STAT 4600 / STAT 7240 Statistics Topics 1, T01: Spatial Statistics, Fall 2010

Instructor: Jeff Babb

Office: 312 Machray Hall

Office hours: MW 10:30 am - 11:30 pm

                I will also be in 311 Machray Hall each Friday from 11:30 am to 12:00 noon.

E-mail: j.babb@uwinnipeg.ca

Class time: MWF 9:30 am - 10:20 am

Class location: 316 Machray Hall

Lab instructor: Carrie Paquette

Lab time: F 11:30 am - 1:00 pm

Lab location: 311 Machray Hall

Calendar Description: These courses consider the theory and application of statistical techniques for analysis of spatial (geographic) data. Topics will include: pitfalls and potential of spatial data, areal units and spatial autocorrelation (joins count statistics, Moran's I and Geary's c statistics), point pattern analysis (measures of density, distance and dispersion), and spatial statistics for fields (trend surfaces, semivariograms and kriging). Use of SAS and R statistical software and some spreadsheet software may be required. In comparison to STAT 4600 students, students registered in the graduate course STAT 7240 will be responsible for more theoretical content and will receive more extensive assignments and additional assigned readings. Note: STAT 4600 and STAT 7240 do not deal exclusively with geographic information systems or specific mapping software.

Textbook (required):
- R. Webster, M.A. Oliver (2007). ***Geostatistics for Environmental Scientists***, 2nd Edition. Wiley, Chichester, UK.

Supplementary textbooks:
- David O'Sullivan, David J. Unwin (2010). ***Geographic Information Analysis***, 2nd Edition. John Wiley & Sons, Inc., Hoboken, NJ.
- Cliff, A.D. and Ord, J.K. (1973). ***Spatial autocorrelation***, Pion Limited, London.

Assigned readings: Various articles to be announced.

Statistical software: SAS, R.

List of topics (tentative):

The order of topics may change. Some topics may be omitted due to time constraints.

Module 0: Introduction to Spatial Data
- Overview of geographic information analysis
- Pitfalls and potential of spatial data
- Maps as outcomes of stochastic processes
- Critiques of spatial statistical analysis

Module 1: Areal Units and Spatial Autocorrelation
- Areal units
- Geometric properties of areal units
- Spatial autocorrelation
    Joins count statistics, Moran's I, Geary's C, extensions

Module 2: Point Pattern Analysis
- Point patterns
- Density-based measures
    Intensity, quadrat count methods, kernel density estimation
- Distance-based measures
    Nearest-neighbour distances, distance functions: G, F and K
- Indices of dispersion

Module 3: Fields and Spatial Statistics
- Fields
- Statistical summaries
    Basic descriptive statistics, assessing skewness, principal components analysis
- Spatial Interpolation
    Trend surface analysis, semivariograms, kriging, extensions

Assignments and Group Project: There will be five assignments and one group project. Assignments must be done independently; they are not a group effort. They need not be typed, but must be legible. Each assignment should have a cover sheet listing the name of the course, assignment number and your name and student number. Assignments that are late by up to one class day may be penalized 10%; later assignments may not be accepted.

Grading scheme:
Assignments	35 %	
Group project	15 %	
Term test	20 %	
Final exam	30 %	

Miscellaneous: Please refer to the sections in the *University of Manitoba Undergraduate Calendar* dealing with academic dishonesty, including plagiarism, cheating, and examination impersonation.