Quantitative Analysis Practicum
Winter 2024
Monday and Wednesdays, 3:00 – 4:30 pm Pacific Time

Professor Max Griswold

Course Description
Conducting an independent analysis from scratch can be difficult. However, this is an essential skill for developing a dissertation and doing policy analysis work.

This practicum will make the analysis process easier by providing students with essential tools and strategies to create effective research products. Over the quarter, students will learn applied skills, develop an independent project, and receive feedback on their progress. Throughout sessions, we will work together to deliver professional critiques to make the final product accurate, impactful, and compelling.

This course will cover the following topics:

- Using code to process data, run research designs, and visualize results.
- The fundamentals for research project management and code reviews.
- Writing useful peer reviews and providing constructive feedback on research projects.
- Techniques for conducting effective analyses and presenting results.

This class provides credit towards the Empirical Analysis Distribution for RAD Stream students.

Student Learning Outcomes
By the end of the practicum, students will be able to conduct an independent empirical analysis from start to finish and be able to provide useful constructive criticism to colleagues on in-progress projects. Students will also be able to process data, conduct a research design, and visualize results using R code. They will be able to review other's code and offer suggestions for improvements.

Prerequisites
Students are expected to have completed the first year of graduate coursework. No previous experience with analysis or coding is required for this course. This course also assumes students will have some familiarity with linear regression, the fundamentals of causal inference, and internal/external validity in research designs.

Fellows will need to bring a research question and dataset to the first session. The instructor will work with students to ensure projects can be completed within the timeframe allotted for the practicum.

Class enrollment cap. This course includes several sessions focused on workshopping research. Accordingly, enrollment will be capped at 12 students to ensure all students receive sufficient feedback on their work.

To register, please sign up for the class on Populi (you will automatically be waitlisted) and submit a paragraph to the instructor briefly describing the research question and data that you plan to use for the class, affirming the project can fit into the ten-week course timeframe. Please reach out to the instructor beforehand if you have any questions.

Auditor policy
This course is not intended for auditing and will not permit auditors.

Evaluation Criteria
Student's work will be evaluated based on their ongoing project code, a final research report, peer feedback given in code reviews and workshops, and written peer reviews.

Project Work (50%): Each week, we will discuss iterative research steps, along with the tools and skills needed conduct these stages. Students will be expected to use R code to apply these lessons to their ongoing project and make this code accessible for code review. Students will also need to give one 5-minute presentation on their ongoing work between weeks two and seven.

By the end of Wednesday on week eight, students will need to have prepared a final report based on their research. Students will be evaluated on the report's clarity, the appropriateness of the data and research design to meet the project's aims, the effectiveness of included tables and visualizations to support arguments in the discussion section, and quality of the report's conclusion. Students will be given a rubric for the final report by week 4.

Peer Feedback (50%): Students will have many opportunities to provide feedback to others on in-progress work. Each week, we will spend 30 minutes in small groups doing code review, 2 minutes discussing published research using a workshop model, and 20 minutes discussing ongoing project work. Students are expected to participate in these sessions throughout the quarter, offering constructive comments and feedback.

Additionally, the last two weeks of the course will be based on workshopping final products. Students will need to participate in all sessions and provide short written peer reviews on two projects. The peer reviews will be evaluated on how well they summarize projects, provide critical feedback, and defend recommendations. Students will be given a rubric for this task at week 8.

Course Structure
Each week there will be online sessions structured as follows:

- On Mondays, there will be a 45 – 60-minute lecture, followed by a 5-minute break, and a 25 – 40-minute coding demonstration.
- On Wednesdays, there will be 30 minutes of code review, then a 25-minute critique of the week's reading. We will then take a 5-minute break and end with two 15-minute sessions for students to present ongoing project work and receive feedback.

Textbooks and Resources

This practicum will use as course reference material *Research Design in the Social Sciences* by Graeme Blair, Alexander Coppock, and Macartan Humphreys and *Regression and Other Stories* by Andrew Gelman, Jennifer Hill, and Aki Vehtari. Both textbooks are available online for free.

I also suggest students reference, *Better Data Visualizations: A Guide for Scholars, Researchers, and Wonks* by Jonathan Schwabish, *Economical Writing* by Deirdre Nansen McCloskey, and *How to Write a Thesis* by Umberto Eco. These books can be found affordably and would be useful reference materials for project work generally, independent of this practicum.

I will also provide students with example R code each week, which is available in the class code repository.

Class Schedule and Readings

Week 1: Project Management

- Monday, 1/8
    - Lecture: Planning a Research Design
        - Class Introduction
        - Asking Solvable Questions
        - Project Planning
        - Choosing the Right Design
    - Code: Packages, Data Types, & Data Manipulation
- Wednesday, 1/10
    - Lecture: Project Management
        - Code Review
        - Version Control
    - Code: Functionals, Conditionals, and Loops
    - Reading: Tong. 2019. *Statistical Inference Enables Bad Science; Statistical Thinking Enables Good Science.*

Week 2: Sourcing Data

- Monday, 1/15
    - No Class (MLK day)
- Wednesday, 1/17
    - Lecture: Sourcing Data
        - Data Taxonomy
        - Thinking Critically about Measurement
        - Synthetic Data
    - Code: APIs and Webscrapping
    - Reading: Knox, Lowe, and Mummolo. 2020. *Administrative Records Mask Racially Biased Policing.*

Week 3: Data Processing

- Monday, 1/22
  - Lecture: Data Processing
    - Data Formatting
    - Data Cleaning
    - Useful transformations
  - Code: Recoding, Merges, Regex, Transformations
- Wednesday, 1/24
  - Reading: Steegen, Tuerlinckx, Gelman, and Vanpaemel. 2016. *Increasing Transparency Through Multiverse Analysis.*
  - Reading: Anscombe. 1973. *Graphs in Statistical Analysis.*

Week 4: Modeling - Descriptive

- Monday, 1/29
  - Lecture: Exploratory Analyses
    - Correlations and Descriptive Statistics
    - Tables, Plots, and Maps
    - Exploratory Models
  - Code:
    - Correlations & Descriptive Statistics
    - Exploratory Plots
- Wednesday, 1/31
  - Readings: Case and Deaton. 2015. *Rising Morbidity and Mortality in Midlife Among White Non-Hispanic Americans in the 21st Century.*
  - Readings: Gelman and Auerbach. 2016. *Age-Aggregation Bias in Mortality Trends.*

Week 5: Modeling – Causal

- Monday, 2/5
  - Lecture: Model Building
    - Pathway Diagrams
    - Choosing Your Model
    - On Assumptions
  - Code:
    - LM/GLM models
    - Longitudinal models
- Wednesday, 2/7
  - Readings: Blair, Cooper, Coppock, and Humphreys. 2019. *Declaring and Diagnosing Research Designs.*

<u>Week 6: Interpreting Results</u>

- Monday, 2/12
    - Lecture: Checking Model Fit
        - From Estimates to Inference
        - Goodness-of-Fit
        - Choosing Sensitivity Tests
    - Code:
        - Goodness-of-Fit Statistics
        - Scaling Analyses for Sensitivity Tests
- Wednesday, 2/14
    - Readings: Gelman, Fagan, and Kass. 2007. *An Analysis of the New York City Police Department's "Stop-and-Frisk" Policy in the Context of Claims of Racial Bias.*
    - Readings: Collinson et al. 2023. *Eviction and Poverty in American Cities.*

<u>Week 7: Communicating Results</u>

- Monday, 2/19
    - Lecture: Figures, Tables, and Visualizations
        - Matching Figures to Arguments
        - Figure Library
        - Figure Design
    - Code:
        - ggplot: Figures and Maps
- Wednesday, 1/21
    - Readings: King, Tomz, and Wittenberg. 2000. *Making the Most of Statistical Analyses: Improving Interpretation and Presentation.*

<u>Week 8: Peer Review</u>

- Monday, 2/26
    - Lecture: Constructive Criticism
        - Effective Peer Reviewing
        - Making the Most of Seminars
        - Anticipating Referees and Criticism
    - Code:
        - Monte Carlo Simulations
- Wednesday, 2/28
    - Readings: Witteman, Hendricks, Straus, and Tannenbaum. 2019. *Are gender gaps due to evaluations of the applicant or the science? A natural experiment at a national funding agency.*

<u>Week 9: Article Workshops</u>

- Monday, 3/4
  - Lecture: Workshopping
    - What is a workshop?
    - Workshop parameters
  - Workshops
- Wednesday, 3/6
  - Workshops

<u>Week 10: Article Workshops</u>

- Monday, 3/4
  - Workshops
- Wednesday, 3/6
  - Workshops