# CS 220 / CS319 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.)
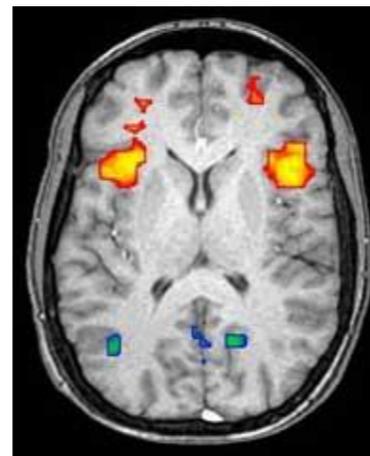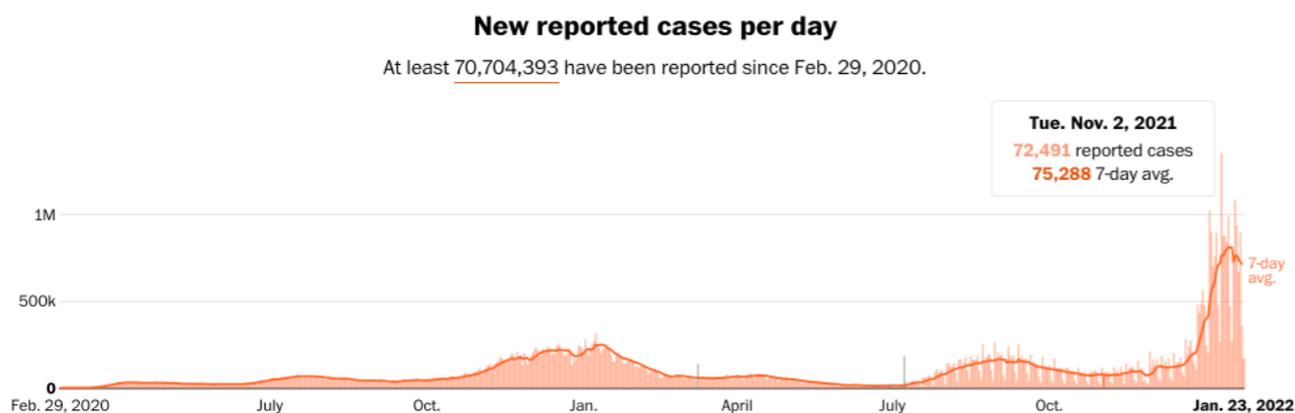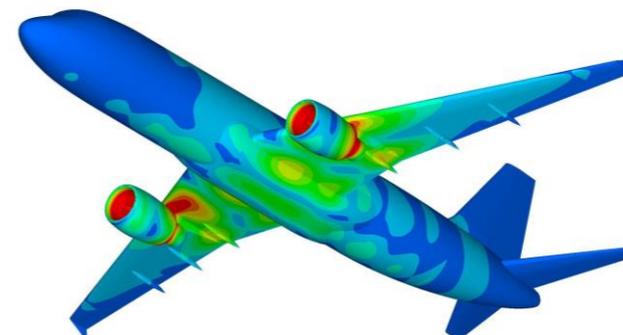
# Welcome to Data Science Programming I

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**



**Approach 2: machine computation**
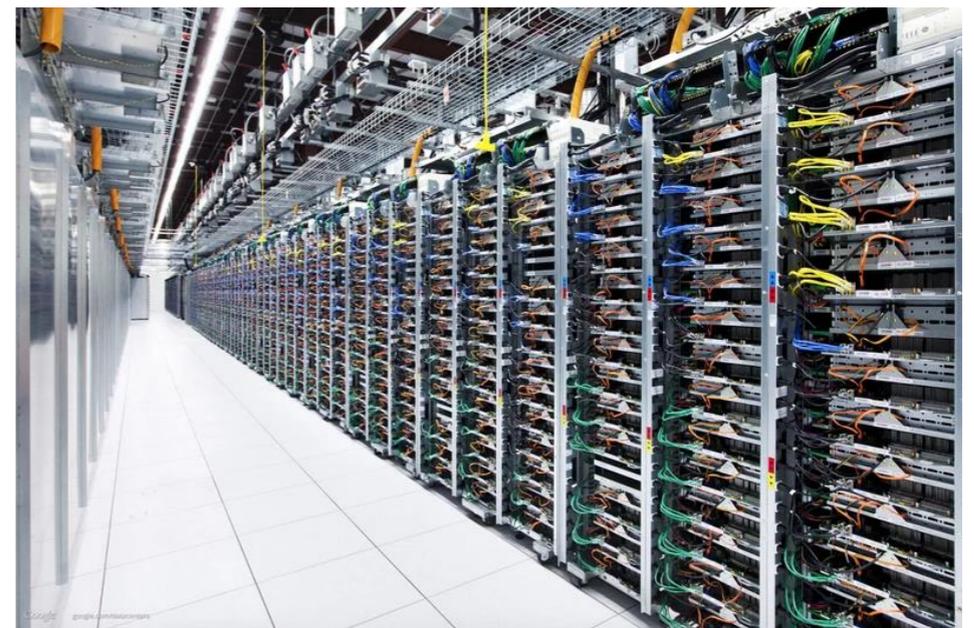
# Welcome to Data Science Programming I

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**



**Approach 2: machine computation**
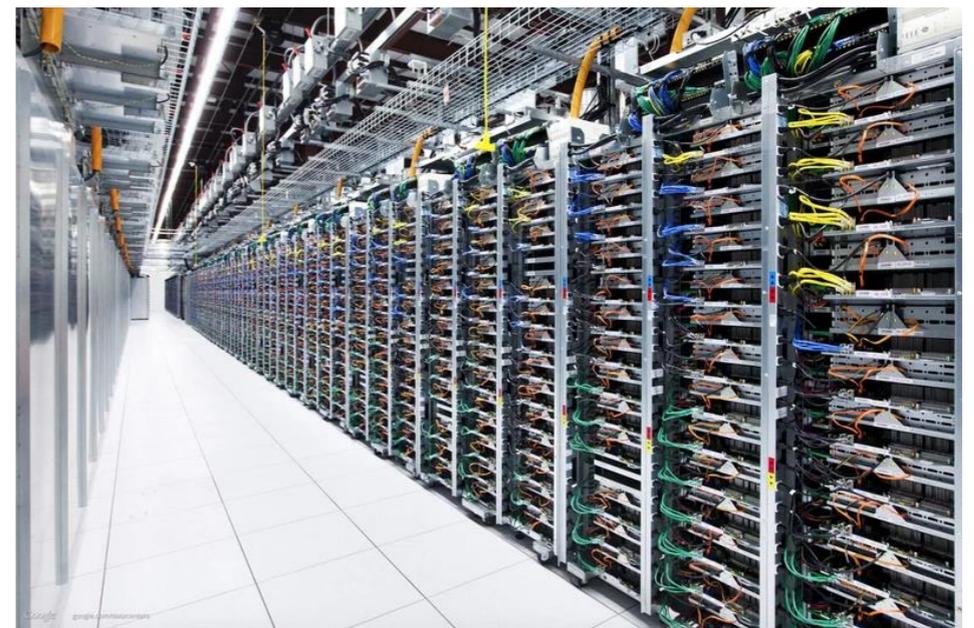
# Welcome to Data Science Programming I

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**
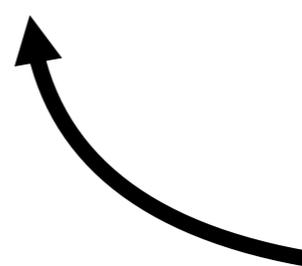
Goal: become "bilingual"
- Speak the language of X (biology, mech eng, journalism, etc)
- Speak the language of computing

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

# Why CS 220?

**People use Data to solve the world's problems**



**Global Food Explorer**
by Our World in Data
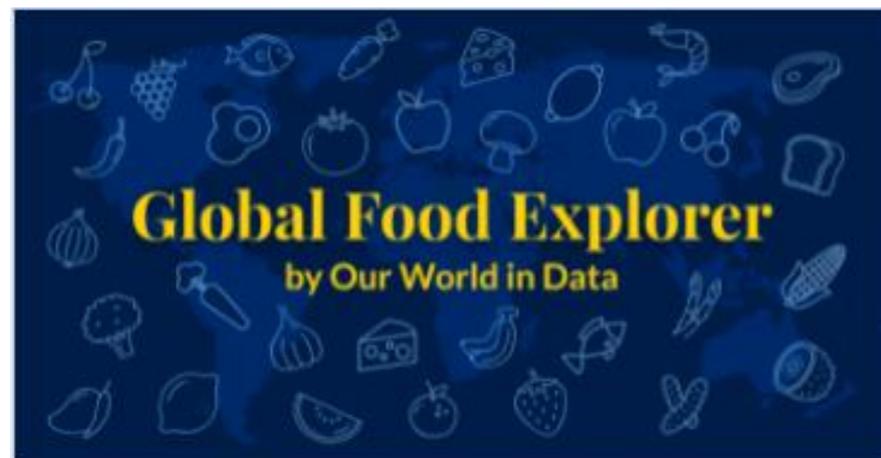
We just published our new Global Food Data Explorer

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



**Measuring progress towards the Sustainable Development Goals**

https://ourworldindata.org/                    https://sdg-tracker.org/

# Today's Topics

Introductions
- Who are the faculty?  Who are you?

Course overview

Website

# Who are the faculty?

Mike Doescher
- Email: [mdoescher@wisc.edu](mailto:mdoescher@wisc.edu)
- Please call me "Mike"

Industry and Teaching experience
- Naval Research Laboratory
- Benedictine College
- SciArt Software
- UW Madison
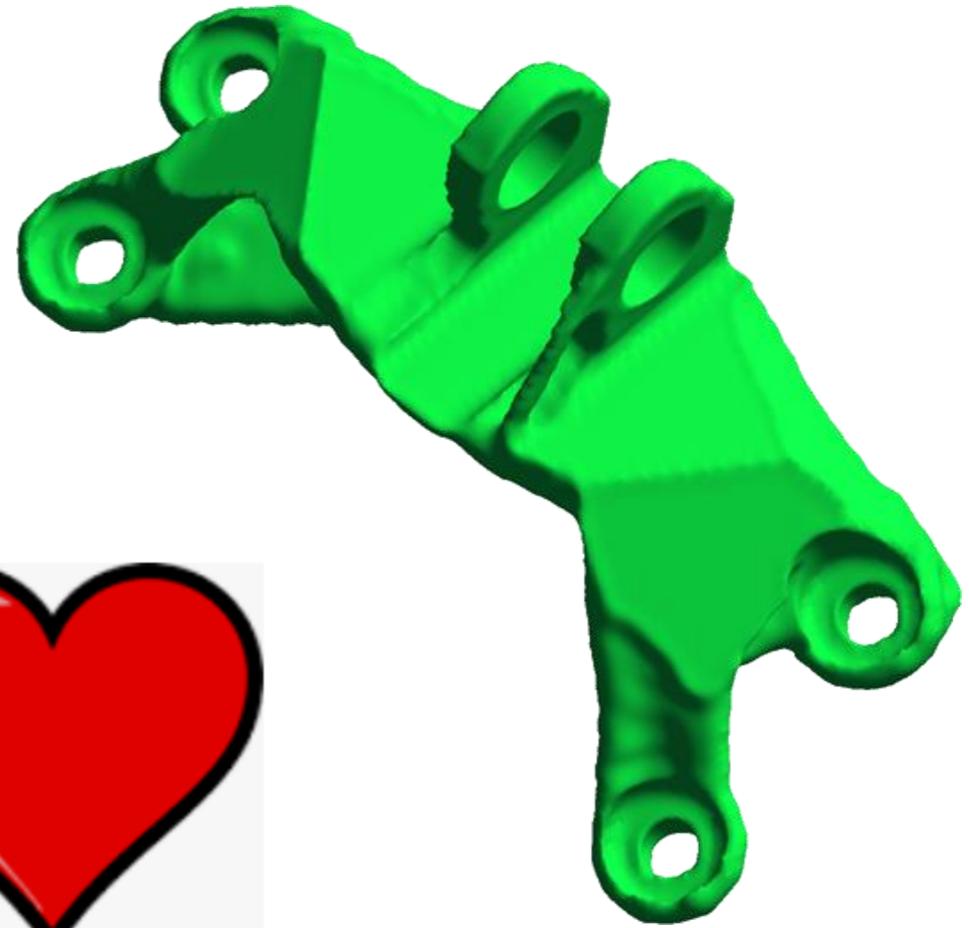
# Who are the faculty?

Gurmail Singh
- Email: Gurmail.Singh@wisc.edu
- Please call me "Singh"

Teaching experience
- BLM Girls College, Punjab, India
- Khalsa College, Punjab, India
- University of Regina, Saskatchewan, Canada

Research Interests
- Algebra and Artificial Intelligence

# Who are you?

- 840 students in 4 sections
- 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
- <span style="color:red">Topics</span>
- Lectures
- Lab
- Readings
- Course tools
- Grades
- Projects
- Exams & quizzes

## Website

# 220 Topics

## Part 1: Control Flow

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

http://net-informations.com/python/flow/default.htm
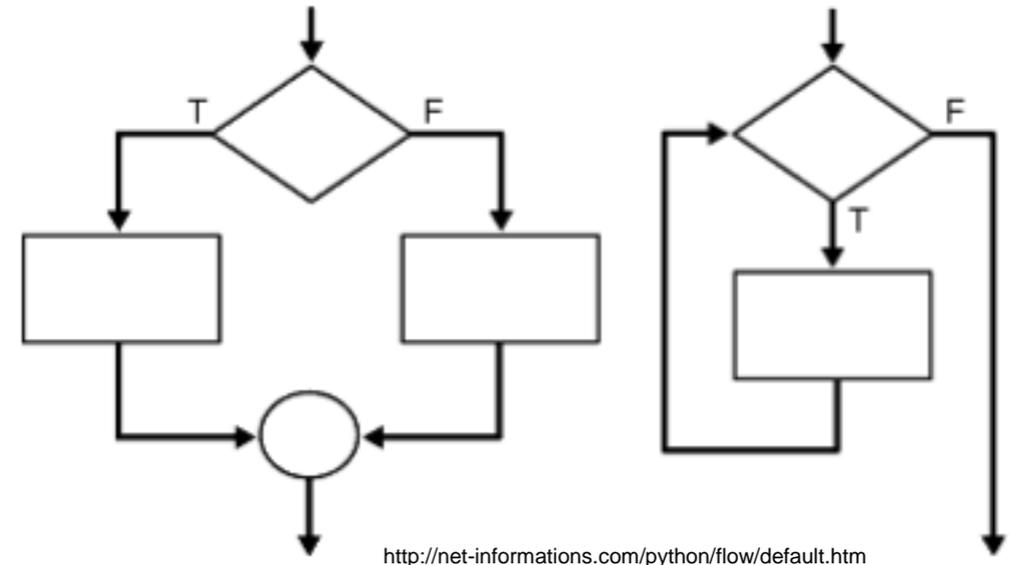
## Part 2: State

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

## Part 3: Data Science

- Tabular data
- Internet
- Databases
- Plotting

# Lectures

**general concepts**

**live coding**
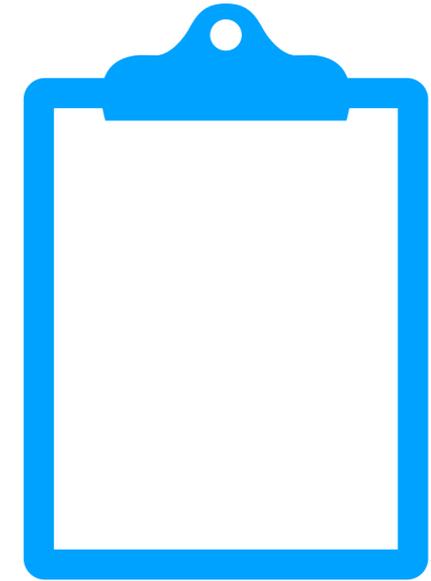
**worksheet practice**

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 Wed, Thu or Fri
- 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
- CS220 students can partner with CS220 students
- If you chose to do lab with a partner, make sure they are your project partner

**we will have labs this first week!!!**

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

# Labs – CS319

## Format
- Self-guided
- Utilize Office Hours to get questions answered

## Partnership
- CS319 students can partner with CS319 students
- If you chose to do lab with a partner, make sure they are your project partner

# 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**!
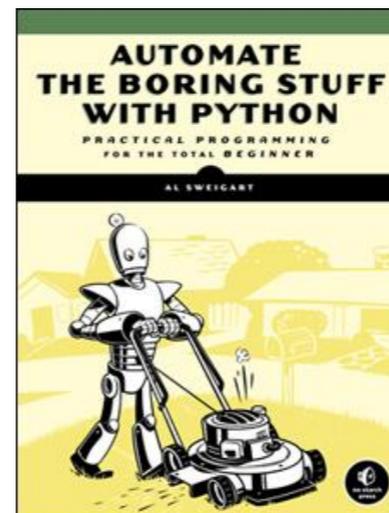
## Automate the Boring Stuff

- Al Sweigart
- Useful for some more advanced topics related to using data
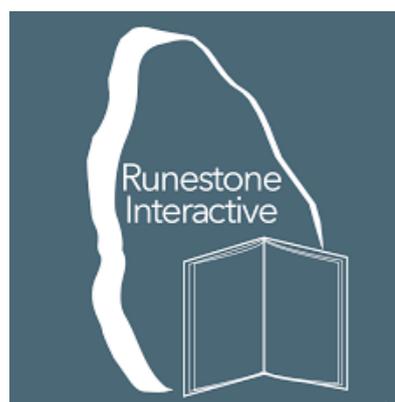
## Python for Everyone – Interactive

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

CS 220 / CS319 Notes
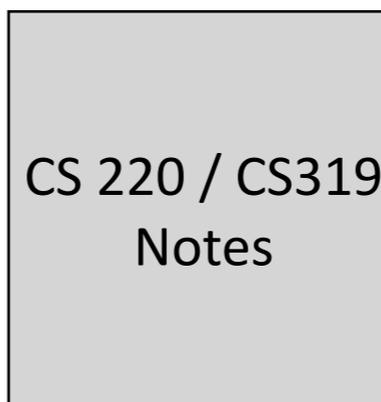
## Course Notes

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

# Course tools

Communication tools
- Office hours (best way to get help):
  - Shared Google calendar: requires login with your wisc email

- Canvas:
  - Quizzes
  - Personal messages (exam room assignment, exam scantron results, etc.,)
  - Grades
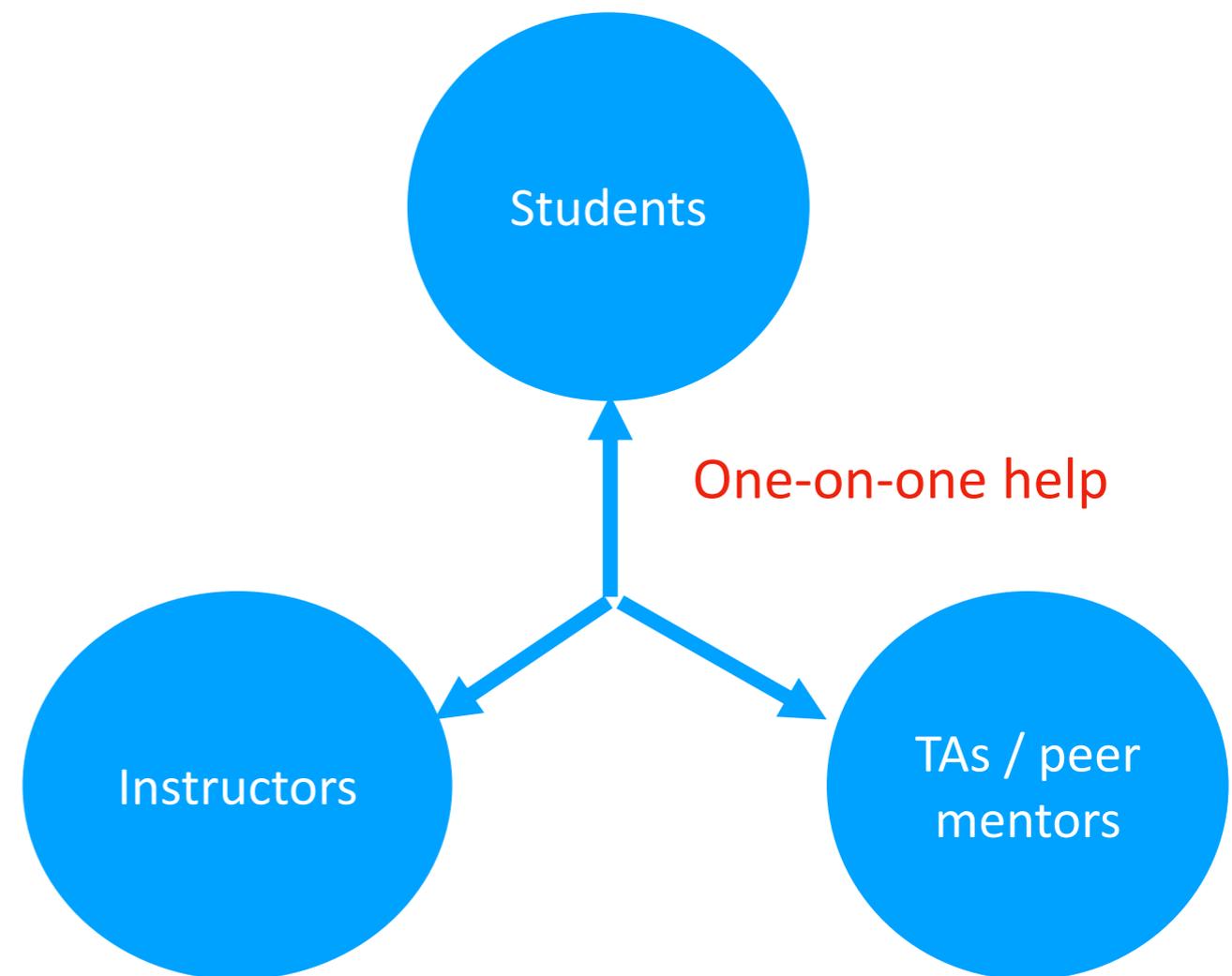
# Course tools

- Piazza:
  - Rule 1: don't post more than 5 lines of code
  - Rule 2: check other posts before posting
- Class Forms:
  - Feedback form (anonymous / non-anonymous)
  - Exam conflict forms
  - Thank you form
- Project Submission: GradeScope
- Email (least-preferred):
  - Class mailing lists

Students

One-on-one help

Instructors

TAs / peer mentors
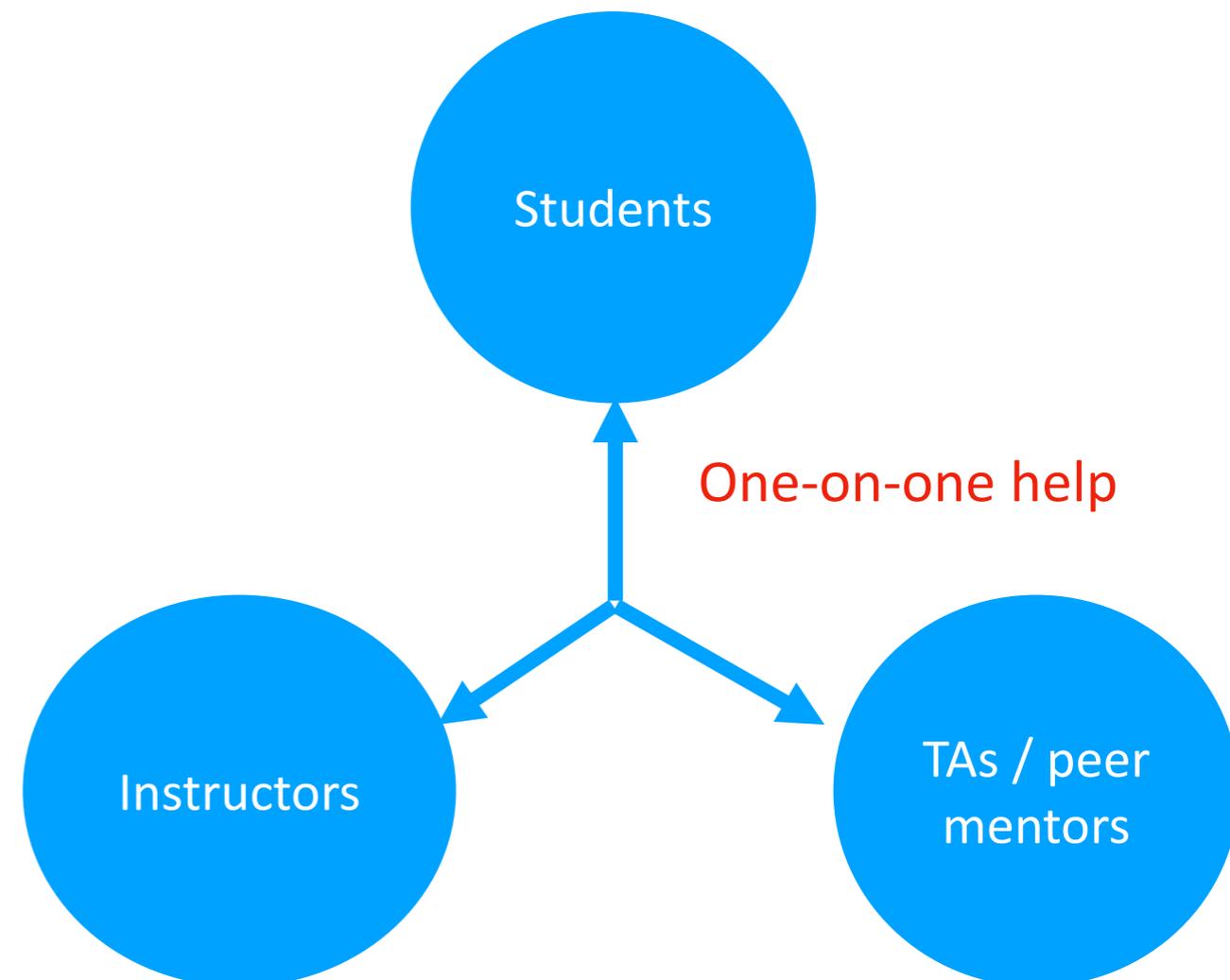
# Grades - CS220

**47%** - programming projects
- 13 projects
- p1: 1%, p9: 2%, remaining projects 4%

**32%** - exams
- 10% midterm 1
- 10% midterm 2
- 12% final

**16%** - quizzes
- 10 quizzes (drop 2 lowest scores)

**4%** - lab attendance
- 13 labs (drop 3 lowest scores)

**1%** - class surveys

# Grades – CS319

**31%** - programming projects
- 9 CS220 projects: p1 to p9
- p1: 1%, p9: 2%, remaining projects 4%

**32%** - exams
- 10% midterm 1
- 10% midterm 2
- 12% final

**16%** - quizzes
- 10 quizzes (drop 2 lowest scores)

**20%** - graduate-level project
- self-guided
- must be related to field of study

**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% - 79.99%:     **C**
- 60% - 69.99%     **D**

# Today's Topics

Introductions

Course overview
- Topics
- Lecture
- Lab
- Readings
- Class communication
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- Exams & quizzes

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# Prior student reaction to projects

Projects: How useful were projects to your learning?
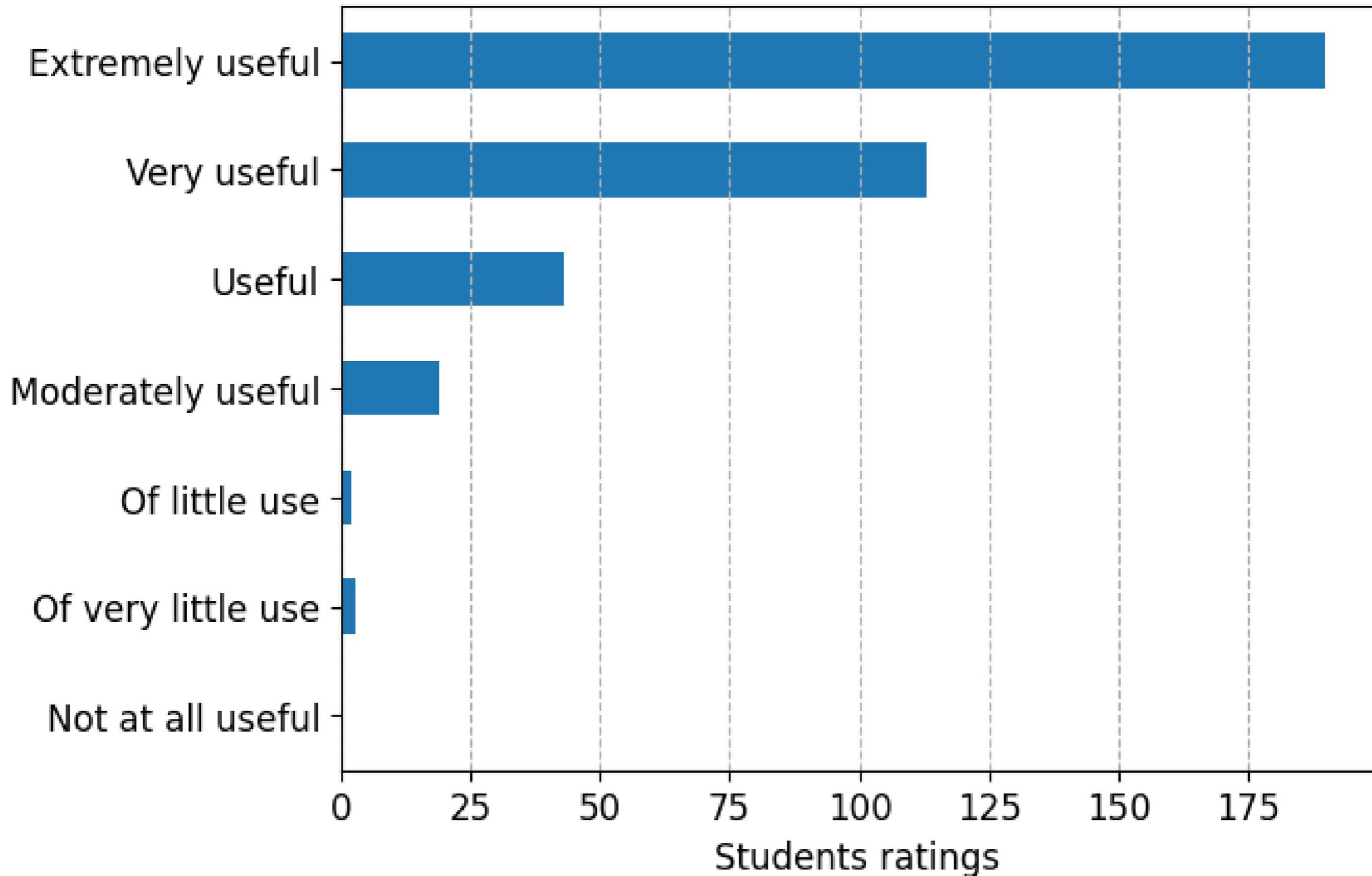
# Project Overview

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

**Timeline**
- Projects will be due on <span style="color:red">Wednesdays at 11:59:00 pm</span>
- You get a bank of 12 late days, but can use only 3 on one project
- After late days, 5% deduction per day late
  - *<span style="color:red">7 days after the project deadline, project submission won't be accepted</span>*

**Getting help**
- Office hours
- Lab sessions
- Piazza

# Pair Programming

**You can optionally work in pairs of two**
- CS220 students can partner with any CS220 students, in any section
- CS319 students can partner with any CS319 students
- You can choose to keep the same partner, for multiple projects or choose to switch partners

partner 1          partner 2
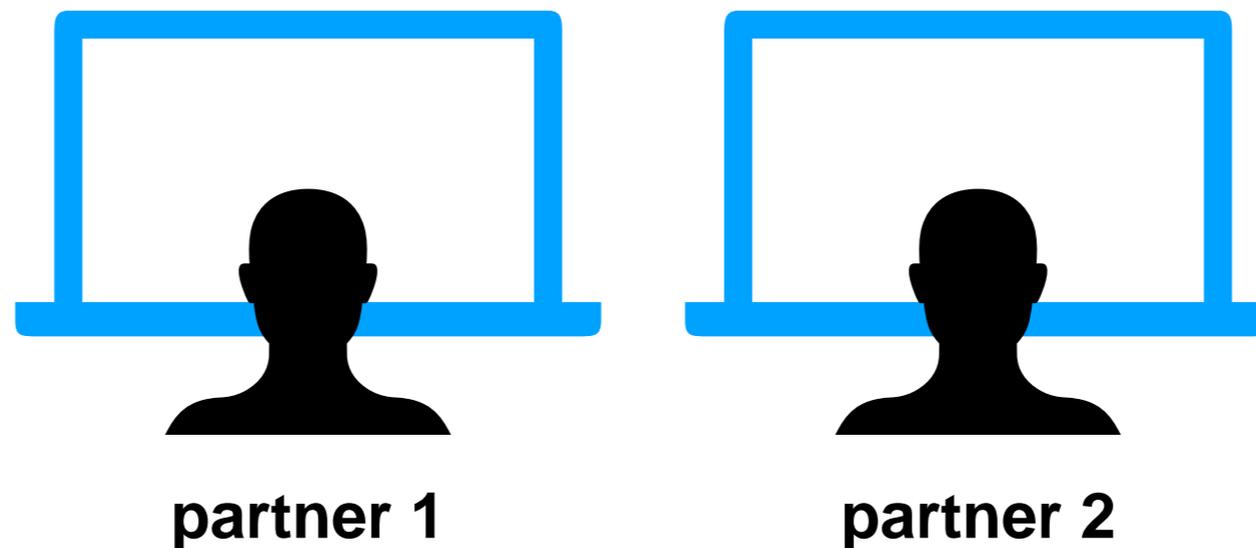
**Best practice:** working alongside each other

# Pair Programming



partner 1

partner 2
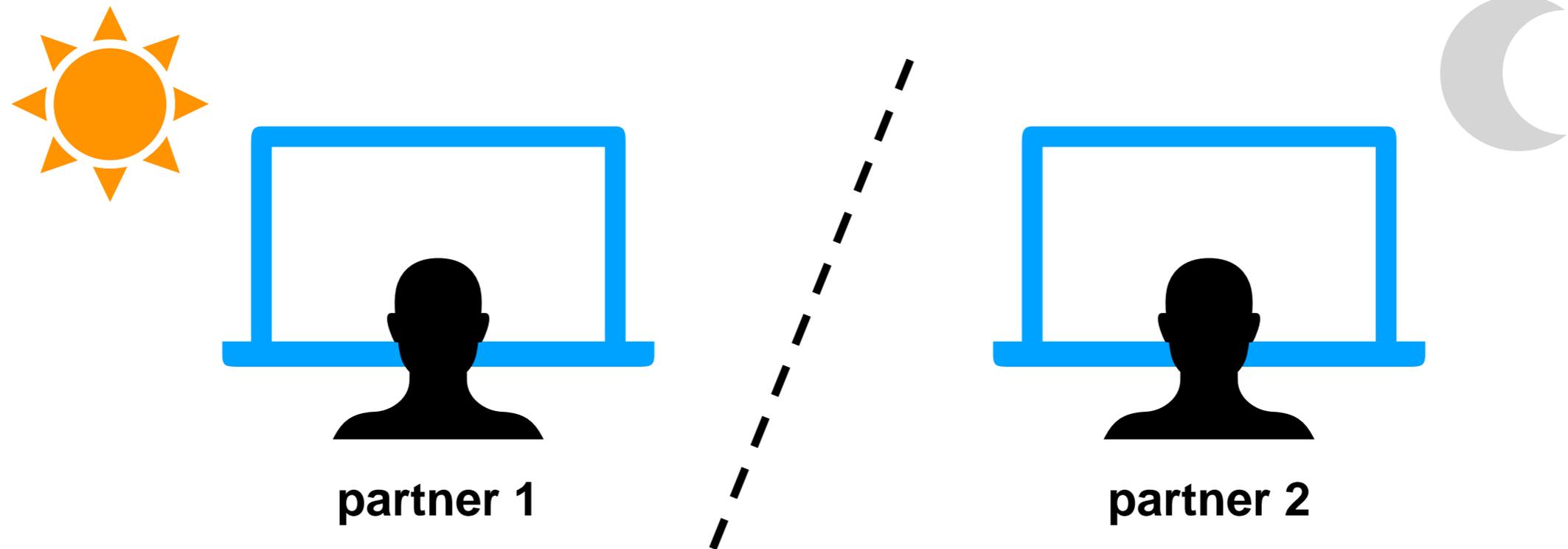
**Breaks syllabus rules:** working on different parts at different times

**Breaks syllabus rules:** working on alternate projects individually

# Project Grading

**YOU**

your project

Submit on
GradeScope

your project

Integrated
otter tests

you run tests

TA looks
at it

otter tests

**predicted test score**

**test score** - **deduction
(rubric)** = **final**
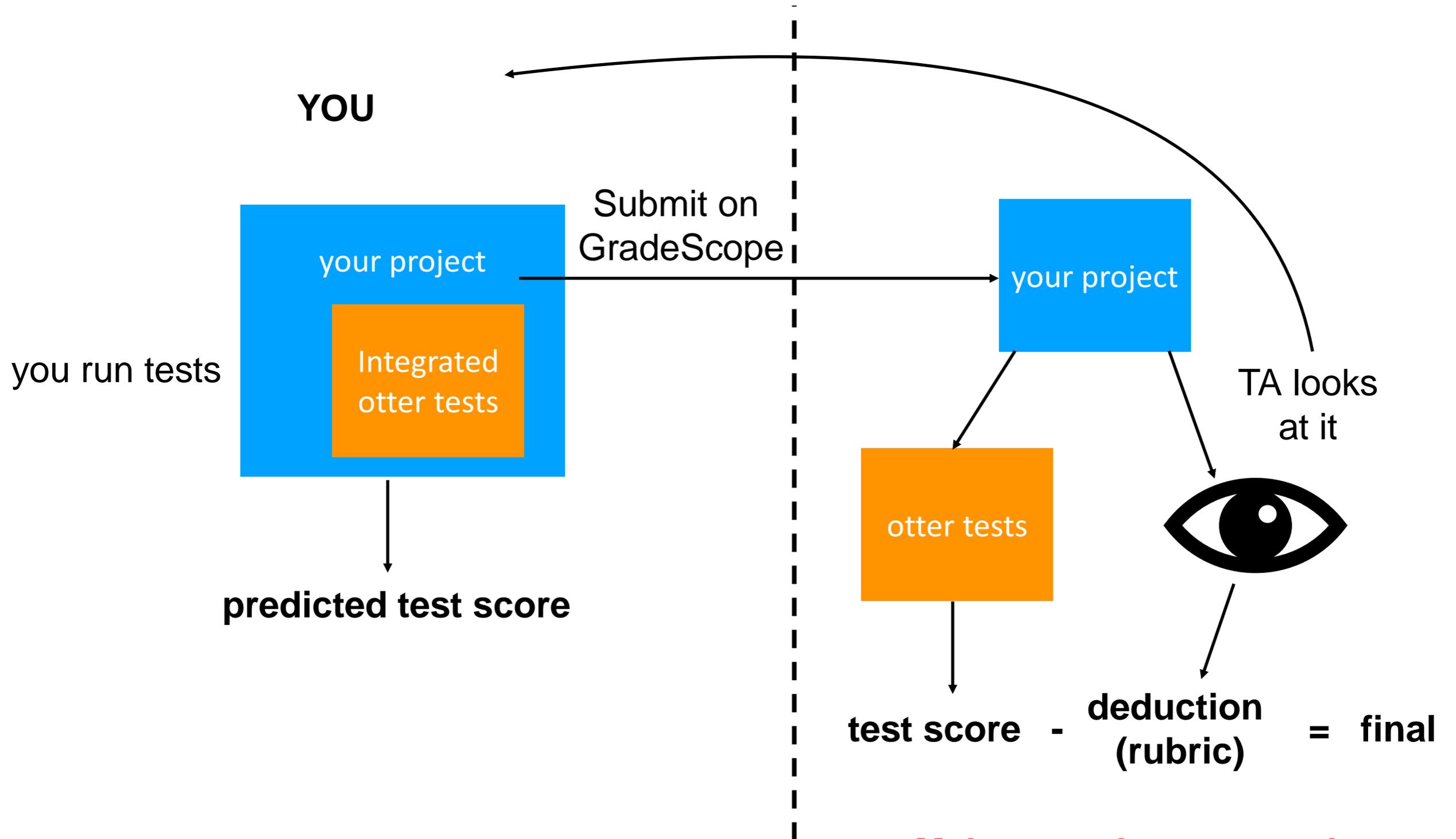
**Make sure that your code
clear tests on GradeScope**

# Today's Topics

Introductions

Course overview
- Topics
- Lecture
- Lab
- Readings
- Class communication
- Grades
- Projects
- <span style="color:red">Exams & quizzes</span>

Website

# Quizzes and Exams

**Quizzes**
- Will be due most weeks, on <span style="color:red">Fri, at 11:59pm</span>
- Focus on recent lectures so you stay current and check your knowledge

**Exams: two midterms and one final**
- Multiple choice
- 1.5 hours midterms
- 2 hours final
- Given in a large lecture hall

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

Website

# Course Website

https://cs220.cs.wisc.edu/s23/schedule.html

Walk through…

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| Bookmarks | ▶ |
| Zoom | − 100% + ⛶ |
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| Cast... | |
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| Edit | Cut Copy Paste |
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| Help | ▶ |

# 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-P1

- Submit P1 (Project 1) after attending lab: due next Wed

- Sign up for GradeScope