





Empirical Methods

INTA 2010



Instructor Info

-  David Muchlinski
-  MW 11:00-12:00 OBA
-  Habersham 147
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Course Info

-  Prereq: None
-  M, W
-  3:30-4:45
-  Habersham G17

Lab Info

-  Indicated on Class Schedule
-  Hab G17

TA Info

-  Jonathan Darsey (JD)
-  Th 2-4 OBA
-  Habersham 312

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.

Material

Required Texts

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

Healy, K. (2018). *Data Visualization: a Practical Introduction*. Princeton University Press.

Reference Texts

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

Xie, Y., Allaire, J. J., & Grolemund, 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

5%	Participation
40%	Homework Assignments
25%	Midterm Exam
30%	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 insure 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 completed 4 or more homework assignments.

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 and coding.

? 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.

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

Students must download and install the statistical programming software R and R Studio. You must download R for R Studio to work. 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/>. I will give an introduction to R Studio and R Markdown during the first week. R is a free, open source statistical programming language, like Python. The reason I utilize R is because it is free, unlike other programs that can cost hundreds of dollars per license. The downside is that R requires programming. There is no point and click GUI. However, developing programming experience for data analytics is a skill that is in very high demand – especially for social scientists. You will be introduced to many aspects of R throughout the semester.

Midterm

Students will receive a take home midterm exam that will test their understanding of proper research methodology both conceptually and in the R programming environment. Students will have two weeks to complete the midterm exam. More detailed instructions will follow when the exam is distributed.

Final Exam

Students will be assigned a final exam on the final day of class. It will be due on the date and time of the scheduled final exam according to the registrar's calendar. 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 three days after the due date, with a penalty of 10% assessed per day late. After three 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 5 homework assignments throughout the semester. Unless otherwise noted, these assignments are to be submitted *one week from the assigned date*. All assignments are to be submitted electronically through the Canvas course portal. Hard copies will not be accepted. All assignments in R must be submitted in R Markdown .html format. Students will receive one courtesy warning if their homework is not in the correct format during the semester and may resubmit. Submitted homework not in .html format will be counted as late.

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

Reasonable accommodations will be made for students with verifiable disabilities. In order to take advantage of available accommodations, students must register with the Office of Disability Services at Suite 123, Smithgall Student Services Building, 353 Ferst Drive, 404-894-2563 (Voice); 404-894-1664 (TDD). For more information on Georgia Tech's policy on working with students with disabilities, please see review the Office of Disability Service's web page at <https://policies.ncsu.edu/regulation/reg-02-20-01/>. The Office of Disability Services collaborates with students, faculty, and staff to create a campus environment that is usable, equitable, sustainable and inclusive of all members of the Georgia Tech community. Disability as an aspect of diversity that is integral to society and Georgia Tech. If students encounter academic, physical, technological, or other barriers on campus, the Disability Services team is available to collaboratively find creative solutions and implement reasonable accommodations.

Academic Integrity

Academic dishonesty in the form of cheating or plagiarism will not be tolerated. In brief, plagiarism is defined, for the purposes of this class, as: copying, borrowing, or appropriating another entity's work and presenting it as your own in any submitted assignment, deliberately or by accident. Acts of plagiarism will be reported in accordance with the Honor Code. In order to avoid being charged with plagiarism, if you use the words, ideas, phrasing, charts, graphs, or data of another person or from published material, then you must either: 1) use quotation marks around the words and cite the source, or 2) paraphrase or summarize acceptably using your own words and cite the source. The plagiarism policy is not restricted to books, but also applies to video and audio content, websites, blogs, wiki's, AI-generated content like Chat-GPT, and podcasts. Plagiarism includes putting your name on a group project to which you have minimally contributed. For information on Georgia Tech's Academic Honor Code, please visit <http://www.catalog.gatech.edu/policies/honor-code/> or <http://www.catalog.gatech.edu/rules/18/>. Any student suspected of cheating or plagiarizing on a assignment will be reported to the Office of Student Integrity. The student will also receive a grade of zero on the assignment at the professor's discretion. Note that none of the above forbids the use of learning tools like AI to *assist* with learning outcomes, and indeed, such tools may prove very beneficial in some contexts. However, to avoid plagiarism, proper attribution must be given when utilizing such technologies, and such tools must be utilized with a heavy dose of common sense. Asking Chat GPT questions about coding in R is acceptable, asking it to complete your homework or exam is not.

Class Schedule

MODULE 1: Introduction to Research Methods

Aug 21	First Meeting and Distribution of the Syllabus	No Required Reading
Aug 23	Introduction to R	Healy Ch. 2 R Lab: Downloading, Installing, and Becoming Familiar with R and R Markdown
Aug 28	R Lab	R Basics I Imai and Williams Ch. 1 Healy Ch. 1 Getting Started in Markdown
Aug 30	R Lab	R Basics II Object Orientated Programming, R Object Types, Simple Arithmetic Operations Homework 1 Assigned
Sept. 4	Labor Day	No Class
Sept 6.	Connecting Quantitative Research to IR/CP	TBD
Sept. 11	Why Stats in IR and CP?	TBD
Sept 13	R Lab	Imai and Williams Ch. 1 Review: pay special attention to §1.3.7-1.3.8 Libraries, Strings and Vectors, Basic Commands Healy Ch. 2 Review
Sept 18	Exploring Causality	Imai and Williams §2.1-2.4
Sep 20	Tidyverse Lab I	Healy Ch. 3 R Lab: Introduction to Tidyverse Homework 2 Assigned
Sept 25	Epistemology	Imai and Williams Ch. 2 §2.5-2.6 Sagan, C. (2007). The Fine Art of Baloney Detection. Paranormal Claims: A Critical Analysis. 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.” <i>Nautilus</i> .
Sept 27	Ontology	Wired (2015). The Science of Why no one Agrees on the Color of this Dress.

Time (2018). The Definition of a Kilogram Just Changed. That's a Major Milestone in the Grand History of the Metric System

Miller, Alan (2022) How Conspiratorial Thinking is Undermining Democracy, and What we can do About it. Bulletin of the Atomic Scientists

Rakich, Nathaniel (2023). What The Polls Say After Trump's Second Indictment. FiveThirtyEight

MODULE 2: Intro to Quantitative Analysis

Oct 2 Measurement I Imai and Williams §3.1-3.3

Oct 4 Measurement II Imai and Williams §3.4-3.8

Healy Ch. 4

[R Lab, Tidyverse II](#)

Oct 9 Professor Travel for Conference: No Class Fall Break

Oct 11 Professor Travel for Conference: No Class

Oct 16 Prediction I Imai and Williams §4.1

Oct 18 Prediction Lab I [R Lab: Loops](#)

Oct 23 Prediction II Imai and Williams §4.2

Oct 25 Prediction Lab 2 [R Lab: Linear Regression](#)

Midterm Exam Assigned.

Oct 30 Prediction III Imai and Williams §4.3-4.4

Nov 1 Prediction Lab 3 [R Lab: Multiple Linear Regression](#)

MODULE 3: Probability and Uncertainty

Nov 6 Probability I Imai and Williams §6.1-6.2

Healy Ch. 6

Nov 8 Probability II Imai and Williams §6.3

Nov 13 Probability III Imai and Williams §6.4

Nov 15 Uncertainty I Imai and Williams §7.1

Nov 20 Uncertainty II Imai and Williams §7.2

Nov 22 Thanksgiving Break No Class

Nov 27 Uncertainty III Imai and Williams §7.3

Nov 30 Review TDB
