

# STAT 532 Project Description

**Presentations: December 2 (1), 4 (3), and Dec 10 (8 from 8-10 a.m.)**

**Written report: FRIDAY, December 4 by 2:00 p.m.**

The focus of this project is thoroughly investigating a particular Bayesian model and analysis used to solve a real problem and reported on in a peer-reviewed journal article. Your chosen article will also be involved in some homework assignments, but this document describes the formal class project which has a written and oral component. For your chosen journal article, you should do and report the following:

1. Provide a **concise** description of the study design, data collection procedures, and main question of interest. Do not re-write the paper, but include the parts that are necessary for understanding the model and inference.
2. Understand the model and explicitly write it out in a way that makes sense to you (*i.e.* it can differ from how it is written in the paper). This should include discussion of chosen prior distributions.
3. Simulate artificial data. You should use the assumed model from the paper if possible, but if you need to simplify it that is okay (as long as you explain this). You do not have to simulate from prior distributions, just choose parameter values consistent with what is reported in the paper. Clearly describe the steps you used to simulate the data, and any problems you encountered. Provide meaningful plots of the artificial data. Do your data look similar to the data used in the paper (if they are shown or provided)?
4. Fit the Bayesian model first under the assumptions the authors of the paper use (or as close as you can get given the information provided). Comment on any problems or confusions with fitting their model. Did they provide enough detail that you could easily do it? How does convergence look, etc.?
5. Make any changes you think need to be made to improve convergence or solve any other problems with specification or implementation of the model. If you do not implement the changes, at least explain what you would do if you had more time.
6. Define and implement at least one appropriate posterior predictive check. I realize you may not be able to fully implement it if you do not have the observed data, but go ahead and implement it using simulated data (you can simulate data from a simpler model and then use the check to make it more interesting).

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Parts of the Project:

- I. (100 pts) Write up your **report** with the following sections:
  - (a) Introduction
  - (b) Model
  - (c) Simulation of artificial data (may have slightly different model for this)
  - (d) Model fitting and results
  - (e) Posterior predictive checks
  - (f) Your opinion of the data analysis presented in the paper and what you learned
- II. (40 pts) Create a **presentation** geared toward your fellow students with the goal of teaching them something you learned in doing the project. You do not have enough time to report on your whole project, so the challenge is to choose a piece that is doable, interesting, and passes some of the knowledge you gained along to your fellow students. Your presentation should not be more than 10 minutes so that we have some time for discussion as well.
- III. (10 pts) Actively participate in asking questions after presentations of your peers. You must ask at least two substantive questions over all presentations.