Recidivism

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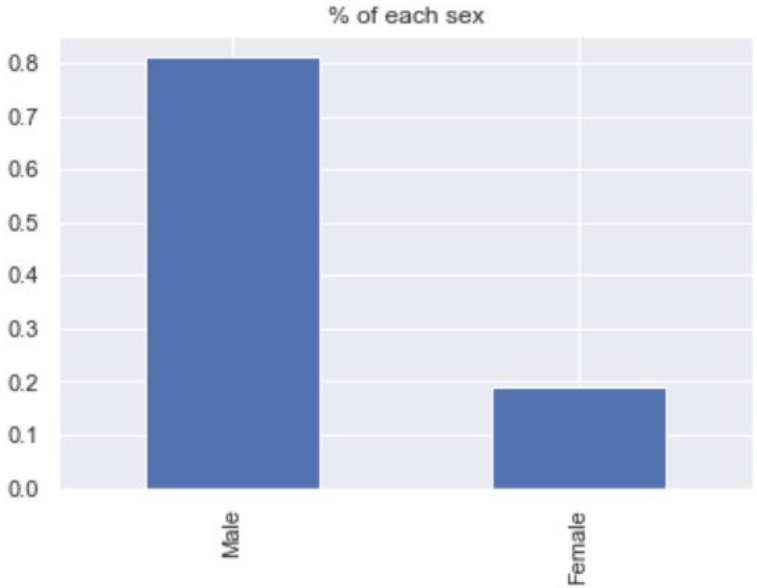
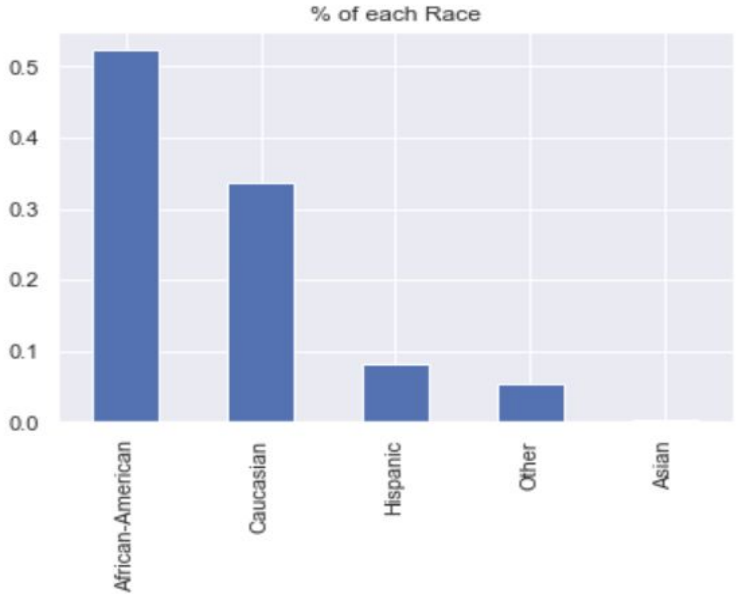
Problem - motivation behind the project

- **The problem is that there is a software used across the country to predict future criminals and it's biased against POC.**
  - **Scores are given to defendants in courts rooms to predict the likelihood of committing a future crime, these are known as risk assessments, and they are increasingly common in courtrooms across the nation. They are used to inform decisions about who can be set free at every stage of the criminal justice system. In Arizona, Colorado, Delaware, Kentucky, Louisiana, Oklahoma, Virginia, Washington and Wisconsin, the results of such assessments are given to judges during criminal sentencing.**

EDA/Hypothesis - acquiring insight in regards to the groups that make up our data

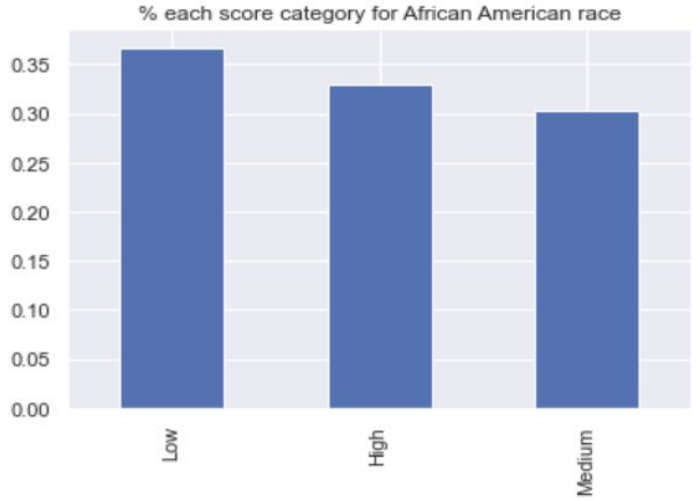


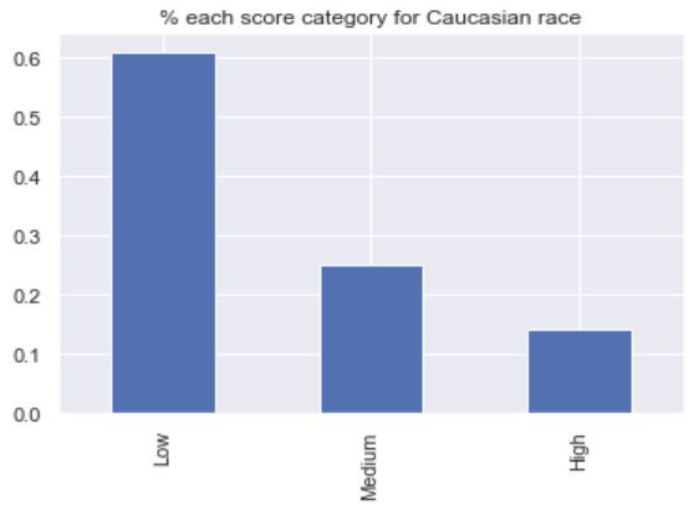
~80% of data is from men the other ~20% comes from women



More than 50% of data is from African Americans, with the next largest group consisting of Caucasian, followed by Hispanic, followed by Other, followed by Asian

EDA/Hypothesis - getting familiar with data and assessing potential bias in scores





~33% of all scores are in the high category
~31% of all score are in the medium category
~36% of all score are in the low category

~14% of all scores are in the high category
~26% of all scores are in the medium category
~60% of all scores are in the low category

Hypothesis: there is definitely bias when assessing African American scores.

EDA/Hypothesis - understanding the independent variables and their values

Columns/Description:

- **Sex: male or female**
- **Age_cat: Greater than 45', '25 - 45', 'Less than 25'**
- **Race: African-American. Caucasian, Hispanic, Asian, Other**
- **juv_fel_count: the # of felonies the defendant had as a juvenile**
- **juv_misd_count: the # of misdemeanors the defendant had as a juvenile**
- **Juv_other_count: the # of other charges the defendant had as a juvenile**
- **priors_count: the total # of prior charges the defendant had**
- **c_charge_degree: the charge degree of the current crime the defendant is getting convicted up**
- **is_recid: 1 or 0 (has committed recidivism or has not)**
- **Is_violent_recid: has committed violent recidivism or has not**
- **score_text (TARGET VARIABLE): the score category assigned to the defendant assessing their risk of recidivism**
- **v_decile_score: the score assigned to defendant assessing their risk of violence**

```
Index(['sex', 'age_cat', 'race', 'juv_fel_count', 'juv_misd_count',
       'juv_other_count', 'priors_count', 'c_charge_degree', 'is_recid',
       'is_violent_recid', 'score_text', 'v_decile_score'],
      dtype='object')
```

Model/Results - cross validating each different type of model and picking best one

initial_tree: no parameters added

simple_tree: only parameter added was max_depth = 4

first_grid: performed GridSearchCV and found best parameters to be max_depth = 9 and criterion = “gini”

random_grid: performed RandomizedSearchCV and found best parameters to be max_depth = None, criterion = "gini", max_features = 6, min_samples_leaf = 1

no_param_knn_classifier: no parameters added

random_knn_classifier: performed RandomizedSearchCV and found best parameters to be weights = "distance", n_neighbors = 20

	fit_time	score_time	test_score	train_score
initial_tree	0.071124	0.002598	0.775459	0.894002
simple_tree	0.065660	0.008793	0.692613	0.697311
first_grid	0.071558	0.003298	0.728378	0.763392
random_grid	0.042515	0.003074	0.771738	0.894002
noparam_knn_classifier	0.260211	0.378609	0.734149	0.805233
random_knn_classifier	0.415916	0.687008	0.785786	0.893605

Model/Results - obtaining the accuracy and mode of my model for different races/sexes

- **using the knn classifier with the appropriate parameters, I was able to make predictions and evaluate the performance of my model**
- **All the accuracies are pretty much the same, however the accuracy for "Other" is ~10% higher than all the others. This could be explained by the small amount of data in the test set (it only had 122 scores to predict, so less room for error)**

```
The total accuracy for African American defendants is 79.9520766773163
The total accuracy for Asian defendants is 80.0
The total accuracy for Caucasian defendants is 81.79384203480589
The total accuracy for Hispanic defendants is 81.91489361702128
The total accuracy for 'Other' defendants is 92.62295081967213
The total accuracy is 81.36833046471601
```

```
The mode score given for African American defendants is Low
The mode score given for Asians defendants is Low
The mode score given for Caucasian defendants is Low
The mode score given for Hispanic defendants is Low
The mode score given for 'Other' defendants is Low
The mode score for all defendants is Low
```

```
the total accuracy for all men is 80.40468583599574
the total accuracy for all women is 85.42600896860986
```

```
The mode score for men is Low
The mode score for women is Low
```

Model/Results - evaluating the importance of each variable for the prediction

- **Because the initial tree classifier gave me the second best test score when cross validating (only ~1% less accurate than the knn classifier), I thought it would be interesting to see how important each independent variable is to the prediction**
- **In my initial tree model the most important variable when predicting the risk of recidivism is priors_count**

```
{'sex': 1.5226591565340402,
 'age_cat': 1.6536055531232976,
 'race': 2.813949117100915,
 'juv_fel_count': 20.28108931436043,
 'juv_misd_count': 4.4319440632619145,
 'juv_other_count': 2.399890340716384,
 'priors_count': 41.23743132236677,
 'c_charge_degree': 1.6151980636795318,
 'is_recid': 1.616411025392808,
 'is_violent_recid': 1.3444587416631906,
 'v_decile_score': 1.588661457326793}
```

Insights - checking for bias in my model

- **I calculated the total amount of false positive ‘High’ and ‘Medium’ occurrences for each race**
- **A false positive ‘High’ indicates a person who was predicted to be a ‘High’ risk of recidivism but their actual score was lower (‘Medium’ or ‘Low’)**
- **A false positive ‘Medium’ indicates a person who was predicted to be a ‘Medium’ risk of recidivism but their actual score was ‘Low’**
- **Conclusion: When keeping in mind the total amount of African Americans (1252) and the total amount of Caucasians (747) in the test data set, the % of false positive ‘High’ and ‘Medium occurrences for African Americans and Caucasians is close enough to conclude that there is no bias.**

```
the total false positives for 'High' and 'Medium' scores given for African Americans is 115
the total false positives for 'High' and 'Medium' scores given for Caucasians is 61
the total false positives for 'High' and 'Medium' scores given for Asians is 0
the total false positives for 'High' and 'Medium' scores given for Hispanics is 13
the total false positives for 'High' and 'Medium' scores given for Other is 4
```

```
the % of false positive 'High' and 'Medium' predictions of total African American People 9.185303514376997
the % of false positive 'High' and 'Medium' predictions of total Caucasian People 8.165997322623829
the % of false positive 'High' and 'Medium' predictions of total Asian People 0.0
the % of false positive 'High' and 'Medium' predictions of total Hispanic People 6.914893617021277
the % of false positive 'High' and 'Medium' predictions of total Other People 3.278688524590164
```