STAT 536F: Statistical theory for the design and analysis of clinical studies — Biostat Part 2

February 27 – April 12, 2024 (1.5 credits)

Instructor: Professor Harry Joe, Dept of Statistics

Lectures: Tuesday & Thursday, 16:00 – 17:30

Prerequisite: Open to any interested graduate students in the Department of Statistics. Graduate students from other departments are welcome, provided they have sufficient statistical and mathematical backgrounds (roughly, mathematical statistics to the level of UBC STAT 460/461). Such students should consult the instructor about suitability. This course is aimed at training statisticians or biostatisticians, so understanding the math and computing behind the methods is the central part of the course.

Text: No required textbook. Some lecture notes will be posted on the course web site. References will be given to books electronically available at www.library.ubc.ca

Description: The course covers basic ideas of some commonly used statistical models and methods in practice, especially in epidemiologic studies and health research. Since this course covers a wide variety of topics, the emphasis will be on understanding of the basic ideas and theory, applications of the models/methods, and data analysis and writing skills in general.

Topics:

- Types of studies/designs in biostatistics, including for pharmaceutical and vaccine trials.
- Design of clinical trials, including sample size based on power.
- Meta-analysis.
- Analysis of survival data, including censoring, Kaplan-Meier estimator, log-rank test, Cox regression, and Weibull regression. Use of numerical minimizer for negative log-likelihood (e.g., `nlm` in R).
- Analysis of clustered data, generalized linear mixed models, adaptive Gauss-Hermite quadrature.
- If time permits, causal inference and propensity scores in observational studies.
- Case studies: Reading publications in health and medical sciences to understand how statistical analyses are reported and interpreted.

Evaluation: Class participation & in-class activities.

Homework includes the following types: (a) data analysis with interpretations; (b) verifying details and exercises left in course notes, with writing using proper math notation; (c) verifying output in statistical software.

The term project might involve discussing a publication involving a clinical study and verifying results that are reported.