

# **CS 220**

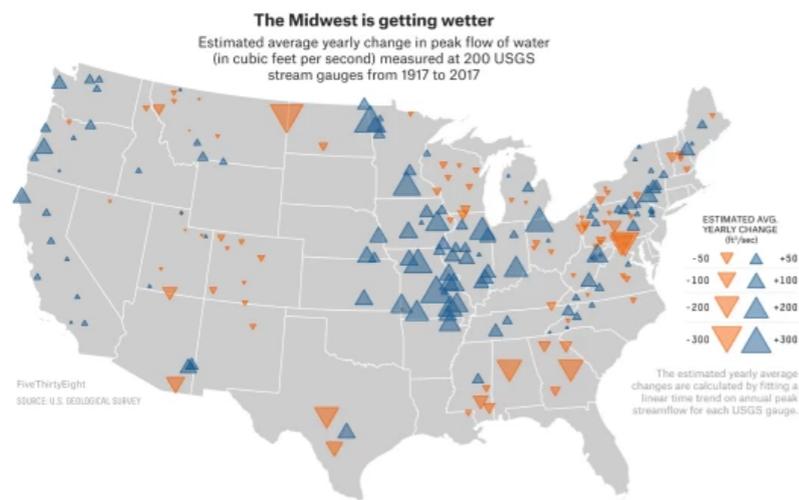
# **Introduction**

Department of Computer Sciences  
University of Wisconsin-Madison

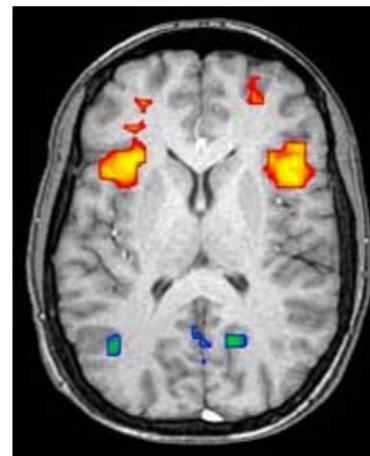
# Welcome to Data Science Programming I

Data is now integrated into in many fields

- Journalism
- Biology, physics, chemistry
- Psychology, sociology, economics, business
- Engineering (mechanical, biomedical, industrial, etc.)



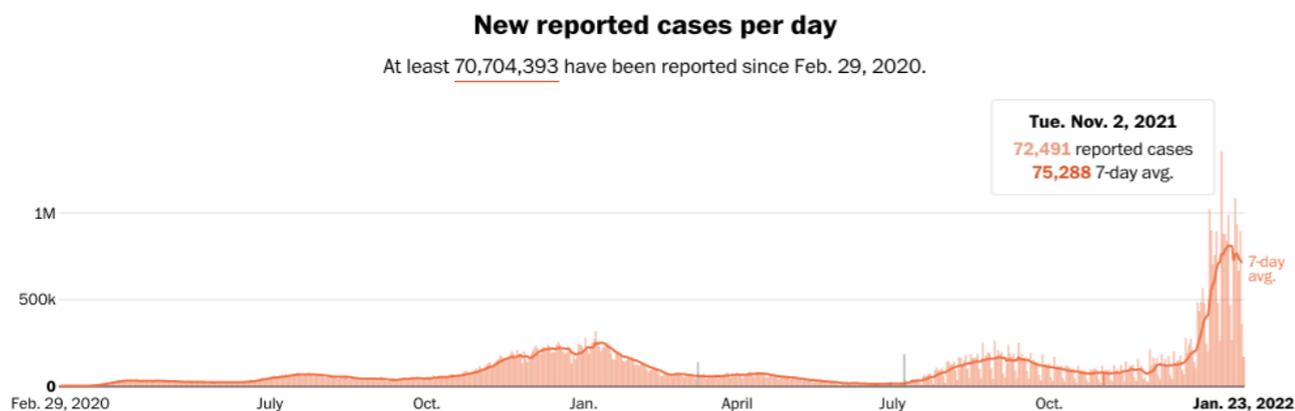
<https://fivethirtyeight.com/features/the-midwest-is-getting-drenched-and-its-causing-big-problems/>



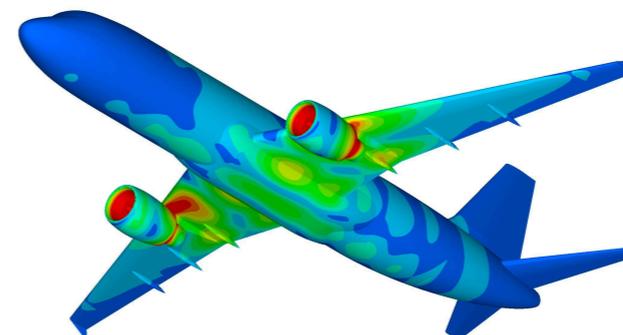
<https://en.wikipedia.org/wiki/Neuroimaging>



<https://science.howstuffworks.com/life/genetic/gattaca-gaptacaz-adding-letters-the-genetic-alphabet.htm>



<https://www.washingtonpost.com/graphics/2020/national/coronavirus-us-cases-deaths/>



<http://www.stressebook.com/finite-element-analysis-in-a-nut-shell/>

# Welcome to Data Science Programming I

Data is exploding in many fields

- Journalism
- Biology, physics, chemistry
- Psychology, sociology, economics, business
- Engineering (mechanical, electrical, industrial, etc)

How can we gain insights from that data?

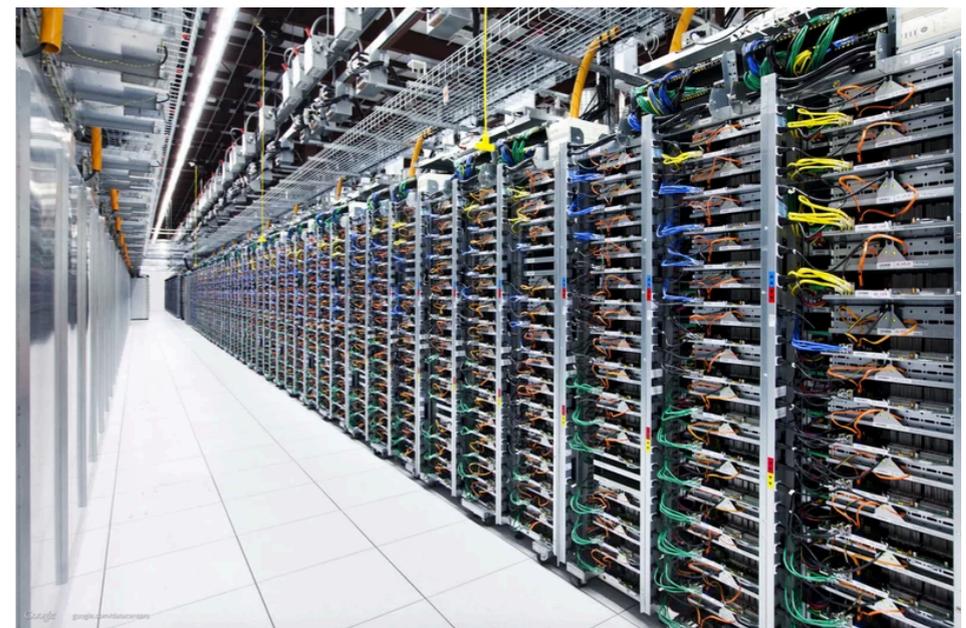
- With computation

Approach 1: human computation



[https://en.wikipedia.org/wiki/Human\\_computer](https://en.wikipedia.org/wiki/Human_computer)

Approach 2: machine computation



<http://fortune.com/2015/11/15/intel-super-7/>

# Welcome to Data Science Programming I

CS 220 is about approach 2

- Faster, more reliable, can churn through more data
- Automate to save human effort

*“Find the leverage in the world, so you can **be more lazy!**”*

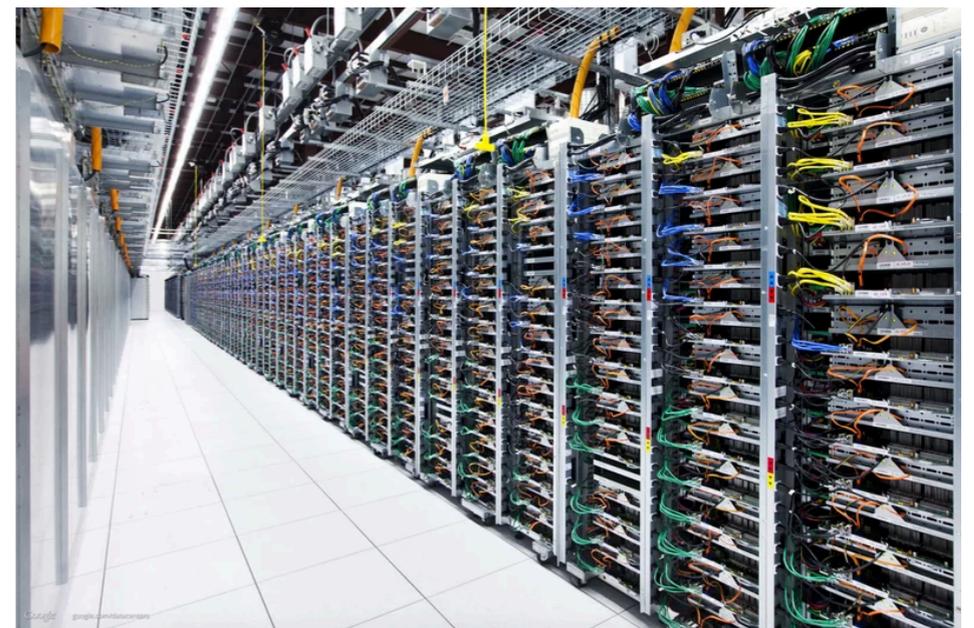
~ Larry Page

Approach 1: human computation



[https://en.wikipedia.org/wiki/Human\\_computer](https://en.wikipedia.org/wiki/Human_computer)

Approach 2: machine computation

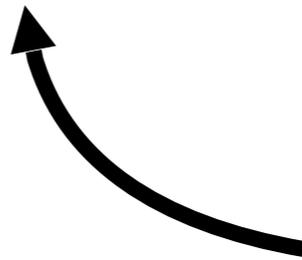


<http://fortune.com/2015/11/15/intel-super-7/>

# Welcome to Data Science Programming I

CS 220 is about approach 2

- Faster, more reliable, can churn through more data
- Automate to save human effort
- Requires being able to tell computers what to do!



society needs more **domain experts**  
in specific fields **who can write code**

Goal: become "bilingual"

- Speak the language of **X** (biology, mech eng, journalism, etc)
- Speak the language of **computing**

Data Science:

- Combines inquiry, statistics, **programming**, and communication skills to provide actionable insights from data sets

# Why CS 220?

## Typical intro CS

- Challenging language (e.g., C++ or Java)
- CS students and other majors together
- Heavy on theory, light on data

vs

## CS 220 approach

- Python (powerful but easier to learn)
- Bring more coding into other fields
- Light on theory, heavy on data
- Emphasize questions and communication

# Why CS 220?

## 50 Best Jobs in America for 2022

	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

[https://www.glassdoor.com/List/Best-Jobs-in-America-LST\\_KQ0,20.htm](https://www.glassdoor.com/List/Best-Jobs-in-America-LST_KQ0,20.htm)

# Why CS 220?

People use Data to solve the world's problems



We just published our new Global Food Data Explorer

Explore the global food system from field to plate, for all countries in the world.



Measuring progress towards the Sustainable Development Goals

# Today's Topics

## Introductions

Course overview part 1

Worksheet: pseudocode

Course overview part 2

Canvas and course materials

# Who is the instructor?

Anna Meyer

- Email: [apmeyer4@wisc.edu](mailto:apmeyer4@wisc.edu)
- Please call me “Anna”

Education & Experience

- BA (Mathematics, Carleton College)
- MS (Computer Science, UW-Madison)
- PhD (Computer Science, UW-Madison) in-progress
- 2 years experience as a software developer

# Who are the TA and peer mentors?

TA: Jane Zhang

- Email: [zhang2752@wisc.edu](mailto:zhang2752@wisc.edu)
- MS student in Computer Science

Peer Mentor: Adi Tewari

# Who are you?

- Say hi to your neighbor and introduce yourself 😊
  - Name
  - Major (potential major)
  - Year in college
  - Fun fact



<https://pixy.org/4356032/>

# Today's Topics

Introductions

Course overview part 1

- Topics

Worksheet: Pseudocode

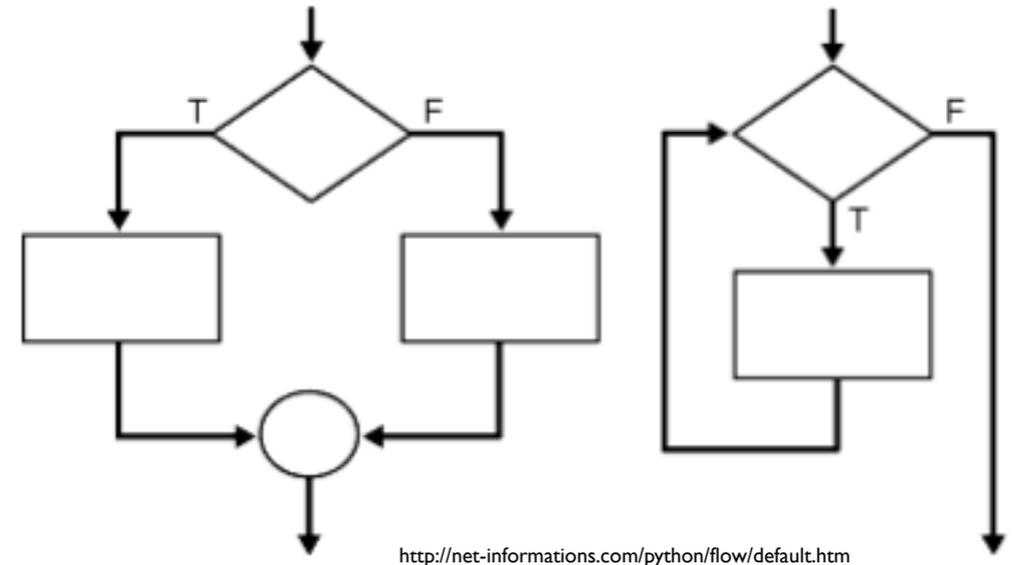
Course overview part 2

Canvas and course materials

# 220 Topics

## Part 1: Control Flow

- What step is currently executing?
- How to write functions?
- How to conditionally do something?
- How to repeat steps?



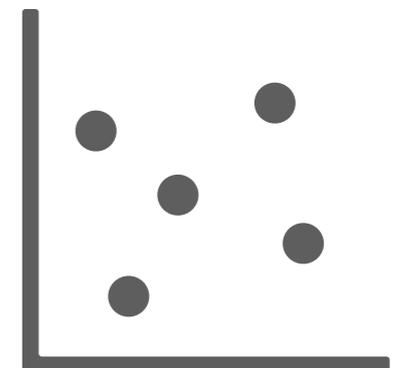
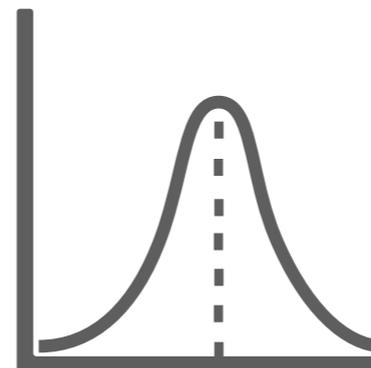
## Part 2: State

- How to structure lots of data?
- How to save data in files?



## Part 3: Data Science

- Tabular data
- Internet
- Databases
- Plotting



# Today's Topics

Introductions

Course overview part 1

**Worksheet: Pseudocode**

Course overview part 2

Canvas and course materials

Pseudocode

# Today's Topics

Introductions

Course overview part 1

Worksheet: Pseudocode

Course overview part 2

- **Lecture**
- Lab
- Readings
- Class communication
- Grades
- Projects
- Exams & quizzes

Canvas and course materials

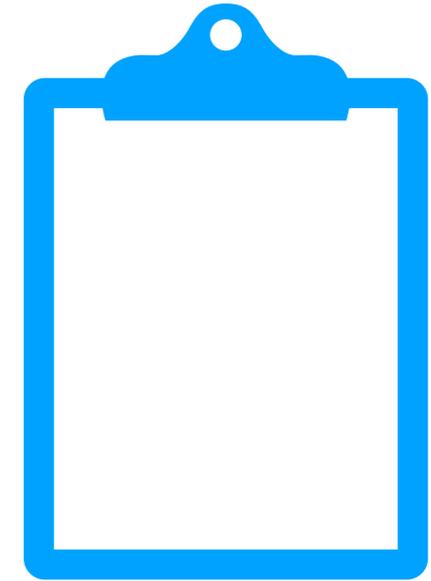
# Lectures



general concepts



live coding



worksheet practice

## Your role

- Do **readings** before or after
- Download the **template file** and code along in lecture
- Ask **questions** during the lectures + office hours
- Lectures **WON'T** be recorded



# Labs – CS220

## Format

- Attendance is mandatory – 3 out of 13 labs will be dropped for grading
- 75 minutes on Tuesdays and Thursdays
- Led by Teaching Assistant (TA) and a Peer Mentor (PM)
- Lab document will be posted each week on Wednesday
- Meant to help you succeed on your project

## Partnership

- We strongly encourage you to find a lab / project partner
- If you chose to do lab with a partner, make sure they are your project partner

**we will have labs starting tomorrow!!!**

(also, get any help needed installing Python during this one)

# Readings (all free!)



## Think Python, 2nd Edition

- Allen B. Downey
- Assumes no programming background
- It's very concise
- Get the 2nd edition, which is for **Python 3!**



## Automate the Boring Stuff

- Al Sweigart
- Useful for some more advanced topics related to using data



## Python for Everyone – Interactive

- Barb Ericson
- Allows you to practice coding as you learn

CS 220 /  
CS319  
Notes

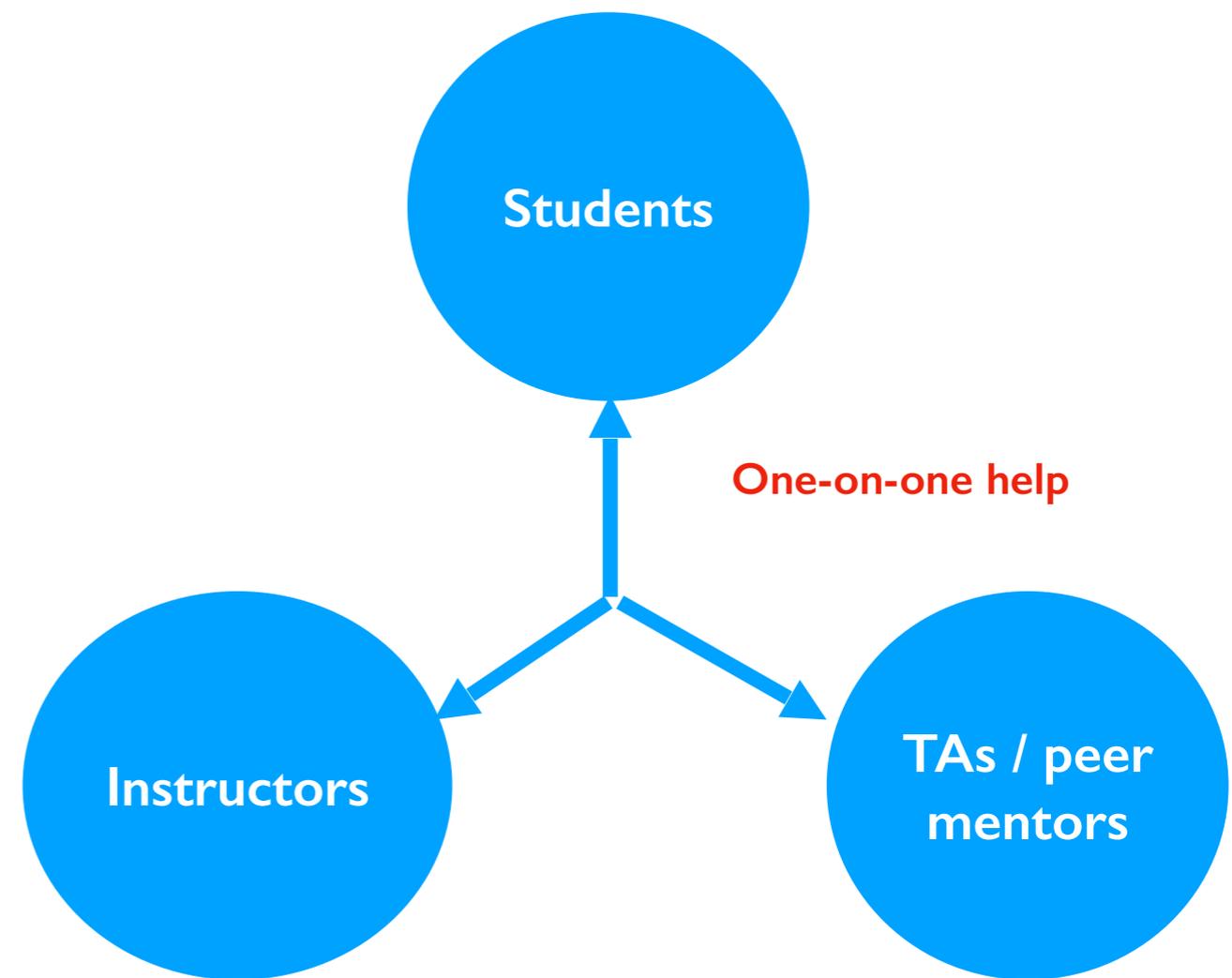
## Course Notes

- 220 / 319 instructors
- Mostly for data science part of class

# Course tools

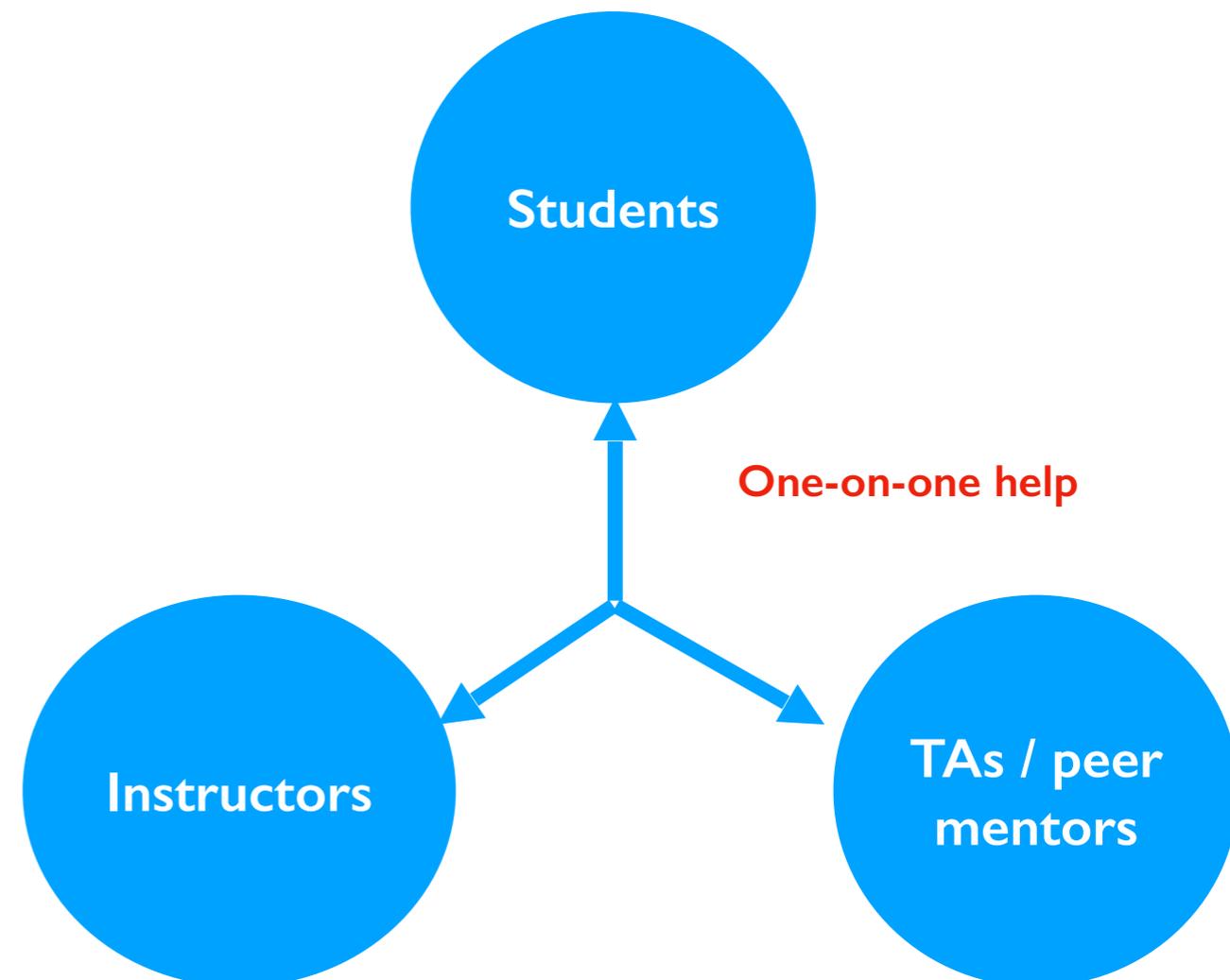
## Communication tools

- Office hours (best way to get help):
  - See schedule on Canvas
- Canvas:
  - Announcements
  - Course schedule
  - Quizzes
  - Grades
- Piazza
  - Question asking and answering
  - Communication with course staff (use a private message)



# Course tools

- Piazza:
  - Rule 1: don't post more than 5 lines of code
  - Rule 2: check other posts before posting
- Project Submission: GradeScope



# Grades - CS220

## **48%** - programming projects

- 13 projects
- p1: 2%, p9: 2%, remaining projects 4%

## **30%** - exams

- 3 “midterms”
- 10% each

## **16%** - quizzes

- 10 quizzes (drop 2 lowest scores)

## **5%** - lab attendance

- 13 labs (drop 3 lowest scores)

## **1%** - class surveys

# Letter Grades

- Your final grade is based on sum of all points earned
- Your grade does not depend on other students' grade – no curving
- We will NOT be rounding off scores at the end of the semester
- No extra credit

## Grade cut-offs

- 93% - 100%: A
- 88% - 92.99%: AB
- 80% - 87.99%: B
- 75% - 79.99%: BC
- 70% - 74.99%: C
- 60% - 69.99%: D

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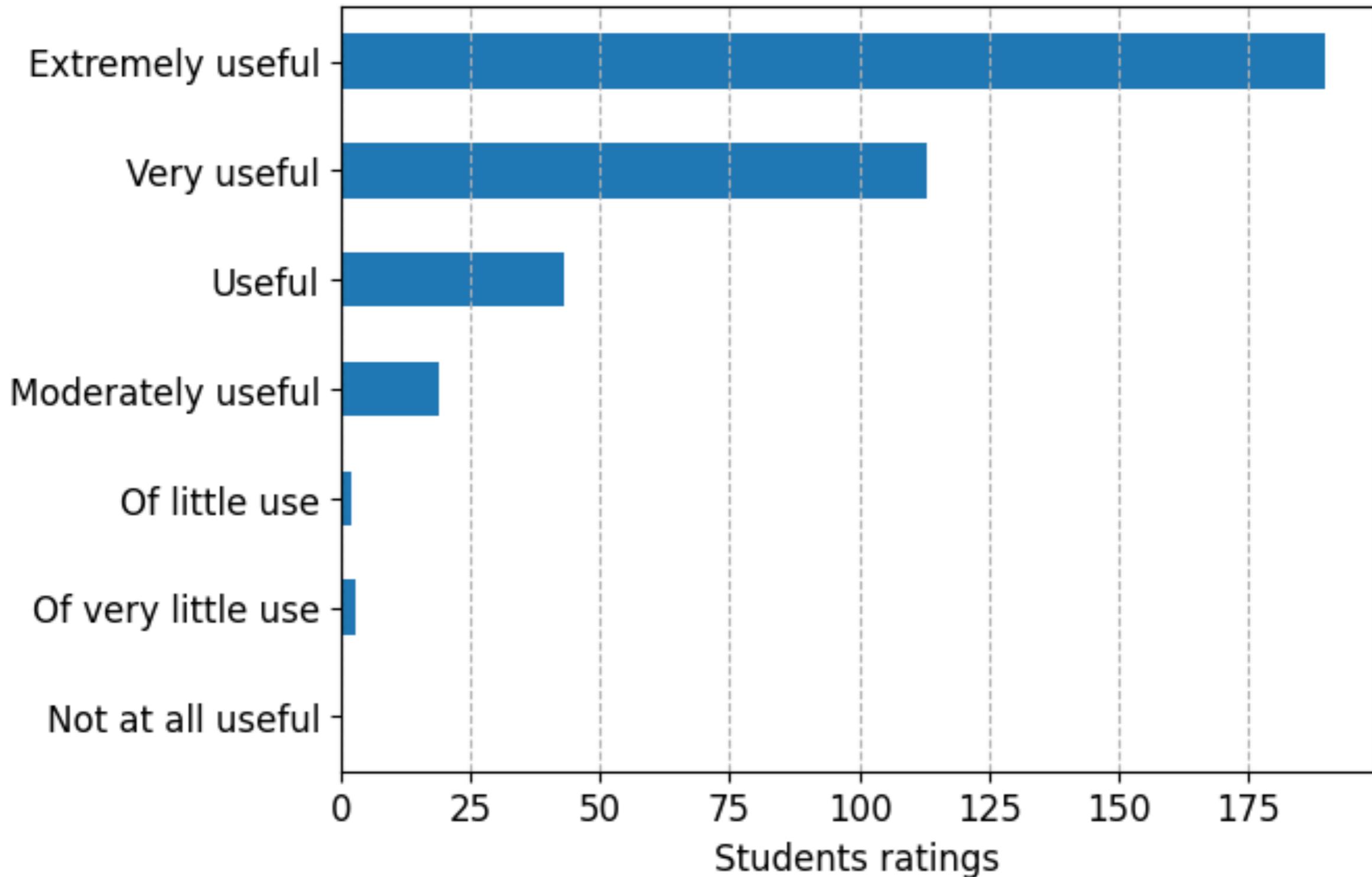
Course overview part 2

- Lecture
- Lab
- Readings
- Class communication
- Grades
- **Projects**
- Exams & quizzes

Canvas and course materials

# Prior student reaction to projects

Projects: How useful were projects to your learning?



# Project Overview

**Nearly all projects will relate to some dataset**

## **Timeline**

- Projects will be due on **Tuesdays and Fridays at 11:59:00 pm**
- You get a bank of 8 late days, but can use only 2 on one project
- After late days, 5% deduction per day late
  - 7 days after the project deadline, project submission won't be accepted

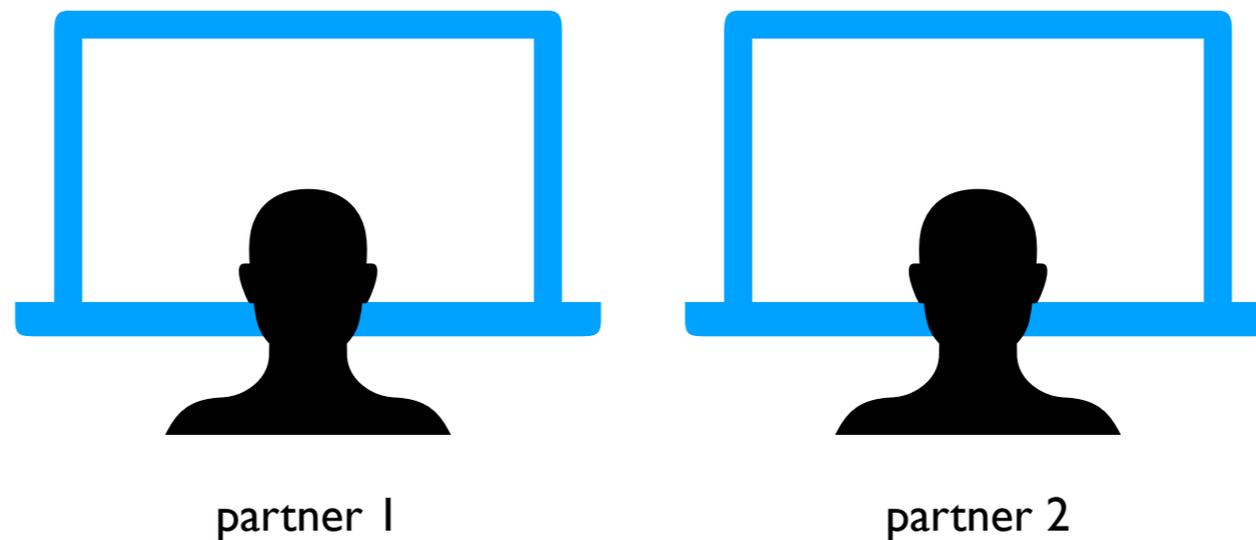
## **Getting help**

- Office hours
- Lab sessions
- Piazza

# Pair Programming

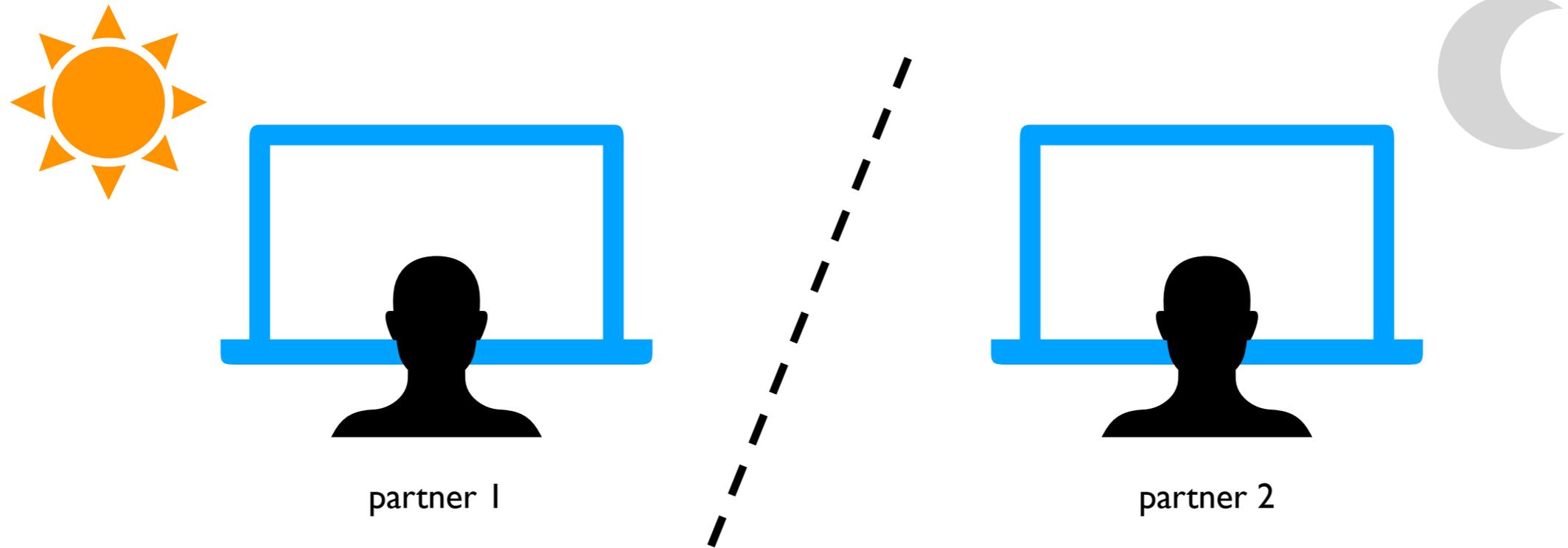
## **You can optionally work in pairs of two**

- Students can partner with students from any lab section
- You can choose to keep the same partner, for multiple projects or choose to switch partners



Best practice: working alongside each other

# Pair Programming

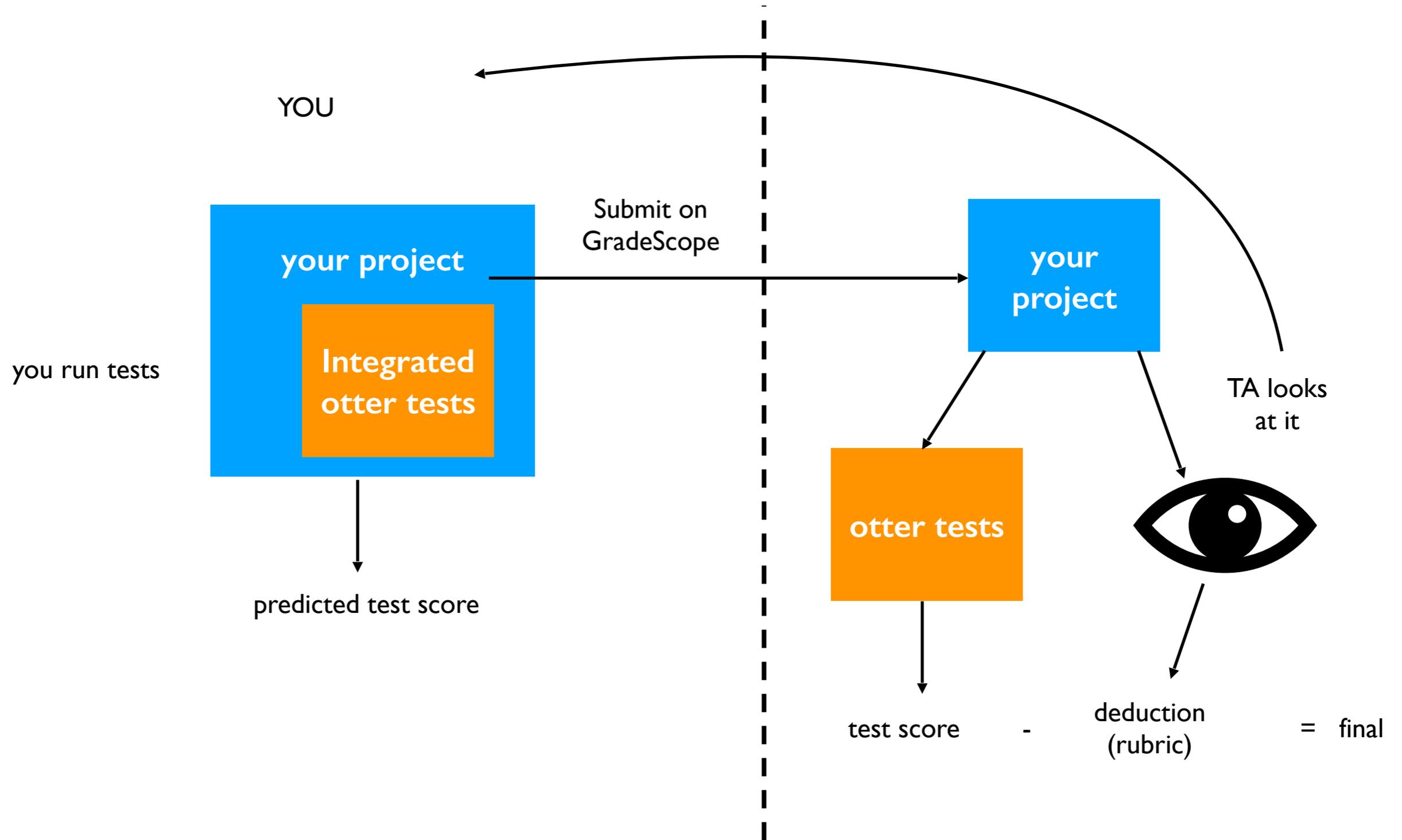


Breaks syllabus rules: working on different parts at different times

Breaks syllabus rules: working on alternate projects individually

# Project Grading

feedback is mostly about how to do things better or more simply (valuable even if you score 100%)



Make sure that your code clear tests on GradeScope

# Today's Topics

Introductions

Course overview part 1

Worksheet: pseudocode

Course overview part 2

- Lecture
- Lab
- Readings
- Class communication
- Grades
- Projects
- Exams & quizzes

Canvas and course materials

Pseudocode

# Quizzes and Exams

## Quizzes

- 10 quizzes total, due 11:59PM on Mondays, Wednesdays, or Fridays.
  - Typically one quiz every 2 lectures (but there's some variation to work around exams, so pay attention to announcements in lecture)
- Quizzes are on Canvas and you can use any resource you want, except other people or AI
- Each quiz has 2 attempts and the higher score counts
- Focus on recent lectures so you stay current and check your knowledge

## Exams: three “midterms”

- Multiple choice, closed-book
- Exams are cumulative but focused on more recent material
- All exams 75 minutes
- Exams will be held these dates
  - July 7 — in class on Friday from **9:50am - 11:05am**
  - July 27 — during lab
  - August 10 — during class from **9:50am - 11:05am**

projects → writing and testing code with a computer

quizzes → reading and interpreting code with a computer

exams → reading and interpreting code without a computer

# Today's Topics

Introductions

Course overview part 1

Worksheet: pseudocode

Course overview part 2

Canvas, Piazza, and online course materials

## **Canvas**

- Syllabus
- Course schedule (readings and due dates)
- Quizzes
- Surveys
- Grades

## **Piazza**

- Need to have cross-site cookies enabled to see Piazza embedded in Canvas, if you prefer, you can also access Piazza directly at <https://piazza.com/class/liabmpaecey579>
- Used to ask and answer questions
- Do NOT post code snippets longer than 5 lines on Piazza (if in doubt, make the post private)

## **GitLab**

Contains all files that you need for this course

- Class notes
- Lab and project materials
- Additional resources: readings and old practice exams

# Next steps...

- Complete the "Student Information Survey" survey quiz on canvas.
- Read **syllabus** carefully
- Setup **Anaconda (Python)** on your computer and attend your lab for **Lab-P I**
- Submit **PI (Project I)** after attending lab: due this Friday
- Sign up for GradeScope and Piazza