STA 2212S: Mathematical Statistics II
Syllabus   Spring 2025

Week	Date	Methods	References
1	Jan 7	Likelihood inference: review of ML estimation; profile likelihood; KL divergence; asymptotic theory ~~mis-specified models; computation;~~ nonparametric mle	MS §§5.1–7, SM Ch 4
2	Jan 14	delta method; calculating MLEs; likelihood ratio statistic ~~Bayesian estimation; Bayesian inference~~	MS §5.7; SM §4.5
3	Jan 21	significance functions; misspecified models; Bayesian estimation; ~~Optimality in estimation~~	MS §§5.5, 5.8; SM §4.5; AoS Ch 11
4	Jan 28	Bayesian inference; choosing priors; ; marginal posteriors ~~Interval estimation; Confidence bands~~	MS §5.8; SM Ch 11; AoS Ch 11
5	Feb 4	Bayesian hierarchical models; finite-sample optimality; asymptotic optimality; efficiency; decision theory ~~Hypothesis testing; likelihood ratio tests~~	SM §11.4; MS §§6.4, 6.5. 6.2
6	Feb 11	Decision theory; Bayes risk; Interval Estimation ~~Significance testing~~	MS §6.2, §§7.1,2; AoS Ch 12; SM §11.5.2
	Feb 18	Break	
7	Feb 25	Theory of testing	MS Ch 7; SM §7.3; AoS Ch 10
8	Mar 4	LRTs and Goodness-of-fit tests	MS Ch 9; AoS §§10.3,4,5,8; SM p.327-8 (hard)
9	Mar 11	Multiple testing and FDR	AoS Ch 10.7, EH Ch 15.1,2
10	Mar 18	Intro to causal inference	AoS Ch 16, 17 SM Ch 9.1.2
11	Mar 25	Aspects of analysis with missing data	SM 5.3,5 AoS Eg. 11.9
12	Apr 1	Loose Ends, Recap, and Project Presentations	

References

MS: *Mathematical Statistics* by K. Knight (Chapman & Hall/CRC).

AoS: *All of Statistics* by L. Wasserman (Springer) If your copy has a **Chapter 1. Introduction**, then all Chapter numbers increase by 1.

SM: *Statistical Models* by A.C. Davison (Cambridge University Press)

EH: *Computer Age Statistical Inference* by B. Efron and T. Hastie (Cambridge University Press)