GOVT 10: Quantitative Political Analysis

Winter 2026

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
- 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

1/6 - 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

1/8 - 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

1/13 - 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

1/15 - 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

1/20 - Class 5: Transforming and Creating Variables

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

1/22 - 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

1/27 - 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

1/29 - 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

2/3 - 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()`

2/5 - Class 10

Midterm Exam

Week 6: Multivariate Analysis

2/10 - Class 11: Multivariate Models

Key Concepts:

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

R Functions Introduced: None
Quiz 4

2/12 - 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: Data Visualization and Experimental Design

2/17 - 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

2/19 - Class 14: Experimental Design in Political Science

Key Concepts:

- Types of experiments: vignette, conjoint, and economic games
- Within-subjects vs. between-subjects designs
- Typical $2x2$ 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: Introduction to Statistical Significance

2/24 - Class 15: Working Toward Statistical Significance?

Key Concepts:

- Understanding populations vs. samples
- Why sampling creates uncertainty
- How sample size affects confidence
- Margin of error and its calculation
- The logic of hypothesis testing

R Functions Introduced: None
Quiz 6

2/26 - Class 16: What is Statistical Significance?

Key Concepts:

- Standard deviation vs. standard error
- Variability in samples vs. variability in estimates
- Systematic method to distinguish real effects from noise
- Political examples: polls, gender gaps, campaign effects

R Functions Introduced: None

Week 9: Statistical Inference

3/3 - Class 17: Statistical Tests

Key Concepts:

- The t-distribution and its uses
- One-sample t-tests for single means
- Two-sample t-tests for comparing groups
- Regression t-tests for coefficients
- Common pitfalls in hypothesis testing

R Functions Introduced: `tibble()`, `rnorm()`, `sample()`, `replicate()`
Quiz 7

3/5 - Class 18: Confidence Intervals

Key Concepts:

- From t-statistics to confidence intervals
- Interpreting confidence intervals correctly
- Precision: narrow vs. wide intervals
- Communicating effect size AND uncertainty

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

Week 10: Actually Using AI

3/10 - 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, March 16 @ 11:30 AM

Mandatory Disclosures

Dartmouth's Academic Honor Principle

All students are expected to abide by Dartmouth's Academic Honor Principle. For detailed information, please visit: http://www.dartmouth.edu/judicialaffairs/honor/index.html

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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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