POLS 3316 Statistics for Political Scientists

Monday/Wednesday 10:00-11:30 AM, Room: S119
University of Houston
Department of Political Science

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Instructor

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Course Description

Statistical (quantitative) methods are mathematical models and techniques used in the systematic analysis of raw research data. Political scientists use statistical methods and data analysis to gain a systematic understanding of human behavior patterns and complex political phenomena (e.g., the allocation of government fiscal resources, political representation, complex policy-making processes, interactions between citizens and government, etc.). This course provides an introduction to the scientific study of politics. The focus of this course is twofold. First, it seeks to teach undergraduate students in political science and related social science disciplines key approaches to research design. Second, it introduces students to various statistical tools to manage, visualize, and analyze data and to answer substantive questions about politics. The course is designed to help students become better "consumers" of information and academic political science research and to help students start their own journeys in producing scientific research on politics. In addition, this course introduces students to various statistical analyses of quantitative data in political science, applied to elections, public policy, and economics, and facilitates students' usage of computer software for evaluating quantitative data. Our class meets twice a week on Mondays and Wednesdays. Monday

sessions will be lectures focusing on the theoretical and conceptual foundations. Wednesday sessions are organized as in-class statistical labs for students to learn and practice specific data analysis techniques using R/RStudio.

Learning Objectives

POLS3316 introduces quantitative research methods and statistical models in political science. This is the course where students will be asked to become familiar with substantive questions in the study of politics. Rather than providing specific opinions about politics, we will focus on understanding research (causal) questions and applying appropriate research design and statistical analysis to further scholarly discussions. By the end of the semester, students are expected to learn:

1. how to establish a valid research question;
2. thinking about the world and complex political phenomena in terms of variables and causal explanations;
3. critically evaluating scholarly work based on the merits of research design;
4. how political scientists collect and manage empirical data;
5. how to match proper statistical methods to relevant research questions;
6. how to develop their own research projects using one or more methods discussed in this class;
7. writing a research paper that puts together the synopsis and critical evaluation of existing research and students' own original knowledge on a topic of interest.

Regarding statistical methods and computer software, students in this class will learn the following skills using `R` and `RStudio`:

1. data management (import, inspect, and prepare data);
2. data visualization;
3. descriptive statistics;
4. basic inferences with correlation, covariance, and bivariate association;
5. linear regression models and diagnostics with continuous variables;
6. generalized linear models with bivariate outcomes, ordinal outcomes, and count data;
7. statistical forecasting using time-serious analysis.

Software, Statistical and Otherwise

All lectures and statistical labs will be instructed using R. R is a statistical environment and high-level programming language for data analysis and visualization. It is the GNU version of the S language. R is a free and open-source software. The current (October 2024) version of R is 4.4.2. (Pile of Leaves) R is an object-oriented language. Unlike Stata and most other statistical packages, it operates by assigning values to objects in the workspace. In the lecture notes, handouts, etc., R commands and outputs will be marked by "R Code" and "R Output", respectively.

———————————-R Code———————————

```
Age<-cps2011$age
summary(Age)
```

———————————-R Output———————————

```
Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
0.00   15.00   34.00   34.99   52.00   85.00
```

The Comprehensive R Archive Network (CRAN) is the to-go spot for all things R-related. We will also use RStudio, which is an integrated development environment for R. It includes a console, syntax-highlighting editor that supports direct code execution, and tools for plotting, history, debugging, and workspace management. I encourage each student to bring his/her own laptop to class. We will use R on Wednesdays for various data examples. Lab handouts will contain relevant data examples and replication code written in R language. Students may also check out laptops from the UH Library Equipment Services.

Textbooks and Readings

In this class, we will primarily use one main textbook listed as "required" below. Kellstedt and Whitten (2018) offer the conceptual foundation of political science research. We will use this book as the roadmap for developing the scientific studies of politics (i.e., political science research). Beyond the required textbook, I also list a few recommended books below. Kellstedt and Whitten's (2018) R Companion book includes data examples and replication R code, which students can use to replicate statistical analyses and tables in the textbook. I listed several additional books, particularly for students who (think they) are afraid of statistics and/or academic research. Salkind (2017) is (hopefully) a "cure" for number phobia and/or mathematics anxiety. This book will be a good companion to our main texts. Wickham et al. (2023) is an excellent open-source book on R. This is an accessible introductory-level book, including various R modules and examples of R code. We will use this e-book as supplemental materials for our Wednesday labs.

1. Kellstedt, Paul M. and Guy D. Whitten. 2018. *The Fundamentals of Political Science Research*, third edition, Cambridge University Press (required main text).
2. Kellstedt, Paul M. and Guy D. Whitten. 2018. *An R Companion for the Third Edition of The Fundamentals of Political Science Research*, Cambridge University Press (required, learning sources for HM assignments).
3. Wickham, Hadley, Mine Cetinkaya-Rundel, and Garrett Grolemund. 2023. *R for Data Secience*, second edition, open access at https://r4ds.hadley.nz/.

4. Salkind, Neil J. 2017. *Statistics for People Who (Think They) Hate Statistics*, sixth edition, Sage Publication (recommended).

5. Additional readings and lab handouts (listed in the subsequent weekly course calendar and distributed weekly through Canvas).

Course Requirements

1. Class attendance and active participation in class discussion.
2. Read the assigned readings and lab handouts before each class meeting.
3. Homework Assignments. There will be weekly short homework assignments throughout the semester. The goal of these homework assignments is to help students practice various data analysis techniques covered in our statistical labs. Each HM assignment will include 2-3 questions and be distributed on a Wednesday class (after the lab session) and due by Monday at 5:00 pm. Grades and comments will be returned to students before the following Wednesday's class. We will then review the problem set in the following Wednesday's class.
4. Exams. There will be two written exams: The Mid-Term Exam will be on Wednesday, March 5, and the Final Exam is on Monday, April 28. Both exams will be in-class and open-book. Students are allowed to use their notes during the exam.
5. Extra Credits. There will be four extra-credit events throughout the semester. These events connect undergraduate students with social science research opportunities and graduate programs. Details are listed in the section, Course Calendar.

Grading

1. Attendance, 10%
2. Homework Assignments, 40% (5% each)
3. Mid-term Exam, 25%
4. Final Exam, 25%
5. Maximum possible extra credit, 10%
6. Final Grades

A	$\geq$	94 (Excellent)
A-	=	93-90
B+	=	89-86
B	=	85-83
B-	=	82-80 (Good)
C+	=	79-76
C	=	75-73
C-	=	72-70 (Average)
D+	=	69-66
D	=	65-63
D-	=	62-60 (Poor passing)
F	=	59-0 (Failing)

Mental Health and Wellness Resources

The University of Houston has a number of resources to support students' mental health and overall wellness, including CoogsCARE and the UH Go App. UH Counseling and Psychological Services (CAPS) offers 24/7 mental health support for all students, addressing various concerns like stress, college adjustment, and sadness. CAPS provides individual and couples counseling, group therapy, workshops and connections to other support services on and off-campus. For assistance, visit uh.edu/caps, call 713-743-5454, or visit a Let's Talk location in-person or virtually. Let's Talk are daily, informal confidential consultations with CAPS therapists where no appointment or paperwork is needed. The Student Health Center offers a Psychiatry Clinic for enrolled UH students. Call 713-743-5149 during clinic hours, Monday through Friday 8:00 a.m.-4:30 p.m. to schedule an appointment. The A.D. Bruce Religion Center offers spiritual support and a variety of programs centered on well-being.

Need Support Now? If you or someone you know is struggling or in crisis, help is available. Call CAPS crisis support 24/7 at 713-743-5454, or the National Suicide and Crisis Lifeline: call or text 988, or chat 988lifeline.org.

Academic Honesty Policy

As commonly defined, presenting the words or works of others as your own is plagiarism. Plagiarism is one of the worst academic sins, for the plagiarist destroys the trust among colleagues, without which research cannot be safely communicated. Plagiarism is also a violation of the UH Academic Honesty Policy. High ethical standards are critical to the integrity of any institution and bear directly on the ultimate value of conferred degrees. All UH community members are expected to contribute to an atmosphere of the highest possible ethical standards. Maintaining such an atmosphere requires that any instances of academic dishonesty be recognized and addressed. The UH Academic Honesty Policy is designed to handle those instances with fairness to all parties involved: the students, the instructors, and the University itself. All students and faculty of the University of Houston are responsible for being familiar with this policy. Students are expected to adhere to the UH Academic Honesty Policy. Cheating or plagiarism in course assignments and the final paper will lead to a grade of F.

Title IX/Sexual Misconduct

Per the UHS Sexual Misconduct Policy, your instructor is a "responsible employee" for reporting purposes under Title IX regulations and state law and must report incidents of sexual misconduct (sexual harassment, non-consensual sexual contact, sexual assault, sexual exploitation, sexual intimidation, intimate partner violence, or stalking) about which they become aware to the Title IX office. Please know there are places on campus where you can make a report in confidence. You can find more information about resources on the Title IX website at https://uh.edu/equal-opportunity/title-ix-sexual-misconduct/resources/.

Excused Absence Policy

Regular class attendance, participation, and engagement in coursework are important contributors to student success. Absences may be excused as provided in the University of Houston Undergraduate Excused Absence Policy and Graduate Excused Absence Policy for reasons including

medical illness of a student or close relative, death of a close family member, legal or government proceeding that a student is obligated to attend, recognized professional and educational activities where the student is presenting, and University-sponsored activity or athletic competition. Under these policies, students with excused absences will be allowed to make up any quiz, exam, or other work that contributes to the course grade or a satisfactory alternative. Please read the full policy for details regarding reasons for excused absences, the approval process, and extended absences. Additional policies address absences related to military service, religious holy days, pregnancy and related conditions, and disability.

Reasonable Academic Adjustments and Auxiliary Aids

The University of Houston is committed to providing an academic environment and educational programs that are accessible for its students. Any student with a disability who is experiencing barriers to learning, assessment, or participation is encouraged to contact the Justin Dart, Jr. Student Accessibility Center (Dart Center) to learn more about academic accommodations and support that may be available to them. Students seeking academic accommodations will need to register with the Dart Center as soon as possible to ensure the timely implementation of approved accommodations. Please contact the Dart Center by visiting the website: https://uh.edu/accessibility/ calling (713) 743-5400, or emailing jdcenter@Central.UH.EDU.

Recording of Class

Students may not record all or part of the class, livestream all or part of the class, or make/distribute screen captures, without the advanced written consent of the instructor. If you have or think you may have a disability such that you need to record class-related activities, please contact the Justin Dart, Jr. Student Accessibility Center. If you have an accommodation to record class-related activities, those recordings may not be shared with any other student, whether in this course or not, or with any other person or on any other platform. Classes may be recorded by the instructor. Students may use the instructor's recordings for their own studying and notetaking. Instructor's recordings are not authorized to be shared with anyone without the prior written approval of the instructor. Failure to comply with requirements regarding recordings will result in a disciplinary referral to the Dean of Students Office and may result in disciplinary action.

UH Email

Please check and use your Cougarnet email for communications related to this course. Faculty use the CougarNet email to respond to course-related inquiries such as grade queries or progress reports for reasons of FERPA. To access your Cougarnet email, login to your Microsoft 365 account with your Cougarnet credentials. Visit University Information Technology (UIT) for instructions on how to connect your Cougarnet e-mail on a mobile device.

Usage of Artificial Intelligence (AI)

From day-to-day tasks to research and data analysis, Artificial Intelligence (AI) is expected to be the next great change agent in how people, working teams, and organizations operate. AI technology is also transforming the field of data science and the practice of data analysis. Although the core

focus of this class is not on AI in data analytics, this course offers some opportunities for students to engage with AI tools (e.g., ChatGPT or Google Genimi) in homework assignments. The purpose is to teach students to use AI tools in a safe and responsible manner and how to critically evaluate the tasks performed by AI tools.

Syllabus Changes

The following weekly class calendar may be subject to modifications. Notice of such changes will be announced as quickly as possible through email.

Late Assignment Submission

Late work will be penalized by one letter grade each day after the deadline. For example, an A-paper turned in one day late will become a B-paper. Late work will only be accepted without a grade penalty if the student has university-accepted excuses.

Course Calendar

PART I. THE SCIENTIFIC STUDY OF POLITICS

Week 1: Course Overview (January 13 & 15)

1. January 13 (Monday): Course overview, no required readings.
2. January 15 (Wednesday): Lab 1. Getting Start with R and RStudio
   - Lab 1 Handouts.
   - R for Data Science: Ch2 Workflow: Basis.

Week 2: Introduction: The Scientific Study of Politics (January 20 & 22)

1. January 20 (Monday): Martin Luther King, Jr. Holiday, no class.
2. January 22 (Wednesday): Class canceled due to snowstorm.

Week 3: Building a Theory (January 27 & 29)

1. January 27 (Monday): The Scientific Study of Politics and the Art of Theory Building
   - Kellstedt and Whitten, Chapter 1&2.
   - Conybeare. 1983. "Tariff Protection in Developed and Developing Countries: A Cross-Sectional and Longitudinal Analysis." *International Organization.* 37(3): 441-467.
2. January 29 (Wednesday): Lab 2. Getting Data Ready: Import, Inspect, and Prepare Data
   - Lab 2 Handouts.
   - R for Data Science: Ch3 Data transformation.
   - Distribute HM1.

Week 4: Evaluating Causal Relationships (February 3 & 5)

1. February 3 (Monday): Roadmap for Theory Building.
    - Kellstedt and Whitten, Chapters 3 & 4.
    - HM1 due by 5:00 pm on Canvas.
2. February 5 (Wednesday): Lab 3. Visualizing Data
    - Lab 3 handouts.
    - R for Data Science: Ch1. Data visualization.
    - Review HM1.
    - Distribute HM2.
3. Extra Credit Opportunity: Discover Political Science: Graduate Program Information Session
    - Thursday, February 6, 2:00-3:30 PM, PGH 446.
4. Extra Credit Opportunity: CLASS Discovery Week (`https://www.uh.edu/class/calendar/discovery-week/index.php`).

PART II. Descriptive Analysis

Week 5 (February 10 & 12): Describing and Evaluating Variables

1. February 10 (Monday): Evaluating Measurement and Variations
    - Kellstedt and Whitten, Chapters 5 & 6
    - Clifford. 2018. "Reassessing the Structure of Presidential Character." *Electoral Studies*. 54 (August): 240-247.
    - King et al. 2004. " Enhancing the Validity and Cross-Cultural Comparability of Measurement in Survey Research." *American Political Science Review*, 98: 191-207.
    - HM2 due by 5:00 pm on Canvas.
2. February 12 (Wednesday): Lab 4. Descriptive Statistics: Central Tendency and Dispersion
    - Lab 4 handouts.
    - R for Data Science: Ch 10. Exploratory data analysis
    - Review HM2.
    - Distribute HM3.

Week 6 (February 17 & 19): Probabilities and Statistical Inference

1. February 17 (Monday): Populations, Samples, and Statistical Inference
    - Kellstedt and Whitten, Chapter 7.
    - HM3 due by 5:00 pm on Canvas.
2. February 19 (Wednesday): Lab 5. Probability Statistics and Basic Inferences
    - Lab 5 handouts.
    - Review HM3.
    - Distribute HM4.

Week 7 (February 24 & 26): Bivariate Hypothesis Testing

1. February 24 (Monday): Bivariate Hypothesis Testing
   - Kellstedt and Whitten, Chapters 7&8
   - Fauvelle-Aymar and Stegmaire. 2013. "The Stock Market and Presidential Approval." *Electoral Studies*, 32(3): 411-417.
   - HM4 due by 5:00 pm on Canvas.
2. February 26 (Wednesday): Lab 6. Bivariate Associations, Difference of Means, and Contingency Tables
   - Lab 6 handouts.
   - Review HM 4.

Week 8 (March 3 & 5): Review and Midterm Exam

1. March 3 (Monday): Review for the Midterm Exam
2. March 5 (Wednesday): Midterm Exam
3. Extra Credit Event: UH Summer Undergraduate Research Fellowship 2025 Application Deadline: Friday (March 7).

PART III. Basics of Regression Analysis

Week 9 (March 10 & 12), Springbreak, no class.

Week 10 (March 17 & 19): Bivariate Regression Models (1)

1. March 17 (Monday): Bivariate Regression Models
   - Kellstedt and Whitten, Chapter 9, 9.1-9.4
   - Frankel. 1999. "Does Trade Cause Growth?" *American Economic Review*, 89(3):379-399.
   - Review the Midterm Exam.
2. March 19 (Wednesday): Lab 7. Estimating Bivariate Regression Models
   - Lab 7 handouts.
   - Distribute HM5.

Week 11 (March 24& 26): Bivariate Regression Models (2)

1. March 24 (Monday): Bivariate Regression Models: Assumptions and Diagnostic Analysis
   - Kellstedt and Whitten, Chapter 9, 9.5
   - HM5 due by 5:00 pm on Canvas.
2. March 26 (Wednesday): Lab 8. Regression Diagnostics
   - Lab 8 handouts.
   - Review HM5.
   - Distribute HM6.

Week 12 (March 31 & April 2): Multiple Regression: Basics

1. March 31 (Monday): Modeling Multivariate Reality
   - Kellstedt and Whitten, Chapter 10
   - Berggren et al. 2010. "The Looks of A Winner: Beauty and Electoral Success." *Journal of Public Economics*, 94(1-2): 8-15.
   - Lawson et al. 2010. "Looking Like a Winner: Candidate Appearance and Electoral Success in New Democracies." *World Politics*, 62(4): 561-593.
   - HM6 due by 5:00 pm on Canvas.
2. April 2 (Wednesday): Lab 9. Multiple Regression Models
   - Lab 9 handouts.
   - Review HM 6.
   - Distribute HM 7.

Week 13 (April 7 & 9): Multiple Regression: Extensions

1. April 7 (Monday): Extensions of Ordinary Least Squares
   - Kellstedt and Whitten, Chapter 11.
   - HM 7 due by 5:00 pm on Canvas.
2. April 9 (Wednesday): Lab 10. Visualizing Multiple Regression Results
   - Lab 10 handouts.
   - Review HM 7.
   - Distribute HM8.
3. Extra-Credit Event: UH Undergraduate Research Day, April 10.

PART IV. Extensions to Linear Regression Models

Week 14 (April 14 & 16): Analyzing Binary Outcomes

1. April 14 (Monday): Generalized Linear Models with Binary Outcomes
   - Kellstedt and Whitten, Chapter 12, 12.1 &12.2
   - HM 8 due by 5:00 pm on Canvas.
2. April 16 (Wednesday): Lab 11. Dummy Dependent Variables
   - Goldman. 2018. "Fear of Gender Favoritism and Vote Choice During the 2008 Presidential Primaries. " *Journal of Politics*, 80(3): 786-799.
   - Lab11 handouts

Week 15 (April 21 & 23): Analyzing Ordinal Outcomes

1. April 15 (Monday): Generalized Linear Models for Ordinal Outcomes
   - Zhu and Wright. 2015." Why Do Americans Dislike Publicly Funded Health Care? Examining the Intersection of Race and Gender in the Ideological Context." *Politics, Groups, and Identities*, 4(4): 618-637.

- Zhu. 2017 "Voices from the Frontline: Network Participation and Local Support for National Policy Reforms." *Journal of Public Administration Research and Theory*, 27(2): 284-300.

2. April 17 (Wednesday): Lab 12. Ordinal Dependent Variables
   - Lab 12 handouts.
   - Review HM8 and Review for the Final Exam

Week 16 (April 28): Final Exam

Caveat: The aforementioned weekly schedule and assignments in this course may be subject to change.