

Stat 238, Fall 2025

Project Minis

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Due: by **5:00 pm** Friday, March 14th, 2025

Mini Project 4: Model Critique

Policies

- This is an individual project.
- All submissions must be properly type-set and sourced. This means providing formal citations and a complete bibliography.
- Project minis should be uploaded to Gradescope under the appropriate mini-assignment.

Prompts

This is a reading project. You will be asked to find, read, and prepare a summary report on 3 research papers. Your report should **not exceed 6 pages**. It should be structured according to the instructions listed below.

- (a) (3 points) Select three research papers that present a Bayesian model for an inference problem of your interest. The three papers must present at least two different prior models for any inferred unknowns.
- (b) (2 points) Explain your interest in your inference problem of choice. Clearly motivate its importance, and explain the relevance of Bayesian modeling in your context.
- (c) (4 points) Provide a comparative overview of the papers, emphasizing their similarities and differences. Highlight their position in the broader literature, and relation to each other. Explain why you have selected these three papers.
- (d) (2 points) Summarize the likelihood model used in each paper. Explain any differences in approach.
- (e) (4 points) Summarize the prior models used in each paper. Clearly state each modeling assumption and its justification. Explain any differences in approach.
- (f) (2 points) Describe how each paper fits for unknown prior parameters, or handles uncertainty with respect to the choice of prior parameters.
- (g) (2 points) Is there a clear asymmetry in the difficulty of, or attention paid to, modeling the prior vs modeling the likelihood? If so, why?

- (h) (2 points) Try to describe the regularizing effect of each prior assumption. Highlight any prior assumptions that cannot be grounded empirically and whose biasing effects are unclear.
- (i) (3 points) Position each paper's modeling approach with respect to the three aims discussed in class (realism, simplicity, tractability). Compare your evaluation to the author's presentation of their models.
- (j) (4 points) Reflect critically on the model formulation. Do you think that the model priorities are appropriate for the inference problem of interest? Which assumptions are best justified, and which are you uncertain about?
- (k) (2 points) Propose a change to the prior model formulation, or argue for one prior model over another.