APSTA 2015 Applied Spatial Statistics (2 pts.)

Tod Mijanovich

[SAMPLE SYLLABUS – SUBJECT TO CHANGE]

Lecture: Tues 3:30-6:45 Lecture followed by Lab; Course meets first 7 weeks of term only
Location: 194 Mercer Room 304

Software: R version 3.1 (freely distributed). This course will use NYU Classes.

COURSE OVERVIEW: Spatial data arise when information is collected on units that reside in different locations. Common examples include geology, criminology and epidemiology, where the goal may be to identify patterning or clusters (‘hot spots’) in the outcomes across the terrain being examined. In the social sciences, a similar set of questions and techniques are required, for example in studies of homelessness, poverty, environmental justice, and education. However, spatial data present a novel set of exploratory and modeling challenges, given the unique way in which outcomes are related (correlated) with each other through proximity. This course is an overview of the methods needed to analyze data for which it is suspected that the spatial component plays an important role.

PREREQUISITES: an advanced course in statistics in which hierarchical or heteroscedastic linear models has been presented. At least one of courses that follow should be sufficient: APSTA-GE 2004, PSYCH-GA 2248, POL-GA 2251 Quant III, SOC-GA 2312, or APSTA-GE 2110 AND PADM-GP 2902. Consult with the instructor before registering if another course is to be used as a prerequisite.

COURSE REQUIREMENTS:

Participation: 10% You are expected to attend class and participate in class discussions
Homework problems: 50% There will be 3 problem sets that will require some computing, analysis, and interpretation.
Project: 30% There will be a 3-5 page project that includes the following components:

- Description of a spatial dataset to which they potentially could gain access.
- The research question(s) they wish to address using this data
- An outline of the methods they would use to do this, based on the material covered in class
- A critique of their choices (limitations, alternatives, etc)

For students with an existing spatial data set that they wish to analyze, an alternative 3-5 page write-up of their analysis in the style of a methods and results section of a journal article can be submitted.

Presentation: 10% Students will make an in-class presentation that outlines their spatial analysis research plan.

COURSE TOPICS AND READINGS FOR EACH CLASS:

Book abbreviations: Waller & Gottway (WG); Haining (H).
NOTE: Readings refer to chapters or sections, e.g., chapter 1 is just listed as 1; section 5.2 is just 5.2.

Meeting 1:
Reading: WG 1-3; H 1,2,1-2.3; simpleR: download http://cran.r-project.org/doc/contrib/Verzani-SimpleR.pdf
Lab: Non-spatial introduction to the R language and environment
Lecture: Introduction to spatial data and spatial correlation

Meeting 2:
Reading: WG 4 (omit 4.4.3); WG 5.1, 5.2; H 4.2.3, 5, 6; optional: H 7
Lab: preparing spatial data for analysis/visualization
Lecture: Spatial data visualization and exploration

Meeting 3:
Reading: WG 5.1-5.2 (again); WG 5.3
Lab: visualization
Lecture: Do my data cluster? First pass

Meeting 4:
Reading: WG 5.3, 6, 7; H 2.4
Lab: simulating Complete Spatial Randomness; estimating and visualizing intensity functions
Lecture: Do my data cluster? Second Pass

Meeting 5:
Reading: H 9, 10 (omit 10.3)
Lab: Monte Carlo tests; visualizing relative risk
Lecture: Variogram models I

Meeting 6:
Reading: H 9, 10 (omit 10.3)
Lab: variogram estimates; model fitting
Lecture: Variogram models II

Meeting 7:
Reading: H 8
Lab: variogram model fitting, interpreting, statistical tests, variance decompositions
Lecture: Misc. topics, wrap-up