PSYCH 490.001

Spring 2025 ▪ TTh 9:05a-10:20a

2025-01-07

Spring 2025 ▪ TTh 9:05-10:25 AM

Figure 1: ChatGPT/Dall-E-3 model response to 'an image of "a picture paints a thousand words"' on 2024-09-19

Themes

If a picture's worth a thousand words (Wikipedia contributors 2024a), what exactly does it say? This course will focus on the psychology of data visualization—how to read, critique, and generate meaningful figures that inform but don't mislead. We'll take inspiration from recognized classic figures and unpack what makes them exemplary. We'll critique figures that

deliberately or inadvertently mislead or confuse. We'll learn what 150 years of vision science, the foundation of experimental psychology, has to say about data visualization. And we'll learn how to build our own reproducible figures using Python, R, and JavaScript. No prior programming experience is required.

Instructor

Rick O. Gilmore, Ph.D.
Professor of Psychology
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Schedule an appointment: https://doodle.com/mm/rickgilmore/book-a-time

Lab web site: https://gilmore-lab.github.io

Teaching Assistant

Sara He
Graduate Student in Social Psychology
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Meetings by appointment over Zoom

Meeting time & location

Tuesday & Thursday, 9:05-10:20 am
009 Sparks Building

Canvas site

We will use Canvas to submit assignments and grade them. The Canvas site may be found here:

https://psu.instructure.com/courses/2381584

Most of the course content will be found on this site.

Course structure

This is a discussion-focused course. On most days we will discuss readings assigned prior to class. On many days, we will work together or individually on the assigned exercises, the final project, or another assignment.

January 13-17

Surveying the landscape

Tuesday, January 14

Course introduction

- Slides
- Exercise 01 assigned

Thursday, January 16

The semiotics of data visualization

- Read: Cairo (2013), Chapter 1-2, PDF on Canvas
- Slides

January 20-24

Who visualizes data and why

Tuesday, January 21

Visualization in government & business

- Slides
- Results from Exercise 01

Thursday, January 23

Visualization in art, sports, and journalism

- Read (recommended): Gelman and Unwin (2013)
- Slides
- Assigned: Exercise 02
- Due: Exercise 01 | Canvas dropbox

January 27-31

Understanding figures

Tuesday, January 28

Making (sense of) data

- Read: Stevens (1946)
- Optional:

    - Wikipedia contributors (2024b)
    - Tourangeau, Rips, and Rasinski (2012) | PDF on Canvas.

- Slides
- Assigned: Exercise-03

Thursday, January 30

Figure types

- Explore (pick at least two):

    - Ribecca (n.d.)
    - Hammond (2024)
    - Discovery (2024)
    - Atlassian (n.d.)

- Watch: Channel (2024)
- Slides
- Due: Exercise 02 | Canvas dropbox |

February 3-7

Tuesday, February 04

Figure components

- Slides
- Review: Making and visualizing data

Thursday, February 06

Cancelled due to weather

February 10-14

Tuesday, February 11

From stimulus to sensation

- Read: Cairo (2013), Chapter 5, PDF on Canvas
- Slides
- Due: Exercise-03 | Canvas dropbox |

Thursday, February 13

From sensation to perception

- Read:

    - Cairo (2013), Chapter 6, PDF on Canvas
    - Few (2004), Chapter 5, PDF on Canvas

- Optional:

    - Cleveland and McGill (1984)

- Slides

February 17-21

Tuesday, February 18

From cognition to understanding

- Read:

    - Franconeri et al. (2021), pp. 109-122, PDF on Canvas
    - Cairo (2013), Chapter 7, PDF on Canvas

- Slides
- Assigned: Final Project proposal

Thursday, February 20

Designing efficient & understandable visualizations

- Read: Franconeri et al. (2021), pp. 123-139, PDF on Canvas
- Slides
- Assigned: Exercise-04

February 24-28

Tuesday, February 25

Introduction to R

- Slides
- Sign up for DataCamp.
- Begin work on Introduction to R.

Thursday, February 27

Communicating uncertainty and risk

- Read: Franconeri et al. (2021), pp. 139-150, PDF on Canvas
- Slides
- In-class work on Exercise 04, Final Project proposal, or DataCamp

March 3-7

Tuesday, March 04

More Slow-R

- Read:

  - Gilmore 2019 "Slow R"

- Slides
- Work on: Datacamp Introduction to R.
- In-class work on Exercise 04, Final Project proposal, or DataCamp

Thursday, March 06

Critiquing figures

- Read:

  - Tufte (2001), Chapter 1, PDF on Canvas
  - Tufte (2001), Chapter 2, PDF on Canvas

- Slides
- Due: Exercise-04 | Canvas Dropbox
- Assigned: Exercise-05
- Due: Final Project proposal | Canvas Dropbox

March 10-14 *Spring Break*

March 17-21

Tuesday, March 18

Why R we doing this?

- Complete:

  - DataCamp, Introduction to R

- Slides

Thursday, March 20

NO CLASS

- Due: Exercise-05 | Canvas dropbox

March 24-28

Exploring data with R

Tuesday, March 25

Gathering & cleaning data

- Slides

Thursday, March 27

Making plots with `ggplot2`

- Read:
    - *Plotting with `ggplot2`*, especially the "Plotting one variable" section.
- Recommended:
    - Introduction to Data Visualization with ggplot2 on DataCamp
- Slides
- Assigned: Exercise-06

March 31 - April 4

More on ggplot

Tuesday, April 01

- Slides
- Assigned: Final project preferences survey

Thursday, April 03

Intro to Python

- Slides
- Complete:
    - DataCamp, Introduction to Python
- Due: Exercise-06 | Canvas dropbox

April 7-11

Exploring data with Python

Tuesday, April 08

- Due: Final project preferences survey
- Slides

Thursday, April 10

More data explorations with Python

- Assigned: Exercise-07

April 14-18

Making plots with JavaScript

Tuesday, April 15

Thursday, April 17

- In-class work on final projects or Exercise 07.
- Due: Exercise-07

April 21-25

Final Project Preparation

Tuesday, April 22

- In-class work on projects.

Thursday, April 24

Final Project Presentations

- Schedule

April 28 - May 2

Final Project Presentations

Tuesday, April 29

- Schedule

Thursday, May 01

- Schedule

May 5-9

Finals Week

Tuesday, May 05

- Due: Final project write-up

Component	Description	Points

Elements

Component	Description	Points
Attendance	You will receive 1 point for each class you attend up to a maximum of 25.	25
Exercises	There will be seven (7) exercises that we will work on. Each exercise is worth 10 points. You are required to submit four (4) toward your final grade.	40
Final project	You will complete a final project, either on your own, or with a small group of 3 or less. Your final project is worth 35 points.	35
	TOTAL POINTS POSSIBLE	100
Extra Credit	If you submit more than four (4) exercise write-ups, you may earn up to 10 extra credit points for these exercises.	

Grading Scheme

Percent	Points	Grade
94+	94+	A
90-93	90-93	A-
87-89	87-89	B+
84-86	84-86	B
80-83	80-83	B-
77-79	77-70	C+
70-76	70-76	C
60-69	60-69	D
<59	<=59	F

This page summarizes some of the key deadlines in the course.

Date	What's due/happening
2025-01-23	Exercise 01
2025-01-30	Exercise 02
2025-02-11	Exercise 03
2025-03-06	Final project proposal due

Date	What's due/happening
2025-03-06	Exercise 04
2025-03-27	Exercise 05
2025-04-03	Exercise 06
2025-04-08	Final project survey
2025-04-17	Exercise 07
2025-05-05	Final project writeup due

Academic Integrity

Students with questions about academic integrity should visit http://www.la.psu.edu/current-students/undergraduate-students/education/academic-integrity.

Penn State defines academic integrity as the pursuit of scholarly activity in an open, honest and responsible manner. All students should act with personal integrity, respect others dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts (Faculty Senate Policy 49-20). Sanctions for academic misconduct can include a grade of F for the course as well as other penalties.

Unless you are told otherwise, you must complete all course work entirely on your own, using only sources that have been permitted by your instructor, and you may not assist other students with papers, quizzes, exams, or other assessments. If I allow you to use ideas, images, or word phrases created by another person (e.g., from Course Hero or Chegg) or by generative technology, such as ChatGPT, you must identify their source.

When you complete assignments, remember the **ABC**s to avoid plagiarism: **A**lways place copied information within quotation marks, include information about the quoted or paraphrased source in a **B**ibliography, and **C**ite the source in the body (in the text) of your paper immediately after the quoted or paraphrased information. When in doubt, cite in the text and include the source in a bibliography.

Students with questions about academic integrity should ask me or the TA before submitting work.

Students facing allegations of academic misconduct may not drop/withdraw from the affected course unless they are cleared of wrongdoing (see G-9: Academic Integrity). Attempted drops will be prevented or reversed, and students will be expected to complete course work and meet course deadlines. Students who are found responsible for academic integrity violations face academic outcomes, which can be severe, and put themselves at jeopardy for other outcomes which may include ineligibility for Dean's List, pass/fail elections, and grade forgiveness. Students may also face consequences from their home/major program and/or The Schreyer Honors College.

Absences or late assignments

Absence from class

Your absence from class may be excused under unusual circumstances such as (a) an interview for graduate school or a job, (b) illness, (c) religious observance, (d) the death of a family member, or (e) any other event recognized by the university as a valid excuse for absence from class.

If you must miss class, you must contact the instructor and the TA **in advance**.

Up to three (3) excused absences will be permitted.

Late exercises

Exercises submitted after the published deadlines will not be eligible for full credit unless the instructor has given specific permission.

Late final projects

Final projects submitted after the published deadline will not be eligible for full credit unless the instructor has given specific permission.

Accommodation for persons with disabilities

Penn State welcomes students with disabilities into the University's educational programs. Please refer to the information provided by Student Disability Resources (SDR) at http://equity.psu.edu/student-disability-resources/ for information about the procedures required to obtain reasonable accommodations in this course. Students should discussSDR-approved accommodations with their instructor as early in the semester as possible, even if they have taken another course with the instructor. Please note: students are not required to provide their instructor with information about the nature of their condition.

Penn State students are also welcome to contact other units for assistance with personal concerns that interfere with academic progress, including: Counseling and Psychological Services (CAPS; http://studentaffairs.psu.edu/counseling/), the Office of Student Affairs (http://studentaffairs.psu.edu/), Career Services (http://studentaffairs.psu.edu/career/), the Center for Women Students (http://studentaffairs.psu.edu/womenscenter/), the LGBTQA Student Resource Center (http://studentaffairs.psu.edu/lgbtqa/), the Office of Sexual Misconduct Prevention and Response (http://titleix.psu.edu/), Penn State Educational Equity (http://equity.psu.edu/), the Multicultural Resource Center (http://equity.psu.edu/mrc), and University Health Services (http://studentaffairs.psu.edu/health/).

Nondiscrimination Statement

The Pennsylvania State University is committed to equal access to programs, facilities, admission and employment for all persons. It is the policy of the University to maintain an environment free of harassment and free of discrimination against any person because of age, race, color, ancestry, national origin, religion, creed, service in the uniformed services (as defined in state and federal law), veteran status, sex, sexual orientation, marital or family status, pregnancy, pregnancy-related conditions, physical or mental disability, gender, perceived gender, gender identity, genetic information or political ideas.
Discriminatory conduct and harassment, as well as sexual misconduct and relationship violence, violates the dignity of individuals, impedes the realization of the University's educational mission, and will not be tolerated.

Direct all inquiries regarding the nondiscrimination policy to:

Suzanne C. Adair Associate Vice President for Equal Opportunity and Access Office of Equal Opportunity and Access The Pennsylvania State University 328 Boucke Building University Park, PA 16802-5901 Email: sca917@psu.edu Tel (814) 863-0471

Diversity Statement

This classroom is a place where you will be treated with respect. All members of this class are expected to contribute to a respectful, welcoming and inclusive environment for every other member of the class.
Penn State is committed to creating an educational environment which is free from intolerance directed toward individuals or groups and strives to create and maintain an environment that fosters respect for others as stated in Policy AD29 Statement on Intolerance.

Mandated Reporting Statement

Penn State's policies require me, as a faculty member, to share information about incidents of sex-based discrimination and harassment (discrimination, harassment, sexual harassment, sexual misconduct, dating violence, domestic violence, stalking, and retaliation) with Penn State's Title IX coordinator or deputy coordinators, regardless of whether the incidents are stated to me in person or shared by students as part of their coursework. For more information regarding the University's policies and procedures for responding to reports of sexual or gender-based harassment or misconduct, please visit http://titleix.psu.edu.

Additionally, I am required to make a report on any reasonable suspicion of child abuse in accordance with the Pennsylvania Child Protective Services Law.

Zoom

At some point in the semester, I may decide to use Zoom to allow students who are unable to attend class in person to participate.

While you are on Zoom, keep in mind that this is a classroom environment and others should be treated with respect. Please keep your microphone muted unless you want to ask a question or interact with someone. If your microphone is not muted, the entire class will be able to hear what is going on in your environment. As an instructor, I personally like to see people's faces. As a participant, I am more involved when I have my camera on. I realize, however, that there are many reasons why you might not want to turn on your camera such as poor internet connection, joining via phone, or other privacy concerns. It is your choice as to whether you would like to have the camera on or not.

Values

Penn State Principles

The Pennsylvania State University is a community dedicated to personal and academic excellence. The Penn State Principles were developed to embody the values that we hope our students, faculty, staff, administration, and alumni possess. At the same time, the University is strongly committed to freedom of expression. Consequently, these Principles do not constitute University policy and are not intended to interfere in any way with an individual's academic or personal freedoms. We hope, however, that individuals will voluntarily endorse these common principles, thereby contributing to the traditions and scholarly heritage left by those who preceded them, and will thus leave Penn State a better place for those who follow.

I will respect the dignity of all individuals within the Penn State community. The University is committed to creating and maintaining an educational environment that respects the right of all individuals to participate fully in the community. Actions motivated by hate, prejudice, or intolerance violate this principle. I will not engage in any behaviors that compromise or demean the dignity of individuals or groups, including intimidation, stalking, harassment, discrimination, taunting, ridiculing, insulting, or acts of violence. I will demonstrate respect for others by striving to learn from differences between people, ideas, and opinions and by avoiding behaviors that inhibit the ability of other community members to feel safe or welcome as they pursue their academic goals.

I will practice academic integrity. Academic integrity is a basic guiding principle for all academic activity at Penn State University, allowing the pursuit of scholarly activity in an open, honest, and responsible manner. In accordance with the University Code of Conduct, I will practice integrity in regard to all academic assignments. I will not engage in or tolerate acts of falsification, misrepresentation or deception because such acts of dishonesty violate the

fundamental ethical principles of the University community and compromise the worth of work completed by others.

I will demonstrate social and personal responsibility. The University is a community that promotes learning; any behaviors that are inconsistent with that goal are unacceptable. Irresponsible behaviors, including alcohol or drug abuse and the use of violence against people or property, undermine the educational climate by threatening the physical and mental health of members of the community. I will exercise personal responsibility for my actions and I will make sure that my actions do not interfere with the academic and social environment of the University. I will maintain a high standard of behavior by adhering to the Code of Conduct and respecting the rights of others.

I will be responsible for my own academic progress and agree to comply with all University policies. The University allows students to identify and achieve their academic goals by providing the information needed to plan the chosen program of study and the necessary educational opportunities, but students assume final responsibility for course scheduling, program planning, and the successful completion of graduation requirements. I will be responsible for seeking the academic and career information needed to meet my educational goals by becoming knowledgeable about the relevant policies, procedures, and rules of the University and academic program, by consulting and meeting with my adviser, and by successfully completing all of the requirements for graduation.

Penn State Values

Integrity: We act with integrity and honesty in accordance with the highest academic, professional, and ethical standards.

Respect: We respect and honor the dignity of each person, embrace civil discourse, and foster a diverse and inclusive community.

Responsibility: We act responsibly, and we are accountable for our decisions, actions, and their consequences.

Discovery: We seek and create new knowledge and understanding, and foster creativity and innovation, for the benefit of our communities, society, and the environment.

Excellence: We strive for excellence in all our endeavors as individuals, an institution, and a leader in higher education.

Community: We work together for the betterment of our University, the communities we serve, and the world.

References

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