

University of California, Santa Cruz
Department of Applied Mathematics and Statistics
Baskin School of Engineering

Classical and Bayesian Inference - AMS 132

General course Information

Instructor: Claudia Wehrhahn *E-mail:* cwehrhah@ucsc.edu Office: BE 357B Phone: 359 16 53

TA: Isabelle Grenier *E-mail:* igrenier@ucsc.edu

TA: Cheng-Han Yu *E-mail:* cheyu@soe.ucsc.edu

Lectures: Monday, Wednesday, and Friday, from 4:00 pm to 5:05 pm, at Merrill Acad 102.

Discussion Section A: Monday from 12:00 pm to 1:05 pm, at N Sci Annex 102, by Cheng-Han.

Discussion Section B: Tuesday from 8:30 am to 9:35 am, at Earth & Marine B210, by Isabelle.

Discussion Section C: Wednesday from 1:20 pm to 2:25 pm, Earth & Marine B210, by Isabelle.

Office hours: Thursday from 3:00 pm to 5:00 pm, at BE 358 conference room.

Isabelle's Office hours: Tuesday from 10 am to 12 pm, at BE 119 room.

Cheng-Han's Office hours: Wednesday from 11 am to 12 pm, at BE 312 C/D room.

web page: the official web page is <https://ams132-winter18-01.courses.soe.ucsc.edu>. News, information about the course, homeworks, etc, will be posted here!

Description

This is a calculus-based introduction to statistical inference course. Both, frequentist and Bayesian methods, will be presented during the course. We will begin with Bayesian estimation methods: we will discuss prior, posterior, and different kinds of prior distributions, define Bayes estimator and what happens in large samples. Then we will move to maximum likelihood estimators, their properties, and numerical methods. We will discuss sampling distributions of statistics: chi-square distribution, sample mean, sample variance, t distribution, followed by confidence intervals and hypotheses testing. Finally, if time permits, we will discuss simple linear models, study simulation methods and Markov chain Monte Carlo simulation-based inference.

Background, references, and statistical software

Background: Courses 131 or Computer Engineering 107 are prerequisites of the course.

Textbook: most of the course material will be taken from the textbook

M.H. DeGroot and M.J. Schervish (2012), Probability and Statistics (Fourth Edition), Addison Wesley

Additional material on Bayesian modeling and inference methods will be taken from appropriate references that will be provided at a later time.

Statistical software: Visit <https://cran.r-project.org> for downloading R and reading the manuals. Also, visit <https://www.rstudio.com/products/rstudio/download/> for downloading RStudio.

Lectures, discussion sections, and office hours

Lectures: we will have three lectures every week. I will use slides for most of the lectures. Slides are not self contained, they are designed for you to take notes. All slides, R codes, and material presented during lectures will be available from the web page.

Discussion sections: students are highly recommended to attend discussion sections. Here, TAs will present and solve problems that complement lecturer's material. Also, they are an instance for students to ask questions regarding class material. Finally, doubts regarding homework can be addressed too, but no formal and complete solutions will be given.

Office hours: office hours are one more instance for asking about class material, exercises, or any other doubt that students may have.

Neither classes nor discussion sections are mandatory.

Course grade

Homework: five homework will be assigned during the course. Late homework will not be accepted; no exceptions to this policy. The homework grade will be given by the average of three randomly selected problems. Some of the homework problems will involve computing. Getting familiar with the R software for statistical computing is strongly recommended. Other software can be used if you prefer. The use of R, or any other software, will not be covered in class.

Exams: three exams will be held during the quarter. All are closed-book, closed-notes, but you can bring one letter size piece of paper with formulas on both sides. Exams will have two parts: one during class and one take home part. Exams grade will be given by the average of both parts. No late take home part will be accepted; no exceptions to this policy.

Doubts about grades can be presented with a written note, no later than a week after the exam or homework was returned to the student. This revision is not restricted only to request and the final grade can be higher

or lower.

The exams dates are the following

Exam 1: Monday, February 5, from 4 pm to 5:05 pm

Exam 2: Monday, March 5, from 4 pm to 5:05 pm

Final Exam: Thursday, March 22, , from 12:00 pm to 3:00 pm

The final grade will be given by

$$0.25 \times \overline{HW} + 0.20 \times Ex1 + 0.20 \times Ex2 + 0.35 \times ExF,$$

where \overline{HW} is the average of the homework, $Ex1$ and $Ex2$ are grades of Exams 1 and 2, respectively, and ExF is the final exam grade.

Make-up exams: 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: UC Santa Cruz is committed to creating an academic environment that supports its diverse student body. If you are a student with a disability who requires accommodations to achieve equal access in this course, please submit your Accommodation Authorization Letter from the Disability Resource Center (DRC) to me privately during my office hours or by appointment, preferably within the first two weeks of the quarter. At this time, I would also like us to discuss ways we can ensure your full participation in the course. I encourage all students who may benefit from learning more about DRC services to contact DRC by phone at 831-459-2089 or by email at drc@ucsc.edu.