Potential Prison Patterns

Predicting Recidivism in Florida Jails Through Classification

Algorithms in the Judicial System

Improve efficiency, but at what cost?

Recidivism

The Definition

"A criminal offense that resulted in a jail booking and took place after the (initial) crime"

PROPUBLICA

The Challenge

"If it's wrong in one direction, a dangerous criminal could go free. If it's wrong in another direction, it could result in someone unfairly receiving a harsher sentence or waiting longer for parole than is appropriate."

Algorithm Failures

Accuracy

“A rule of thumb according to several recent articles is that AUCs of .70 or above typically indicate satisfactory predictive accuracy”

Validity

“In most cases, validity had only been examined in one or two studies…completed by the same people who developed the instrument.”

False Positives

Thousands of lives are affected as judges who are not trained in the use of scores make sentencing decisions directly or indirectly based on an imperfect algorithm

Objectives

- Create recidivism classifier with industry-level accuracy using basic demographics and criminal history
- Identify underlying factors prevalent in recidivism in Broward County, FL

The Data

Broward County Sheriff's Office

- All prisoners completed COMPAS Risk Assessment
- Referenced at trials
- 2013-2014
- Target: Recidivism within two years

Key Features

- Over 50 Demographic or Criminal features
- Details about crime(s), jail stay, criminal history, and assessment results.
- Condensed to 9 key features

Tools

Pandas

Used for prison data upload, cleaning and initial EDA

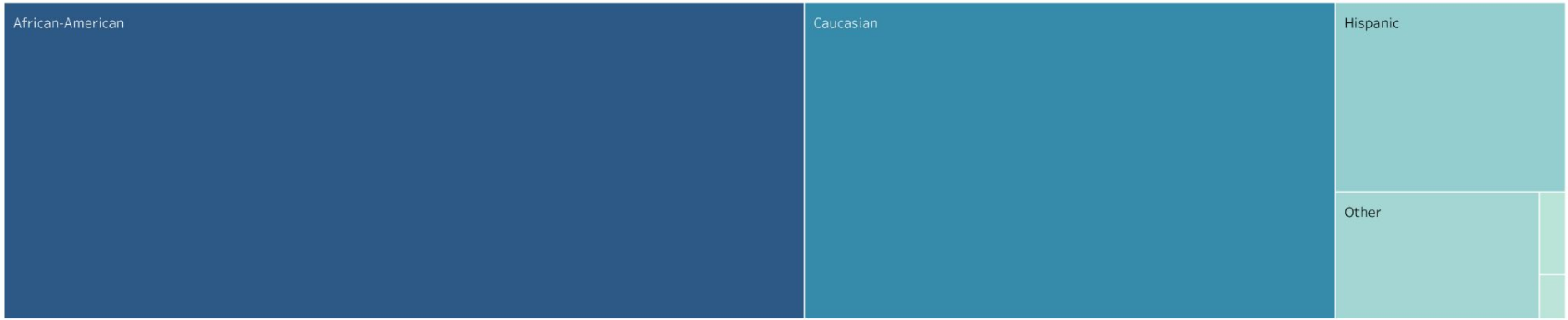
SciKit-Learn
XGBoost

Classification models were fit and assessed for various metrics

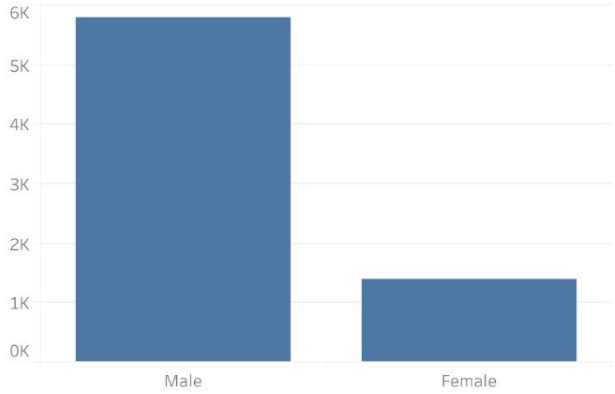
Tableau
Seaborn

Visualizations to enhance analysis of data and models

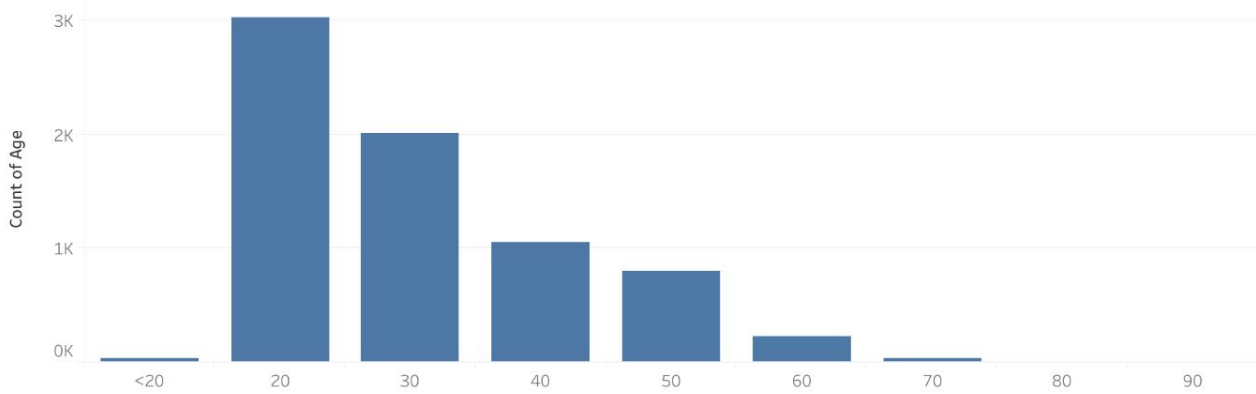
Prisoner Counts By Race



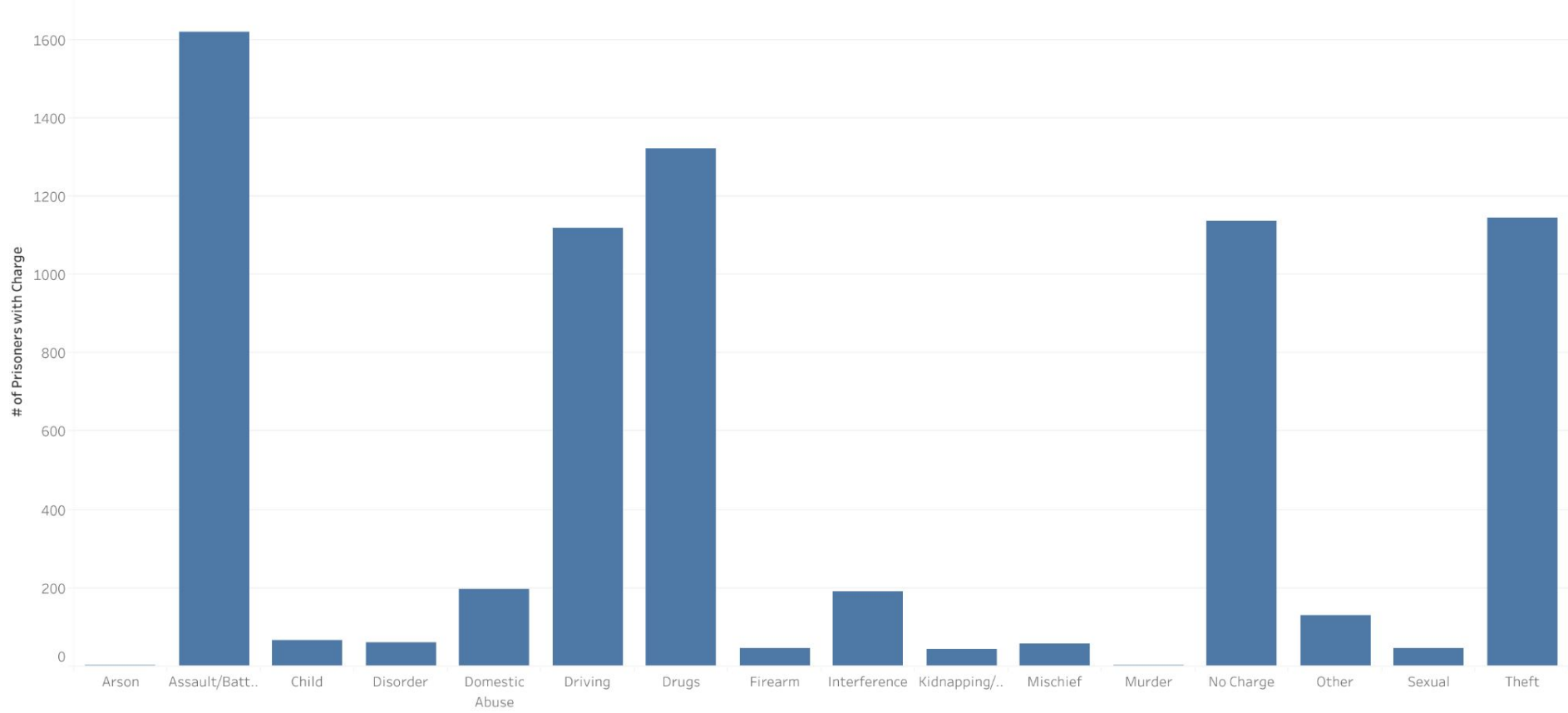
Counts by Sex



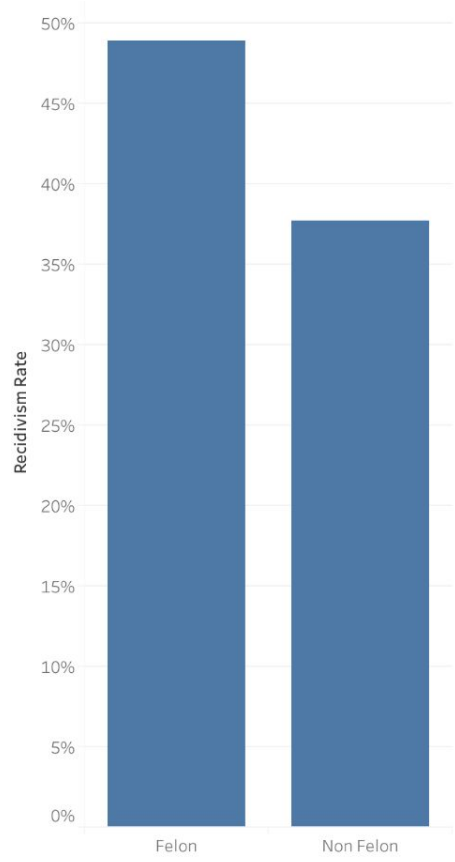
Counts by Age



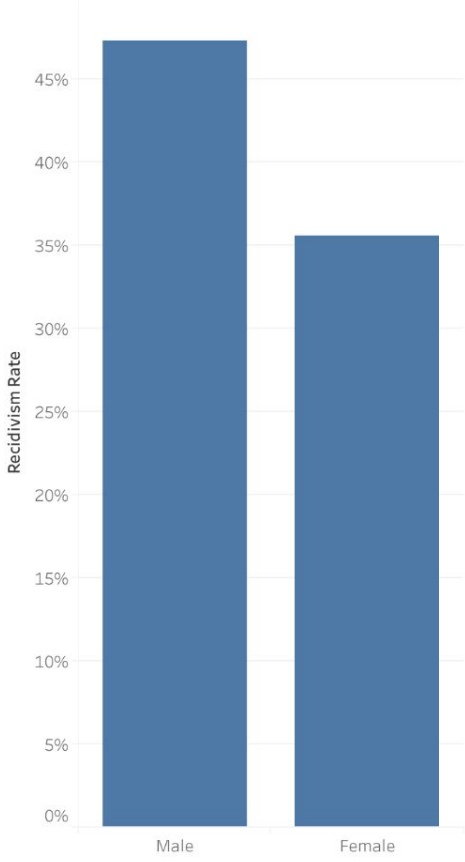
Counts by Charge



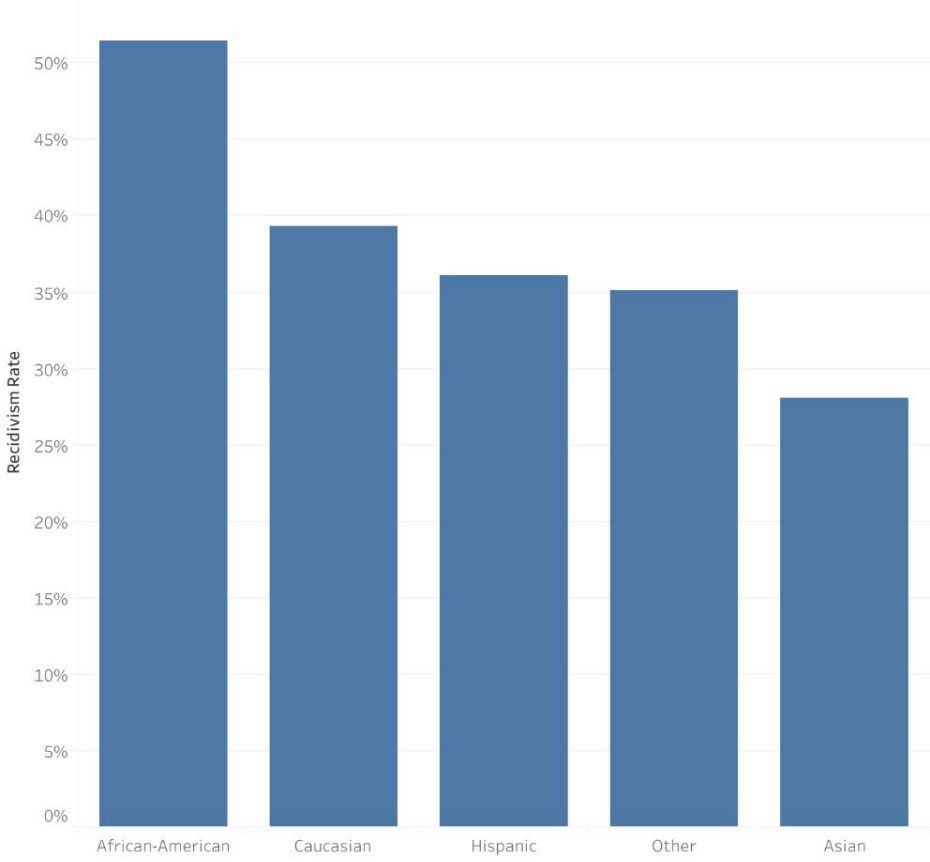
Recidivism Rates by Felony Status



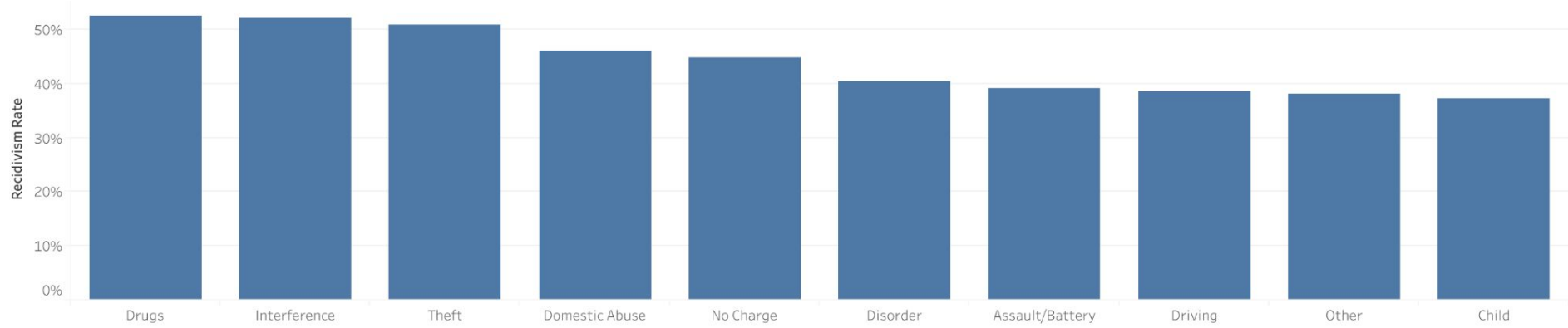
Recidivism Rates by Sex



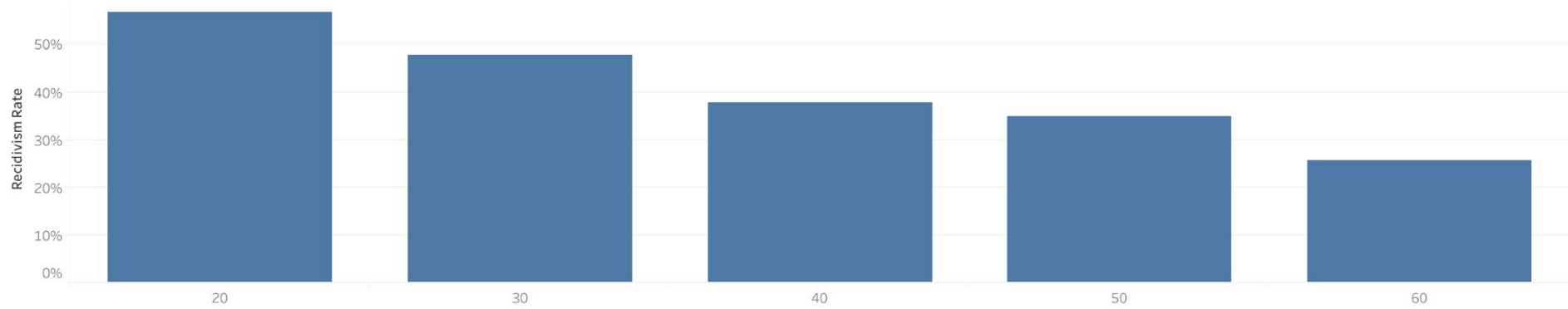
Recidivism Rates by Race



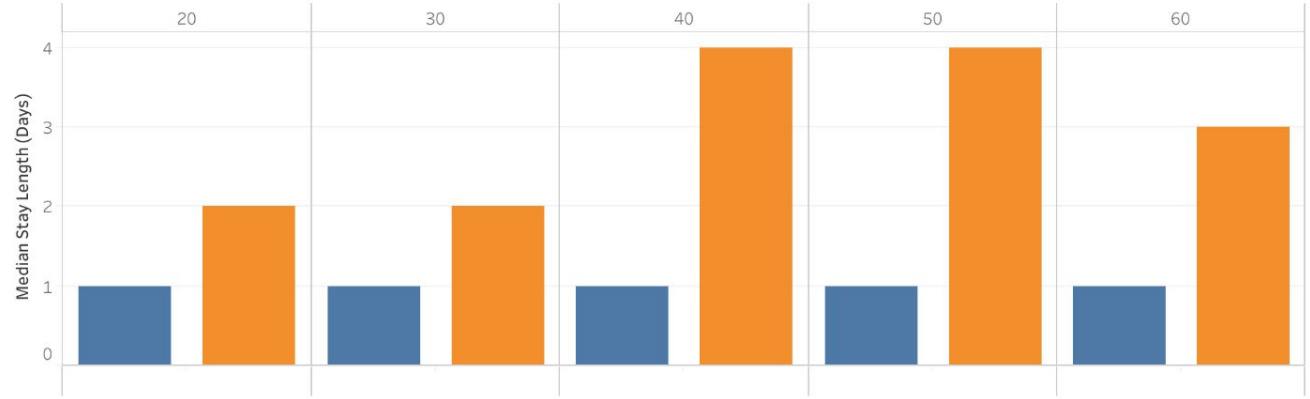
Recidivism Rates by Charge



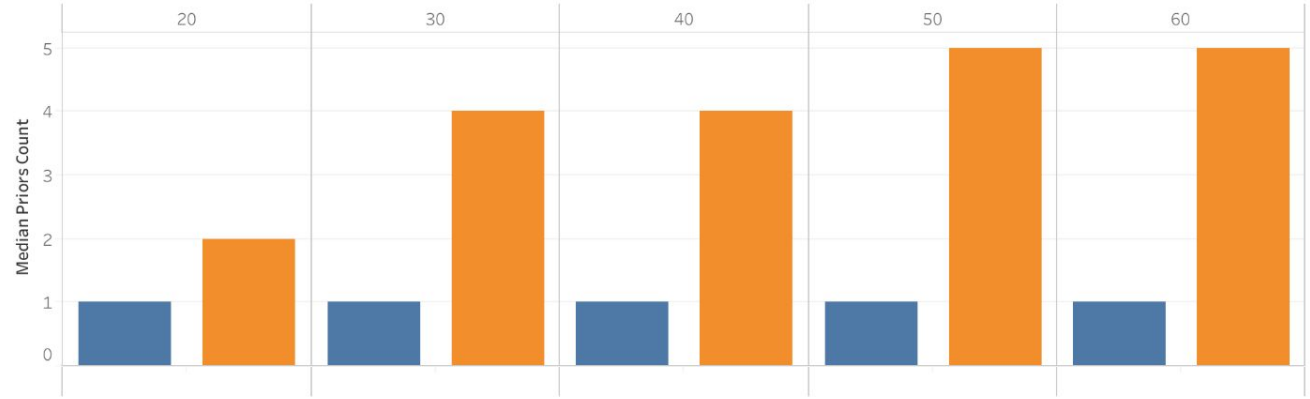
Recidivism Rates by Age



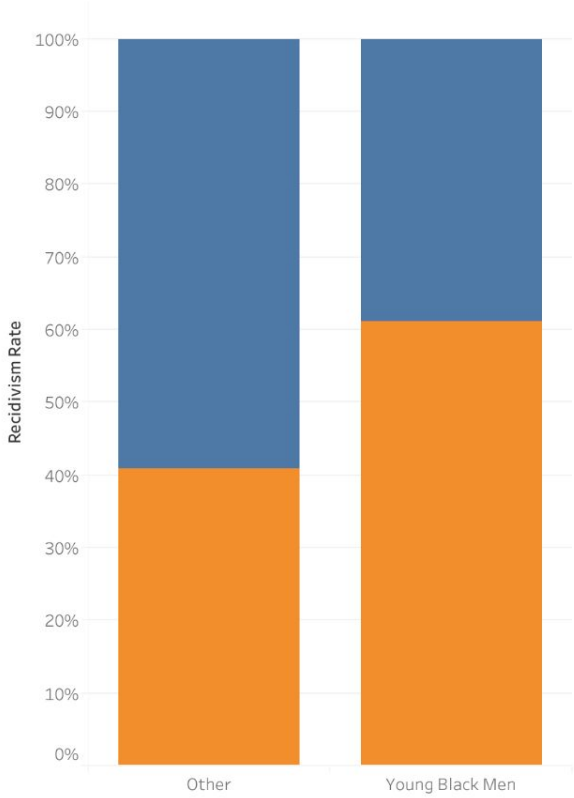
Median Stay vs. Age



Median Priors vs. Age

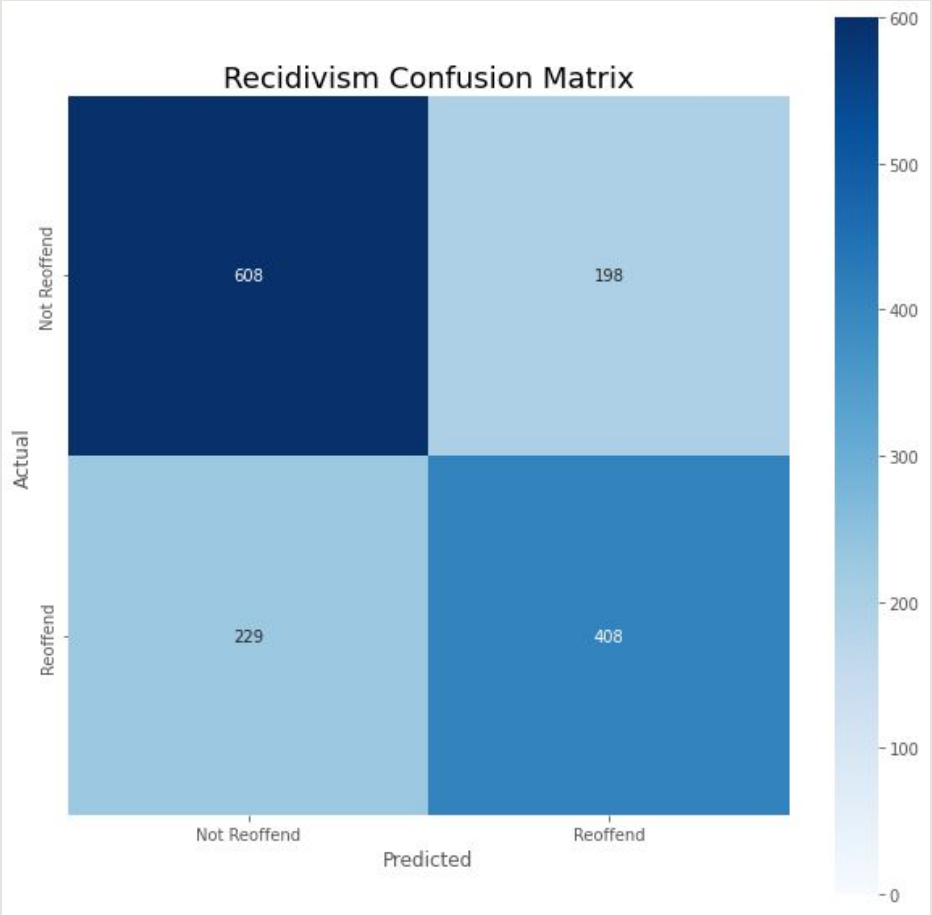


Recidivism Rates, Black Men Under 30 vs. Other Populations

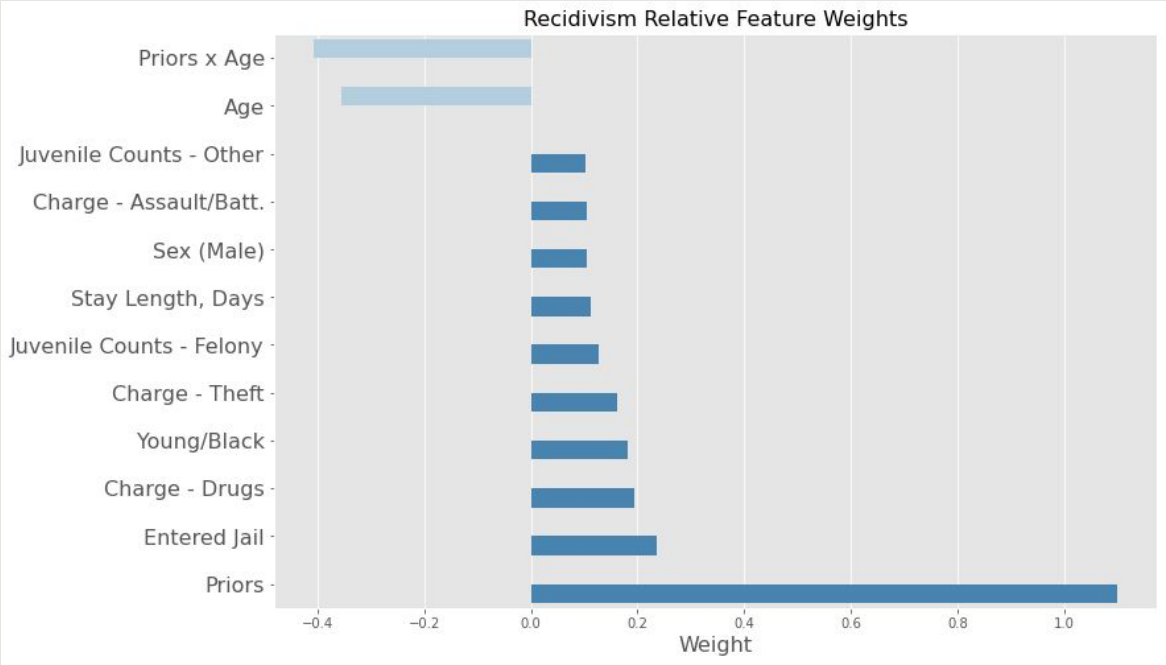


Metrics

- Accuracy of 0.70: 70% of people are classified accurately
- Precision of 0.67: ⅓ of positive predictions are false
- Recall of 0.64: over ⅓ of prisoners who recidivate are missed
- Model has significant drop in recall in for white prisoners (0.46)



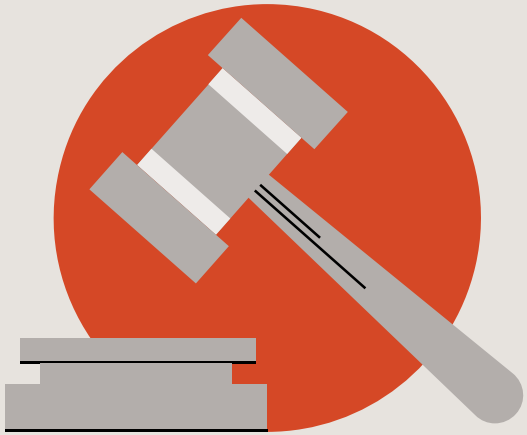
Factor Analysis



- Prior criminal activity is a strong indicator
- Various charges/juvenile history increase recidivism risk
- Younger prisoners are higher risk of recidivism, especially if black

Conclusions

- A simple model meets/exceeds the baseline COMPAS accuracy level
- Judicial system has significant demographic trends.
- Priors counts, previous prison stay, and age have largest weight on recidivism



Next Steps

Analyze Time

- Repeat offenders
- Long term recidivism

Other Metrics

- Run similar analysis on alternative settings
- Examine prisoner location and supports

Bias

- Run further analysis of model bias
- Examine model in alternative locations

Model Tuning

- Further tuning of hyperparameters
- Additional feature engineering

Thanks!

Source/Links:

- Data :
  - https://github.com/propublica/compas-analysis
- ProPublica analysis:
  - https://www.propublica.org/article/how-we-analyzed-the-compas-recidivism-algorithm
- Washington Post review:
  - https://www.washingtonpost.com/news/monkey-cage/wp/2016/10/17/can-an-algorithm-be-racist-our-analysis-is-more-cautious-than-propublicas/