SPRING 2016 - STAT 857 G100

SPACE-TIME MODELS (4)

Class Number: 5618 *Delivery Method: In Person*

COURSE TIMES + LOCATION:

Tu, Th 2:30 PM – 4:20 PM
AQ 5004, Burnaby

INSTRUCTOR:

Luke Bornn
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778-782-9975
Office: SC-K10557

PREREQUISITES:

STAT 830 or permission of the instructor.

Description

CALENDAR DESCRIPTION:

The theory and application of statistical approaches for the analysis of spatial and time dependent data. Topics will include: point pattern analysis, spatial autocorrelation analysis, geostatistics, lattice processes, modeling spatial count and binary data, spatio-temporal models and time series analysis.

COURSE DETAILS:

1. Visualization and exploration of spatial data, smotthing of maps for rates
2. Point pattern analysis: assessing whether a pattern of locations is clustered, spaital point processes, nearest neighbour statistics, bivariate and space-time point patterns
3. Spatial autocorrelation analysis: descriptive statistics for spatial autocorrelation, constructing spatial weighths, visualizing spatial auotcorrelation, local indicators of spatial association, multivzriate spatial correlation
4. Geostatistics: variograms, kriging
5. Lattice processes; Markov chains; Markov random fiels; neighbourhoods; joint distributions; joint distributions from conditionals; pairwise interactions
6. Conditional exponential distributions and pairwise only distributions; conditional autoregressive models; selection of neighbourhoods; auto-Poisson distribution; auto-binomial distribution
7. Spatial simultaneous and conditional models; moving average models; autoregressive moving average models; parameter estimation; connections to time series analysis
8. Mixture models; zero-heavy spatial count data
9. Extenstion to spatio-temporal analyses

Grading

Homework	30%
Participation	10%

Paper Presentation	10%
Final Project	50%

Materials

RECOMMENDED READING:

Spatial Statistics:

Statistics for Spatial Data by Noel Cressie
Statistics for Spatio-Temporal Data by Noel Cressie and Chris Wikle
Handbook of Spatial Statistics by Gelfand, Diggle, Fuentes, and Guttorp Online in Library
Model-based Geostatistics by Diggle and Ribeiro Online in Library
Applied Spatial Data Analysis with R by Bivand, Pebesma, and Gomez-Rubio Online in Library
Spatial Statistics and Spatio-Temporal Data by Michael Sherman Online in Library
Hierarchical Modeling and Analysis for Spatial Data by Banerjee, Carlin, and Gelfand

R Programming:

The Art of R Programming by Normal Matloff Online in Library, Online in Library

Machine Learning:

Elements of Statistical Learning by Hastie, Tibshirani, Friedman Online in Library
Machine Learning: A Probabilistic Perspective by Kevin Murphy
Bayesian Reasoning and Machine Learning by David Barber Online in Library

GRADUATE STUDIES NOTES:

Important dates and deadlines for graduate students are found here: http://www.sfu.ca/dean-gradstudies/current/important_dates/guidelines.html. The deadline to drop a course with a 100% refund is the end of week 2. The deadline to drop with no notation on your transcript is the end of week 3.

REGISTRAR NOTES:

SFU's Academic Integrity web site http://students.sfu.ca/academicintegrity.html is filled with information on what is meant by academic dishonesty, where you can find resources to help with your studies and the consequences of cheating. Check out the site for more information and videos that help explain the issues in plain English.

Each student is responsible for his or her conduct as it affects the University community. Academic dishonesty, in whatever form, is ultimately destructive of the values of the University. Furthermore, it is unfair and discouraging to the majority of students who pursue their studies honestly. Scholarly integrity is required of all members of the University. http://www.sfu.ca/policies/gazette/student/s10-01.html

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