STA 6327 **Introduction to Theoretical Statistics 2** **Spring, 2023**

Course Information

Sta 6327. Section:

Time: MWF Period 7 (1.55 pm-2.45 pm) **Location:** G Flo 230

Instructor: Dr. Sayar Karmakar

Office: `https://ufl.zoom.us/j/97605846243` **E-mail:** `sayarkarmakar@ufl.edu`

Office Hours: Wednesday 2.45-4.45 pm over zoom

Class mode: In-person

Exceptions:

- Mar 20 Class online.
- Apr 24: No class / Reserved if some class is missed due to university closing

Teaching Assistant: Cheng Zeng Office: G FLo 218 **E-mail:** `czeng1@ufl.edu`

Office Hours: Tuesday 2-4.30 pm

Text: 2nd edition of Statistical Inference by Casella and Berger.

PS: Your primary study material should be your lecture notes. As a reference, we will use the 2nd edition of Statistical Inference by Casella and Berger. We will cover selected topics from Chapter 5 to Chapter 10, along with additional material not in the book.

Running list of topics: Indexed by lecture number

1. General statistical framework, fundamental principle of statistics
2. Sufficiency, Factorization theorem
3. Method of moments
4. Maximum likelihood estimation – definition
5. Maximum likelihood estimation – examples
6. Maximum likelihood example – linear model (derivation of MLE)
7. Maximum likelihood – linear model (derivation of distribution of MLE)
8. Maximum likelihood – linear model (derivation of distribution of MLE)
9. EM algorithm – Normal mixture example
10. EM algorithm – General form
11. Invariance of the MLE

12. Convergence of the EM algorithm
13. EM algorithm – Probit regression
    Exam 1
14. Bayesian statistics – Introduction
15. Bayesian statistics – Examples
16. Bayesian statistics – Data Augmentatin (DA) algorithm
17. DA algorithm – Probit regression example
18. DA algorithm – Normal mixture example
19. Uniformly Minimum Variance Unbiased Estimation (UMVUE) – Introduction
20. UMVUE – Function of complete, sufficient statistic
21. UMVUE – Conditioning on complete, sufficient statistics
22. UMVUE – Proofs
23. Cramer-Rao inequality
24. Cramer-Rao inequality (attainment of lower bound)
25. Hypothesis testing – Introduction
26. Likelihood ratio test
    Exam 2
27. Likelihood ratio test – further examples
28. Size of a test and choice of cutoff for the rejection region
29. Randomized test functions, Binomial LRT
30. Power function and Most Powerful tests
31. Neyman-Pearson lemma – proof
32. Neyman-Pearson lemma – examples
33. Karlin-Rubin theorem, p-value
34. Confidence regions
35. Revision of convergence concepts
36. Methods of establishing consistency
37. Consistency of MLE
38. Methods of establishing asymptotic normality
39. Asymptotic normality of MLE and Lyapunov CLT
    Exam 3

Grades

- Three in class exams cover 30% each and homework problems cover 10%. No late homeworks are accepted
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		A	91 to 100	A-	88 to $<$ 91
B+	84 to $<$ 88	B	80 to $<$ 84	B-	77 to $<$ 80
C+	74 to $<$ 77	C	70 to $<$ 74	C-	67 to $<$ 70
D+	64 to $<$ 67	D	60 to $<$ 64	D-	55 to $<$ 60
E	$<$ 55				

Exam dates

- The in-class (**non-cumulative**) exams are **tentatively** scheduled:

  Exam 1: Feb 10

  Exam 2: Mar 22

  Exam 3: Apr 26

Policies

Students are responsible for all material covered in class. If you are absent, make arrangements with a classmate to borrow the notes and any handouts from them. Handouts will be distributed once and only once