STAT 461/561 - STATISTICAL INFERENCE II
Updated for 2017/18, TERM II

Course description: Detailed development of the theory of testing hypotheses and confidence regions, Bayesian models and inference, elements of decision theory and additional topics. Any contemporary topics we come up with (e.g. Bootstrap, FDR, Lasso, Empirical likelihood). Intended for honours students and graduate students.

Pre-requisites: Stat460/Stat560 or consult the instructor.

Textbook: Lecture notes will be posted.

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

Website: Part of instructor's website or any convenient alternative.

References:

Bickel and Doksum, Mathematical Statistics. Volumes 1 and 2. CRC Press.
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 significance test: Null hypothesis, Alternative hypothesis, Pure significance test, General notion of statistical significance test.

2. Optimality discussions on hypothesis tests: Neyman-Pearson Lemma, Uniformly most powerful for one-sided alternative, Monotone likelihood ratio, Existence of UMPU tests, Locally most powerful test.

3. Likelihood based hypothesis test: Likelihood ratio test, Score test, Wald test. Goodness-of-fit test.

4. Inferences for data with normal distribution: One-sample problem, Test for equal variance, Test for equal mean under equal variance assumption, Test for hypothesis in linear models.

5. Non-parametric test: One-sample sign test. Two-sample permutation test, Wilcoxon two-sample rank test, Kolmogorov-Smirnov and Cramér-von Mises tests.

6. Confidence intervals or confidence regions: Confidence interval via hypothesis test, Confidence interval via pivotal quantities, Likelihood intervals, Prediction intervals.

7. Empirical likelihood: Likelihood ratio function and profile likelihood, Numerical problem, Hypothesis test and confidence region, Adjusted empirical likelihood.

8. Resampling: Estimating Variance estimation, Estimating cumulative distribution function, Bootstrap Confidence Intervals.

9. Multiple comparison: Analysis of variance for one-way layout, The Bonferroni Method, Tukey Method, False discovery rate.

10. Variable selection/Model selection problem: Bayesian information criterion, Consistency of BIC, Extended BIC, Regularization methods.

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%.