STAT 5150 (section 001)
Advanced Statistical Inference I

Instructor: Wei Wang   E-mail: wwa@upenn.edu
Class hours: Tuesday and Thursday, 10:15 am - 11:45 am (EST)
Office hours: After class, email or by appointment.

Course description
This is a theoretical course on statistical inference. Basic measure theory will be covered. Probability is defined using the axiomatic approach. A random variable is defined as a measurable map. Topics also include distributions, moments, characteristic function, conditional expectation/probability/variance, central limit theorem, point estimation, hypothesis testing, and confidence intervals. If time permits, additional topics such as simulation and bootstrap will also be covered.

References

Essentials of Probability Theory for Statisticians. MA Proschan and PA Shaw.
Mathematical Statistics, Basic Ideas and Selected Topics, Volume 1, PJ Bickel and KA Doksum.
Statistical Inference, G Casella and RL Berger.

Prerequisite: STAT 4300, STAT4310, and MATH 2400.

Point set theory: union, intersection, complement.

Calculus: limit, supremum, infimum, continuity, differentiation, integration, Taylor expansion.

Linear algebra: vector, matrix, Jacobian matrix, Hessian matrix.

Undergraduate level probability and statistics: normal distribution, mean, variance, scatter plots, histograms, t-test and so on.

Software
We will use the free statistical computing software R (http://www.r-project.org/) frequently in class. Sample R code will be provided to help you solve homework problems.

Homework
The homework will be assigned biweekly. Without a convincing reason, late homework will not be given full credit (25 points off every 24 hours). If you are not certain about your situation, ask the instructor in advance instead of a last minute request.

Grading
The final grade will be based ~60% on homework, and 40% on the take home final exam.

Notes
- Pdf format is preferred, and html format is not recommended.
- If R is used, attach both the code and the output. Otherwise, 50% points will be deducted. Irrelevant R output will be penalized.
- The solution must be in your own words. Identical solutions will be marked zero.
- Try to provide some explanation of your answer instead of a simple yes or no.
- You are not allowed to use generative AI (e.g, tools like ChatGPT) for your work. Using such tools in this course will be considered a violation of Penn's Code of Academic Integrity and will be reported to the Center for Community Standards and Accountability.
- Regular classroom attendance and participation is anticipated. If you are not able to attend some lectures, you can request to view the recorded videos. The request will be approved, within reason.
- Independent work is expected for the final exam. Discussion or communication with other people is not allowed. Otherwise, it will be considered cheating, and the exam paper will be marked 0.