# PSTAT 115: Introduction to Bayesian Data Analysis

Spring 2023

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| **Instructor:** | Rodrigo Targino | **Time:** | T/R 9:30-10:45 |
| **Email:** | rodrigotargino@ucsb.edu | | |

**Course Pages:**

- Location: HSSB 1174
- Gauchospace: link
- Nectir: link. We ask that when you have a question about the class that might be relevant to other students, post it on Nectir instead of emailing us. That way, all the staff can be on the same page and everyone can benefit from the response. Click on the Nectir link on Gaucho to be automatically added to the class channel. If you don't have an account already, to please make one at ucsb.nectir.io.
- JupyterHub: link. All your work should be completed here. Use this to sync new assignments and labs.
  - Bookmark this link, you will use it a lot!
- GradeScope: link. Weekly homework assignments are a required part of the course.

**Office Hours:**
Professor Targino rodrigotargino@ucsb.edu: Office Hours, Wednesdays 4.45-5.45pm at OG1203 and on Zoom https://fgv-br.zoom.us/j/97377443266
[TA] Gabrielle Salo gsalo@umail.ucsb.edu: Office Hours, Tuesdays from 3-4pm at https://ucsb.zoom.us/j/83407131759
[TA] Lauren ughes laurenhughes@ucsb.edu: Office Hours, Mondays 10am-12pm at SH5421

**Course Texts**

- **Required:** Alicia A. Johnson, Miles Q. Ott, Mine Dogucu *Bayes Rules* https://www.bayesrulesbook.com/
- Optional: Peter Hoff *A First Course in Bayesian Statistical Methods*; https://www.springer.com/us/book/9780387922997).
- Optional: Jim Albert *Bayesian Computation with R*; https://www.springer.com/us/book/9780387922973).
- Optional: Richard McElreath *Statistical Rethinking*; https://xcelab.net/rm/statistical-rethinking/).
- Optional: Andrew Gelman, John Carlin et al. *Bayesian Data Analysis*; http://www.stat.columbia.edu/~gelman/book/).

**Objectives:**

At the end of the course, a successful student will be able to:

- build and refine statistical models using the Bayesian paradigm
- utilize Monte Carlo methods for statistical inference

**Prerequisites:** PSTAT 120 A-B (probability and math-stat) and 126 (regression). Familiarity with R is required.

**Tentative Course Topics:**

- Review of frequentist inference
- One parameter models
- Monte Carlo computation
- The normal model
- Markov chain Monte Carlo
- Hierarchical models
- An introduction to probabilistic programming

**Grading Policy:**

- Homework (35%).
  - There will be approximately 4 homeworks, due roughly every week on Fridays at midnight.
  - Each homework assignment will be given as a template that you should work from.
  - All code must be written to be reproducible in Rmarkdown
  - All derivations can be done in any format of your choosing (latex, written by hand) but must be legible and *must be incorporated into your final pdf.*
  - Ask a TA *early* if you have problems regarding submissions.
  - Homework not submitted online before the deadline will be considered late (10 point deduction). 24 hours after the deadline homework will not be accepted and no credit will be awarded. Do not wait until the night before it is due to start working!
- Midterm exam (20%). **In person, May 9th 2023** .
- Quizzes (15%)
  - Approximately 5 quizzes (online), lowest dropped
  - There is no make-up for missed quizzes.
  - Section attendance is an important part of the course.
- Final exam (30%). **In person, June 13th 2023**

**Tentative course schedule**

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| Tue | 04/Apr/23 | | | | |
| Wed | 05/Apr/23 | | Wed | 10/May/23 | |
| Thr | 06/Apr/23 | HW1 out | Thr | 11/May/23 | |
| Fri | 07/Apr/23 | | Fri | 12/May/23 | |
| Sat | 08/Apr/23 | | Sat | 13/May/23 | |
| Sun | 09/Apr/23 | | Sun | 14/May/23 | |
| Mon | 10/Apr/23 | | Mon | 15/May/23 | |
| Tue | 11/Apr/23 | | Tue | 16/May/23 | |
| Wed | 12/Apr/23 | | Wed | 17/May/23 | |
| Thr | 13/Apr/23 | | Thr | 18/May/23 | HW3 out |
| Fri | 14/Apr/23 | HW1 due | Fri | 19/May/23 | |
| Sat | 15/Apr/23 | | Sat | 20/May/23 | |
| Sun | 16/Apr/23 | | Sun | 21/May/23 | |
| Mon | 17/Apr/23 | | Mon | 22/May/23 | |
| Tue | 18/Apr/23 | | Tue | 23/May/23 | |
| Wed | 19/Apr/23 | | Wed | 24/May/23 | |
| Thr | 20/Apr/23 | HW2 out | Thr | 25/May/23 | |
| Fri | 21/Apr/23 | | Fri | 26/May/23 | HW3 due |
| Sat | 22/Apr/23 | | Sat | 27/May/23 | |
| Sun | 23/Apr/23 | | Sun | 28/May/23 | |
| Mon | 24/Apr/23 | | Mon | 29/May/23 | |
| Tue | 25/Apr/23 | | Tue | 30/May/23 | |
| Wed | 26/Apr/23 | | Wed | 31/May/23 | |
| Thr | 27/Apr/23 | | Thr | 01/Jun/23 | HW4 out |
| Fri | 28/Apr/23 | HW2 due | Fri | 02/Jun/23 | |
| Sat | 29/Apr/23 | | Sat | 03/Jun/23 | |
| Sun | 30/Apr/23 | | Sun | 04/Jun/23 | |
| Mon | 01/May/23 | | Mon | 05/Jun/23 | |
| Tue | 02/May/23 | | Tue | 06/Jun/23 | |
| Wed | 03/May/23 | | Wed | 07/Jun/23 | |
| Thr | 04/May/23 | | Thr | 08/Jun/23 | |
| Fri | 05/May/23 | | Fri | 09/Jun/23 | HW4 due |
| Sat | 06/May/23 | | Sat | 10/Jun/23 | |
| Sun | 07/May/23 | | Sun | 11/Jun/23 | |
| Mon | 08/May/23 | | Mon | 12/Jun/23 | |
| Tue | 09/May/23 | MIDTERM | Tue | 13/Jun/23 | FINAL |

**Course Policies:**

- Learning Cooperatively
  - We encourage you to discuss all of the course activities with your friends and classmates as you are working on them.
  - You will definitely learn more in this class if you work with others than if you do not. Ask questions, answer questions, and share ideas liberally.
- Academic Honesty
  - Cooperation has a limit.
  - You should not share your code or answers directly with other students.
  - Doing so doesn't help them; it just sets them up for trouble on exams.
  - Feel free to discuss the problems with others beforehand, but not the solutions.
  - Please complete your own work and keep it to yourself.
  - Penalties for cheating are severe — they range from a zero grade for the assignment up to dismissal from the University, for a second offense.
  - Rather than copying someone else's work, ask for help. You are not alone in this course! We are here to help you succeed. If you invest the time to learn the material and complete the projects, you won't need to copy any answers.
- Copyright of Course Materials
  - Most of the material for this course was prepared by Professor Alex Franks.
  - The lectures and course materials, including PowerPoint presentations, tests, outlines, and similar materials, are protected by U.S. copyright law and by University policy.
  - I am the exclusive owner of the copyright in those materials I create. You may take notes and make copies of course materials for your own use.
  - You may also share those materials with another student who is enrolled in or auditing this course.
  - You may not reproduce, distribute or display (post/upload) lecture notes or recordings or course materials in any other way — whether or not a fee is charged — without my express prior written consent. You also may not allow others to do so.
  - If you do so, you may be subject to student conduct proceedings under the UC Santa Barbara Student Code of Conduct.
  - Similarly, you own the copyright in your original papers and exam essays. If I am interested in posting your answers or papers on the course web site, I will ask for your written permission.