areas: The Dynamic Continuous-Area Space-Time System. *American Journal of Epidemiology*. 157(9): 843-854.

WEEK 13 (Local Indicators of Spatial Association)
Chapter 10 (Rogerson)
Exercise Due
Schmidtlein, M.C., Finch, C. and S.L. Cutter. (2008). Disaster Declarations and Major Hazard Occurrences in the United States. *Professional Geographer*. 60(1): 1-14.
Derksen, C., Wulder, M., LeDrew, E. and B. Goodison. (1998). Associations between spatially autocorrelated patterns of SSM/I-derived Prairie Snow Cover and Atmospheric Circulation. *Hydrological Processes*. 12: 2307-2316.

WEEK 14
Project Presentations
Project Presentations

WEEK 15
Project Presentations
Project Presentations

WEEK 16 (Finals Week)
Final Project Due by 5p.m., Thurs., May 1 – Please deliver to SB120