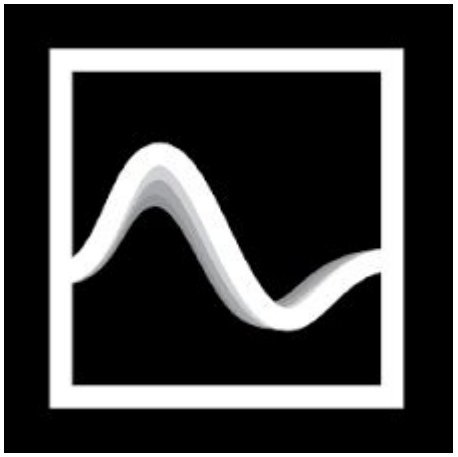
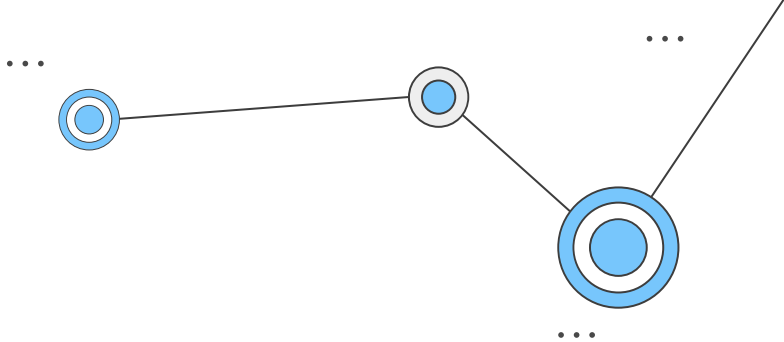




CRA Week 1: Intro to EDA

MAISI

Michigan Data Science Team

Fall 2025

Meet Your Leads! - Will McKanna

Hometown: Rockford, MI
Major: DS and Statistics
Year: Sophomore
Ask me about: Studying abroad in Iceland, crocheting, trombone, Michigan and Detroit football

Meet Your Leads! - Ryan Zimmel

Hometown: Fargo, North Dakota
Major: Information Analysis - UMSI
Minors: Data Science, Business
Year: Junior
Ask me about: A2 Coffee shops, Marching Band, School of Information, Music + Concerts

Session 1 Agenda

01

Fun Icebreaker :)

Get to know your projectmates (and maybe win a prize ?!?!)

02

Expectations

What you stand to gain and what we expect in return

03

Intro to COMPAS

What are risk assessment algorithms?

04

Project Overview

Setting our goals for the next seven weeks

05

Practice Time!

Work on a dataset utilizing homegrown data :O (cool stuff)

Icebreaker Bingo!

	A	B	C	D	E
1	I'm a fan of the Detroit Lions	Slept overnight at a UofM non dorm building	I can whistle	I'm part of another CS/DS club	I get the supreme slice @ Joe's
2	I'm a member of MAISI	I have season tickets to Michigan Football	Touched grass this summer (3+ outdoor activities)	I'm a Data Science major	I know the capital of Mongolia
3	I play a sport	I'm a non CS/DS major	I'm a part of MDST	I pay for guac at chipotle	I live on North
4	I'm a Computer Science major	Took Math 215 at Michigan (WCC >>)	I play an instrument	I've taken a formal statistics class (HS/college)	I've visited the Upper Peninsula
5	I'm from the state of Michigan	Skipped < half of my lectures last week	I live on Central	I've customized my VSCode	Read 3+ books this year

Expectations:

Be responsible and show up!

Enjoy working collaboratively

Bring excitement about data science and analysis

Hands-on practice (lectures 👎)

Gain hard skills each week

Final slides deliverable!

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 personal, 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 in U.S. Courts

- First risk assessment algorithm (1930): UIUC, Northwestern, and University of Chicago all collaborate to create a statistical model to assess “rehability” to see which criminals should go on parole
- 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

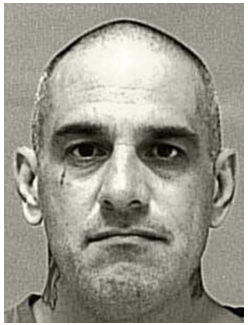
Violent/Non-Violent
1-10
Low/High Risk:
Low/High Number

...

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



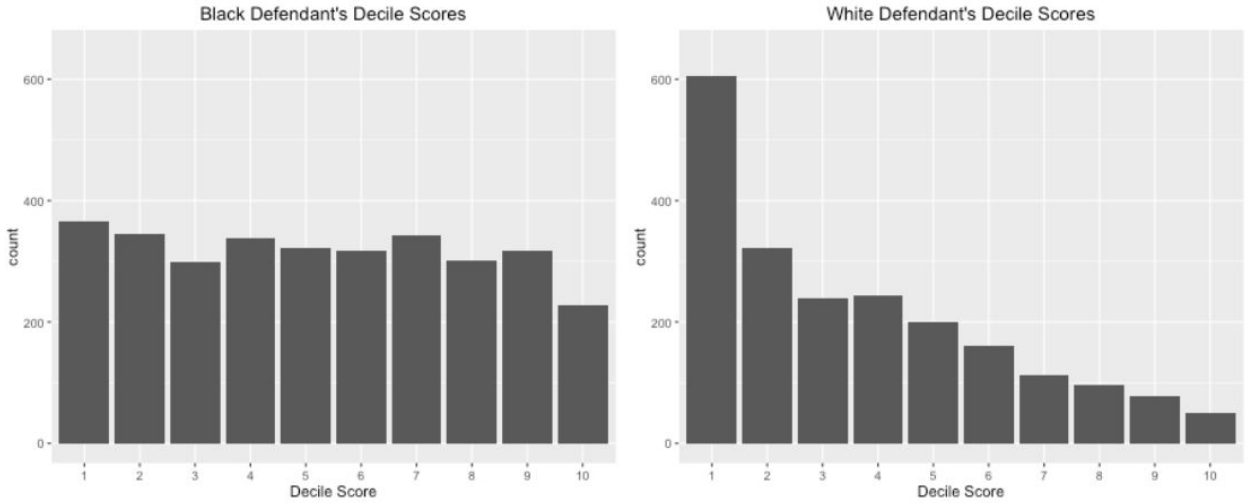
Risk:
LOW

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?

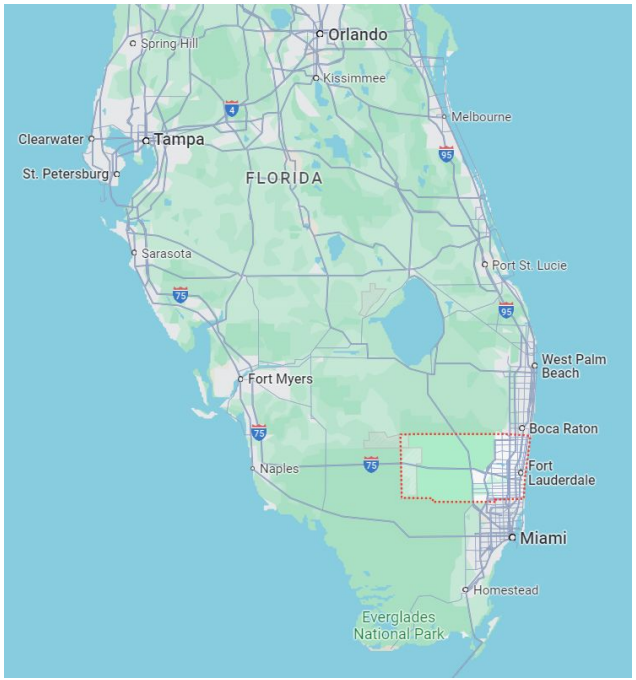
Upon doing exploratory data analysis on a dataset of COMPAS risk scores...



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?

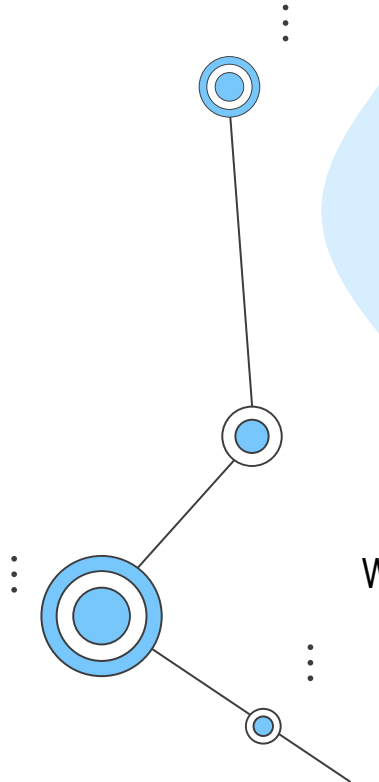
- **False positives:** black defendants who *did not recidivate* in two years were nearly twice as likely to be misclassified as higher risk compared to white defendants (45% vs 23%)
- **False negatives:** white defendants who reoffended in two years were nearly twice as likely to be misclassified as 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!

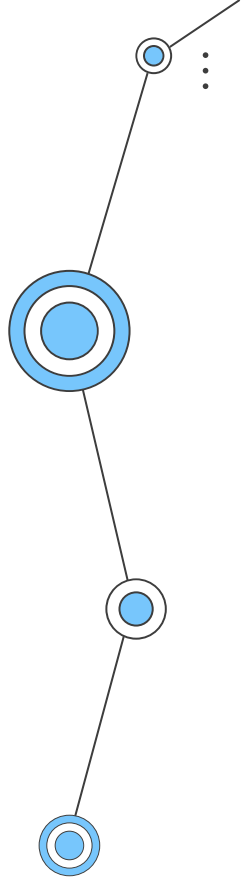
What is Fairness, and How Does It Relate to AI Safety?

- 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

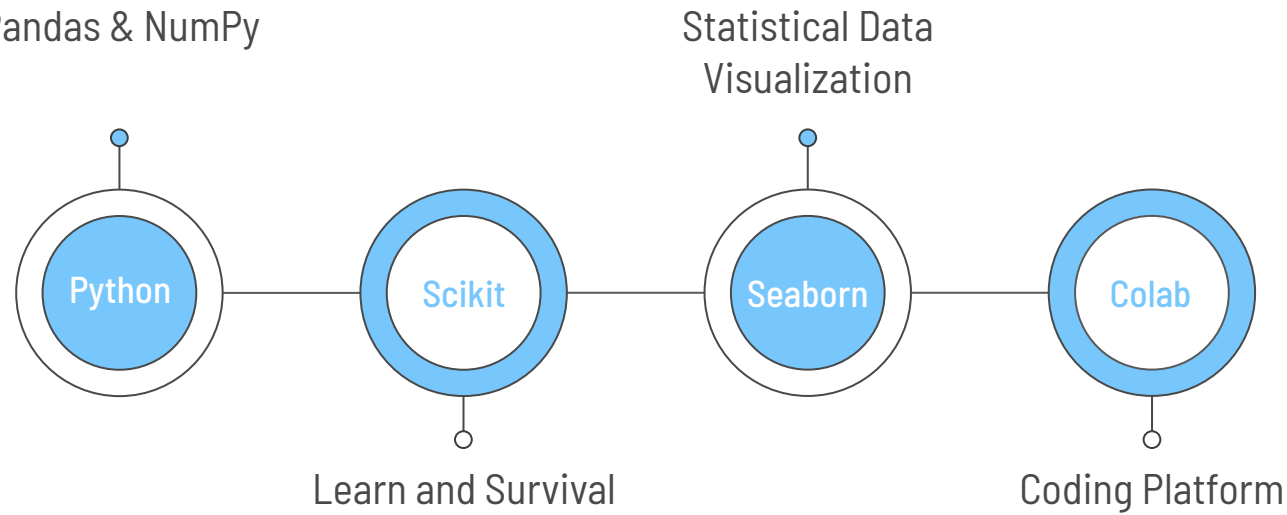
-Black defendants are nearly twice as likely to be falsely labeled as high risk compared to white defendants.
-White defendants are more often labeled as low risk.

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

Techniques/Libraries



Timeline

Week 1: Icebreaker/EDA intro (Programming/Python basics)

Week 2: EDA/Data Cleaning

Week 3: Error/Bias Analysis

Week 4: Logistic Regression

Week 5: Cox Proportional Hazards

Week 6: Kaplan Meier Curves

Week 7: Work Session (Form teams and brainstorm ideas)

Week 8: Work Session (Create slides for final presentation)

Survey!

Practice Time!

Let's learn more about each other while practicing Exploratory Data Analysis!

Hands-On Data Science!! :O

Next Steps:

1. Find/Download the F25 CRA notebook and F25_survey_data.csv in the MDST GitHub
    a. You can just Google “https://github.com/MichiganDataScienceTeam”
2. Split into teams of 2-3 and introduce yourselves!
    a. Name, hometown, year, intended major, favorite UMich memory, hobbies
3. Work on the exercises in the notebook!
    a. You are free to go as soon as you’re finished, but we encourage you to stick around and help your teammates!