SYLLABUS FOR STATISTICS 100B - LECTURE 1
INTRODUCTION TO MATHEMATICAL STATISTICS
WINTER QUARTER 2018

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Office hours: MTWRF 15:00-17:00

Lecture	Day	Class Time	Location
Lecture 1	MWF	14:00 - 14:50	Public Affairs Building 1234

Section	Day	Discussion Time	Location
1A	T	17:00 - 17:50	Royce Hall 156
1B	T	16:00 - 16:50	Royce Hall 156

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`, `RStudio` (can be downloaded freely from `http://cran.stat.ucla.edu` and `https://www.rstudio.com`).
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 for a one random variable.
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.
8. Method of moments and method of maximum likelihood. Simple regression. Asymptotic properties of maximum likelihood estimates for the univariate and multi-parameter case. Fisher information.
9. Order statistics.
10. Data reduction: Sufficient statistics.
11. Factorization theorem.
12. Minimal sufficiency and MVUE.
13. Lehmann and Scheffé theorem.
14. Rao-Blackwell theorem.
15. Confidence intervals.
16. Hypothesis testing. Neyman-Pearson lemma, power functions and likelihood ratio tests.

COURSE POLICIES:
Please remember to turn off cell phones. The use of laptop computers will not be permitted in class unless there is a lab activity during lecture. Students needing academic accommodations based on a disability should contact the Center for Accessible Education (CAE) at (310) 825-1501 or in person at Murphy Hall A255. For more information visit `http://www.cae.ucla.edu`.

ACADEMIC INTEGRITY:
You are expected to adhere to the honor code and code of conduct. As a student and member of the University community, you are here to get an education and are, therefore, expected to demonstrate integrity in your academic endeavors. All students must uphold University of California Standards of Student Conduct as administered by the Office of the Dean of Students. Students are subject to disciplinary action for several types of misconduct, including but not limited to: cheating, multiple submissions, plagiarism, prohibited collaboration, facilitating academic dishonesty, or knowingly furnishing false information. You may have assignments or projects in which you work with a partner or with a group. For example, you are welcome, and even encouraged, to work with others to solve homework problems. Even though you are working together, the assignment you submit for a grade must be in your own words, unless you receive specific instructions to the contrary. For more information about academic integrity, please go to `http://www.deanofstudents.ucla.edu/`.

COURSE GRADES:
There will be two midterm exams, a final exam, and homework or labs that will be assigned every week. Please write your name and staple your homework and labs. Late homework or labs will not be accepted and make-up exams will not be given. Being in class on time and fully participating is important for your understanding of the material and therefore for your success in the course. The tentative dates for the exams are shown below.

The course grade will be based on the calculation:

$$\texttt{Final score} = 0.15 \times \texttt{Homework/Labs} + 0.25 \times \texttt{Miderm1} + 0.25 \times \texttt{Miderm2} + 0.35 \times \texttt{Final}$$

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

IMPORTANT DATES:
First lecture: 08 January.
Last lecture: 16 March.
Holidays: 15 January (Martin Luther King, Jr.), 19 February (Presidents' Day).

EXAMS:
Midterm 1: Thursday, 01 February, 18:00 - 20:00
Midterm 2: Thursday, 22 February, 18:00 - 20:00
Final exam: Saturday, 17 March, 11:30-14:30