



Empirical Methods

INTA 2010
Fall 2026

Instructor Info



David Muchlinski



MW: 12:00-1:00



Habersham 147



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Course Info



Prereq: None



M, W



8:00-9:15



Habersham G17

Lab Info



Indicated on Class Schedule



Habersham G17

TA Info



TBA

Overview

In this course we will be introduced to the fundamentals of statistical research in political science. We will focus on understanding basic statistical skills and understanding basic programming in the R programming environment. Understanding how to analyze numerical data effectively is of fundamental importance in the modern world, where information is plentiful, but knowledge is scarce. We will investigate the foundations of data analysis to provide real world skills in demand in the job market for social scientists. We will engage in hands-on activities to develop these specialized skills. At the end of this course, students will have a basic understanding of the application of statistical methods to common problems in political science.

Reading

Required Texts

Imai, K and Williams, N.W. (2022). *Quantitative Social Science: An Introduction and Introduction in Tidyverse*. Princeton University Press.

Reference Texts

Agresti, A. *Statistical Methods for the Social Sciences*. 5th Edition. Pearson Education Limited. 2018.

Xie, Y., Allaire, J. J., & Golemund, G. (2018). *R Markdown: The Definitive Guide*. Chapman and Hall/CRC.

Available for free here: <https://bookdown.org/yihui/rmarkdown/> A useful guide for working within the R Markdown Environment.

Grolemund, G., & Wickham, H. (2016). *R for Data Science: Visualize, Model, Transform, Tidy, and Import Data*.

Available for free here: <https://r4ds.had.co.nz/>. A useful guide for common questions in R. A guide to the tidyverse package.

Other Texts

Any other required reading will be provided on Canvas.

Grading Scheme

10%	Attendance
10%	Quizzes
20%	Homework
30%	In-Class Homework Labs
15%	Midterm Exam
15%	Final Exam

Grades will follow the standard scale: A = 90-100; B = 80-89; C = 70-79; D = 60-69; F < 60. Curving is at the discretion of the professor and will ONLY be utilized if needed to ensure a normal grade distribution with a mean centered around 75%. "Rounding" of grades will ONLY be done if a student is 0.5% or less away from the higher letter grade, and ONLY if they have submitted every homework assignment and attended all homework labs.

FAQs

? What are Empirical Methods?

! Empirical means something verified by observation or experience. Methodology is the study of the methods used in a particular field. So empirical political science methodology is concerned with using scientifically valid means of observing, measuring, and verifying observations related to the study of international politics.

? What will we be Doing?

! Learning how to develop the knowledge to systematically and critically evaluate verifiable facts about the world of international affairs. Also learning how scientific, empirically verifiable research is conducted in a professional manner.

? How will we be Doing This?

! With statistics, statistics software R and R Studio, and LLMs.

? Are there any Extra Requirements for this Course?

! Yes. Students are required to download the R and R Studio statistical software package(s) on their personal computers. We will be using this software for all exams and homework. Students are strongly encouraged to ensure they have access to a computer and means of organizing and storing data locally or on a cloud-based platform (i.e. thumb drive, Google Drive) for the entire semester. Students are also recommended to create a GPT account on OpenAI.

Learning Objectives

- Students will be able to apply basic statistical skills to include quantitative and qualitative methodologies in academic and professional contexts within the field of international affairs.

Downloading and Installing R and R Studio

We will install the statistical programming software R and R Studio during the first week of class. We will work exclusively in R Studio in Markdown format. R can be downloaded here <https://cran.r-project.org/>, and R Studio here: <https://rstudio.com/products/rstudio/>. We will utilize R extensively during cooperative Lab sessions each week. R is a free, open source statistical programming language, like Python. I strongly recommend that students also utilize ChatGPT to assist with developing R code during Lab and for their homework. If possible, I suggest students pay the \$20 per month fee to access the most advanced GPT model as it produces far better code, with fewer hallucinations, than the free model, and it is not rate-limited. We will work cooperatively with GPT to solve statistical problems using R.

Attendance Policy

Attendance accounts for 10% of your grade. To ensure proper all students receive proper credit for their attendance, I will be keeping track of all students who attend class.

Midterm

Students will receive an in-class Blue Book midterm which will test their conceptual knowledge regarding statistical concepts they have learned in class. No coding or analysis will be required for this exam. The exam will be a Blue Book exam. More detailed instructions will follow before the midterm exam.

Final Exam

Students will be assigned a final exam on the date specified by the Final Exam Matrix distributed by the registrar's office. Like the midterm exam, it will be a Blue Book exam. More detailed instructions will follow when the exam is distributed.

Make-up Policy

Make-ups will be given for missed or late assignments due to illness on a case-by-case basis with the professor. Notification from Student Life, Stamps, or a medical professional should be made available for make-ups related to serious illness. Advance notification should be provided for absence due to officially scheduled Institute activities. Late assignments without a legitimate excuse will be accepted for up to seven days after the due date, with a penalty of 5% assessed per day late. After seven days, the student will receive a grade of zero for the assignment. Make up exams must be scheduled with the professor directly, and may only be made up with official, legitimate, documentation. There will be no "make up" courses, recordings, or hybrid in-person/online lectures provided for this course unless an Institute-wide Digital Learning Day must be implemented, or if mandated by ODS and I am in receipt of a letter informing me of such necessity. If a student is ill, please stay home and get the notes from a fellow classmate, or see the professor or TA during office hours once recovered.

Homework

There will be multiple homework assignments during the semester. Students must come to class having prepared answers to the required homework questions, which will be worked on cooperatively during flipped class “lab” sessions. The most effective way to learn statistics and research methods is to *do* statistics and research methods. Therefore, students will complete the assigned homework assignments to the best of their ability, and these homework assignments will serve as the basis for learning the various concepts discussed in each chapter. Students will be graded on an oral defense of their homework answers during class.

Homework Labs

Students will complete homework assignments cooperatively during flipped lab class periods. Students must attempt to complete each homework question on their own, but will work cooperatively to finish their assignments during lab periods. Students will submit their homework labs at the end of each lab period.

Quizzes

Students will be assigned a number of quizzes at the beginning of randomly selected class periods. Students will submit their quizzes during class. Material for the quizzes will be drawn exclusively from the Imai and Willimas text.

Diversity and Inclusivity Statement

The Institute does not discriminate against individuals on the basis of race, color, religion, sex, national origin, age, disability, sexual orientation, gender identity, or veteran status in the administration of admissions policies, educational policies, employment policies, or any other Institute governed programs and activities. The Institute’s equal opportunity and non-discrimination policy applies to every member of the Institute community. The Institute’s affirmative action program, Title IX program, and related policies are developed in compliance with applicable law. Pursuant to Title IX, the Institute does not discriminate on the basis of sex in its education programs and activities. As such, the Institute does not tolerate any kind of gender-based discrimination or harassment, which includes sexual violence, sexual harassment, and gender-based harassment. Inquiries concerning the Institute’s application of or compliance with Title IX may be directed to the Title IX Coordinator, Burns Newsome, burnsnewsome@gatech.edu, 404-385-5151. Additionally, inquiries concerning the application of applicable federal laws, statutes, and regulations (such as Title VI, Title IX, and Section 504) may be directed to the U.S. Department of Education’s Office of Civil Rights at www2.ed.gov/ocr.

Accommodations for Students with Disabilities

If you are a student with learning needs that require special accommodation, contact the Office of Disability Services (404-894-2563) as soon as possible to make an appointment to discuss your special needs and to obtain an accommodations letter. Please also e-mail the professor as soon as possible in order to set up a time to discuss your learning needs.

Academic Integrity

Georgia Tech aims to cultivate a community based on trust, academic integrity, and honor. Students are expected to act according to the highest ethical standards. Review Georgia Tech’s Honor Code and the student Code of Conduct. Any student suspected of cheating or plagiarizing on a quiz, exam, or assignment will be reported to the Office of Student Integrity, who will investigate the incident and identify the appropriate penalty for violations. This includes violations of the Generative AI policy.

Use of Generative Artificial Intelligence (AI) Tools

To be clear, students are expected to use AI tools, like GPT, to assist with developing R code to analyze data properly during class lab exercises and for homework. Students should not use AI to derive analytical responses to numerical problem solving using R code. Students may also use generative AI programs to help generate ideas and brainstorm. However, students should be aware that the material generated by these programs, including R code, may be inaccurate, incomplete, biased or otherwise problematic. As the purpose of the assignments in this class are to demonstrate that the student has learned the required skills, if the professor suspects the heavy use of AI to complete an assignment the student may be asked to demonstrate their knowledge orally in an informal one-on-one meeting with the professor to make sure the ideas/skills are their own. The professor reserves the right to alter any grade on any assignment due to a student's performance in any such oral defense. Generative AI derives its output from previously created texts from other sources that the models were trained on yet doesn't cite sources. Per GaTech's Honor Code, students may not submit any work generated by an AI program as their own. If students include material generated by an AI program, it should be cited like any other reference material (with due consideration for the quality of the reference, which may be poor). When/if students use AI platforms in their assignments, they should write a note to clarify where in the process they used AI, include the prompt used to generate the material, and which platform(s) were used. See this article for how to cite AI properly: [How to cite ChatGPT](https://apastyle.apa.org/blog/how-to-cite-chatgpt) <https://apastyle.apa.org/blog/how-to-cite-chatgpt>.

Recording Classroom Activities

In order to preserve class integrity, student privacy, and a safe environment to express opinions, recording of our classes using digital, tape, or audio devices is not allowed. This applies to taking pictures of slides as well. Students are heavily encouraged to take notes using a pen (pencil) and a notebook. Class slides will convey only the general gist of the lecture, and homework and exams will test students' knowledge of all class material, even that which may not be written in the available slides. Empirical research demonstrates that students learn significantly more when transcribing information in their notes, rather than expecting professors to provide all information on class slides (Kobayashi, K. (2006), Combined Effects of Note-Taking/Reviewing on Learning and the Enhancement through Interventions: A meta-analytic review. *Educational Psychology*, 26(3), 459-477.).

Student-Faculty Expectations

At Georgia Tech, we believe that it is important to strive for an atmosphere of mutual respect, acknowledgement, and responsibility between faculty members and the student body. The Student-Faculty Expectations (available at <https://catalog.gatech.edu/rules/22/>) articulate some basic expectations that you can have of me and that I have of you. In the end, simple respect for knowledge, hard work, and cordial interactions will help build the environment we seek. Therefore, I encourage you to remain committed to the ideals of Georgia Tech while in this class.

Class Schedule

MODULE 1: Discovery of Knowledge

Jan 12	First Meeting and Distribution of the Syllabus	No Required Reading
Jan 14	Introduction to R	The Tidy Tools Manifesto https://cran.r-project.org/web/packages/tidyverse/vignettes/manifesto.html Welcome to Tidyverse https://cran.r-project.org/web/packages/tidyverse/vignettes/paper.html R Lab: Downloading, Installing, and Becoming Familiar with R, R Markdown, and ChatGPT for Coding
Jan 19	MLK Day	No Class
Jan 21	R Lab	Introduction and Causality QSS §1.3 and 2.1 Homework 0.5 Assigned
Jan. 26	Randomized Experiments	QSS §2.1-2.4
Jan. 28	Observational Studies	QSS §2.5-2.6
Feb. 2.	Causality Wrap-Up	QSS §2.1, 2.3-2.5
Feb. 4	R Lab	Identifying Causal Questions using Real-World Data Introducing the Varieties of Democracy (VDEM) Dataset
Feb 9	Survey Sampling	QSS §3.1-3.4
Feb 11	Visualizing Distributions	QSS §3.3-3.4 Homework 1.0 Assigned
Feb 16	Measuring Ideology	QSS §3.5-3.7
Feb 18	Clustering R Lab	QSS §3.7 Measurement Wrap-Up

MODULE 2: Probability and Regression

Feb 23	Electoral Polls and Prediction	QSS §4.1
Feb 25	Predicting the US Presidential Election	QSS §4.1
Mar 2	Linear Regression	QSS §4.2
Mar 4	Causation and Regression	QSS §4.3 Midterm Exam Assigned
Mar. 9	Probability and Conditional Probability	QSS §6.1-6.2
Mar 11	Bayes' Rule	QSS §6.3

Let's Make a Deal (for Extra Credit)

Mar 16	Random Variables and Probability Distributions	QSS §6.4
Mar 18	Large Sample Theorems	QSS §6.4-6.5
Mar 23	Spring Break	No Class
Mar 25	Spring Break	No Class

MODULE 3: Hypothesis Testing

Mar 30	Estimation: Surveys	QSS §7.1
Apr 1	Estimation: Experiments	QSS §7.1

Homework 2.0 Assigned.

Apr 6	Hypothesis Testing I	QSS §7.2
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The Conversation (2012) "No, You're not Entitled to your Opinion".

Zimmer, Carl (2017). "Why We Can't Rule Out Bigfoot: How the Null Hypothesis Keeps the Hairy Hominid Alive." *Nautilus*.

Apr 8	Hypothesis Testing II	QSS §7.2
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Frankfurt, H. G. (2009). On Bullshit. (Yes, this is a real academic work)

Sagan, C. (2007). The Fine Art of Baloney Detection. *Paranormal Claims: A Critical Analysis*.

Apr 13	Regression with Uncertainty	QSS §7.3
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Association of American Medical Colleges (2022). "Widespread Distrust in Science: Is the way we Communicate to Blame?" AAMC News.

Homework 3.0 Assigned

Apr 15	R Lab: Uncertainty Estimation in Real World Data	Statistical Estimation using Real World Data
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Apr 20	Professor Research Presentation	Muchlinski, D. (2021). Swords and Plowshares: Property Rights, Collective Action, and Nonstate Governance in the Jewish Community of Palestine 1920-1948. <i>American Political Science Review</i> , 115(4), 1373-1387.
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Apr 22	Review	TDB
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Apr 27	Review	TDB
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May 6	Final Exam 11:20-14:10	In Class
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