

Reference: <https://iitk.ac.in/math/index.php/2014-05-21-10-30-47/courses> (MTH 418)

Syllabus: Pre-requisite: MSO 201, None for M.Sc. 2 yr Stats

Exponential families-introduction, canonical form, full rank; Sufficient statistic-sufficiency, Neyman Fisher factorization criterion, minimal sufficiency; Ancillary statistic; Completeness-completeness of family of distributions, completeness of statistic; Basu's theorem and its uses; Rao-Blackwell theorem and its implications; Unbiasedness-basic concepts, locally minimum variance unbiased estimator, uniformly minimum variance unbiased estimator, Lehmann- Scheffe's theorem and its importance; Methods for finding UMVUE-method of solving, Rao-Blackwellization; Non-parametric families and Hoeffding's U-statistic; Information inequality and lower bounds-Hammersley-Chapman-Robbins inequality, Fisher information, Cramer-Rao lower bound; Information inequality for multi-parameter case-information matrix, s-parameter exponential family, Bhattacharya system of lower bounds; Methods of estimation-MLE, MOME, MinMSE; Basic concepts in statistical hypotheses testing-simple and composite hypothesis, critical regions, Type-I and Type-II errors, size and power of a test; Neyman-Pearson lemma and its applications; Type of optimum tests and their construction using NP lemma-Most powerful test, uniformly most powerful test, unbiased test and uniformly most unbiased test; Monotone Likelihood ratio and testing with MLR property; Testing in one-parameter exponential families-one sided hypothesis, UMP and UMPU tests for different two-sided hypothesis; Testing in multi-parameter exponential families-tests with Neyman structure, UMP and UMPU similar size-tests; Likelihood Ratio test; Confidence intervals-pivotal functions, shortest expected length confidence interval, UMA and UMAU confidence intervals.

Reference materials:

1. John Rice: Mathematical Statistics and Data Analysis, 3rd edition
2. Jun Shao: Mathematical Statistics, 2nd edition
3. George Casella and Roger Berger: Statistical Inference, 2nd edition

Credits: 11

