STAT:5201
Spring 2020 Project Description

As an adjustment to the original grading weights in the course, we will now add a project that will be worth 20% of the total grade. Previously, the four exams were each worth 20%, but we will now have the exams each worth 15%, to allow for the inclusion of the project.

For this project, you will be conducting an experiment, on your own at home. You will decide on a topic for your experiment (more below), plan the experiment, set-up the protocol for the experiment (which must include randomization), collect the data, and then analyze the data using `SAS` software. Your final product will be a report written in LaTeX summarizing all the important parts of your experiment.

Timeline and due dates (NOTE: doing any item early is strongly encouraged)

Week	Dates	Step in the process/Items due
Week 9	March 23-27	Read through the ideas list for possible projects (included here). **Selection due Friday March 27 via email. Include a short statement describing the motivation for your experiment of choice.**
Week 10	March 30-April 3	Plan the data collection process. Think about the materials needed, and the time needed to do runs or do data collection. Perhaps do a trial run for data collection.
Week 11	April 6-10	Using the checklist below provided by Dean et. al, create a checklist for planning your experiment. **Turn-in the written checklist (no more than one page) by Wednesday April 8 on ICON by 12:30pm**.
Week 12	April 13-17	Do the experiment. Collect data, write report.
Week 13	April 20-24	**Written report due Friday April 24**.
Week 14	April 27-May 1	**Presentations due and given in week 14**.

Checklist for planning an experiment (see Dean et. al 2017 Chapter 2 for concrete examples):

(a) Define the objectives of the experiment.

(b) Identify all sources of variation, including:
(i) treatment factors and their levels,
(ii) experimental units,
(iii) blocking factors, noise factors, and covariates.

(c) Choose a rule for assigning the experimental units to the treatments *(i.e. describe randomization).*

(d) Specify the measurements to be made, the experimental procedure, and the anticipated difficulties.

(e) Run a pilot experiment. *[WE WILL NOT HAVE TIME FOR A FULL PILOT STUDY HERE]*

(f) Specify the model. *[THIS SHOULD ALIGN WITH YOUR DATA COLLECTION PLAN]*

(g) Outline the analysis.

(h) Calculate the number of observations that need to be taken. *[WITH NO PILOT STUDY, WE MAY NOT BE ABLE TO CALCULATE POWER HERE]*

(i) Review the above decisions. Revise, if necessary.

Rubric general guidelines for project grading:

10% **Selection and statement**

- Was thought given to the choosing of the experiment?

30% **Written checklist**

- Did you include all relevant items?
- Did you think about sources of variation?
- Did you write your statements clearly?

50% **Written report**

- Did you use LaTeX? Did you use appropriate LaTeX sectioning and subsectioning to make the report flow well and easily read?
- Did you clearly describe how the data were collected?
- Did you clearly show the observed data set?
- Did you provide relevant output and graphics?
- Did you provide results and conclusions?
- Did you state any difficulties you encountered? Did you overcome some difficulties but not others?
- If you were to repeat this experiment, what would you do differently? What did you learn during the project?

10% **Presentation**

- Were the slides created with care?
- Did the audience understand your experiment and your conclusions?
- Did you provide relevant output and graphics?

Some ideas for projects (but you can think of your own too! Just get it OK'd.)

1. Investigate how type of pan (at least 2) and cover (yes/no) affects time to boil water
   - Use same amount of water and heat
   - Response: time to boil water for each run
   - NEED: kitchen access
2. Investigate paper airplane dynamics relative to...
   - Shape, size, design, weight
   - Response: flying time or distance
   - Google around, there's a lot of ideas on this one
3. Investigate effect of popcorn brand and batch size on yield
   - Pop 1/3 cup of popcorn kernels for each brand, and 2/3 cup for each brand
   - Response: cups popped
   - NEED: to purchase numerous boxes of popcorn, ability to pop the corn

4. Investigate effect of sticky-note brand and surface type on how well they stick
    - Place sticky note on surface, attach cup, fill with pennies
    - Response: number of pennies until note falls
    - NEED: purchase of sticky notes, cups, have some pennies
5. Investigate effect of rubber-band brand and size on breaking length
    - Stretch rubber band until it breaks
    - Response: inches at breakage
    - NEED: to purchase rubberbands
6. Investigate effect of cooking method (frying/grilling) and % fat on final weight of hamburgers
    - Cook 1/4 pound raw hamburgers under each method
    - Response: final cooking weight
    - NEED: access to kitchen, kitchen electronic scale
    - Dean et. all (2017) provide an example of this one
7. Investigate how different ratios of sugar/corn syrup in marshmallows affect either...
    - Taste, or texture, or time until melting
    - Response: depends on choice above
    - NEED: access to a kitchen (and they're messy to make, I've done this one!)
    - [Hyperlink (click for on-line article)]
8. Investigate how differing levels of distraction affect video game scores for two different video games
    - Expose subjects (maybe male/female or old/young) to differing levels of noises or distractions
    - Response: video game score
    - NEED: access to video game with a scoring mechanism and players
9. Investigate how water temperature affects the dissolving time of alka-seltzer
    - Set numerous distinct water temperatures
    - Record: time it takes to dissolve one tablet
    - NEED: purchase of alka-seltzer
    - [Hyperlink (click for on-line article)]
    - COMMENT: Can you fit this as a dose-response curve (i.e. polynomial)?
10. Investigate how baking soda affects the height of muffins
    - Set distinct quantities of baking soda (0 tsp, 1 tsp, 2 tsp, 3 tsp)
    - Record: height of muffin
    - NEED: access to kitchen, muffin tins
    - [Hyperlink (click for on-line article)]
    - COMMENT: Can you fit this as a dose-response curve (i.e. polynomial)?
11. Investigate the greasiness of differing potato chip brands
    - The response would be the tricky item here. Read how they use a piece of engineering paper (with squares) to determine the amount of greasiness
    - [Hyperlink (click for on-line article)]