STA 250/MTH 342 - Intro to Mathematical Statistics (Fall 2017)

Lecture: Wed and Fri 8:30am-9:45am, Old Chem 116
Lab: Thu 3:05pm-4:20pm or 4:40-5:55pm, Old Chem 101

Instructor

Li Ma
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Tel: (919)684-2871
Office hour: Fri 9:45am–11am.

Required text:

DeGroot and Shervish, *Probability and Statistics*, 4th edition, ISBN-10: 0321500466.

Course description

This course presents an introduction to the concepts and methods of statistical inference. We will cover ideas and methods from both the classical sampling theory and the modern Bayesian approach. The plan is to cover roughly Chapters 7–11 in the textbook.

Prerequisites

Proficiency in multivariate calculus based probability theory at the level of STA 230 is required. Homework 1 is for testing your background. For another check here is a past STA 230 final exam.

Syllabus

Week	Topics	Readings
1	Course overview, Inference using Bayes theorem	Ch1-6, 7.1-7.2
2	Inference using Bayes theorem, Conjugate families	Ch7.3-7.4
3	Point estimation, likelihood	Ch7.4-7.5
4	Maximum likelihood estimation, Quiz 1	Ch7.5, 8.1, 8.7
5	Properties of MLE, Sampling distributions of estimators	Ch7.6, 8.2

6	Sampling distributions of estimators cont'ed, Quiz 2	Ch8.3, 8.4
7	Central limit theorem, Fisher's approximation	Ch8.4, 8.5
8	Interval estimation, Midterm	Ch8.4, 8.8
9	Testing simple hypotheses, NP paradigm/lemma	Ch9.1,9.2
10	Testing composite hypotheses, UMP test	Ch9.3-9.5
11	Generalized LR test, t-tests, Quiz 3	Ch9.5-9.6
12	Two sample comparison, p-values	Ch10.1-10.4
13	Testing goodness-of-fit, Categorical data, Quiz 4	Ch10.4, 11.1
14	Tests on contingency tables, linear regression	Ch11.2-11.3

Teaching assistants

Yolanda Chen, Email: yingshi.chenPANDA@duke.edu, Office hours: Mon 5pm-7pm in Old Chem 211A/025

Huijia Yu, Email: huijia.yuPANDA@duke.edu, Office hours: Tue 5pm-7pm in Old Chem 211A/025

Don't forget to remove the Chinese bear!

Homeworks

Weekly homeworks will be posted on Sakai and are due each Wednesday at the beginning of class starting from the second week. You must **show your work** to receive full credit. Late homeworks will be accepted until the solutions are posted online, but will incur a one-level grade penalty for each day it is late. The solutions will generally be posted on the Friday or Saturday following the due date. The lowest homework grade will be dropped.

Labs

There will be a total of 9 weekly lab sessions on Thursdays starting from the second week. The main purpose of the lab is to provide you with a basic training in using the statistical software package **R**. Occasionally the lab may be used for review. Grading on the labs is based on attendance and participation.

Quizzes

There will be four in-class 25-minute closed-book quizzes. You may use a scientific calculator. The lowest quiz grade will be dropped to accommodate special circumstances such as short-term illness.

Exams

There will be an in-class, closed-book midterm exam, and a close-book cumulative final. For the exams, you may bring a calculator and a letter sized cheat-sheet (which may be 2-sided).

If you have an unchangeable conflict with any of the exams, you **must** submit the appropriate university online form (NOVAP, RHoliday) and arrange with me **at least one week prior to** the scheduled exam. The make-up exam in such cases will typically occur **before** the scheduled one. If you miss the midterm due to short-term illness, you should submit the online Illness Form **before the exam**, and email me **before the exam. In such cases your final will count for both the midterm and the final.**

Grading

The course grade will consist of weekly homework (10%), weekly labs (5%), quizzes (20% total), the midterm (25%), and the final (40%). All grades are reported on Sakai.

Collaboration

Discussions on the homework problems are allowed, but you must write down your own solutions independently.

Resources

The Department of Statistical Science provides daily walk-in help hours Sunday through Thursday in Old Chem 211A. Detailed information is available here.

Academic integrity

Each student is committed to Duke's community Standard. No form of academic dishonesty will be tolerated. Some examples include cheating, plagiarism, and lying about illness or other reasons for absence. Violations of the standard will result in failure of this course and will be reported to the Office of Student Conduct.