STAT 432: MATHEMATICAL STATISTICS

COURSE INFORMATION AND SYLLABUS

Lectures. Monday and Wednesday, 5:15 PM–6:45 PM. Location: TBA.

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Course Description and Syllabus. This is an advanced undergraduate course on the theoretical aspects of statistical estimation, hypothesis testing, and their applications. The following is a (tentative) list of topics that will be covered in the class:

- Review of probability and linear algebra, multivariate normal distribution.
- Asymptotics and simulation.
- Method of moments and maximum likelihood estimation, Cramér-Rao.
- Hypothesis testing: Neyman-Pearson, goodness of fit, two-sample problem, likelihood-ratio tests.
- Linear regression: Multivariate regression model, geometry of least squares, model selection.
- Generalized linear models, ridge regression, LASSO.
- Resampling methods: Bootstrap, permutations tests, cross-validation.
- Nonparametric inference: Empirical distributions, sign and rank tests.

Prerequisites. STAT 430, STAT 431, a year of calculus, and introductory linear algebra. *Any student not having this background should contact the instructor immediately.*

Textbook and References. The class has no required textbook. Lectures are self-contained, and students are expected to take notes. Additional materials are given as handouts when necessary. The following book will serve as a good reference:

- *Statistical Inference*, Casella and Berger, 2nd Edition, 2002.

Homework. There will be five homeworks, assigned approximately biweekly. Homeworks will generally be due on Wednesdays and must be handed in during class or in the BBB's mailbox (located on the 4th floor of Academic Research Building) by 7:00 PM on the date the assignment is due. *No late homework will be accepted, but the lowest score will be dropped.*

Exams. There will be a midterm exam and a final exam. Dates to be announced.

Grading. The course grade will be based on the homeworks, a midterm, and a final.
- Homework: 30% (lowest score dropped)
- Midterm: 30%
- Final: 40%

Statistical computing. Basic familiarity with statistical computing (preferably in R) will be assumed. Few homework assignments will involve coding and statistical analysis on datasets provided.