SYLLABUS FOR STATISTICS 100B - LECTURE 2
INTRODUCTION TO MATHEMATICAL STATISTICS
SUMMER SESSION C 2021

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Office hours: MWF 12:00 - 14:00, TR 15:00 - 17:00, Saturday 17:00 - 19:00.

Lecture	Day	Class Time	Location
Lecture 2	TR	09:00 - 10:50	Online - Recorded

Section	Day	Discussion Time	Location
2A	TR	11:00 - 11:50	Online - Recorded
2B	TR	12:00 - 12:50	Online - Recorded

Teaching Assistant: Conor Kresin.

OFFICE HOURS:
Office hours are offered every day including weekends. Do not hesitate to come to office hours if you have any questions. It will be great to see you! The office hours are on MWF 12:00 - 14:00, TR 15:00 - 17:00, Saturday 17:00 - 19:00.

RESOURCES:
Textbook (optional):
John Rice, *Mathematical Statistics and Data Analysis,* Third Edition, Duxbury Press, 2006.

Handouts can be accessed at `http://www.stat.ucla.edu/~nchristo/statistics100B/`.

Probability and Statistics EBook (freely available at):
`http://wiki.stat.ucla.edu/socr/index.php/EBook`.
Software: `R` (can be downloaded freely from `http://cran.stat.ucla.edu/`), and Statistics Online Computational Resource (SOCR), freely available at: `http://www.socr.ucla.edu/`.

COURSE PREREQUISITES:
Statistics 100A or Mathematics 170A.

COURSE DESCRIPTION AND OBJECTIVES:
Statistics 100B mainly deals with parameter estimation of various distributions. The problem is stated as follows: Suppose $X_1, X_2, \ldots, X_n$ are i.i.d. random variables from a distribution with pdf $f(x;\theta)$, where θ is unknown. Given this sample we would like to find an estimate of the parameter θ. We will also discuss properties of estimators, confidence intervals, and hypothesis testing. The t, χ^2, and F distributions will be discussed at the beginning of the course. They are very important in statistical inference. If time permits we will also discuss simple regression and correlation (this will be an introduction to Statistics 100C).

COURSE TOPICS

1. Exponential families.
2. Moment generating functions of random variable. Distribution of a function of a random variable. Joint probability distribution of functions of random variables.
3. Random vectors.
4. Joint moment generating functions for a random vector, multivariate normal distribution.
5. The central limit theorem and the law of large numbers. The distribution of the sample mean and sum of n independent and identically distributed random variables.
6. The χ^2, t, and F distributions.
7. Estimation and properties of estimators. Cramér-Rao inequality. Information and information matrix.
8. Method of moments and method of maximum likelihood. Estimation of the simple regression model using the method of maximum likelihood. Asymptotic properties of maximum likelihood estimates for the univariate and multi-parameter case.

9. Order statistics.
10. Data reduction: Sufficient statistics.
11. Factorization theorem.
12. Minimal sufficiency, Lehmann and Scheffé theorem.
13. Rao-Blackwell theorem, minimum variance unbiased estimators (MVUE).
14. Confidence intervals.
15. Hypothesis testing. Neyman-Pearson lemma, power functions and likelihood ratio tests.

COURSE POLICIES:
Zoom etiquette:

- If you can, please be on time and be prepared with your device charged. Make sure all tech works 5-10 minutes before the meeting.
- Mute yourself to eliminate background noise. You can unmute yourself when asking a question.
- You can also use the chat function when needed so the instructor can respond to questions promptly.
- All lectures will be delivered live and attendance is highly recommended. The lectures will be recorded and the videos will be posted on CCLE on the same day.

ACCOMODATIONS:
Students needing academic accommodations should contact the Center for Accessible Education (CAE): `http://www.cae.ucla.edu`) or call (310) 825-1501.

STUDENT RESOURCES:

- Student resources for remote learning: `https://teaching.ucla.edu/resources/students/` .
- COVID-19. You can find information for students related to COVID-19 here: `https://covid-19.ucla.edu/information-for-students/`.
- Counseling and psychological services (CAPS): `https://www.counseling.ucla.edu` .
- Resources on Equity, Diversity, and Inclusion: `https://equity.ucla.edu/know/`.
- Undocumented Student Program (USP): `https://www.usp.ucla.edu` .
- Students can embrace their identities - LGBTQ Center: `https://www.lgbt.ucla.edu` .

COURSE GRADES:
We will maintain the academic rigor of an upper division mathematical course in statistics while being flexible in student assessment. There will be two quizzes, one midterm exam, weekly homework, and a final exam.

1. Final exam (35%): This will be a 3-hour exam assigned on Thursday, 09 September and can be taken starting at 17:00. The exam must be uploaded 3 hours after downloading and completed before 17:00 on 10 September.
2. Midterm exam (25%): This will be a 2-hour exam assigned on Tuesday, 24 August and can be taken starting at 17:00. The exam must be uploaded 2 hours after downloading and completed before 17:00 on 25 August.
3. Two quizzes (20%): Assigned during week 2 and 5. These will be take-home quizzes and will be submitted in 24 hours after they are assigned.
4. Weekly homework (20%). There is flexibility on the submission due dates. Homework can still be uploaded 48 hours after the due date. Part of the homework will be discussed during TA sessions.

All assignments will be uploaded on `Gradescope` (`https://www.gradescope.com`).

The course grade will be based on the calculation:

$$\text{Final score} = 0.20 \times \text{Homework} + 0.20 \times \text{Quizzes} + 0.25 \times \text{Midterm} + 0.35 \times \text{Final}$$

COMMUNICATION:
Please keep a current e-mail address with my.ucla.edu in order to receive class announcements and reminders.

IMPORTANT DATES:
First class: 03 August.
Last class: 09 September.
Holidays: Labor Day, Monday, 06 September.

EXAMS:
Final exam: Thursday, 09 September.
Midterm exam: Thursday, 24 August.
Quiz 1: Week 2.
Quiz 2: Week 5.

Good Luck !!!