

STAT 510: Mathematical Statistics I

2020 Spring

Tue & Thu 8:00AM – 9:20AM, 245 Altgeld Hall

Course Information

Instructor: Yun Yang, Assistant Professor, Department of Statistics, 104F Illini Hall, yy84@illinois.edu. Office hours: Tue 9:30AM – 11:00AM or by appointment via email (at least 24 hours in advance).

Website: On Compass at <https://compass2g.illinois.edu>

TA: Yifan Chen, yifanc10@illinois.edu. Office hours: Wed, 8:30AM – 10:30AM, 104 Illini Hall,

Prerequisites: Stat 510 requires familiarity with calculus, statistics and probability at the level of Stat 410.

Textbooks: John Marden, *Mathematical Statistics: Old School*, online available at <http://www.istics.net/pdfs/mathstat.pdf>

Course Topics:

This is an introductory course to mathematical statistics at the level of master students majored in statistics. Tentative topics are listed below. (Chapters 2-11 and 15-19 in the textbook)

- Distribution theory: moment generating functions, transformation of random variables, Poisson process, multivariate normal distribution.
- Point estimation: method of moments, maximum likelihood, Bayes estimation, EM algorithm, Markov chain Monte Carlo.
- Hypothesis testing: likelihood ratio test, Bayesian tests, confidence intervals, nonparametric tests (if time permits).
- Model selection: AIC, BIC, penalized methods.
- Asymptotics: law of large numbers, central limit theorem, continuous mapping, Slutsky's theorem, Delta-method.

Assessment:

Grading: The course grade will be calculated on the basis of a midterm (30%), a final exam (40%), and homework (30%). The following scheme will be used to convert your percentage scores to letter grades.

- If your final score is 90 - 100, your letter grade will be at least A-.
- If your final score is 75 - 89, your letter grade will be at least B-.
- If your final score is 60 - 74, your letter grade will be at least C-.
- If your final score is 50 - 59, your letter grade will be at least D-.
- If your final score is below 50, your letter grade may be an F.

Homework: There will be homework assignments every two weeks. Homeworks will be posted on Compass after Thursday's class, and will be due two weeks later (Thursday 5:00PM). **Late homework will not be accepted.** You are encouraged to discuss with each other, but should write down the answers independently. Your final grade for homework (30%) will be based on the best 6 out of total 7 homework assignments.

Homework Dropbox: Illini Hall 1st floor near the elevator. Include your **NAME**, and the course number. Emailed homework will not be accepted.

Exams: There will be a midterm exam and a final exam. The midterm will be based on the material covered by the time of the exam. You are allowed to bring an 8.5×11 sheet of notes and a calculator to the exams. **There will be no makeup exams.** The midterm exam will take place in class. Following is a tentative schedule.

- Mid term exam: **Thu, March 12, 8:00AM – 9:20AM in class.**
- Final Exam: **Fri, May 8, 1:30PM – 3:30PM.**

Academic Integrity: The official University of Illinois policy related to academic integrity can be found in Article 1, Part 4 of the Student Code. Section 1-402 in particular outlines behavior which is considered an infraction of academic integrity: http://studentcode.illinois.edu/article1_part4_1-402.html.

Safety: The university values your safety. Please read this document: <http://police.illinois.edu/dpsapp/wp-content/uploads/2017/08/syllabus-attachment.pdf> or watch this video: <http://police.illinois.edu/emergency-preparedness/run-hide-fight/>.

Other Policies:

Classroom Policy: The classroom environment is an important factor for effective learning. In order to not distract other students' attention please follow these classroom policies. The first one of these is the university policy:

1. Remember that no food or drinks are allowed in the classroom.
2. Turn off all audible alarms (cell phones, pagers, calculators, watches etc.) Do not use cell phones in the class.
3. Come to the class on time. Opening and closing the classroom door in the middle of a class cause distraction to the students and the teacher.
4. Do not talk to other students without permission while the professor is teaching. More than one conversation creates noise and makes it difficult for the students to pay attention to the lecture.

Students With Disabilities: Students with disabilities in need of academic accommodation should:

1. Register with and provide documentation to the Disability Resources & Educational Services (DRES);
2. Bring a letter to the instructor indicating the type of accommodation needed.

This should be done before the second week of class. See <https://www.disability.illinois.edu/> for more information.

Syllabus Change Policy: This syllabus is a guide for the course and is subject to change without advance notice.

Some Helpful Hints:

- **Don't fall behind!** It is particularly important to maintain a steady effort throughout the semester, rather than hope to cram just before homework deadlines or exams. This is because it takes time and practice for the ideas to sink in. Make sure you allocate a sufficient number of hours every week to the class, including enough time for reading and understanding the material as well as for doing assignments.
- **Take the homeworks seriously!** The homeworks are explicitly designed to help you to learn the material as you go along. There is usually a strong correlation between homework scores and final grades in the class. Regardless of how well you did on the homework, read the sample solutions, even for the problems you got right.
- **Make use of office hours!** The instructor and the TA hold office hours expressly to help you. You are free to attend as many office hours as you wish. You will also likely get more out of an office hour if you have spent a little time in advance thinking about the questions you have, and formulating them precisely.