STAT 461/561 - STATISTICAL INFERENCE II
Updated for 2014/15, 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.

Topics covered in year 2014/2015

1. General discussion: Discipline of Statistics, Probability and Statistics model, Statistics inference. Point estimation.
2. Statistical significance test: Null hypothesis, Alternative hypothesis, Pure significance test, General notion of statistical significance test.
3. 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.
4. Likelihood based hypothesis test: Consistency of MLE for one-dimensional θ and as a local maximum, Likelihood ratio test, Score test, Wald test.
5. Inferences for data with normal distribution: One-sample problem, Test for equal variance, Test for equal mean under equal variance assumption.
6. Non-parametric test: One-sample sign test. Two-sample permutation test, Wilcoxon two-sample rank test, Kolmogorov-Smirnov and Cramér-von Mises tests.
7. Confidence intervals or confidence regions: Confidence interval via hypothesis test, Confidence interval via pivotal quantities, Likelihood intervals, Prediction intervals.

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

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

10. Multiple comparison: Analysis of variance for one-way layout, The Bonferroni Method, Turkey Method,

11. False discovery rate, (regularization methods such as Lasso and Scad will be added this year).

12. Variable selection/Model selection problem: Bayesian information criterion, Consistency of BIC, Extended BIC.