

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 and Teaching Assistants:

Instructor: Claudia Wehrhahn *E-mail:* cwehrhah@ucsc.edu Office: BE 357B Phone: 359 16 53
TA: Isabelle Grenier *e-mail:* igrenier@ucsc.edu
TA: Daniel Spencer *e-mail:* daspence@soe.ucsc.edu
TA: Chunyi Zhao *e-mail:* czhao19@ucsc.edu

Lectures and Discussion Sections:

Lectures: Monday, Wednesday, and Friday, from 8:00 am to 9:05 pm, at Baskin Engr 152.
Discussion Section A: Monday from 10:40 am to 11:45 am, at Earth & Marine B210, by Daniel.
Discussion Section B: Thursday from 9:50 am to 10:55 am, at Earth & Marine B210, by Isabelle.
Discussion Section C: Friday from 1:20 pm to 2:25 pm, Earth & Marine B210, by Chunyi.

Office Hours:

Claudia's office hours: Tuesday and Wednesday from 1:20 pm to 2:25 pm, at E2 399.
Daniel's office hours:
Isabelle's office hours:
Chunyi's office hours:

Web page:

web page: the official web page is <https://canvas.ucsc.edu/courses/19362>.
News, information about the course, class material, homeworks, etc, will be posted here!
Additional web page (but not official) is <https://ams132-winter19-01.courses.soe.ucsc.edu>.

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 frequentist methods studying moment and maximum likelihood estimators and their properties and sufficient statistics. We will discuss sampling distributions of statistics: chi-square distribution, sample mean, sample variance, t distribution, followed by confidence intervals and hypotheses testing. Then, we will move to Bayesian estimation methods and will discuss prior, posterior, different kinds of prior distributions, define Bayes estimator and what happens in large samples. 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. Slides and material presented during lectures will be available from the web page. Some classes can make use of the R statistical software for complementing the material.

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 (HW): five HWs will be assigned during the course. Late HW will not be accepted; no exceptions to this policy. Each HW will have four problems. The HW's grade will be given by the average grade of the first three problems and the fourth problem is a *bonus* that can replace the grade of any problem in any HW and is not mandatory.

Exams: one midterm and a final exam will be held during the quarter. Both are closed-book, closed-notes, but you can bring one letter size piece of paper with formulas on both sides.

Doubts about grades can be presented with a written note, no later than a week after the exam or HW 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

Midterm exam: Friday, February 8, from 8:00 am to 9:05 am

Final exam: Monday, March 18, from 4:00 pm to 7:00 pm

The final grade will be given by

$$0.35 \times \overline{HW} + 0.30 \times MidEx + 0.35 \times ExF,$$

where \overline{HW} is the average grade of HWs, $MidEx$ is the grade of the midterm exam and ExF is the grade of the final exam.

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.