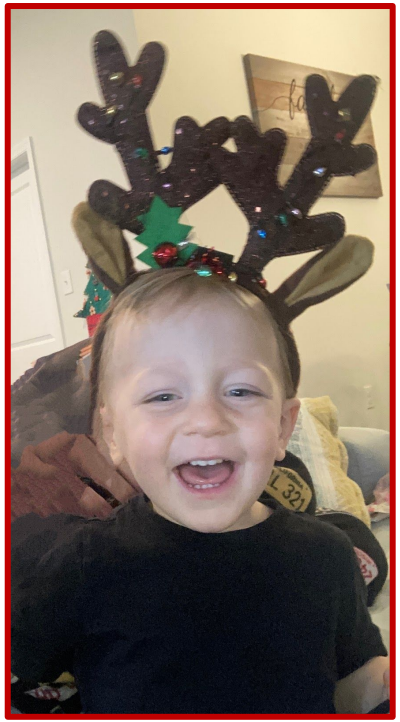
Welcome to COGS 108!

Data Science in Practice

Shannon E. Ellis, Ph.D

Associate Teaching Professor
Department of Cognitive Science
sellis@ucsd.edu

Lectures : https://github.com/COGS108/Lectures-Ellis/tree/wi24

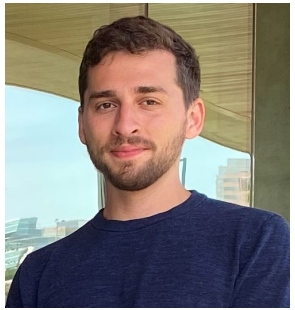


hello

my name is

Shannon Ellis

COGS 108 Instructional Staff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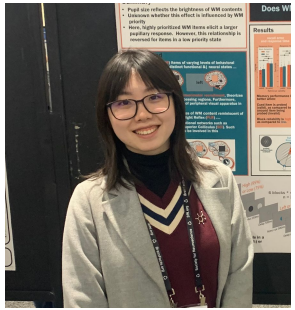
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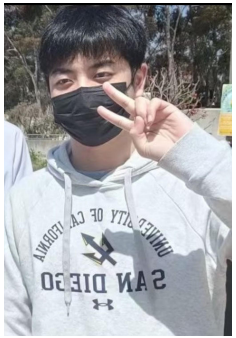
Zhicheng

Jietao

The (dreaded) waitlist

1. I know this matters to you and is a source of stress (and I hate that).
2. I have no control over the waitlist
   a. I know in other departments' profs have control of this
   b. I quite literally do not have access to the system
3. A few people in each section typically get off the waitlist, but that number varies each quarter.
   a. Typically it's ~3-5 people from each section (which is 40-60 more students across 12 sections)
   b. This course is project-based. I already have 750 students in this class.
4. The waitlist settles after week 2.
5. Our staff (cogsadvising@ucsd.edu) take care of this.

Students on the waitlist have access to Canvas/all course materials. If you want/hope to be enrolled, please keep up with the material these first two weeks. **You will be expected to have completed the material if you are eventually enrolled.**

...so what exactly is data science?

Google

what is biology

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The study of life, living things, & organisms

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science | study | definition | lesson | introduction | presentation | organisms | education | dominant | life | chapter | biologist | concept | ecology | living

Introduction to Biology | What is ...
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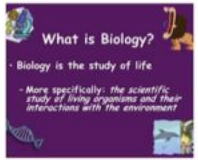

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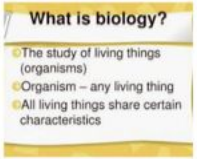

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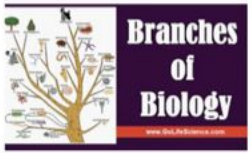

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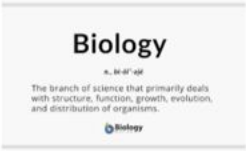

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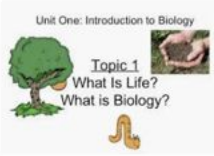

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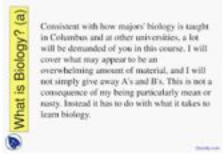

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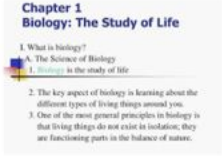

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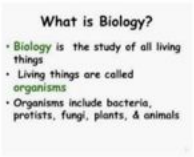

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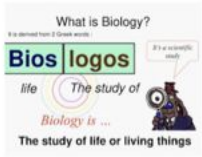

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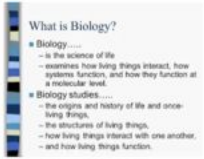

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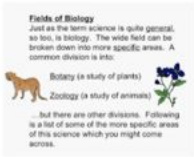

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Study of matter, energy, atoms, mechanics, and so on.

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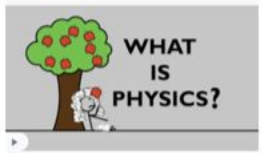

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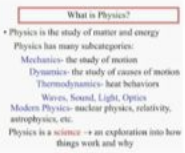

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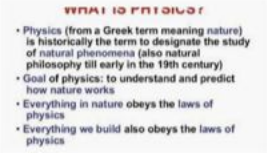

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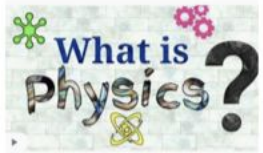

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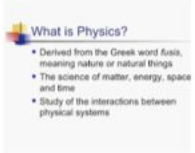

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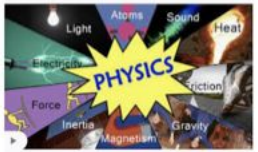

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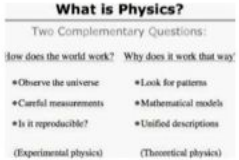

An Introduction to String Theory: What ...
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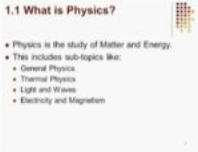

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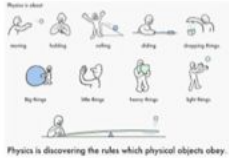

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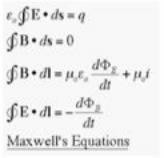

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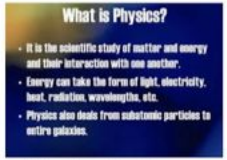

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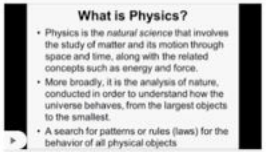

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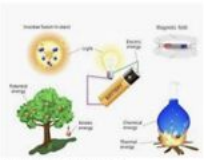

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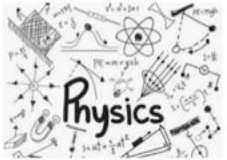

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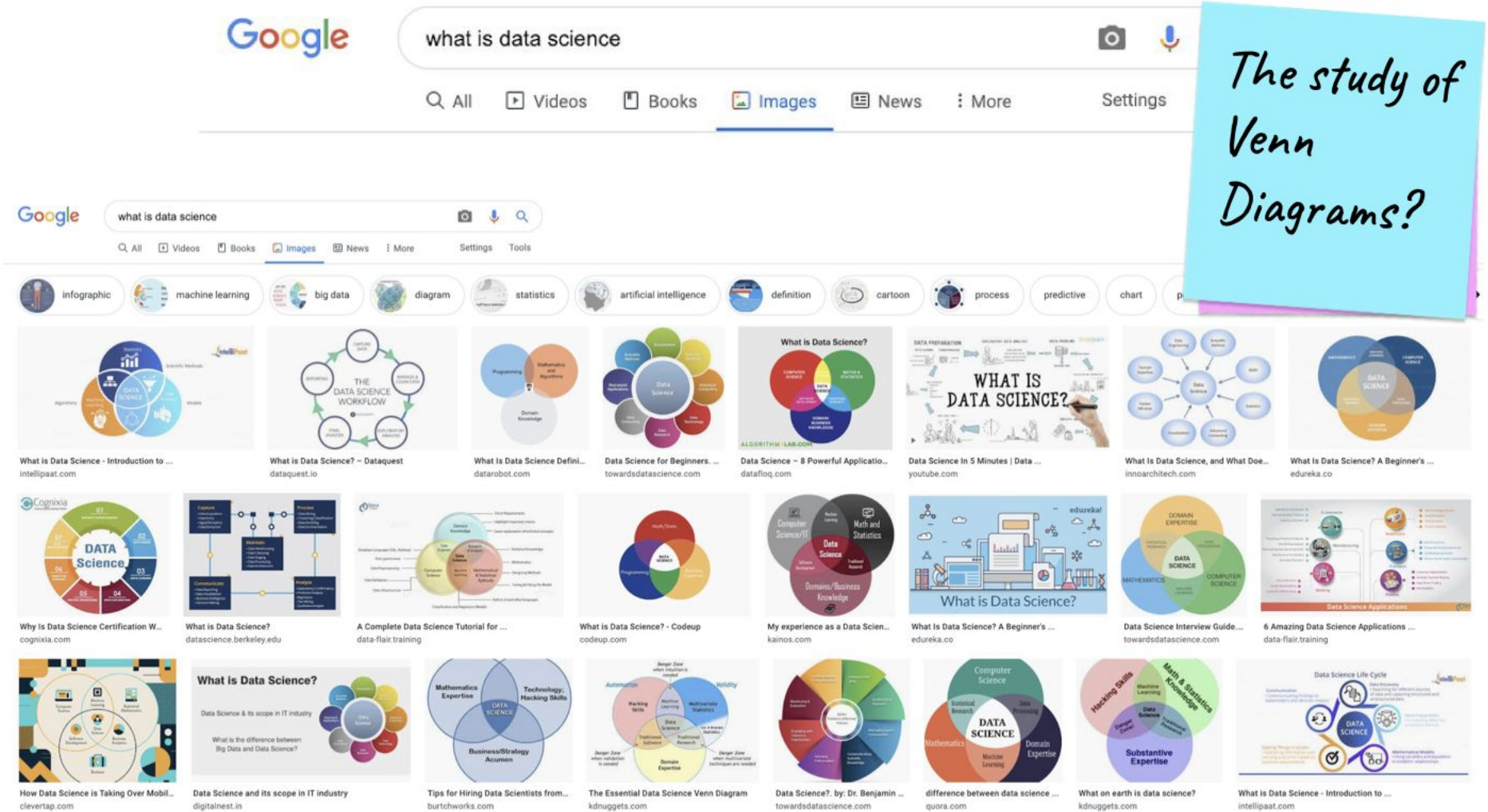

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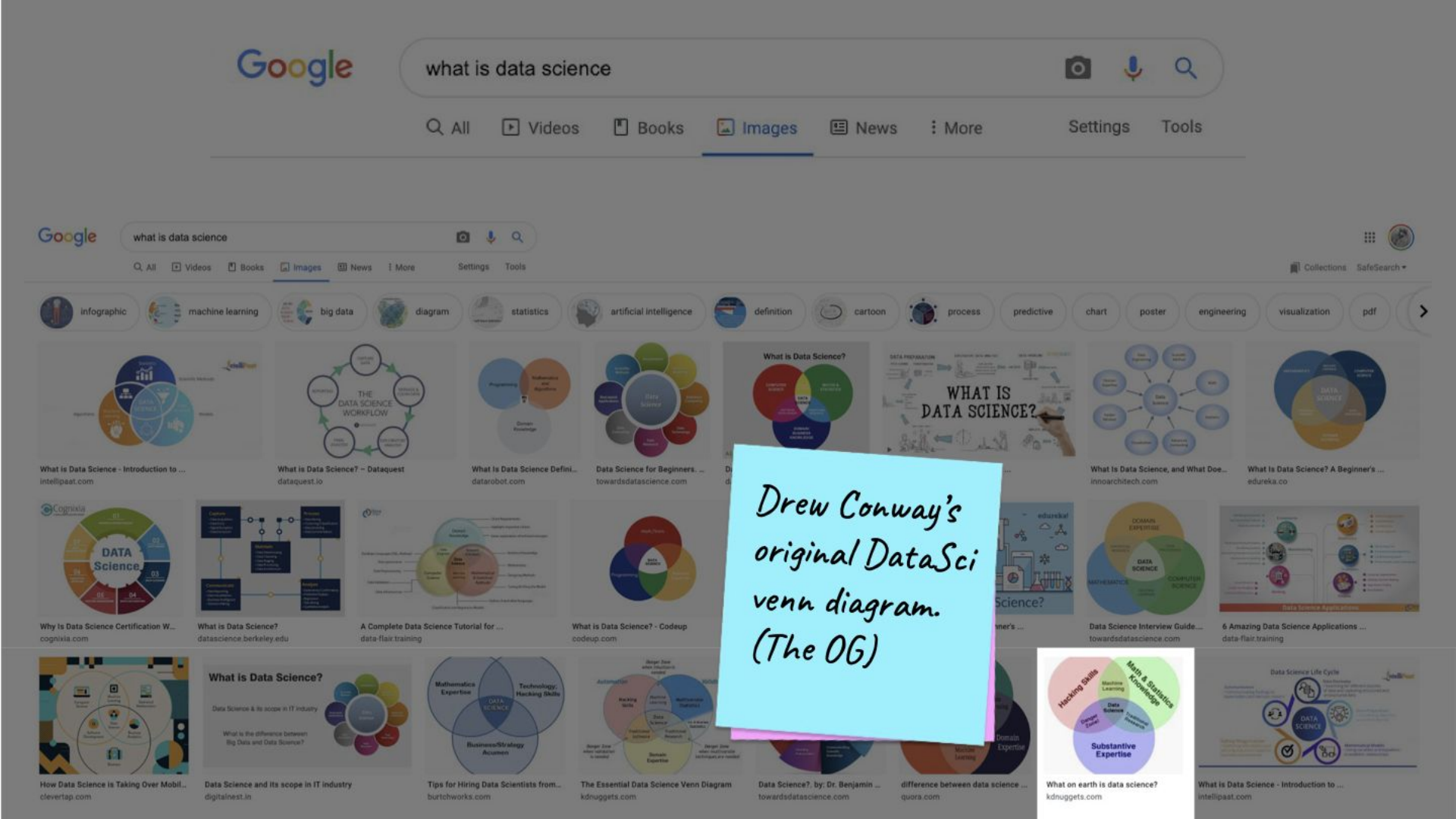
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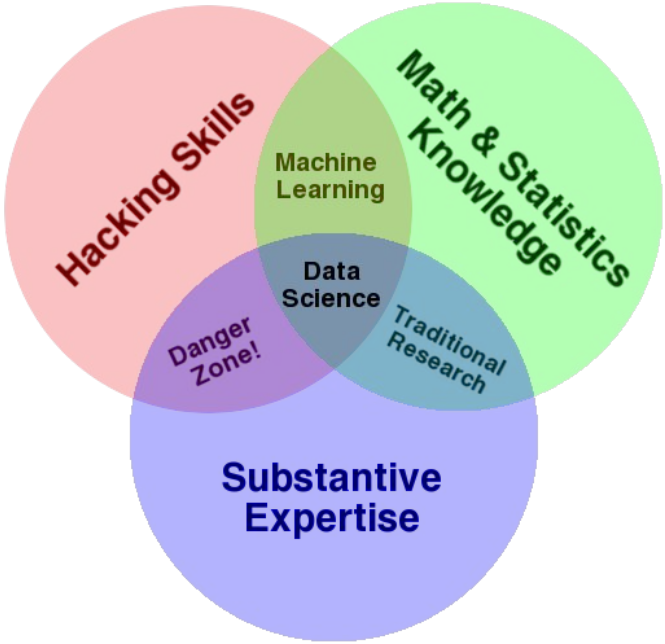
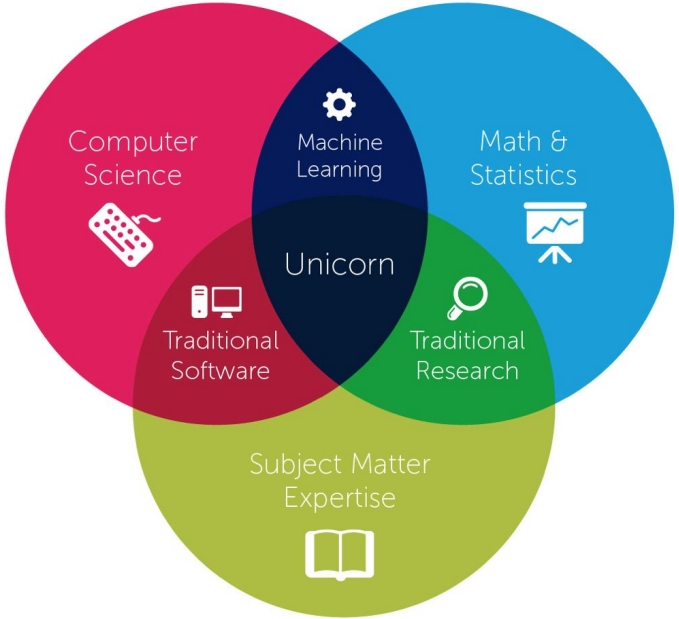
Drew Conway's original DataSci venn diagram. (The OG)

What is data science?





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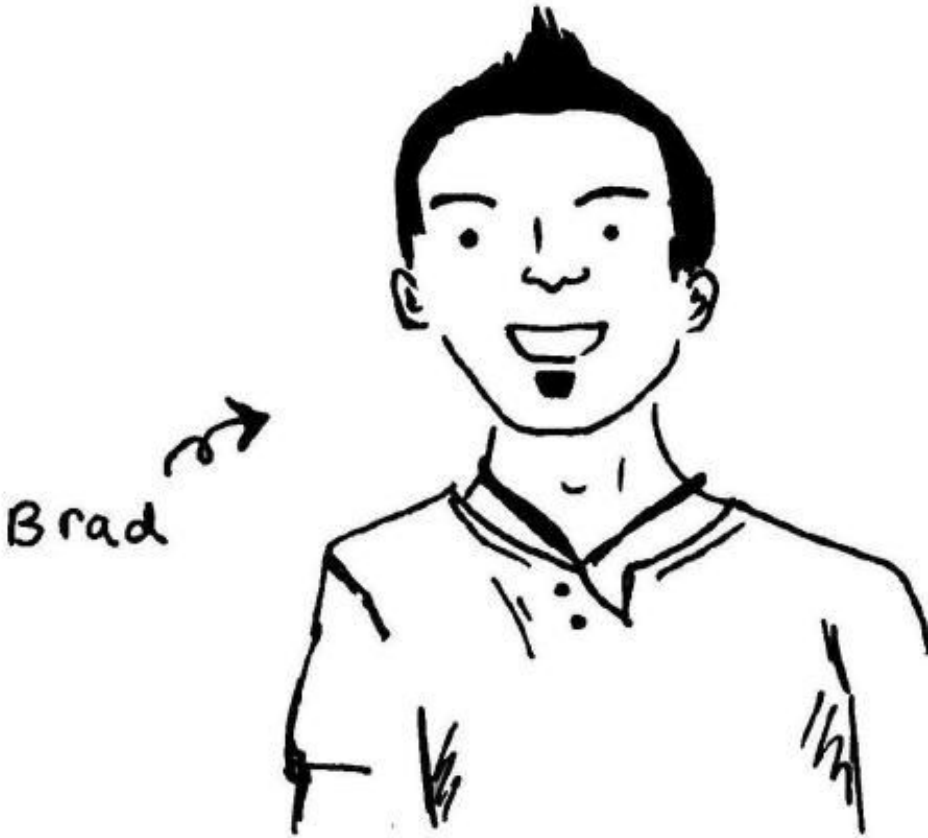
http://drewconway.com/zia/2013/3/26/the-data-science-venn-diagram

David Donoho

This coupling of scientific discovery and practice involves the collection, management, processing, analysis, visualization, and interpretation of vast amounts of heterogeneous data associated with a diverse array of scientific, translational, and interdisciplinary actions.

Bradley Voytek

The study of how the quantification of observable phenomena can lead to human understanding of the processes giving rise to those phenomena—or even the ability to predict future outcomes absent human understanding—and why certain phenomena require more or less data to lead to human understanding and/or prediction accuracy

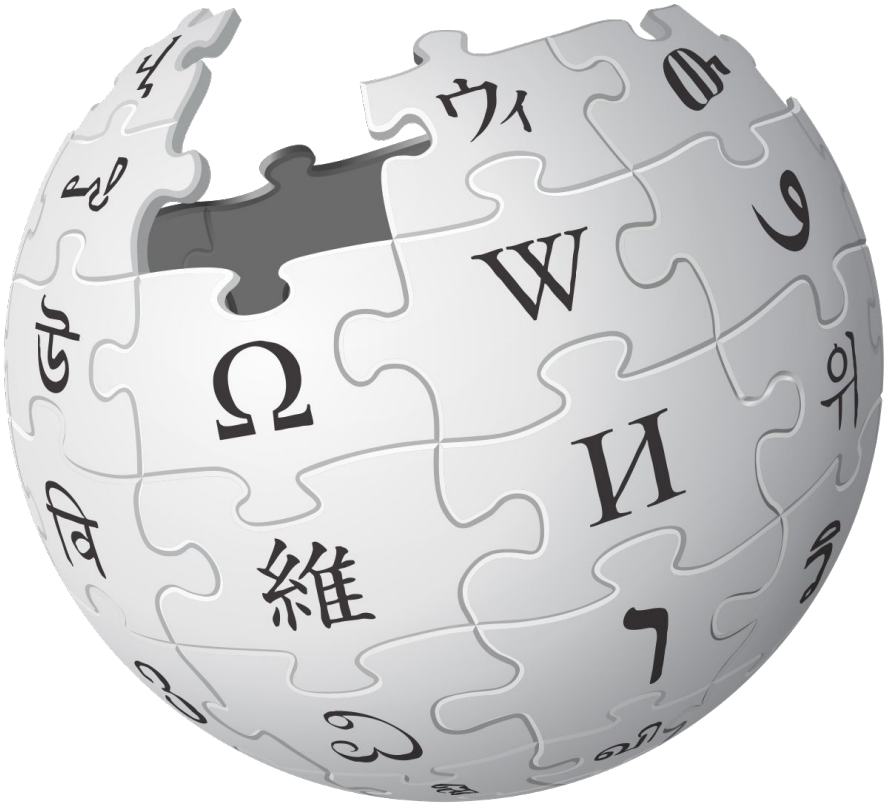


Rafael Irizarry

An umbrella term used by organizations to describe the processes used to extract value from data.

Wikipedia

A concept to unify statistics, data analysis, machine learning and their related methods" in order to "understand and analyze actual phenomena" with data.[3] It employs techniques and theories drawn from many fields within the context of mathematics, statistics, information science, and computer science.



Cogs 108 Definition

The scientific and ethical process of extracting value from data.

UC San Diego
Cognitive Science

50 Best Jobs in America

Awards

This report ranks jobs according to each job's Glassdoor Job Score, determined by combining three factors: number of job openings, salary, and overall job satisfaction rating.

	Job Title	Median Base Salary	Job Satisfaction	Job Openings
#1	Enterprise Architect	$144,997	4.1/5	14,021
#2	Full Stack Engineer	$101,794	4.3/5	11,252
#3	Data Scientist	$120,000	4.1/5	10,071

Highest Paying Jobs

Oddball Interview Questions

View Jobs

https://www.glassdoor.com/List/Best-Jobs-in-America-LST_KQ0,20.htm

Data scientists ask interesting questions & answer them with data

The goal in COGS 108 is to *do* data science.

Course Objectives

- Formulate a plan for and complete a data science project from start (question) to finish (communication)
- Explain and carry out descriptive, exploratory, inferential, and predictive analyses in Python
- Communicate results concisely and effectively in reports and presentations
- Identify and explain how to approach an unfamiliar data science task

How we'll approach learning about *and doing* data science in COGS 108

Scheduling

Lecture: MWF 9-9:50 (CTL 125) AM OR 2-2:50 PM (PETER 108)
Discussion Sections: M, W, Th, F

A03	M	8:00a-8:50a	PETER	103
A02	M	1:00p-1:50p	PCYNH	120
A01	W	11:00a-11:50a	PCYNH	120
B03	W	12:00p-12:50p	PCYNH	121
B01	Th	5:00p-5:50p	PCYNH	120
B02	Th	6:00p-6:50p	PCYNH	120
A04	F	8:00a-8:50a	PETER	103
B04	F	3:00p-3:50p	WLH	2111
B05	F	5:00p-5:50p	WLH	2207
B06	F	6:00p-6:50p	WLH	2207
A05	F	5:00p-5:50p	DIB	121
A06	F	6:00p-6:50p	DIB	121

Prof Office Hours: Fri 10-12 PM (starting week 2)

What are course staff up to in COGS 108?

Everyone | assisting in discussion section labs, answering students on Piazza, providing me with feedback

TAs | *very* project focused

- For project: advising, feedback & grading
- Hold OH 1h/wk

IAs | varies by individual

- Administrative duties
- Autograding assignments and labs
- Managing group project tech
- Suggesting quiz questions

When helping, our goal is to do just that. Help. Often, you'll be under time pressure to complete an assignment (which we understand), but we *really* care about your learning. So, <u>we all will prioritize guiding you to an answer to ensure learning</u> (rather than just giving an answer away).

COGS 108: General Plan

Week	Topic(s)
1	Data Science, Python, & Version Control
2	Data Intuition &
3	Wrangling, Data Ethics
4	DS Questions & Data Visualization
5	Exploratory Data Analysis
6	Inference
7	Text Analysis
8	Machine Learning
9	Nonparametric Analysis & Geospatial Analysis
10	Data Science Communication & Jobs

Programming Prerequisite

- MAE 8 - MATLAB
- CSE 8A or 11 - Python/Java
- COGS 18 - Python
- DSC 10 - Python

Bottom line: **we will assume programming knowledge.**

Python will be used for all labs/projects/assignments.

No programming experience (or you forget it all)?

- *Preferred option*
  - Take a programming course first
  - COGS 18 : Introduction to Python
- *Can't wait?*
  - Use online sites like *codecademy.com* or *LearnPython.org*
  - *Python Data Science Handbook*

Course links

GitHub	https://github.com/COGS108	lecture/section slides & final projects
datahub	https://datahub.ucsd.edu	assignment & lab completion & submission
Piazza	https://piazza.com/class/lqzo7aetmf06m8 *(also directly available from Canvas)*	questions, discussion, and regrade requests
Canvas	https://canvas.ucsd.edu/courses/52091	grades
Anonymous Feedback	Submit via Google Form	if I ever offend you, use an example you hate, or to provide general feedback that you don't want your name attached to

General grading:

	% of Total Grade
Pre-course Survey (#finaid)	1
(8/9) Weekly Quizzes (lecture content)	8
(8/9) Discussion Labs (technical)	16
(4) Assignments	32
Final Group Project	43
(1) Project Review*	5
(1) Project Proposal*	9
(2) Project Checkpoints*	10
(1) Final Report*	15
(1) Final Video*	3
(1) Project Survey	1

* indicates group submission

Lecture attendance is *not* required, but is incentivized

iclickers will be used for in-class **lecture** Q&A

- Starting Wed, if you attend 75% of all lectures (exc. guest lectures), you will earn 0.5% extra credit on your grade
- To get credit for lecture attendance, you must respond to 75% of that days' questions

<u>Notes</u>:

- you can attend *either* lecture on a given day to get credit. If you attend both, you'll only get credit for attending one day's lecture.
- If you attend both 9AM and 2PM throughout the quarter, you'll need both courses on your iclicker app.
- If you use the app, use your UCSD email for login
- If you're using a physical iclicker, be sure it's registered it on Canvas

Why iclicker questions in COGS 108?

- There are a whole lot of you!
- Checks understanding
- Provides me with feedback
- Aids in critical thinking & allows for application of concepts
- Give you all a break from listening to me (we humans need this!)

Weekly Lecture Quizzes:

- (9) weekly quizzes (first one due Sunday of this week)
- Goal: to help you keep on top of the material covered in lecture
- Why?: experience + student feedback
- How:
  - Taken on Canvas
  - Single Attempt
  - ~10 Questions
  - Timed : 15 minutes
  - Posted by Friday @ 3PM (after each week of lecture)
  - Meant to test concepts from that week's lecture

Lecture quizzes will be due on Sundays by 11:59 PM.

No late submissions. Lowest quiz score will be dropped.

All deadlines Sun at 11:59 PM

Week	Quiz	Discussion Lab	Lecture Quiz	Assignment
1	Data Science, Python, & Version Control	--	Q1	--
2	Data Intuition &	D1	Q2	A1 - python, Pre-course survey
3	Wrangling, Data Ethics	D2	Q3	--
4	DS Questions & Data Visualization	D3	Q4	A2 - pandas/viz, Project Review*
5	Exploratory Data Analysis	D4	Q5	Project Proposal*
6	Inference	D5	Q6	A3 - Inference
7	Text Analysis	D6	Q7	Checkpoint #1: Data*
8	Machine Learning	D7	Q8	A4 - NLP/ML
9	Nonparametric Analysis & Geospatial Analysis	D8	Q9	Checkpoint #2: EDA*
10	Data Science Communication & Jobs	--	--	--

Final Project(Report*, Video*, Survey): due Wed of finals week by 11:59 PM

*indicates group submission. All other assignments/surveys are completed & submitted individually.

(4) Assignments

Assignments are completed individually and graded programmatically.

- These are meant to get you practice programming around the topics covered in class.
- The first two are much simpler than the following two and should take less time.
- You will have to look some stuff up on your own. This is by design.
- Instructions must be followed to receive credit.
- You'll have the opportunity to practice in discussion section.

Assignments will be due on Sundays by 11:59 PM.

75% credit if submitted w/n 72h after deadline.

Assignment Submission @ Datahub: https://datahub.ucsd.edu

DATA SCIENCE / MACHINE LEARNING PLATFORM

UC San Diego

Information Technology Services - Educational Technology Services Help Options

UC San Diego Jupyterhub (Data Science) Platform

Before Fri: log onto datahub. (If you have Canvas access, you have datahub access)

All deadlines Sun at 11:59 PM

Week	Quiz	Discussion Lab	Lecture Quiz	Assignment
1	Data Science, Python, & Version Control	--	Q1	--
2	Data Intuition &	D1	Q2	A1 - python, Pre-course survey
3	Wrangling, Data Ethics	D2	Q3	--
4	DS Questions & Data Visualization	D3	Q4	A2 - pandas/viz, Project Review*
5	Exploratory Data Analysis	D4	Q5	Project Proposal*
6	Inference	D5	Q6	A3 - Inference
7	Text Analysis	D6	Q7	Checkpoint #1: Data*
8	Machine Learning	D7	Q8	A4 - NLP/ML
9	Nonparametric Analysis & Geospatial Analysis	D8	Q9	Checkpoint #2: EDA*
10	Data Science Communication & Jobs	--	--	--

Final Project (Report*, Video*, Survey): due Wed June 9th of finals week by 11:59 PM

*indicates group submission. All other assignments/surveys are completed & submitted individually.

Group Projects: the main focus of COGS 108

Assigned groups of 4-5 Individuals

Carry out the entire data science process on a topic of your choosing

All deadlines Sun at 11:59 PM

Week	Quiz	Discussion Lab	Lecture Quiz	Assignment
1	Data Science, Python, & Version Control	--	Q1	--
2	Data Intuition &	D1	Q2	A1 - python, Pre-course survey
3	Wrangling, Data Ethics	D2	Q3	--
4	DS Questions & Data Visualization	D3	Q4	A2 - pandas/viz, Project Review*
5	Exploratory Data Analysis	D4	Q5	Project Proposal*
6	Inference	D5	Q6	A3 - Inference
7	Text Analysis	D6	Q7	Checkpoint #1: Data*
8	Machine Learning	D7	Q8	A4 - NLP/ML
9	Nonparametric Analysis & Geospatial Analysis	D8	Q9	Checkpoint #2: EDA*
10	Data Science Communication & Jobs	--	--	--

Final Project(Report*, Video*, Survey): due Wed June 9th of finals week by 11:59 PM

*indicates group submission. All other assignments/surveys are completed & submitted individually.

Discussion Section

Goals:

- help with technical aspects of the course
- Provide time to work on labs
- Get questions answered

Students will complete and submit weekly labs (low stakes), where you will get to practice the material presented in class before seeing it on an assignment (higher stakes).

If you're able to fly through the labs, you never *have* to attend section.

If you're struggling, you should absolutely attend section.

Discussion Sections will start Wed of week 2 (Mon is a holiday*)

All deadlines Sun at 11:59 PM

Week	Quiz	Discussion Lab	Lecture Quiz	Assignment
1	Data Science, Python, & Version Control	--	Q1	--
2	Data Intuition &	D1	Q2	A1 - python, Pre-course survey
3	Wrangling, Data Ethics	D2	Q3	--
4	DS Questions & Data Visualization	D3	Q4	A2 - pandas/viz, Project Review*
5	Exploratory Data Analysis	D4	Q5	Project Proposal*
6	Inference	D5	Q6	A3 - Inference
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8	Machine Learning	D7	Q8	A4 - NLP/ML
9	Nonparametric Analysis & Geospatial Analysis	D8	Q9	Checkpoint #2: EDA*
10	Data Science Communication & Jobs	--	--	--

Final Project(Report*, Video*, Survey): due Wed June 9th of finals week by 11:59 PM

*indicates group submission. All other assignments/surveys are completed & submitted individually.

Course Confusion

- If something in lecture, a section workbook, or an assignment is unclear:
  - *ask in class*
  - *ask during section*
  - *post on Piazza*
  - *ask a classmate*
  - *come to office hours*

Please do not use Canvas messages.

(The UI is the worst. I miss messages all the time. I will not look at them first. I look at Piazza first every day. Then email. I have 750+ students. Please use Piazza when possible.)

CLASS CONDUCT

In all interactions in this class, you are expected to be respectful. This includes following the UC San Diego principles of community.

This class will be a welcoming, inclusive, and harassment-free experience for everyone, regardless of gender, gender identity and expression, age, sexual orientation, disability, physical appearance, body size, race, ethnicity, religion (or lack thereof), political beliefs/leanings, or technology choices

At all times, you should be considered and respectful. Always refrain from demeaning, discriminatory, or harassing behavior and speech. Last of all, **take care of each other**.

If you have a concern, please speak with Prof. Ellis, your TAs, or IAs. If you are uncomfortable doing so, the OPHD and/or CARE are wonderful resources on campus.

Academic Integrity Policy

Don’t cheat.

Group work is required (projects) and encouraged throughout to help you learn.

COGS 108 is meant to be collaborative. We have a lot of students. Let’s harness that and learn from one another.

But, copying + pasting someone else’s work without understanding is not learning.

AI Policy

LLMs (and the Internet generally) are great.

Learning is important.

Use resources to help you learn...not to do your work.

If it helps you complete a task *and you understand what it provides you*, go ahead and use it.

But be sure to *think* about the output. Check it. Edit it.

And, be sure to cite it if you do.

https://github.com/COGS108/Overview/blob/wi24/COGS108-Syllabus.md#policy-on-using-ai-programming-assistance

What COGS 108 logistics questions do you have?

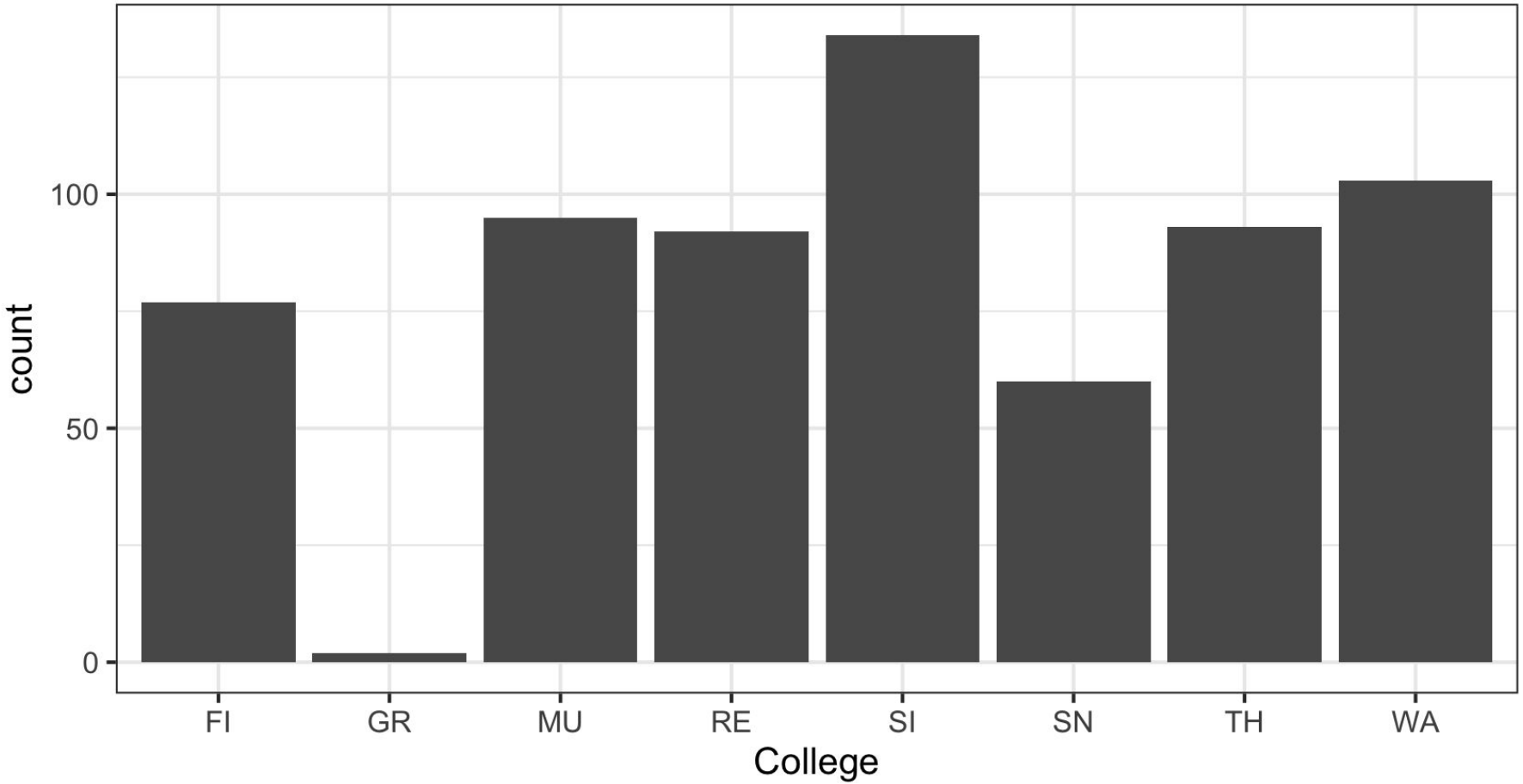
Why this course?

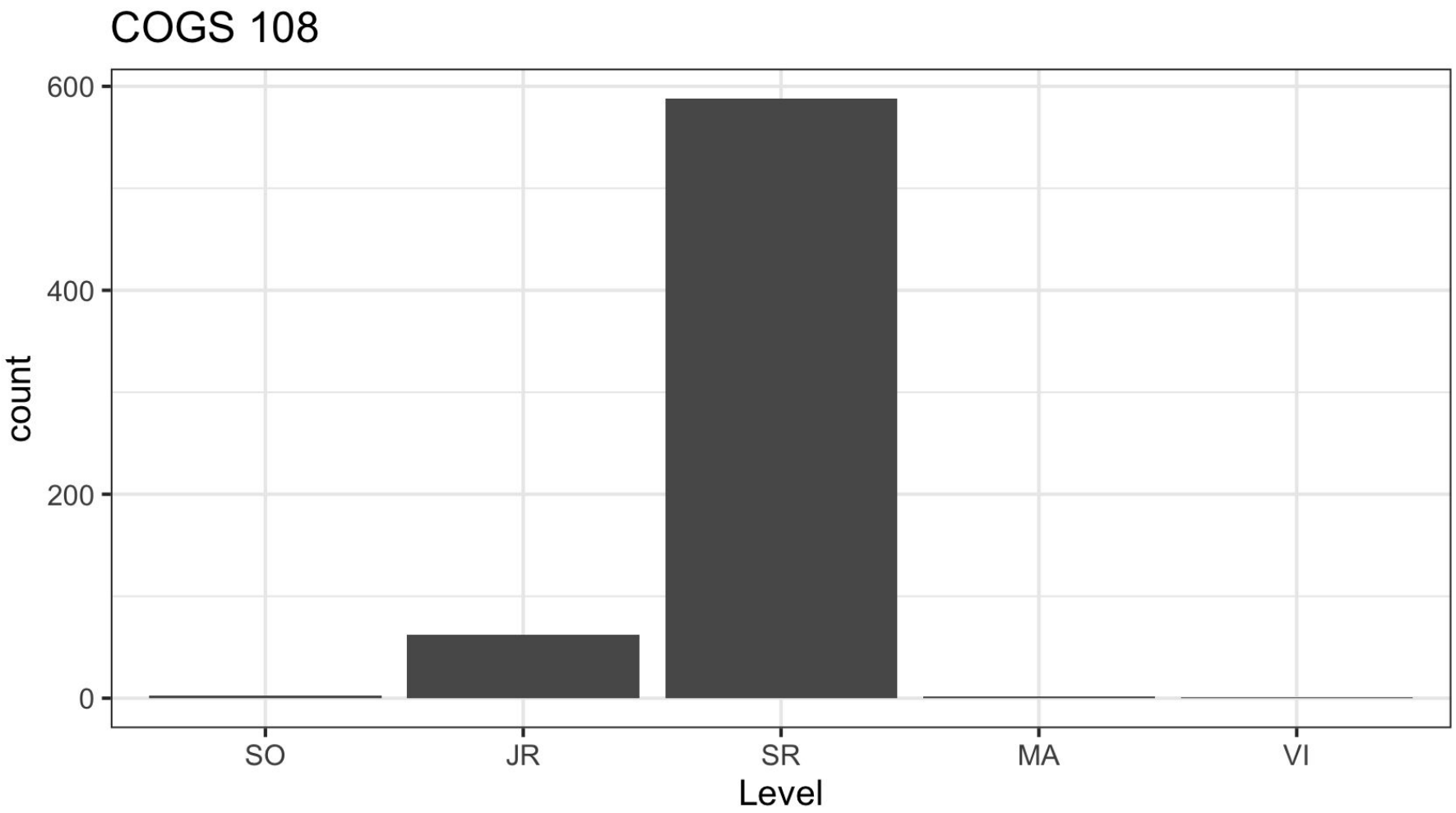
You are going to be analyzing lots of data because you're studying to be a:

cognitive scientist
data scientist
computer scientist
neuroscientist, biologist, or chemist
social scientist (linguist? psychologist?)
statistician or biostatistician
CEO/small business owner
something else really awesome

I’m excited to have you all in COGS 108!

COGS 108

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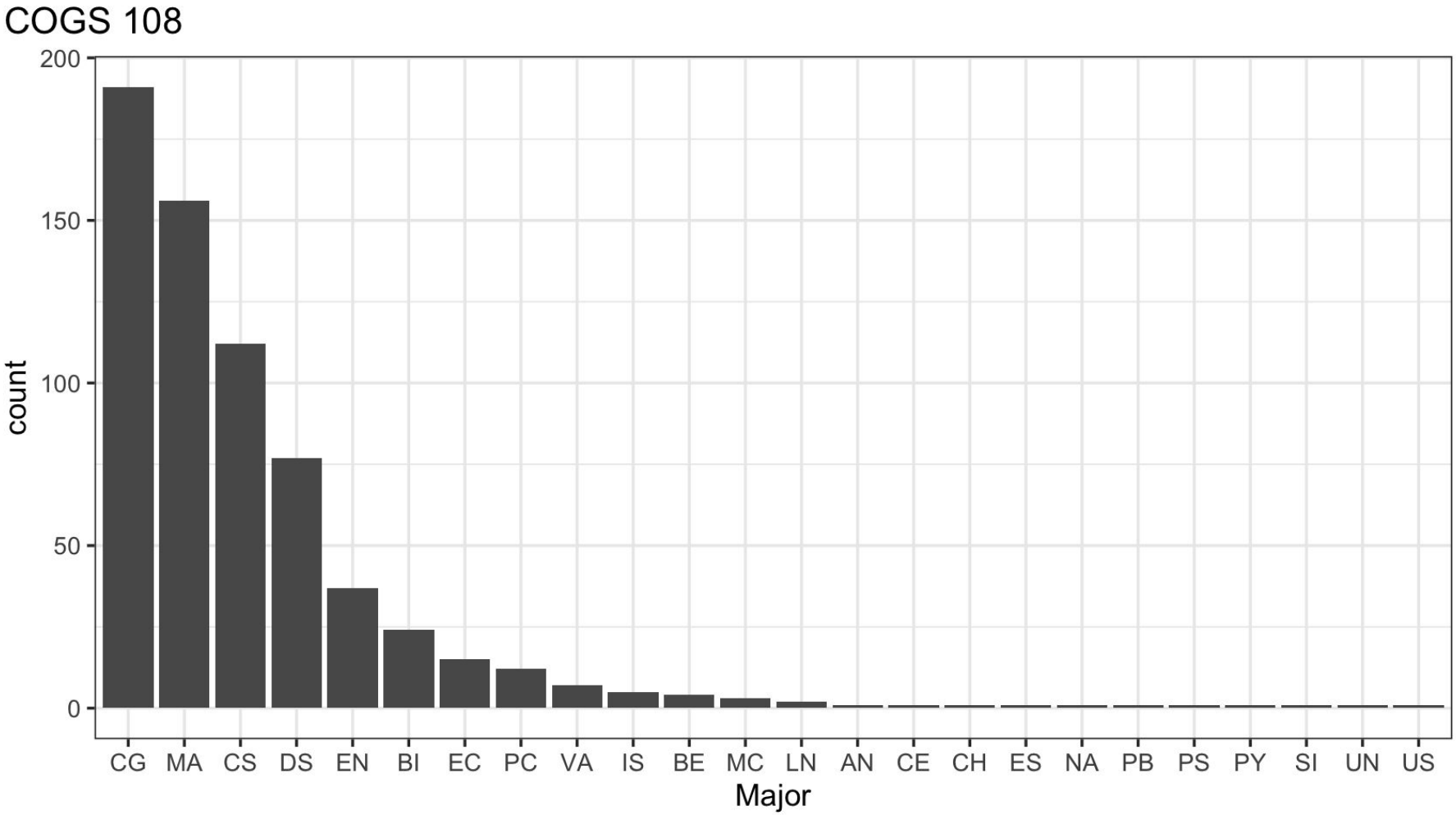
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Survey (link also on canvas; #finaid)

due 11:59 PM
Sunday after week 2

COGS 108 Student Survey (Winter 2024)

This survey must be completed by the Sunday following Week 2. It is being used as our #finaid survey.

This survey has three parts. The first part helps me get to know you better. It also collects data that will be anonymized and then used to demonstrate data science in class.

The second part collects your GitHub username. If you don't yet have one, you'll be directed where to go to get one.

The third part of the survey is collecting demographic information. THIS SECTION IS OPTIONAL - refusing to fill it out does NOT affect your grade. If you do fill out section 3, you will be participating in research to make this course better in the future. Please read the instructions in that section carefully. Thanks in advance for your participation!

If any of these data are used/displayed in class, the data will be anonymized. Please answer as truthfully as possible. How you respond will NOT affect how you do in this class. Also, many questions are NOT required. Please do not answer anything that makes you uncomfortable.