Instructor:
Rudy Banerjee
Course Meeting Times/Location
Tuesdays 6-8:40 pm CA436
Lectures:
1 session / week
1.5 hrs/session
Laboratory:
1 session / week
1.5 hrs/session:

Office Hours
Mondays 4:30-6 pm @ CA 207D or by appointment
Level
Undergraduate/Graduate
Feedback
Send feedback to rbanerje@iupui.edu about this course.

Course Home

Applied Spatial Statistics

Syllabus Spring 2013

Course Objectives

The objectives of this course are four:

- To explore the foundations of spatial analysis (related mathematical and statistical theory) at a level and depth appropriate for someone aspiring to study higher-level applied science and/or to become a professional applied scientist.
- To present an introduction to the field of topology, with emphasis on those aspects of the subject that are basic to advanced spatial statistics.
- To introduce the student to what it means to do spatial statistics, as opposed to learning about spatial statistics or to learning to do exercises.
- To help the student learn how to write spatial statistics text according to the standards of the profession.
- To develop competence in handling large multivariate spatial analysis e.g. analyzing EPA point source data and population health data.

Prerequisites

Familiarity with mathematical statistics is optional. Knowledge of basic statistics desired.

Optional Textbook

The text for the course is:

Last Update 01/8/13

Lawson, A. B., Browne, W. J. and Vidal Roderio, C. L. (2003). **Disease Mapping with OpenBUGS and MLwiN**. New York: Wiley.

(optional textbook: available online from the IUPUI library website) Waller, L. A., and Gotway, C. A. (2004). **Applied Spatial Statistics for Public Health Data.** New York: Wiley.

See website: http://site.ebrary.com.proxy2.ulib.iupui.edu/lib/iupui/docDetail.action?docID=10114139

Woodward, Phillip. 2012. **Bayesian analysis made simple: an Excel GUI for OpenBUGS.** Boca Raton, FL: CRC Press.

Banerjee, S., Gelfand A. E., Carlin B. P. (2003) **Hierarchical modeling and analysis for spatial data.** Boca Raton, FL: Chapman and Hall/CRC.

Additional Materials:

Additional textbook readings and journal articles will be provided by the instructor

Students will need to purchase media on which to back up exercise data (flash drives, etc.) or they may use a network to transfer their data to a stable location (data cannot be stored on computers in the lab outside of class or laboratory time).

Expectations

We will deal with materials in lectures and exercise sessions since all materials cannot be in the text. The technological aspect will be comprehensively covered but students are not expected to know anything about a Spatial Statistics or a Geographical Information System or GIS.

Graduate Students should provide all exercise solutions and a final project (whether as solo or group effort) in a portfolio format at appropriate times during the semester. This will satisfy the professional requirements of working in a comprehensive GIS/health environment. Exercises will be evaluated and will be used to determine grade. Exams grades will guarantee whether one has mastered the concepts. Quizzes may be held.

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Optional problems will be provided for those intending to use knowledge acquired in this course to help with their dissertation.

Grading

Letter of Points	Percentage Grade Earned
A+	97-100
A	93-96
A-	90-92
B+	86-89
B	83-85
B-	80-82
C+	76-79
C	73-75
C-	70-72
D+	66-69
D	63-65
D-	60-62
F	< 60

ACTIVITIES	POINTS
Exercise	100
Midterm Exam	100
Final Exam	100
Students Project: Student projects can take the form of an applied project or literature review. The overall purpose of the project is to provide students with the opportunity to explore the application of the concepts and techniques discussed in class to their own area of expertise. The instructor will meet with students to help plan and direct the student project on an individual basis.	50
Final grade = points earned/350	350

Calendar

WEEK #	READINGS	ASSIGNMENTS	TOPICS
Jan 8	None		Ses 1: Introduction to Spatial Statistics, Adjacency and Introduction to Bayes Theorem
Jan 15	Ch 1	Exercise 1	Ses 2-3: Introduction to Bayes Theorem contd; Mapping Basics/Logic and Foundations in Spatial Analysis
Jan 22	TBA		Ses 4-5: Basic Statistical Analysis/ Spatial Descriptive Statistics; Moran's I
Jan 29	TBA	Exercise 2	Ses 6-7: Bayes Theorem (contd); Spatial Descriptive Statistics; Spatial Point Process
Feb 5	Ch 2.1/4.1		Ses 8-9: Likelihood and Posterior Distributions/Empirircal Bayes Estimation Using Microsoft-Excel™
Feb 12	Ch 2.2/4.2	Exercise 3	Empirircal Bayes Contd.. Introduction to R Programming Language
Feb 19	Ch 2.3-2.4/4.3	Exercise 4	Ses 10-11; Hierarchical Models/ OpenBUGS introduction
Feb 26	Ch 4.4-4.8	Exercise 5 **Exam 1**	Ses 12-13 Posterior Inference; MCMC methods/ OpenBUGS: Specification of the Model
Mar 5		Exercise 1-5 & Exam1 9due Friday March, 8 5pm)	
Mar 12			Spring Break!
Mar 19	Ch 6.1 & 2	Exercise 6	Ses 14-15 OpenBUGS: Scripts; Convergence; Model Fitting; Spatial Models: GeoBUGS;
Mar 26	TBA	Exercise 7	Ses 16-19 Relative Risk Estimation/Using OpenBUGS & Spatial Prediction;
Apr 2	TBA	Exercise 8	Ses 20-21 Excel & OpenBUGS
Apr 9	TBA	Exercise 9	Ses 22-23 Ecological Analysis
	TBA		Association of American Geographers Annual Meeting, Los Angeles, CA (CA008C LAB OPEN)
Apr 16			Ses 24-25 Statistical Models in Ecological Analysis
Apr 23	TBA	Exercise 10	Ses 26-27 OpenBUGS Analysis of Ecological Datasets.
Apr 30		Final Exam, Project & Ex6-10 (due May 4, 5 PM)	
May 9			Grades Available on OneStart

Last Update 01/8/13