

Spatial Analysis – Fall 2011 Syllabus

Full Class Information: ERE621 - SPATIAL ANALYSIS

Instructor:

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Class time: Mondays 1:50 - 4:50 Baker 437

Instructor and TA Office Hours: To be determined

Course Description:

Topics covered in this course include elements of spatial statistics and modeling as applied to single point and continuous data. The triangle visualize-explore-model will be employed with emphasis in the modeling section. Examples of taught methods include: first/second order effects, complete spatial randomness, tessellation, kernel, covariograms and variograms, and several types of kriging.

Note: General programming experience and quantitative background are required. Assignments will use Matlab software package, though no prior knowledge of Matlab is required.

Course Objectives:

The course aims to provide:

- Understanding of the basic principles and concepts in spatial statistics.
- The application of spatial analysis methods to hands-on geographic problems.
- Customization of taught methods as applied to student-chosen problems.

Course Outcomes:

Upon successful completion of the course students will be able to:

- Formulate their own hypotheses on a variety of geographic problems and establish a spatial analysis plan to test multiple hypotheses for each problem.
- Synthesize various statistical methods (e.g. on point data, continuous data) to analyze their hypotheses, critique results from various methods and refine hypotheses as appropriate.
- Apply the two aforementioned goals to geographic problems beyond their strict area of expertise (e.g. a biologist working on a transportation problem).

Note: Becoming an expert in Matlab or any other software is NOT an expected outcome.

Grading:

Homeworks (35%), Midterm (25%), Project (30%), Paper Presentation (10%)

Textbook:

Interactive Spatial Data Analysis (2nd Edition) by Trevor Bailey and Tony Gatrell
Publisher: Prentice Hall, ISBN: 0582244935. Available from Follett's Orange Bookstore

Course Delivery: Class will use BlackBoard for all homeworks, lectures and class updates.

Detailed Course Content:

Students need to start by identifying a spatial problem. They should examine available spatial analysis techniques taught in lectures and establish a plan of action. They should follow the triangle visualize-explore-model. Combinations of methods can be used leading to a variety of results. Students need to evaluate these results and possibly identify a new approach to test.

Sequence of topics and concepts:

**** Introductory material**

**** Discrete point data**

- Visualize (Dot maps and labeling)
- Explore (First/second order effects, Quadrat, kernel, nearest neighbor, k-function)
- Model (Complete Spatial Randomness)
- Expand VEM concepts to bivariate datasets.

**** Continuous data**

- Visualize (Symbol maps)
- Explore (Moving average, tessellation, kernel, covariograms and variograms)
- Model (Trend surfaces, least squares, kriging (simple, ordinary and universal, block, co-kriging))

**** Combine the above in your project**

Course Schedule

Date	Lecture #	Lab
Monday, August 29, 2011	Syllabus + L1. Introduction	#1. Getting Started with Matlab + Visualization
Monday, September 05, 2011	No Class	
Monday, September 12, 2011	L2. Visualization-Quadrat-Kernel	#2. Kernel
Monday, September 19, 2011	L3. Nearest Neighbor	#3. Nearest Neighbor
Monday, September 26, 2011	L4. K-Function + L5. Modeling CSR	#4. K-Function + Confidence (CSR)
Monday, October 03, 2011	L6. Bivariate K-Function	#5. Bivariate K-function
Monday, October 10, 2011	L. Bonus: Space time Kari + Review	Paper Presentations
Monday, October 17, 2011	Midterm	
Monday, October 24, 2011	L7. Cont.data: Visualization + Kernel	#6. Continuous Kernel/Delaunay
Monday, October 31, 2011	L8. Variograms	#7. Variogram + Variogram cloud
Monday, November 07, 2011	L9. Variograms2 + L10. Trends	#8. Trends Surface Analysis
Monday, November 14, 2011	L11. Variogram fit + L12. Simple Kriging	#9. Simple Kriging - Project Proposals
Monday, November 21, 2011	No Class	
Monday, November 28, 2011	L13. Ordinary Kriging	#10. Ordinary Kriging
Monday, December 05, 2011	L14. Var. Effects on K + L15. Cross Val.	Working on Projects
Final Exam - Date TBD	Project Presentations + Report Due	

Important Deadlines:

Every lab is due right before the next lab

Paper selection for presentation is due 10/3/2011

Project proposal is due 11/08/2011, preferably earlier