STA465/ STA2016: THEORY AND METHODS FOR COMPLEX SPATIAL DATA (WINTER 2019/20)

Instructor: Daniel Simpson

Office Hours: Thursday 3-4pm (Excluding week 1)
Friday 1-2pm
Other times by appointment only

Email: simpson@utstat.toronto.edu

Communication: In general, I am not able to answer questions about the course material by e-mail. Before you send an e-mail, make sure that you are not asking for information that is already on the course web site, or questions about the course material or assignments that are more appropriately discussed in tutorial or during office hours. If you do not get a response, this may be why. Questions about the course material can be posted on the discussion board on Blackboard. I will check it at least once every 2 days.

E-mail is appropriate for private communication. Use your utoronto.ca account to ensure that your message doesn't automatically go to my Junk folder. I will generally answer e-mail within one business day.

Announcements will be posted on Blackboard. Please check there regularly. If an urgent matter arises, I may contact the entire class by e-mail. In order to receive these messages, please make sure that your ROSI account has your utoronto.ca e-mail.

Lectures:

Thursday 13:00–14:00, SS 2110 (Sidney Smith)
Friday 11:00–13:00, SS 2110 (Sidney Smith)

Assessment:

	WEIGHT	DATE	TIME
HOMEWORK 1	5%	Friday 24 January	Due 12:00pm (Midday)
HOMEWORK 2	5%	Friday 31 January	Due 12:00pm (Midday)
ASSIGNMENT 1	20%	Friday 28 February	Due 12:00pm (Midday)

HOMEWORK 3	5%	Friday 13 March	Due 12:00pm (Midday)
HOMEWORK 4	5%	Friday 27 March	Due 12:00pm (Midday)
FINAL EXAM	60%	Set by Faculty	

Practice problems will be posted on the web for each chapter. The practice problems are to help you prepare for the assignments and exam and are not to be handed in.

The assignments will each be a data analysis project for which you will use R. You will not need to know R syntax on the exam, but you may need to interpret output from R.

No late assignments will be accepted without documentation of a valid reason. ‘

Any requests to have marked work re-evaluated must be made in writing within two weeks of the date the work was returned to the class. The request must contain a justification for consideration.

Re-grading policy:

Regrading requests should only be made for genuine grading errors, and should be initiated by writing or typing a complete explanation of your concern (together with your full name, student number, and e-mail address) on a separate piece of paper, and giving this together with your original unaltered homework/test paper to the instructor within two weeks of when the graded item was first available. Warning: your mark may end up going down rather than up.

Textbook and slides:

- This course has no specific textbook, however the following two books, which are electronically available from the library, will be referred to on occasion:
  - *Spatial and spatio-temporal Bayesian models with R-INLA* by Marta Blangiardo and Michela Cameletti
  - *Statistical Analysis and Modelling of Spatial Point Patterns* by Janine Illian, Antti Penttinen, Helga Stoyan, and Dietrich Stoyan
- Further information will be contained in slides, handouts, and specific references that will be available on Quercus before classes.

Computing:

- The course will be run using the R computing environment.
- This course will use the R package INLA. This is not available from CRAN but can be installed into R using the command
  install.packages("INLA", repos=c(getOption("repos"), INLA="https://inla.r-inla-download.org/R/testing"), dep=TRUE)

- You are strongly encouraged to use RStudio (https://www.rstudio.com), which is a free IDE for R.

- All instructions in the course will assume that you have the latest version of both RStudio and R installed. We will not answer any R related questions unless both of these things are true.

Course outline:

This course will cover practical and theoretical aspects relevant to the analysis of spatial data. The course will cover some of the following topics:

- Linear regression as a Bayesian model
- Multivariate Gaussian distributions and conditional independence
- Bayesian multilevel models
- Models for areal data
- Model checking, validation, and workflow
- Gaussian random fields in theory and practice
- Modelling non-Gaussian spatial data
- Point processes and log-Gaussian Cox processes