

STAT 460/560 - STATISTICAL INFERENCE I

Updated for 2017/18, TERM II

Course description: A detailed theoretical development: statistical models, exponential families, sufficiency, completeness, and detailed properties of point estimation. Intended for Honours and graduate students.

Pre-requisites: MATH 320; STAT 305 are recommended. For others, consult the instructor.

Textbook: Lecture notes will be posted.

Instructor: Jiahua Chen, ESB3136, jhchen@stat.ubc.ca

Time/Place: MWF 11:00-12:00 pm, ESB 4192

References:

Bickel and Doksum (2016), *Mathematical Statistics*. Volumes 1 and 2. CRC Press.

Hogg, McKean and Craig (2005). *Introduction to Mathematical Statistics*. Prentice Hall.

A.C. Davison (2003), *Statistical Models*.

Cox and Hinkley (1974). *Theoretical Statistics*. Chapman and Hall.

J. Shao (1998). *Mathematical Statistics*. Springer-Verlag.

E.L. Lehmann (1983) *Theory of Point Estimation*. Wiley/Wadsworth.

C.R. Rao(1980). *Linear Statistical Inference and its Applications*. Wiley.

Topics

1. Statistical models, goals and performance criteria.
Data, Model, Parameters and statistics; Sufficiency, Completeness, Ancillary and Pivotal; Exponential families.
2. Properties of normal distributions. t-distribution, F-distribution, χ^2 -distribution; Quadratic forms.

3. Methods of Estimation.

Method of moments; Maximum likelihood estimation; Estimating functions; M-estimate; L-estimate; U-statistics; Bayes estimations;

4. Optimality criterion.

C-R inequality; Efficiency; Asymptotic properties; Robust estimation.

5. Algorithmic issues.

The method of bisection; Coordinate ascent, Newton-Raphson algorithm, EM-algorithm.

6. Linear models and least squares.

Gauss-Markov theorem; cross-validation; Generalized cross-validation; Variable selection.

7. Nonlinear models.

Kernel method, Local linear method and Splines.

Assignments, Midterm and Final: There will be one in-class midterm and one regular final exam.

We aim at giving 50 assignment problems for the whole semester (reductions for undergraduate students in Stat460). Please write on regular lined papers with a ball-pen and in double space. If you use latex, choose a big font and use double space! Start a new page when you start a new problem. Skip two lines when you start a new part of a problem. Explain your steps to ensure that the TA and/or myself can understand your logic.

Marking will emphasize the logical flow in addition to the correctness. A smooth answer with generally correct answer is sufficient for full mark. We may refuse to mark Illogical answers. TA will be instructed to provide

as much comments as possible. Do ask the instructor/TA if you do not understand or agree with these comments.

Final grade: If one attains 50% or higher mark in the final exam, then his final grade will be:

40% assignment + 40 % midterm + 40% final exam - 20% of the worst of midterm/final.

Otherwise, the final grade will be calculated as 25% + 25% + 50%.