**Special Topics Assignment Overview**

Choose an advanced statistical topic you find interesting, learn about it, teach the rest of us about it

**Final Deliverables:**

* 25 – 40 minute presentation/activity in December (Week 14 + Finals Week)
* Written report (Saturday, December 10)

**Intermediate Deliverables:**

* Proposal, Saturday, October 15
* Outline, Saturday, November 12
* Rough Draft, Monday, November 29

**Final Presentation:**

Structure your 25 – 40 minutes however you want. If you go over 25 minutes, it should include an active learning component.

**How the presentation will be evaluated:**

* Went beyond the scope of what has already been covered in 361 and 362
* Statistical concepts were accurately described
* Statistical concepts were clearly explained
* Relevance of the statistical concepts were clearly demonstrated (either via application or connection to other statistical ideas)
* Time was well-structured
* Presentation was engaging
* Participants learned something new
* Connected it to other concepts we are familiar with

**Guiding questions you may want to address:**

* What should your classmates know about this topic?
* Where is this method applied?
* What types of questions can be answered using this method?
* What did you find most interesting?
* What was most challenging for you to grasp?

Presentations will take place during the last two weeks of the semester. You may sign up for a time slot on Canvas. There will be two presentation slots on each of the following three dates:

* Tuesday, December 6
* Thursday, December 8
* Thursday, December 15

**Written report**

Relatively brief (<5 pages) written artifact that captures the main points covered in your presentation, and anything else you want to demonstrate from what you learned. You are encouraged, but not required, to write your report in RMarkdown.

How the report will be evaluated

* Report demonstrates what was learned, and helps the reader learn
* Includes at least 3 credible and relevant citations
* Statistical concepts were accurately described
* Statistical concepts were clearly explained
* Relevance of the statistical concepts were clearly demonstrated (either via application or connection to other statistical ideas)
* Writing is clear, organized, and grammatically correct
* Formatting is clean, organized, and easy to read – including visuals, tables, and/or LaTeX as appropriate
* Report is of reasonable length – 1 page is probably too short, more than 5 pages is probably too long.

Written report is due Saturday, December 10

**Proposal**

Propose 3 potential topics. For each of the three, include:

* A brief (1 paragraph) description of what the method is and what it’s used for
* A brief indication of why you’re interested in the topic
* At least 1 citation that might be relevant to your presentation/report. Note, this should be a credible source that you might cite in a final report.
* Any questions/concerns you might have or would like my input on (optional)

Altogether, this proposal should not exceed 2 pages. Brevity is appreciated.

Written proposal submitted to Canvas by Saturday, October 15, 11:59pm

**Outline**

Prepare the following:

* Written outline for how you plan to structure your 25 – 40 minutes
* Written outline for how you plan to structure your written report
* Rough draft of your intro
* At least 3 citations you plan to incorporate into your final deliverables
* 2-3 things you would like feedback on from your peers and/or Dr. Fitz

You will submit these items as a single document on Canvas by Saturday, November 12, 11:59pm.

**Rough Draft**

Prepare the following:

* Complete rough draft of your written report
* Complete rough draft of your slide deck (or other presentation tool)
* 2-3 things you would like feedback on from your peers and/or Dr. Fitz

You will submit these as two separate documents (report + slides) by Monday, November 28, 11:59pm. You should include your 2-3 areas of feedback at the top/beginning of these documents.

**List of potential Advanced Topics**

* Meta-analysis
* Survey sampling
* Statistical demography
* Advanced design of experiments (e.g. randomized bock designs, random effects)
* Causal inference (e.g. RCTs, potential outcomes framework, regression discontinuity, propensity score methods, instrumental variables, synthetic controls)
* Design of clinical trials
* Time series & forecasting
* Hierarchical Linear Models / Longitudinal Data analysis
* Survival analysis
* Statistical analysis of social networks
* Record linkage / entity resolution
* Non-parametric statistics
* Generalized linear models
* Cluster analysis
* Multivariate analysis (e.g. principal components analysis, factor analysis)
* Econometrics
* Statistical genetics
* Monte Carlo methods / Markov chains
* Bayesian statistics
* Statistical methods for spatial data analysis
* Mathematics of Machine Learning
* Statistical Learning
* Statistical methods for risk management
* Biostatistics
* Decision Theory (e.g. loss functions)
* Resampling methods (e.g. bootstrap, jacknife)
* Stochastic Processes
* Advanced topics from probability theory / measure theory (e.g. Law of large numbers, Brownian motion)
* Missing data / multiple imputation
* Linear algebra for statistics/data science
* Statistical methods for financial data
* Other topic approved by Dr. Fitz

**Alternative approaches to finding a topic:**

1. Choose a “famous” statistician and learn what methods they are known for, what motivated the method development, how their identity/beliefs shaped their methods
2. Google “how statistics is used in \_\_\_\_\_,” find a method relevant to an application you’re interested in
3. Find a peer-reviewed article you find interesting, choose a topic from the article and/or choose the author as a “famous” statistician and look into more of their work

**(Incomplete) List of “famous” statisticians**

**Past statisicians:**

* John Tukey
* Florence Nightingale
* Ronald Fisher
* Karl Pearson
* Jerzy Neyman
* Thomas Bayes
* Gertrude Mary Cox
* George Box
* David Cox
* Carl Gauss
* David Blackwell
* W. Edwards Deming
* William Gossett
* Adolphe Quetelet

**Living statisticians:**

* Bradley Effron
* C.R. Rao
* Mario Marazzi
* Susan Murphy
* Rob Tibsherani
* Daniella Witten
* Larry Hedges
* Andrew Gellman
* Sherri Rose
* Elizabeth Tipton
* Brady West
* Rob Santos
* Jennifer Hill
* Erin Hartman
* Wendy Cho
* Talithia Williams
* Ben Hansen
* Maria Cuellar
* Avi Feller
* Julian Higgins
* Jessaca Spybrook
* James Pustejovsky
* Elizabeth Stuart
* Emily Tanner-Smith
* Tyler Vanderwheele
* Tyler McCormick
* Luke Miratrix