Project Guide

Proposal

The project will be an experimental study with at least two categorical independent variables. A continuous independent variable is allowable, and projects with mixed effects or blocks are regarded favorably. You may refer to people.stat.sc.edu/grego/courses/stat 506/project.ideas.pdf for a wide range of experimental studies pursued by students in an introductory design of experiments course. Students focused on two-level experiments in that course and predictors are generally categorical, albeit with only two or three levels. Project selection should be an iterative process; I can help you develop project ideas and shape the project to ensure that it is feasible, well-designed, and includes measurable outcomes.

The project proposal is informal; if it is clear that we have arrived through email and spoken communication at a satisfactory point with respect to design, response, and predictors, this will suffice for a proposal. Otherwise, I will provide an ungraded assignment for the proposal so that you can upload a brief document describing your project.

Introduction

Often, the most interesting part of a project is the student's motivation in choosing a particular project. The student may have extensive background knowledge or other personal reasons for a project choice. Do not be afraid to discuss this in detail in your introduction. I would prefer a less formal approach for this section, since you are not typically presenting technical material. The informality of the introduction, actually, sets the tone for the entire paper. Presenting the introductory material (and hence the entire paper) in first person, for instance, is acceptable.

Design Choices

Finding a suitable response can often be the hardest part in selecting a suitable topic for experimentation. You may have found an interesting measuring device for your response or you may have uncovered a simpler-to-measure surrogate characteristic. If you are particularly pleased with the way you have chosen to measure your response, be sure to discuss it.

Discuss the design in some detail, identifying blocks and other randomization restrictions. For categorical and continuous predictors, include details on what guided your choices–which predictors were included/excluded and why, and the number and choice of levels for your predictor variables.

Be sure to discuss randomization, and acknowledge any compromises made in replication or randomization. In these experiments, with our limited resources in time and effort, there are almost always compromises made in one or both of these two areas.

This would also be a good time to discuss any hypotheses or predictions you may have for the predictor variables.

Experiment

Discuss any difficulties you had in carrying out your design. It often turns out to be impossible to carry out the experiment as originally envisioned. If things do not work out, do not worry about it or try to cover it up–it is all part of the experimental process. If any changes in the design had to be made, please discuss them and their implications for experimental outcomes and analysis. You may also share preliminary observations with respect to unusual observations, hypotheses, unmet expectations, etc.

Analysis

At this point, you can write out your model, if you haven't done so already, being sure to identify random and fixed effects, blocks and other model assumptions. In addition to testing, be sure to step through the various methods we have learned in this class: exploratory data analysis, preliminary models, diagnostics, transformations, post hoc comparisons, etc. If results are different from what you anticipated, please discuss any discrepancies. Once you have selected a final model, analyze model terms, construct and interpret confidence intervals, evaluate collinearity, and test model assumptions. What would you do for a follow-up experimentation–would you choose different factors or factor levels? Would more replicates be necessary?

Most importantly, discuss the implications of your experimental results. Do not simply point out that an effect is significant, but discuss the effect within your experimental context. What did you learn and how does it affect you and your behavior?

Presentation

I will typically point out patterns in mechanical problems (spelling, grammar, etc.) only if they seriously interfere with the presentation of your material. I also do not like to modify a student's "voice" too much–I may prefer to phrase something differently, but such decisions are more often personal than preferable. Do try to avoid stylistic problems–I am not a big fan of the passive voice and I know it can be hard to come up with transition elements, but make the attempt nonetheless–do not compartmentalize your text.

I would also like tables and graphs (when embedded in the text) kept to a minimum, though they can certainly be included in appendices. In general, do not include output in the text unless you refer to it explicitly, and even then it should be modified to a more attractive format.