Introduction to Statistics

COURSE INFORMATION
Term: Fall 2024
Class: Tuesdays & Thursdays, 9:30-10:50
Room: Maxwell 108
Labs: Announced in class

INSTRUCTOR
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DESCRIPTION
Public policy and administration decisions are often difficult and risky because decisions must be made with incomplete and imperfect information. The primary purpose of this course is to introduce the basics of modeling and analyzing problems that involve decision-making under uncertainty. A high priority will be placed on learning how to choose the appropriate statistics to examine a particular problem, and how to avoid being misled by statistics presented by others that do not appropriately reflect available information.

OBJECTIVES
Students will learn how to use quantitative data and statistical tools to understand problems, how to become smart consumers of statistical reports and quantitative information, and how to communicate statistical findings to a variety of audiences.

PREREQUISITES
Thorough understanding of high school algebra and geometry.

Materials

BOOKS
Required: You will need a core statistics textbook for the class, and there are two options:

- *Traditional*: Moore, David S., George P. McCabe, Bruce A. Craig. *Introduction to the Practice of Statistics*. W.H. Freeman and Company. *Any edition 6th or newer is sufficient.*

- *Web Option*: Favero, Nathan. 2024. Statistics Minus the Math: An Introduction for Social Sciences. Free/open web resource: https://minusthemath.com

You may find one of these books suits you better than the other. (I recommend trying both!) Each book has a slightly different focus. Favero is more focused on a math-light presentation, preferring conceptual explanations, but is light in detail (especially in probability). Moore et al is a more traditional statistics book (although still applied). If you have strong opinions about either book at the end of the semester, let me know!

Recommended: A resource to assist you with Stata usage and coding.

- *Traditional*: Acock, Alan. *Stata: A Gentle Introduction*. Stata Press. Any edition 4th or newer is sufficient.

- *Web Resources*: UCLA Statistical Methods and Data Analytics Stata Learning Modules: https://stats.oarc.ucla.edu/stata/modules/

SOFTWARE

Stata (any version after 13; the most basic is fine). You can also purchase a student license, which are available for 6- or 12-month intervals, or perpetually. See the Stata website for pricing: https://www.stata.com/order/new/edu/profplus/student-pricing/. If you will be taking PAI 722 in the Spring, I recommend a 12-month license ($94). Otherwise, a 6-month subscription is also available ($48). For those of you who do not wish to purchase your own version, copies are located on the computers in the student clusters in the basement of Eggers. You can access Stata on the computers in the student clusters in the basement of Eggers, or via Syracuses remote desktop: rds.syr.edu. Information on how to log in to the remote desktop is available here.

Your TA for this course will be conducting a Stata intro workshop early in the semester in place of office hours. Please watch Blackboard for details.

HARDWARE

You may use a simple scientific calculator on exams, if you desire. Graphing calculators are not allowed in exams.

You will need to use a computer to complete assignments in this class. If you do not have one of your own, you may use one on campus. The student clusters in the basement of Eggers are likely the most convienient.

ONLINE CLASS RESOURCES

Blackboard is our internet-based course platform (http://blackboard.syr.edu). In it, you will find course announcements, a submission portal for your assignments, and a link to the course drive, where you will find the course syllabus, problem sets, and links to supplementary readings. In addition, during the semester, solutions to the problem sets and lecture slides will be posted. Please note, however, that class attendance is the primary source of course-related announcements and material.

Course Requirements

OVERVIEW

Satisfactory completion of the course requires completion of the following:

1. Regular course preparation and attendance (10%)

2. Assignments (30%)

3. Midterm (25%)

4. Final (35%)

ATTENDANCE

One of the guiding principles of my class is that you are adults, and thus, capable of managing your own time. I have little interest in policing your lives. Attendance is kept for each day of class, but you will lose no points on attendance if you miss a couple days: everyone has things that occasionally come up in life that need to be dealt with, and I fully realize that some of those things are things you - very understandably - may not want to discuss with your professor. That's OK!

That said, attendance in class is an important element to doing well in the course. If you miss more than a couple days, I'll want to check in to be sure that you have a reasonable reason for missing. The easiest way to do this is just email me with a brief reason when something comes

up and you have to miss class (which will also allow me to tell you if you're missing anything particularly important).

If you must miss class, the way to make up what you've missed is straightforward: make sure to look over the posted slides, do the reading for the day, get notes from a friend, and still complete the assignment if you are able (or, if it is a day we are going over the assignment, make sure to look over the assignment solutions). If you do these things and still feel like you're missing something, please feel free to come into my office hours and we can talk it through.

PARTICIPATION   Class participation will be based on your active participation in class and submitting statistics in the wild examples on blackboard. On the course blackboard page, there is a discussion board specifically for statistics in the wild. Please post links along with a brief (1-2 paragraphs) discussion of an example of bad statistics (bad graphics, examples of articles that conflate correlation and causation, etc.) or a good example of graphics or stories with some relation to topics weve discussed in class. Post at least one example with its corresponding discussion at some point during the semester.

ASSIGNMENTS   There is an assignment each week in class, **due Friday at midnight**.[1] Assignments will vary in nature: some will be one-off problem sets, some may build on problem sets from a prior week. All material needed for an assignment will be covered by the Tuesday before the assignment is due, and the assignment itself will be posted no later than Tuesday of the week in question. If you miss a Friday deadline, you may still turn in the assignment for one point off, up until the next Tuesday's class. **No assignment work is accepted after class Tuesday**, as we will go over answers for assignments in class.

Assignments are graded on a check plus/check/check minus system. A check plus is worth four points, a check is worth three points, and a check minus is worth two points. You will lose a point if you skip *any* problem.

There will be no assignments on the midterm week. Students may miss up to two assignments without penalty. If no assignments are missed, the lowest assignment scores will be dropped from the student's average.

COMPUTING   Some of the homework assignments will be done on a computer using Stata. Please do not simply hand in output from Stata. Instead, paste the relevant results into a word processor adding text to explain these results.

TESTS   Tests may have in-class and out-of-class components. The course is cumulative, and each test will be comprehensive.

Course Expectations & Guidelines

ETIQUETTE &
DECORUM   A college course is fundamentally a learning community. Be courteous to fellow students and the professor. Don't let yourself be distracted by your cell phone in class, and don't let what is on your computer screen distract fellow students in the class, either.

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[1] Although, I should note, I very much hope you aren't working on my assignments on Friday at 11 PM! I suggest you work on assignments starting on Tuesday of the week in question and finish them early enough so your Friday afternoon and evening isn't overcome with them.

OFFICE & CONSULTATION HOURS, APPOINTMENTS		I encourage you to chat with me at any point if you have questions about the course. You can schedule a meeting with me by going to my website here: http://jacklreilly.github.io and sign up for time at your convenience. You can also always just drop in during my regularly scheduled drop-in office hours without appointment. Your TA also has time dedicated to meeting with students outside of class (times noted in the syllabus header.)		

E-MAIL
Email is the best way to contact me. Students can generally expect a response to all e-mails within 24 hours (and typically sooner), excepting weekends. If your email requires a long response, expect me to encourage you to schedule an appointment with me so that we can more effectively discuss the matter. Note that I do not typically respond to email over the weekend, so if you email me at 4 PM on Friday, you will likely not hear back from me until Monday.

ARTIFICIAL INTELLIGENCE, LLMS, ETC
Artificial Intelligence - in particular, Large Language Models like ChatGPT - are incredibly useful tools. However, in the very beginning phases of learning how to write code and conduct statistics, using them can hamper your ability to understand fundamentals. Accordingly, all generative-AI tools are prohibited in this course because their use inhibits achievement of the course learning objectives. This policy applies to all stages of project and writing processes including researching, brainstorming, outlining, organizing, and polishing. Do not use Generative-AI tools to create any content (i.e., images and video, audio, text, code, etc). If you have any questions about a feature and whether it is considered Generative-AI, ask your instructor.

ACKNOWLEDGE-MENTS
This course, and this syllabus, consists in large parts of material developed by other professors in the PAI 721 rotation, including, but not limited to, Jun Li, Tomas Olivier, and Ying Shi. I am grateful for their support and permission to use their materials.

Course Topics

SCHEDULE OVERVIEW

	Topic	Moore et al	Favero
I	Descriptive statistics	1.2; 1.3; 1.4	1, 2
II	Statistical relationships	2.1; 2.2; 2.3; 2.4; 2.5; 2.6; 2.7	3
III	Producing data	3.1; 3.2; 3.3; 3.4;	4
IV	Probability	4.1; 4.2; 4.3; 4.4; 4.5	5
MIDTERM EXAM (THURSDAY, OCTOBER 17)			
V	Sampling distributions	5.1; 5.2; 5.3	6
VI	Inference	6.1; 6.2; 6.3; 6.4	7
VII	Inference for distributions	7.1; 7.2;	8, 9
VIII	Simple linear regression	10.1	10
IX	Less simple linear regression*	11.1; 11.2	11, 12
FINAL EXAM (THURSDAY, DECEMBER 12, 9 AM - 12 PM, EGGERS 070)			
*if time allows			

We will cover the above material in sequence, with particular readings recommended for each day in class announced in class (and in slides) a class session ahead. In general, if you need to prioritize, make sure to focus on your weekly assignment first, and readings second.

A WORD ON READING
Reading in a statistics class is different from a substantive class. You should generally keep up with readings, but you are not expected to thoroughly digest it by the day we cover it in class. The textbook(s) are there to serve as an addition resource to course lectures and help you understand the material more effectively. They also occasionally go into detail that we may not

always explicitly cover in class (and vice versa - we will cover things occasionally in class that don't show up in the textbook).

You should also be aware of the strengths of each book, and decide which will be your primary reference accordingly. *Minus the Math* is a more conceptual introduction, focusing more on common-language and explanations to help you gain the intuition behind statistics. It is also, by definition, less in depth and takes particularly short coverage of some topics, including probability. *Introduction to the Practice of Statistics* is a more traditional applied statistics textbook, with a higher amount of math and more in-depth explanations.

You can use either book as your primary reference, but if you find yourself needing more depth, make sure you look at *Practice*. If you find yourself not "getting" it on a more intuitive level, give *Minus the Math* a try.

Campus Academic Resources & Policies

ACADEMIC INTEGRITY

As a pre-eminent and inclusive student-focused research institution, Syracuse University considers academic integrity at the forefront of learning, serving as a core value and guiding pillar of education. Syracuse University's Academic Integrity Policy provides students with the necessary guidelines to complete academic work with integrity throughout their studies. Students are required to uphold both course-specific and university-wide academic integrity expectations such as crediting your sources, doing your own work, communicating honestly, and supporting academic integrity. The full Syracuse University Academic Integrity Policy can be found by visiting class.syr/edu, selecting, Academic Integrity, and Expectations and Policy.

Upholding Academic Integrity includes the protection of faculty's intellectual property. Students should not upload, distribute, or share instructors' course materials, including presentations, assignments, exams, or other evaluative materials without permission. Using websites that charge fees or require uploading of course material (e.g., Chegg, Course Hero) to obtain exam solutions or assignments completed by others, which are then presented as your own violates academic integrity expectations in this course and may be classified as a Level 3 violation. All academic integrity expectations that apply to in-person assignments, quizzes, and exams also apply online.

Students found in violation of the policy are subject to grade sanctions determined by the course instructor and non-grade sanctions determined by the School or College where the course is offered. Students may not drop or withdraw from courses in which they face a suspected violation. Any established violation in this course may result in course failure regardless of violation level.

DIVERSITY

It is the intent of this course for students from all diverse backgrounds and perspectives to be well served by this course, that students' learning needs be addressed both in and out of class, and that the diversity that students bring to this class be viewed as a resource, strength, and benefit. It is also critical to present materials and activities that are respectful of diversity: gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture. Your suggestions are encouraged and appreciated. Please let your instructor know ways to improve the effectiveness of the course for you personally or for other students or student groups.

INCLUSION

Syracuse University values diversity and inclusion; we are committed to a climate of mutual respect and full participation. There may be aspects of the instruction or design of this course that result in barriers to your inclusion and full participation in this course. I invite any student to contact me to discuss strategies and/or accommodations (academic adjustments) that may

be essential to your success and to collaborate with the Center for Disability Resources (CDR) in this process.

If you would like to discuss disability-accommodations or register with CDR, please visit Center for Disability Resources. Please call (315) 443-4498 or email disabilityresources@syr.edu for more detailed information.

The CDR is responsible for coordinating disability-related academic accommodations and will work with the student to develop an access plan. Since academic accommodations may require early planning and generally are not provided retroactively, please contact CDR as soon as possible to begin this process.

DISCRIMINATION AND HARASSMENT
The University does not discriminate and prohibits harassment or discrimination related to any protected category including creed, ethnicity, citizenship, sexual orientation, national origin, sex, gender, pregnancy, disability, marital status, age, race, color, veteran status, military status, religion, sexual orientation, domestic violence status, genetic information, gender identity, gender expression or perceived gender.

Any complaint of discrimination or harassment related to any of these protected bases should be reported to Sheila Johnson-Willis, the University's Chief Equal Opportunity & Title IX Officer. She is responsible for coordinating compliance efforts under various laws including Titles VI, VII, IX and Section 504 of the Rehabilitation Act. She can be contacted at Equal Opportunity, Inclusion, and Resolution Services, 005 Steele Hall, Syracuse University, Syracuse, NY 13244-1120; by email: titleix@syr.edu; or by telephone: 315-443-0211.

FAITH AND RELIGIOUS ACCOMMODATIONS
Syracuse University's Religious Observances Policy recognizes the diversity of faiths represented in the campus community and protects the rights of students, faculty, and staff to observe religious holy days according to their traditions. Under the policy, students are given an opportunity to make up any examination, study, or work requirements that may be missed due to a religious observance, provided they notify their instructors no later than the academic drop deadline. For observances occurring before the drop deadline, notification is required at least two academic days in advance. Students may enter their observances in MySlice under Student Services/Enrollment/My Religious Observances/Add a Notification.

HEALTH AND WELLNESS
Mental health and overall well-being are significant predictors of academic success. As such it is essential that during your college experience you develop the skills and resources effectively to navigate stress, anxiety, depression, and other mental health concerns. Please familiarize yourself with the range of resources the Barnes Center provides (https://ese.syr.edu/bewell/) and seek out support for mental health concerns as needed. Counseling services are available 24/7, 365 days, at 315-443-8000.