MA 538: STATISTICAL INFERENCE (3-1-0: 4)

Parametric Models

Problems of inference, random sample and its likelihood, statistic and its sampling distributions. Examples from standard discrete and continuous models such as Bernoulli, Binomial, Poisson, Negative Binomial, Normal, Exponential, Gamma, Weibull, Pareto etc.

Point Estimation

Concept of sufficiency, minimal sufficiency, Neyman factorization criterion, unbiasedness, Fisher information, exponential families. Maximum likelihood estimator (MLE), method of moment estimator (MME), consistency results of the MLE's and the MME's. Asymptotic relative efficiency, consistent and asymptotic normal (CAN) estimators, uniformly minimum variance unbiased estimator (UMVUE), Rao-Blackwell theorem, Cramer-Rao lower bound, completeness, Lehmann-Scheffé Theorem, different applications. Ancillary statistics, Basu's Theorem. Bayes estimators, limit of Bayes estimators, minimax estimators and their relations.

Testing of Hypothesis

Statistical hypotheses-simple and composite, statistical tests, critical regions, Type-I and Type-II errors, size and power of a test, Neyman-Pearson lemma and its different applications. Families with monotone likelihood ratio, most powerful test, uniformly most powerful (UMP) test, unbiased test and uniformly most unbiased test. Likelihood ratio test.

Interval Estimation

Confidence intervals, construction of confidence intervals, shortest expected length confidence interval, most accurate one sided confidence interval and its relation to UMP test.

Text Books and References

1. G. Casella and R. L. Berger, “Statistical Inference”, Duxbury Press
2. V.K. Rohatgi and A.K. Saleh, “An Introduction to Probability and Statistics”, Wiley India Pvt. Ltd.
3. E.L. Lehmann and G. Casella, “Theory of Point Estimation”, Springer
4. E.L. Lehmann and J.P. Romano, “Testing of Statistical Hypotheses”, Springer
5. M.H. DeGroot, “Probability and Statistics”, Addison-Wesley

Prerequisites: Probability and Statistics (MA 410) and Mathematical Analysis