AMS 132/206: Classical and Bayesian Inference (Winter 2015)

General course information

Athanasios Kottas (Instructor)  Yifei Yan (TA)

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Office hours*  Wednesday 12-1:30pm  Monday 10-11am; Friday 10-11am

* The TA office hours will be held in Baskin Engineering room 312 C/D.

Web pages: https://courses.soe.ucsc.edu/courses/ams132/Winter15/01
and https://courses.soe.ucsc.edu/courses/ams206/Winter15/01

Lectures: Tuesday, Thursday 4-5:45pm (Engineering 2 192)

Course description: This course provides a calculus-based introduction to the basic concepts and methods for statistical inference. We will begin with maximum likelihood estimation, including study of properties of maximum likelihood estimators. We will also discuss sufficient statistics, and sampling distributions of estimators to motivate construction of confidence intervals. We will next turn to Bayesian modeling and inference which will form the majority of the course material. Building on background from probability theory (Bayes theorem and conditional distributions), we will develop the Bayesian approach to statistical inference. We will study methods for prior specification, Markov chain Monte Carlo simulation-based inference, and hierarchical modeling. Finally, if time permits, we will provide a brief introduction to inference for linear regression models and/or hidden Markov models.

Background: The key prerequisite is a calculus-based course on probability theory, such as AMS 131 or Computer Engineering 107 (for AMS 132) and AMS 203 (for AMS 206).

Textbook and reading material: Most of the course material will be taken from the textbook:


Additional material on Bayesian modeling and inference methods will be taken from appropriate references that will be provided at a later time.
**Homework:** Homework will be assigned every other week. Detailed solutions to selected homework problems will be discussed during the lectures. Working on the homework problems is key as it will enable you to develop facility in the methods of the course through regular practice. Some of the homework problems will involve computing. Becoming familiar with the R software for statistical computing ([http://www.r-project.org/](http://www.r-project.org/)) is strongly recommended, but you can use other software if you prefer. The use of R, or any other software, will **not** be covered in class.

The material in this course is cumulative and may go quickly. It is expected that you will stay up to date by reviewing lecture notes, reading from the relevant textbook chapters, and practicing with the homework problems.

**Exams:**

- Exam 1: Thursday January 29
- Exam 2: Thursday February 26
- Final exam: Wednesday March 18, 8-11am

The final exam date and time is designated by the registrar. All three exams will be closed-book, closed-notes, but you may bring one (letter size) piece of paper with formulas on both sides. The final exam will be comprehensive.

**Course grade:** Homework assignments: 25%; Exams 1 and 2: 40% (25% for the higher exam score, and 15% for the lower); Final exam: 35%

**Make-up exams and late homework policy:** Late homework will not be accepted; no exceptions to this policy. For all practical purposes, there will be no make-up exams. Requests for make-up exams will be considered only for truly exceptional circumstances.

**Accommodations for students with disabilities**
If you qualify for classroom accommodations because of a disability, please submit your Accommodation Authorization Letter from the Disability Resource Center (DRC) to me (outside of class time) as soon as possible, preferably within the first week of the quarter. Contact DRC by phone at 831-459-2089 or by email at drc@ucsc.edu for more information.