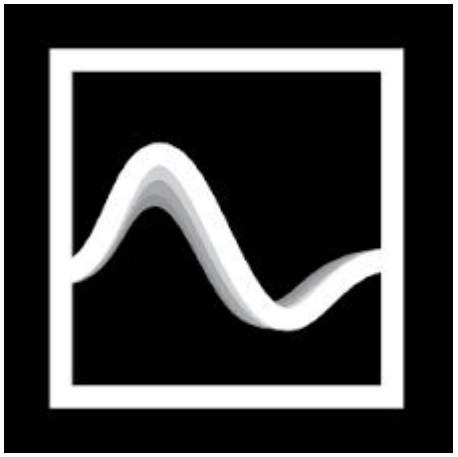


MAISI

CRA Week 2:

Data Cleaning, EDA, and Intro to COMPAS

Michigan Data Science Team

Fall 2025

Session 2 Agenda

01

Fun Icebreaker!!

Get to know your projectmates (electric boogaloo)

02

History of Risk Assessment

What are risk assessment algorithms?

03

Intro to COMPAS

How was COMPAS used, and what are its flaws?

04

AI Safety Mini-Lesson

How does COMPAS relate to the use of biased AIs?

05

Practice Time!

Work on the COMPAS dataset (with a fun warmup)!

Quick Icebreaker!!

What is your go-to karaoke song? (Even if you would never dare to sing it in public)

Share with the people around you!! :)

What are risk assessment algorithms?

Risk assessment algorithm: algorithm used in the criminal justice system to predict the chance of an event: not showing up to trial, reoffending

- Replace human labor in making decisions about risk
- More importantly, replace the emotional, potentially biased nature of human judgement with an unbiased factual decision.
  - **“Hungry judge effect”**
- Be more “objective” in choosing who goes to jail
- Idea that statistics is always better than human judgment

History of Risk Assessment Algorithms

- One of the earliest-known "risk assessment" algorithms used in courts was called the Burgess Method, developed by UChicago Professor Ernest Burgess.
  - Scored 21 factors using unit-weighted regression (0-1)

- 1990-2000: Computer boom, risk assessment algorithms = common practice

- COMPAS is one of the biggest ones

What is COMPAS, and what is it used for?

- The COMPAS (Correctional Offender Management Profiling for Alternative Sanctions) algorithm is a risk assessment algorithm that predicts whether a criminal will recidivate in the next 1-3 years

- It's used in different stages of the criminal sentencing process. Broward County - Pretrial Release (bail)

- Created by Northpointe. (Now called Equivant)

equivant

How Does COMPAS Work?

Weighted, linear combination of questions

- “A hungry person has a right to steal”
- “Was one of your parents ever sent to jail or prison?”
- No questions directly mention race.
- Additional questions mention job and education.

...

Proprietary, ‘Black-Box’ model

Weights on questions/factors are not publicly disclosed

...

Numerical Scoring System

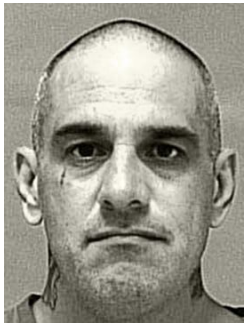
Violent/Non-Violent
1-10
Low/High Risk:
Low/High Number

...

Racial Bias in Algorithmic Risk Assessment

- **Context:** Brisha Borden (18, Black) and Vernon Prater (41, White) committed similar petty crimes.
- **Borden's Incident:** Stole a child's bike and scooter, valued at $80; had a minor juvenile record.
- **Prater's Incident:** Shoplifted tools worth $86.35; had a history of armed robbery with previous prison time.
- **Algorithmic Risk Assessment:**
  - Borden was rated as high risk for reoffending. (8)
  - Prater was rated as low risk for reoffending. (3)
- **Outcome:** The algorithm's prediction was incorrect:
  - **Borden:** No new charges after two years.
  - **Prater:** Convicted again, serving an 8-year sentence for burglary.

Risk:
HIGH



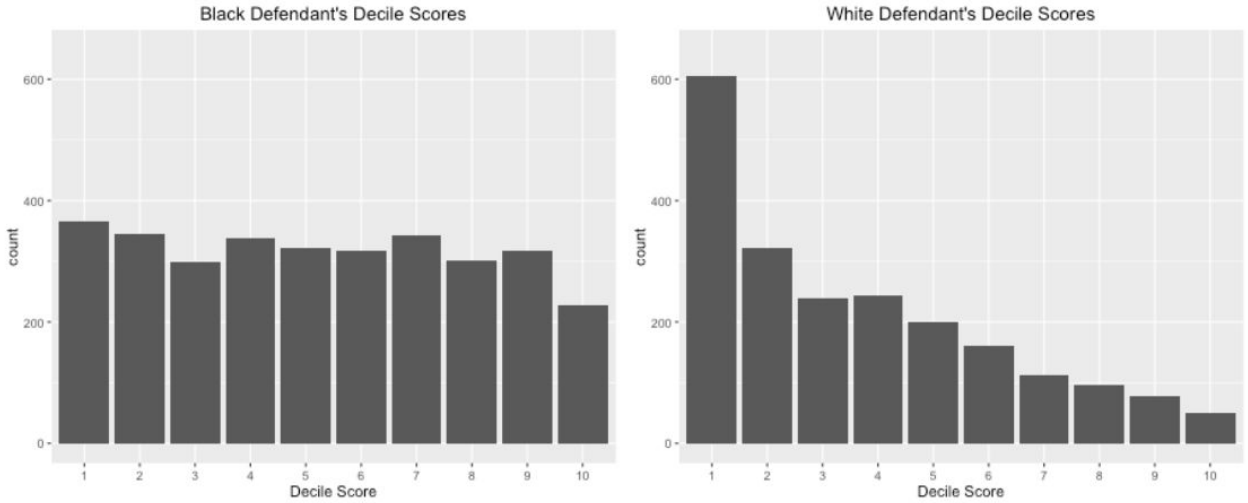
Risk:
LOW

Who are ProPublica, and why did they choose to investigate?

- Independent, nonprofit newsroom founded in 2007-2008.
- **Mission:** Expose abuses of power through investigative journalism. (Watchdog role in bureaucracy)
- COMPAS lacked independent studies on its **accuracy** and **fairness**
- Concerns about **bias** injected into the judicial process due to risk scores.
- Ensure fairness in the criminal justice system by scrutinizing widely used tools like COMPAS.

What Did ProPublica Find?

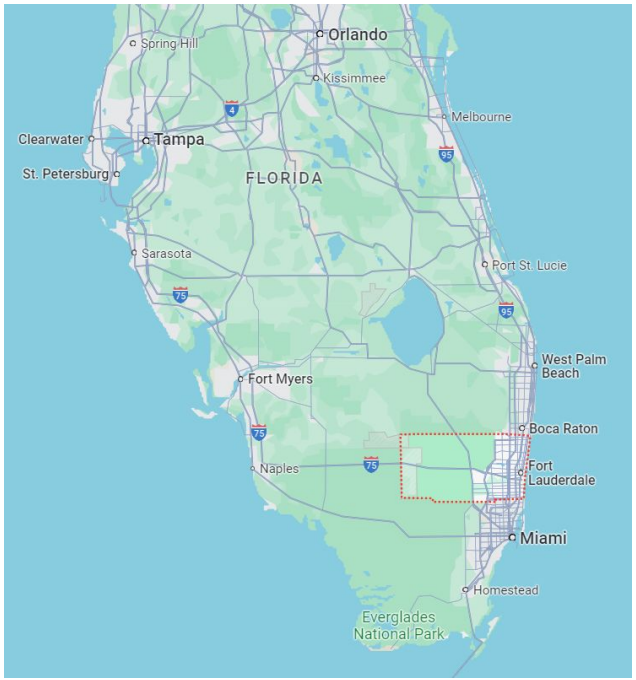
Upon doing exploratory data analysis on a dataset of COMPAS risk scores...



Is this evidence of bias?

What Did ProPublica Find?

- These graphs alone are **not <u>sufficient</u> evidence** of bias
- Another way to assess the bias of the model: cross-reference recidivism risk scores with REAL recidivism
  - What we're doing!!
- Look at criminal histories of Broward County, FL residents and compare them with COMPAS scores



What Did ProPublica Find?

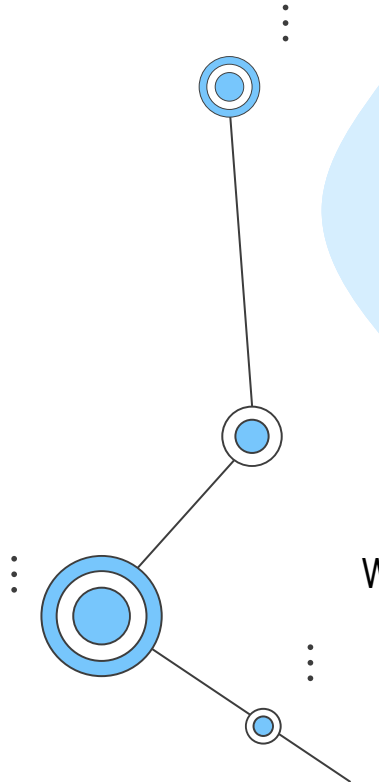
- **False positives:** Black defendants who *did not recidivate* in two years were nearly twice as likely to be misclassified as higher risk compared to white defendants (45% vs 23%)
- **False negatives:** white defendants who reoffended in two years were nearly twice as likely to be misclassified as lower risk compared to black defendants (48% vs 28%)
- **Gender bias:** a high risk woman has a lower chance of recidivating than a male counterpart
- Even disregarding bias across races, COMPAS correctly predicted an offender's recidivism only **61 percent** of the time!

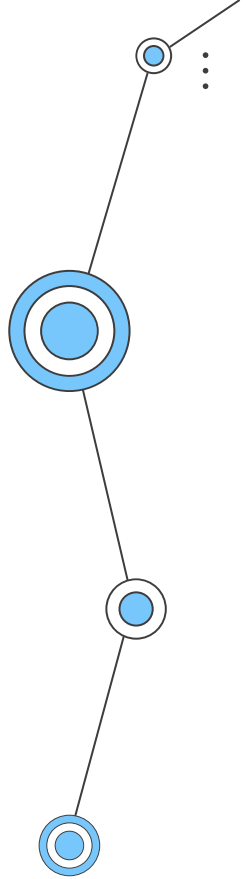
What is Fairness, and How Does It Relate to AI Safety?

- Fairness is complicated because no algorithm can be perpetually accurate, especially if its outputs are associated with inputs with different traits.
- 3 different definitions of Fairness:
  - **Statistical Parity:** an algorithm makes positive decisions at an equal rate across all groups
  - **Equalized odds:** False positive & False negative rate are equal between all groups
  - **Calibration:** Prediction matches the real outcome at the same rate across groups

Which of these fairness definition does **COMPAS** fail?

Answer: **ALL OF THEM!!**





Critical Issues

Inaccuracy

-Only 20% of those predicted to commit violent crimes did so.
-When all crimes were considered, only 61% of those predicted to reoffend did so within two years.

Racial Disparities

-Black defendants are nearly twice as likely to be falsely labeled as high risk compared to White defendants.
-White defendants are more often labeled as low risk.

Our Partnership with MAISI

- Student org on campus focusing on AI ethics and current events (Will is a board member!)
- Bi-weekly meetings in East Quad B804
- Weekly reading groups on Alignment and Governance
- Feel free to stop in and say hi!!

M A I S I

Practice Time!

Time to apply our skills to the Titanic and COMPAS datasets!

Reminders

- Don’t share colab notebooks with teammates if you are working at the same time
- Where to put csv and data files
  - Google Drive
    - Need to include:

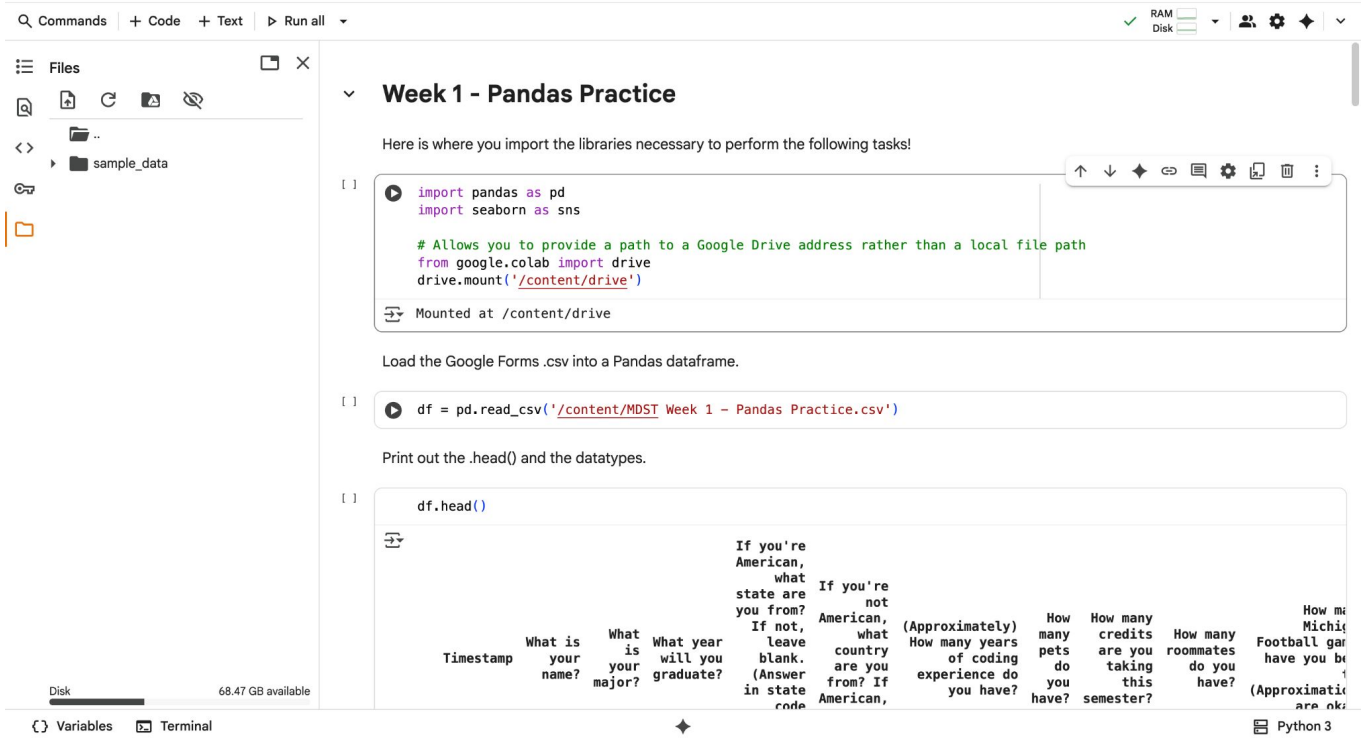
```
from google.colab import drive
drive.mount('/content/drive')
```

```
pd.read_csv(‘/content/drive/MyDrive/[FILE NAME]’)
```

  - Colab Files
    - See next slides

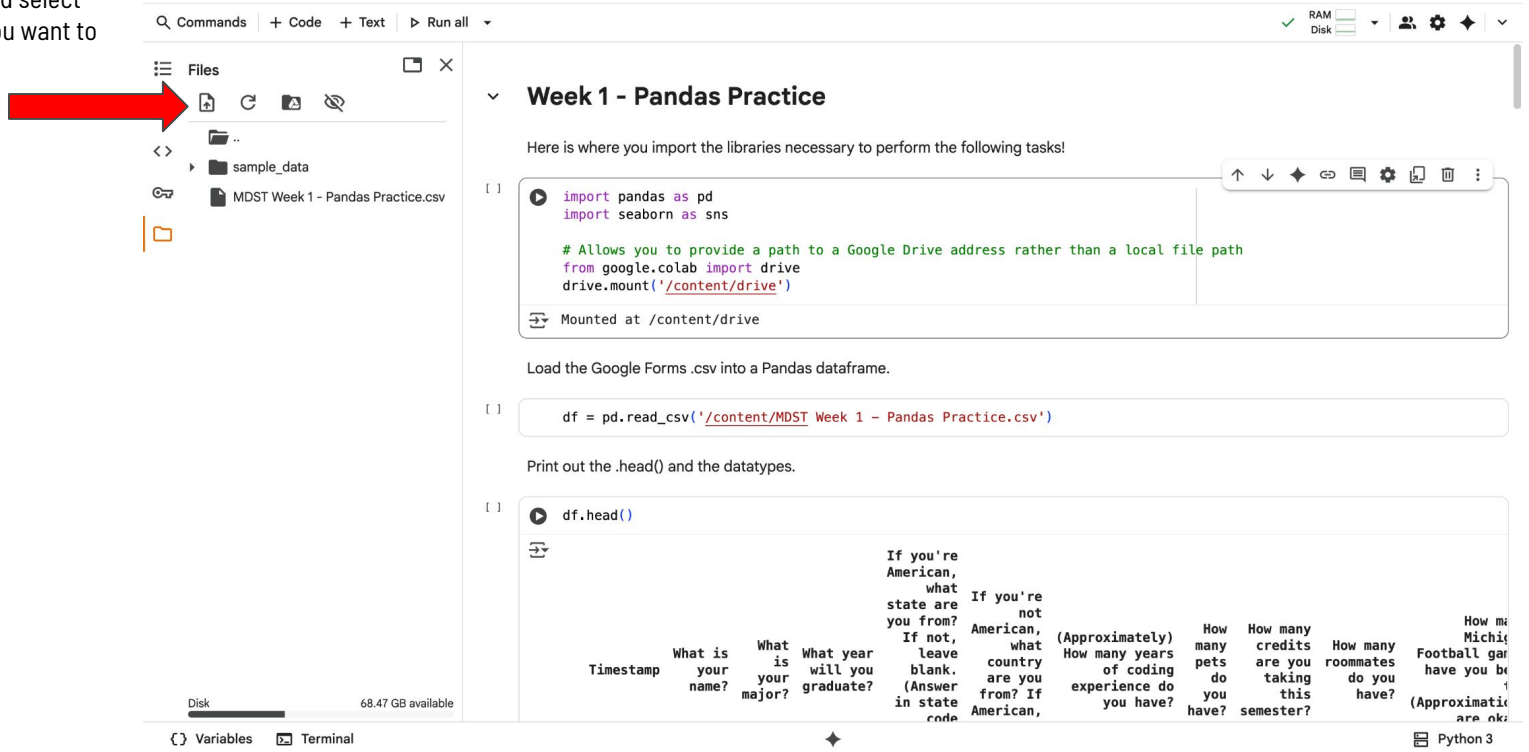
Reminders

Click on the folder in the sidebar



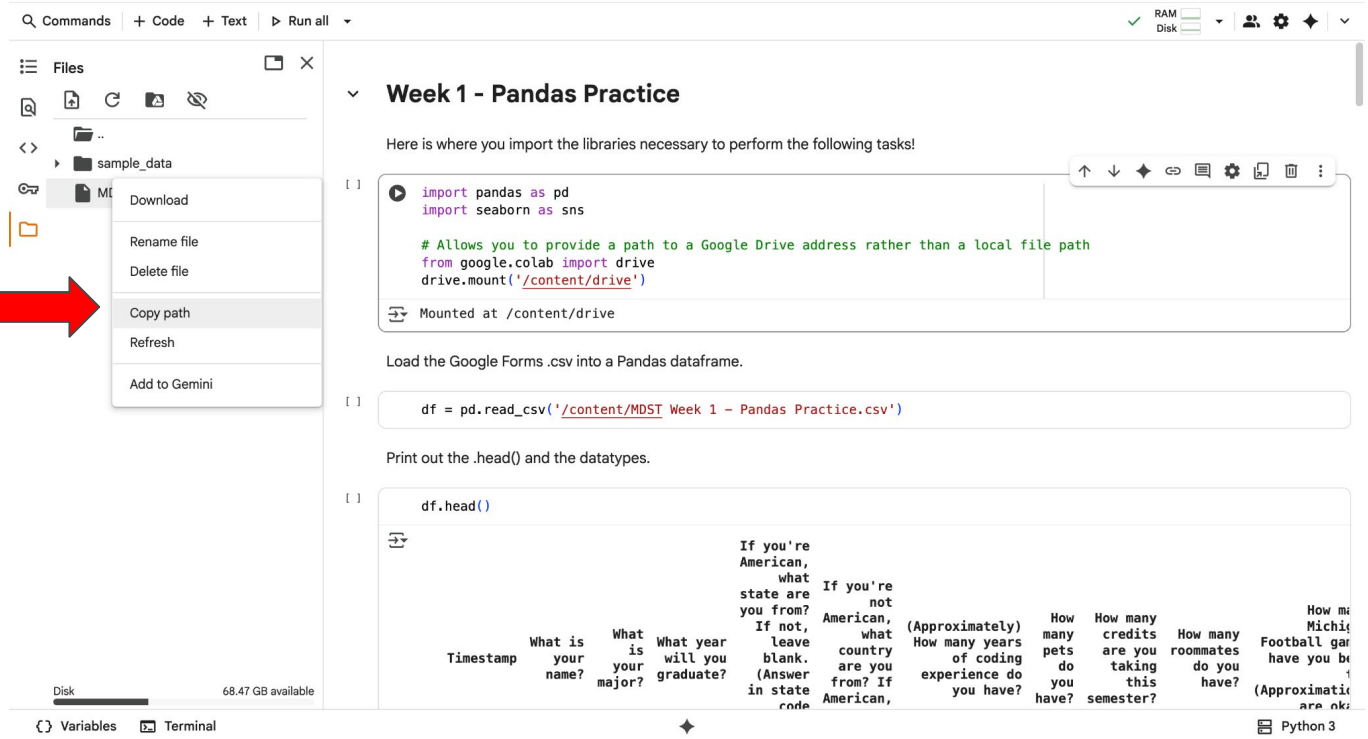
Reminders

Click the upload button and select the file you want to upload



Reminders

Click the three dots and copy the path. Put this in your read function



Hands-On Data Science!! :O

Next Steps:

1. Find the F25 CRA repo in the MDST GitHub and Download all the files in the Week 2 directory
   a. You can just Google “https://github.com/MichiganDataScienceTeam”
2. Split into teams of 2-3 (new ones or same as last week)
   a. If you’re working with new people, introduce yourselves!!
3. Work on the exercises in the notebooks!
   a. Start off with the Titanic dataset and see how far you can get. We’ll let you know when you should move on to the COMPAS module.

Pandas Cheat Sheet Seaborn Cheat Sheet