GOG 529/BIO534: Spatial Statistics

(This syllabus is subjected to change. The updated syllabus is available at: http://bit.ly/SpatialStatsSyllabus)

Class Meeting: Spring 2018: MW 2:45-4:05PM, AS003 (B03)

Instructor
Shiguo Jiang
Contact: Arts & Sciences 227, sjiang2@albany.edu, 518-591-8561
Office Hours: MW: 9:30-10:00AM, 2:00-2:30PM, and by appointment

Course Description
This course provides an introduction to spatial statistics for spatially referenced data. Spatial point patterns, geostatistical data, and areal (regional/lattice) are studied using the viewpoint that these are realizations from random processes. Major topics to be covered include spatial stochastic process, exploratory spatial data analysis, intensity function, K function, cluster statistics, spatial interpolation, spatial covariance functions, variograms, kriging, spatial autoregressive models. Computer exercises with R programming language (http://www.r-project.org) are designed to help students gain hands-on experience on the topics presented in lectures. Students are required to present and discuss assigned readings and develop an individual research project that applies spatial statistical methods in problem solving. Please refer to Page 3 below for the detailed course schedule.

Point pattern          Geostatistical data          Area data

After finishing the course, the students have the potential to answer such questions as:
- How did the 1854 London Cholera outbreak spread, through "miasma" in the air or contaminated water?
- How to characterize the spatial temporal patterns of oak mortality associated with a new forest disease?
- What are the spatial patterns of the motor vehicle theft? What are the underlying socioeconomic factors?
- How to characterize the spatial distribution of air pollution? How to downscale images more effectively?

Prerequisites
Students should be familiar with basic probability theory, multiple linear regression, and basic linear algebra.

Course Website: Google Drive
- Lecture notes and assignments: SpatialStatisticsContents folders on Google Drive.
- Completed assignments: Please upload to the folder named after you.

Textbook and References
There is no required textbook. Readings will be given when appropriate.
Major References [related chapters will be uploaded to the course website]

1. [BG] Interactive spatial data analysis / Bailey & Gatrell (1995)
2. [BPG] Applied spatial data analysis with R / Bivand, Pebesma, & Gómez-Rubio (2013)
5. [C] Statistics for spatial data / Cressie (1993)

Course Evaluation

Final course grades will be based on the following weighting of assessment components:

- **Class Participation (10%)**: Class attendance and participation is expected for all students. Students will receive credits for participating in-class activities including class exercises (5%), and discussions (5%).
  - Before each class, you are required to post at least one question on the following link: [http://bit.ly/SpatialStatsQuestions](http://bit.ly/SpatialStatsQuestions)
- **Laboratory exercises (40%)**: The laboratory exercises will require the use of R. All lab assignments should be turned in on time.
- **Exam (20%)**: There will be one take-home exam assigned in early April (see the schedule for detail).
- **Final project (30%)**: Students are required to complete a final project that applies spatial statistical methods to solve a real-world problem of their own interest. The project consists of a proposal (5%), preliminary report (5%) an oral presentation (5%), and a final report (15%). The oral presentation is scheduled at the last week of the semester. The requirements and due dates for the proposal and final report will be discussed in class.

Communication Devices

Cell phones and other communication devices must be either turned off or in vibrate mode during class.

Academic Integrity

Please help maintain an academic environment of mutual respect and fair treatment. Academic misconduct will be reported to the graduate dean. The term academic misconduct includes all forms of student academic misconduct wherever committed; illustrated by, but not limited to, cases of plagiarism and dishonest practices in connection with course work. Please refer to UAlbany Standard of Academic Integrity website for details: [http://www.albany.edu/studentconduct/standards_of_academic_integrity.php](http://www.albany.edu/studentconduct/standards_of_academic_integrity.php)

Disability Services

Reasonable accommodations will be provided for students with documented physical, sensory, systemic, medical, cognitive, learning and mental health (psychiatric) disabilities. If you believe you have a disability requiring accommodation in this class, please notify the Disability Resource Center (518-442-5490; drc@albany.edu). Upon verification and after the registration process is complete, the DRC will provide you with a letter that informs the course instructor that you are a student with a disability registered with the DRC and list the recommended reasonable accommodations. The website for DRC: [http://www.albany.edu/disability/](http://www.albany.edu/disability/)

Course Schedule

Updated schedule can be found at the following website: [http://bit.ly/GOG529Schedule](http://bit.ly/GOG529Schedule)