Project:
Advanced Topic in Applied Statistics

Important reminder This project is in lieu of a test, and as such you are not allowed to work with anyone, including other students. Any questions that you have about it should be directed to me only.

Assignment

Choose a method or topic in applied statistics that was not covered in Math 260 or in this course. Write a paper that is an introduction to that subject, and present an introduction to the subject in class.

Purpose

In order of priority, the goals of this assignment are:

1. To learn how to teach yourself statistical methods without the guidance of class lectures.
2. To learn how to explain statistical methods, both in a paper and in a presentation.
3. To learn an advanced statistical method that is new to you.

While learning the actual statistical method a goal, it is not the most important one.

Due dates

This project has two due dates:

- Friday, March 23 to Friday, March 30: in-class presentation (exact date TBA)
- Friday, March 30: paper due

Before the presentations begin, we will decide in class on your exact in-class presentation date.

Grading

Only the paper is graded; the in-class presentation is not graded separately but is an important part of the learning goals. The only way that the in-class presentation would contribute to your project grade is if you did not prepare adequately for it. If that is the case, then that will decrease your overall grade. Otherwise, the presentation is solely for the experience and is not graded.

I will grade your papers separately in two broad areas: content and writing. Content refers to the mathematical aspects of the paper and how well you have shown that you understand
them. *Writing* refers to clarity of exposition, which includes structure, grammar, spelling, typos, layout, and so forth.

There is a trade-off between your topic’s level of sophistication and the depth of understanding that I expect. If you choose a simple topic, you will have to explain it extremely well and demonstrate that you have a solid understanding of it in order to earn a high grade. If you choose a more advanced topic, your explanation and understanding of the material still need to be good, but I will not hold them to quite so high a standard as with a simpler topic.

## Assignment details

In this project, you should introduce your chosen topic to a reader who has a background similar to that of students in Math 360. The topic must be approved by me in advance of your presentation.

Some things to keep in mind when introducing such a topic:

1. Probably your topic is a deep one, and there is no way that you can cover more than the tip of the iceberg in such a short paper and presentation.

2. As such, focus on things such as:

   (a) What is this method designed to do? (For example, what are its inputs and outputs?)
   (b) What types of problems does this method address, or when should this method be used? When should it *not* be used?
   (c) What are some of the assumptions underlying the technique? How can those assumptions be verified?
   (d) What is involved in this method, from a technical or mathematical standpoint? (You probably won’t be able to go into full detail on this, but even giving a sense of the mathematics used is helpful.)
   (e) What are some possible pitfalls and traps that can arise using this technique? Are there things related to this technique that are often misinterpreted?

3. While anecdotes don’t produce good data to analyze, they can make excellent learning tools. As such, you will should work through one or more simple examples to illustrate your method or topic.

4. While you might state in your presentation or paper what packages or commands relate to your topics, you should not include R code or unformatted R output (except graphics of course) in your presentation or paper. The paper is supposed to be about the statistical method, *not* how that method is implemented in R.

There is no required length for your paper. It should be long enough to clearly explain what you are trying to explain, and no longer. I am guessing that this will make most students’ papers about 10-14 pages long (double-spaced), but you should not strive specifically for this range. (I would like the distribution of page lengths in the class to be approximately normally distributed with mean 12 and standard deviation 2.)

Your in-class presentation should be 12-15 minutes, and it should be both interesting and informative to your fellow classmates. You shouldn’t necessarily present everything that is
in your paper, since people can follow highly technical arguments in a paper much better than they can absorb them in a talk. A short talk such as this calls for especially careful consideration of which details to include and, more importantly, which to leave out.

You may use any type of technology that you like in your presentation: R Markdown (Slidy), Powerpoint, chalk, none of the above, etc.

Also, I offer the following two suggestions to help your presentation go smoothly:

1. **Rehearse** your presentation, preferably in front of at least one other person. Rehearsing the presentation is the best (if not the only) way to get the timing right. Rehearsing also helps catch typos, errors, stumbling points, and other subtleties that can detract from or even derail a presentation.

2. **Check the technology.** If you are going to use any technology in your presentation, try it out on the equipment that you will be using. If you will use the classroom computer, check that your files display correctly on it. If you will hook your laptop into the classroom projector, make sure beforehand that you can indeed connect it and that when you do, your files display correctly.

Following these suggestions won’t necessarily eliminate all the errors and foibles from your talk, but it will at least help to minimize them.