**Special Topics Assignment Overview**

Choose an advanced statistical topic, 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:**

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

**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?

**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.

How the report will be evaluated

* Includes at least 3 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.

**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