

GOVT 10: Quantitative Political Analysis

Fall 2025 (2A)

Sean Westwood

Location: Silsby 126

Office Hours: Monday 3:00-4:00 PM EST or by arranged appointment

Office Hours Appointments: <https://calendar.app.google/kZSwzLebXkikPaG86>

Course Overview

This course introduces practical uses of AI in research. You will learn to interpret published work, generate clear summaries, and support your own scholarship. The goal is to provide a shared foundation of AI skills that helps level differences in prior experience.

The growing amount of available quantitative data is changing the way we understand and engage in politics, how we implement policy, and how organizations across the world make decisions. In this course, we will learn the fundamental tools of quantitative analysis and apply them to a wide range of political and policy oriented questions. How do we predict presidential elections? Did economic voters bring Hitler to power? How does the ideology of the Supreme Court change over time? These are just a few of the questions we will work on in the course.

Students are not expected to have any programming, advanced math or statistical knowledge. The course will be centered around assignments that will help build skills from scratch. Students will leave the course equipped for work in any setting that requires a social scientific approach to data science, from policy non-profits to government, from Silicon Valley to Wall Street and beyond. There are no formal prerequisites for this course.

Teaching in the Age of AI

AI has fundamentally changed the world, and we need to work WITH it, not against it. Some professors are pretending AI doesn't exist, others are dejected by its rise, but our job is to teach students the skills they actually need. AI is what you will use in the real world—that is what this class embraces and teaches.

The traditional approach to teaching quantitative methods—memorizing syntax, debugging code line by line, struggling with programming details—is becoming obsolete. In 2025, successful data analysts don't spend their time remembering whether it's `filter()` or `subset()`. Instead, they focus on the intellectual work: understanding what questions to ask, designing appropriate analyses, interpreting results correctly, and communicating findings effectively. When you graduate and work in political consulting, policy analysis, journalism, or research, you'll use AI daily. The

valuable skill isn't knowing every function in R—it's knowing when a regression is appropriate, what confounding variables to consider, how to interpret a confidence interval, and whether your findings actually answer your research question. Those are the skills that make you irreplaceable in an AI-enabled world.

This course reflects that reality. We use AI as a powerful assistant that handles the technical implementation while we focus on the higher-order thinking that no AI can replace. You'll learn to be sophisticated consumers and creators of quantitative political analysis, equipped with both technical skills and critical thinking abilities.

Rather than memorizing programming syntax, we focus on:

- **Understanding concepts** and their applications to real political problems
- **Interpreting results** and their political implications in context
- **Asking the right questions** and designing appropriate research strategies
- **Working effectively with AI** to accelerate analysis and overcome technical barriers
- **Verifying logic** and critically evaluating AI suggestions for accuracy and appropriateness
- **Recognizing limitations** of both data and analytical methods
- **Communicating findings** clearly to diverse audiences

This approach prepares you for a future where AI handles the technical details, but human judgment determines the quality, ethics, and meaning of research. You'll leave this course not just knowing how to analyze political data, but understanding how to think scientifically about politics in an era of artificial intelligence.

Assessment

Grades:

- 25% Midterm Exam
- 25% Final Exam
- 30% Quizzes (8 total)
- 10% Assignments (weekly submission of class exercises)
- 10% Participation (engagement in class and attendance)

Exams and Quizzes:

- All exams and quizzes are **closed book** and conducted **on paper**
- Quizzes are 10-15 minutes each, administered once per week starting in Week 2 (excluding the week of the midterm)
- No quiz during midterm week or final week

Class assignments:

On most class meetings, you will be given an assignment to work through. The content will be a mixture of multiple-choice, fill-in-the-blank, and matching questions, along with tasks that require reasoning and interpretation. You will have access to a computer for these assignments. You will not submit them for credit, but it will not be possible to pass quizzes and exams without completing them.

Class Format

Class will be a mixture of lecture and hands-on exercises.

- **During lecture portions:** Class will be **closed computer/no devices** to maintain focus and engagement.
- **During hands-on portions:** Laptops required for coding exercises and AI-assisted analysis.

Required Tools

- **R** (statistical programming language)
- **Positron** (modern IDE optimized for data science)
- **Claude Plus subscription** (AI assistant for coding and analysis)

Book

There is no book. I will provide all needed materials.

Weekly Schedule

Week 1: Introduction to Quantitative Political Analysis

9/16 - Class 1: Introduction to Quantitative Political Analysis

Key Concepts:

- What quantitative political analysis is and why it matters
- Data analysis applications to real political problems
- Role of AI in modern political analysis

9/18 - Class 2: Introduction to R and Data Frames

Key Concepts:

- Basic R operations with variables and vectors
- Examining data frames
- Effective AI assistance for R programming

R Functions Introduced: `library(tidyverse)`, `read_csv()`, `glimpse()`, `head()`, `mean()`, `table()`, `summary()`

Week 2: Working with Data

9/23 - Class 3: Working with Real Data

Key Concepts:

- Exploring real political datasets
- Data manipulation with tidyverse
- Handling missing values (NA) properly

- Correlation vs. causation

R Functions Introduced: `filter()`, `select()`, `arrange()`, `names()`, `is.na()`, `!is.na()`

Quiz 1

9/25 - Class 4: Summary Statistics

Key Concepts:

- Central tendency: mean, median, mode
- Measures of spread: range, variance, standard deviation
- When each measure is appropriate

R Functions Introduced: `group_by()`, `summarise()`, `median()`, `sd()`, `n()`, `ggplot()`, `geom_histogram()`, `geom_density()`, `geom_vline()`

Week 3: Research Designs

9/30 - Class 5: Data Transformation and Variable Creation

Key Concepts:

- Creating and modifying variables with `mutate()`
- Conditional logic and recoding data
- Logical operators and data transformation

R Functions Introduced: `mutate()`, `case_when()`, `if_else()`, `pull()`, `n_distinct()`, `across()`, `recode()`

Quiz 2

10/2 - Class 6: Research Designs

Key Concepts:

- Experimental vs. observational designs
- Natural experiments
- Cross-sectional vs. longitudinal data
- Design tradeoffs and internal validity

R Functions Introduced: `count()`

Week 4: Regression and Causal Inference

10/7 - Class 7: Causality

Key Concepts:

- Three requirements for causation: association, temporal ordering, no confounding
- Spurious correlations and confounding variables

- Using AI to identify alternative explanations

R Functions Introduced: None

Quiz 3

10/9 - Class 8: Modern Causal Inference

Key Concepts:

- Fundamental problem of causal inference
- Average Treatment Effect (ATE) calculation and interpretation
- Randomized experiments and difference-in-differences design

R Functions Introduced: None

Week 5: Advanced Regression

10/14 - Class 9: Linear Regression

Key Concepts:

- Linear relationships and OLS intuition
- Model fitting and interpretation
- Political applications of regression

R Functions Introduced: `lm()`, `broom::tidy()`

10/16 - Class 10

Midterm Exam

Week 6: Multivariate Analysis

10/21 - Class 11: Multivariate Models

Key Concepts:

- Controlling for confounding variables
- Partial relationships and model building
- Multiple predictors

R Functions Introduced: None

Quiz 4

10/23 - Class 12: Categorical Predictors and Interactions

Key Concepts:

- Dummy variables and reference categories
- Interpreting categorical predictors in regression
- Interaction terms and conditional relationships
- When and how to use interaction terms

R Functions Introduced: `factor()`, `levels()`

Week 7: Uncertainty and Statistical Testing

10/28 - Class 13: Plotting Data

Key Concepts:

- Grammar of Graphics principles
- Line plots for time series data
- Scatter plots for relationships
- Box plots for group comparisons

R Functions Introduced: `scales::percent_format()`, `geom_line()`, `geom_point()`, `geom_smooth()`, `geom_boxplot()`

Quiz 5

10/29 (x-hour) - Class 14: Designing Experiments

Key Concepts:

- Types of experiments: vignette, conjoint, and economic games
- Within-subjects vs. between-subjects designs
- Typical 2×2 factorial designs
- Control group strategies and placebo effects
- Design considerations: survey length and respondent fatigue
- Random assignment and treatment implementation

R Functions Introduced: None.

Week 8: Data Visualization

11/4 - Class 15: Advanced Plots

Key Concepts:

- Multi-panel figures and faceting
- Area plots for compositions over time
- Pie charts vs. alternative visualizations

R Functions Introduced: `geom_area()`, `coord_polar()`, `facet_wrap()`, `geom_tile()`, `coord_equal()`

Quiz 6

11/5 (X-hour) - Class 16: Advanced Plotting Techniques

Key Concepts:

- Bubble plots for multi-dimensional data
- Density plots for distribution comparisons
- Professional design guidelines

R Functions Introduced: `coord_cartesian()`, `theme_minimal()`, `scale_fill_viridis_d()`, `geom_density()`

Week 9: Statistical Significance

11/11 - Class 17: What is Statistical Significance?

Key Concepts:

- Logic of hypothesis testing
- Distinguishing real effects from chance
- What significance means vs. what it doesn't

R Functions Introduced: `tibble()`, `rnorm()`, `sample()`, `replicate()`

Quiz 7

11/13 Class 18: Statistical Tests and Confidence Intervals

Key Concepts:

- Standard errors
- Confidence interval interpretation
- t-tests and significance in regression
- Type I and II errors

R Functions Introduced: `t.test()`, `confint()`, `broom::glance()`

Week 10: Actually Using AI

Class 19: Data Analysis with AI

Key Concepts:

- Complete analysis workflow from question to conclusion
- Data cleaning strategies for messy real-world data
- Robustness checks and validation techniques
- Fact-checking results with AI assistance
- Professional presentation of findings

R Functions Introduced: None **Quiz 8**

Final Monday, November 24 @ 8:00 AM - Final

Mandatory Disclosures

Dartmouth's Academic Honor Principle

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Once SAS has authorized services, students must show the originally signed SAS Services and Consent Form and/or a letter on SAS letterhead to their professor. As a first step, if students have questions about whether they qualify to receive academic adjustments and services, they should contact the SAS office. All inquiries and discussions will remain confidential.

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