STA450H1-S Topics in Statistics

Statistical Methods for Emerging Infectious Disease Management

Patrick Brown

Fridays 10:00-13:00, UC 140

- Head TA: TBA
- TA office hours: TBA
- Course web page: q.utoronto.ca/courses/245007
- Instructor's office hour: TBA

Course description

The course will focus the using and interpreting advanced statistical methods with applications in infectious diseases. The course is a mixture of theory and applications, and will include a number of assignments which will involve computing with R.

Statistical methodology to be covered includes:

- Reproducible research with R
- generalised linear models and maximum likelihood estimation
- Bayesian inference using INLA
- generalized linear mixed models
- semi-parametric regression
- survival analysis
- Spatial models and disease mapping

Lecture format

Prerequisites (Informal)

- STA303 is the official prerequisite
- Material from the second year statistical theory courses which are prerequisites to STA302 will be drawn on extensively
- Knowledge of programming with R is essential

Grading

Three assignments will each account for 10% of the final grade, with a midterm of 20% and a final exam providing the remaining 50%.

Assignments

- (February 11) Assignment 1: Individual-level models
- (March 11) Assignment 2: Forecasting and Spatial Modelling
- (April 1) Assignment 3: Mismeasurement classification and Seroprevalence

Exams

Midterm

The midterm will cover the majority of the first five lectures on Individual-level models. Midterm will be on 18 Feb.

Final Exam

The exam will consist of four questions and will cover all topics in all lectures and assignments to assess the student's understanding of the material and its application.

Computing

Students will need to have access to a computer running a recent version of R, and several additional packages for R will be installed. Those not familiar with R are encouraged to become so within the first few weeks of the course.

Syllabus

- (January 14) Lecture 1: Deterministic SIR

  - Basic SIR model and application

- (January 21) Lecture 2: Stochastic SIR

  - Models and inference

- (January 28) Lecture 3: Stochastic SIR

  - Applications and interpretation

- (February 4) Lecture 4: Spatial SIR

  - models and inference

- (February 11) Lecture 5: Infectious Disease Epidemiology

- (Feburary 18) Midterm
- (February 25) Lecture 7: Forecasting, Time Series
  - Random walks and Bayesian semi-parametrics
  - GCAM model
- (March 4) Lecture 8: Spatial Random Effects Models
- (March 11) Lecture 9: Mismeasurement classification
- (March 18) Lecture 10: Mismeasurement classification
- (March 25) Lecture 11: Serosurveys
- (April 1) Lecture 12: Infectious Disease Epidemiology
- Final Exam: to be scheduled centrally