

COMPASS Project

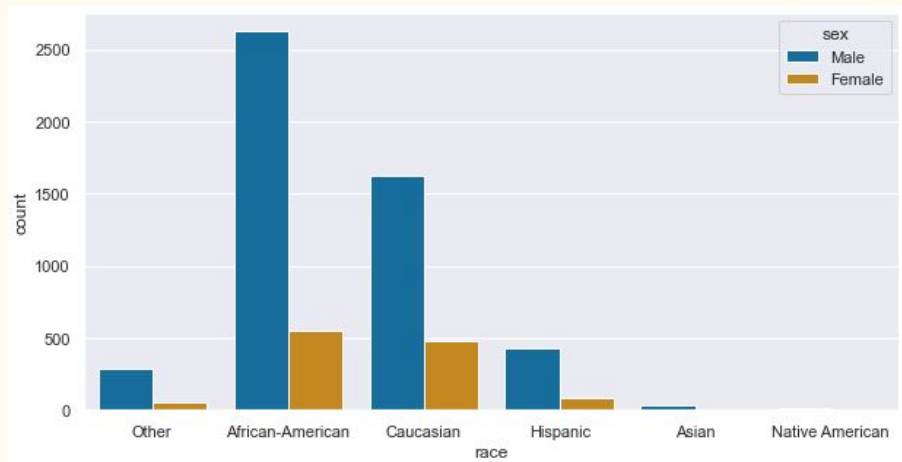
Pablo Focke and Eniko Toth

Compass analysis

- Useful (understood) parameters

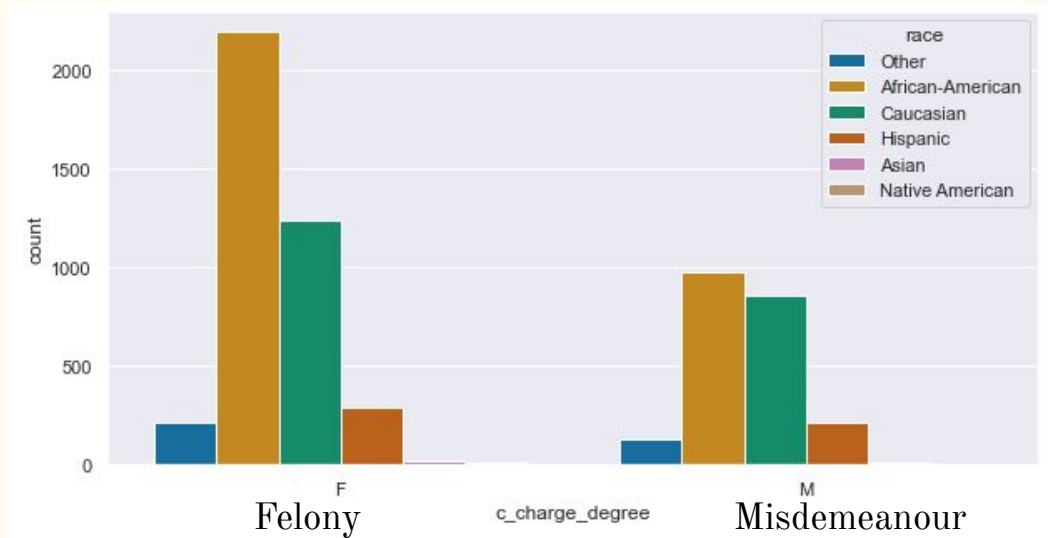
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'sex', 'race', 'age', 'age_cat', 'juv_fel_count', 'juv_misd_count', 'priors_count',  
'decile_score', 'score_text', 'c_charge_degree', 'c_charge_desc', 'two_year_recid'
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- Demographic analysis



Compass analysis

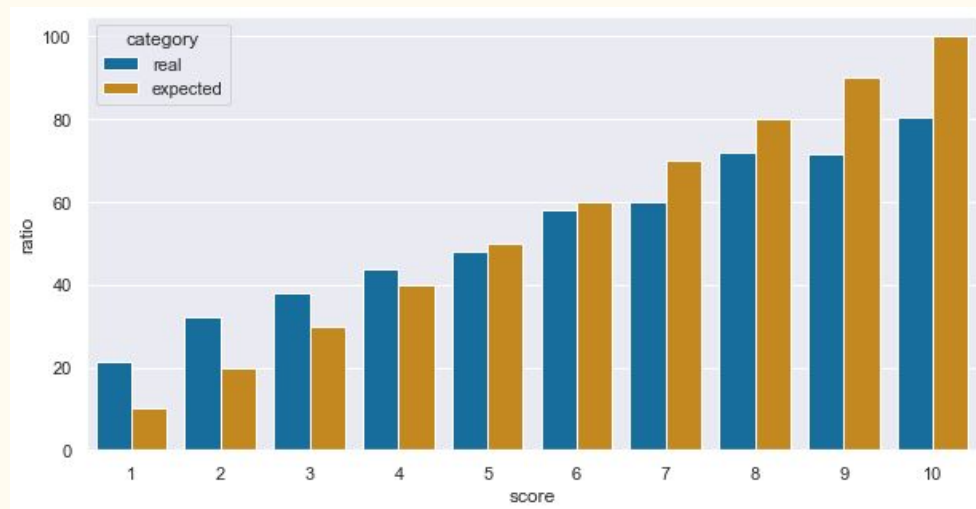
- Crime specifics



	count	recid	ratio
race			
African-American	3173	1661	52.35
Asian	31	8	25.81
Caucasian	2100	822	39.14
Hispanic	509	189	37.13
Native American	11	5	45.45
Other	343	124	36.15

Accuracy of COMPAS

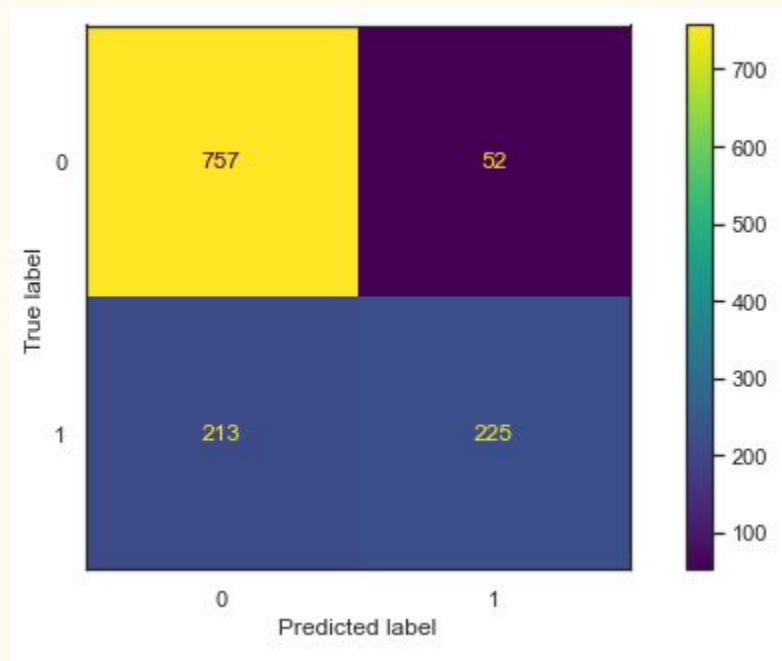
- Metric: $\text{abs}(R - (E/N * 100))$
 - R: number of people recidivating
 - E: expected number of people recidivating
 - N: all people with the same score
-
- Accuracy: 90.89%



Accuracy of COMPAS

- Score 1 - Prediction 0
- Score 10 - Prediction 1

- Accuracy: 78.75%
- Precision: 81.23%
- Recall: 51.37%

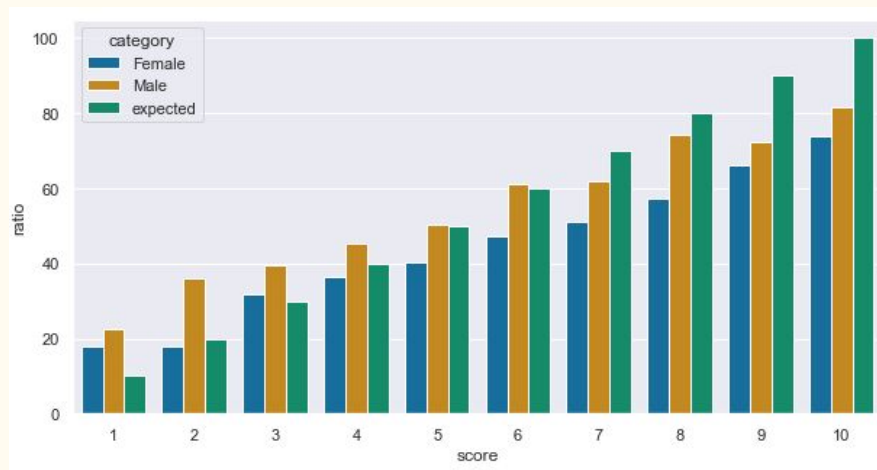
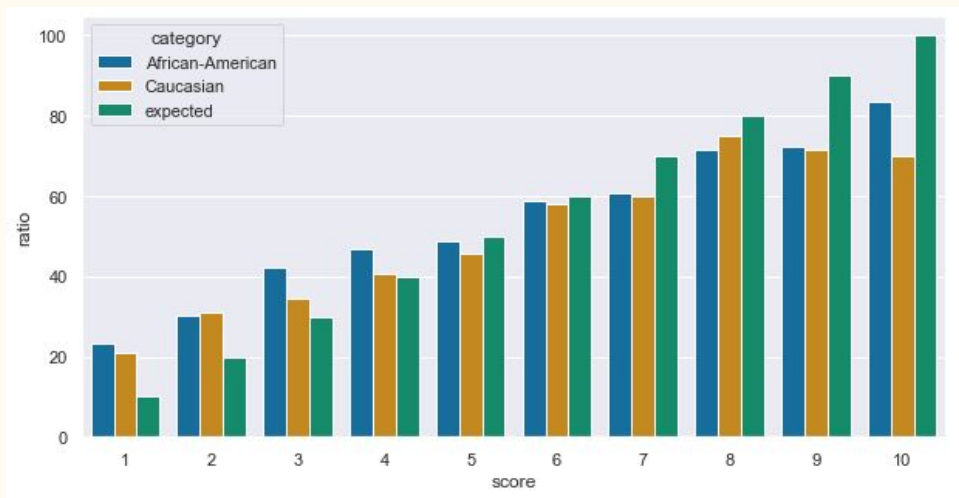


Bias?

- With first metric:

	count	error	accuracy
race			
African-American	3173	302	90.48
Caucasian	2100	172	91.81

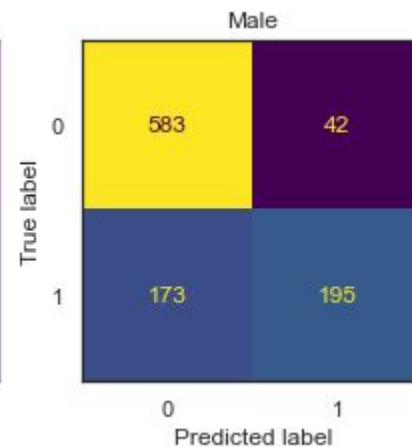
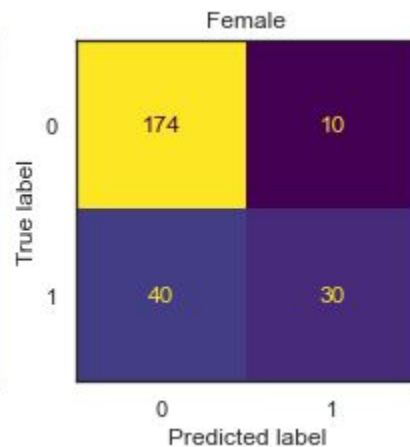
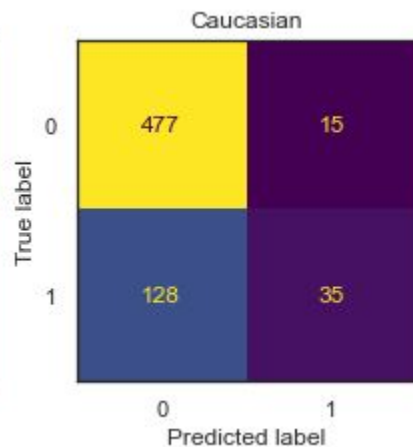
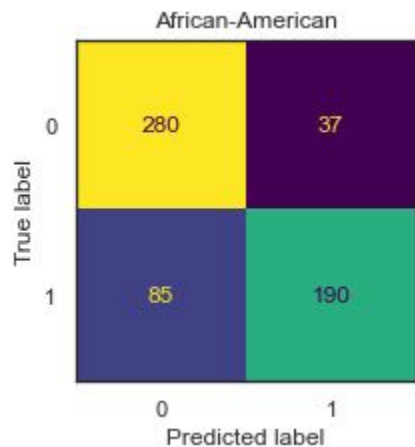
	count	error	accuracy
sex			
Female	1173	110	90.62
Male	4994	484	90.31



Bias?

- With second metric:

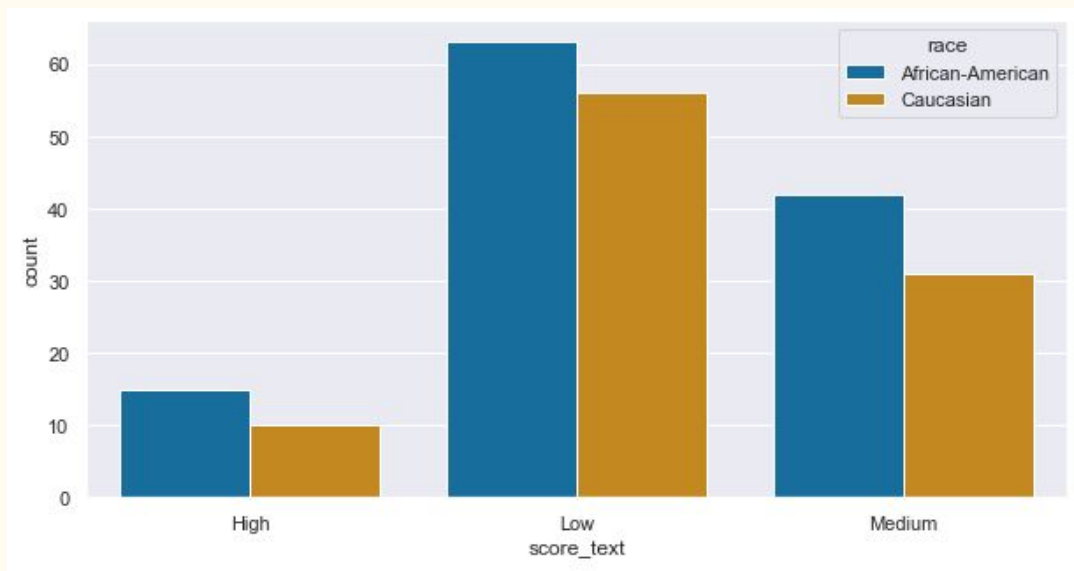
	accuracy	precision	recall
COMPAS African-American	79.39	83.7	69.09
COMPAS Caucasian	78.17	70.0	21.47
COMPAS Female	80.31	75.0	42.86
COMPAS Male	78.35	82.28	52.99



Bias?

- Based on similar circumstances:

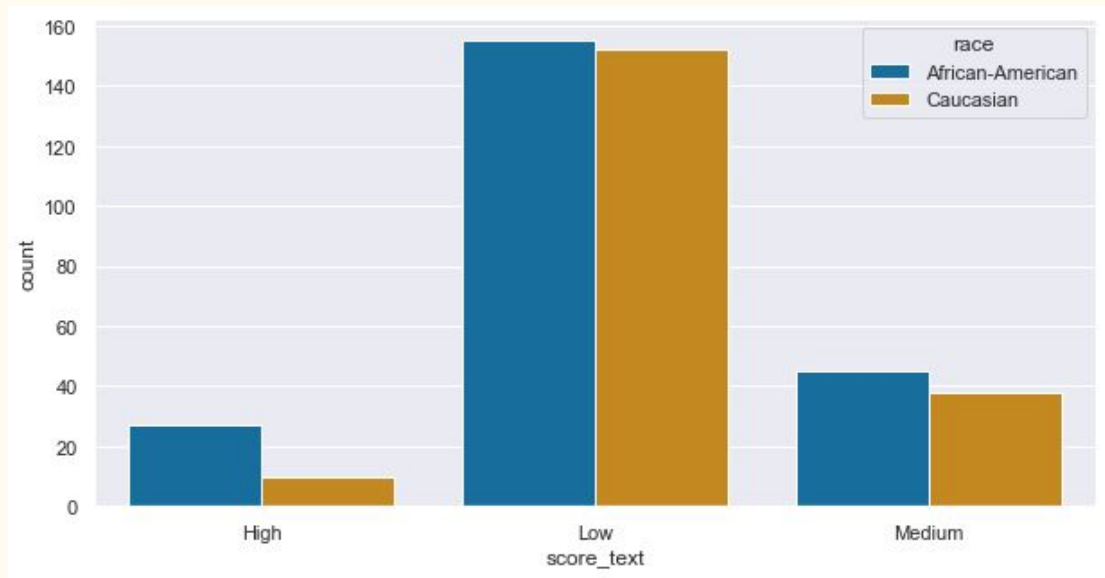
- Age between 25-45
- Priors: 2
- Juvenile priors: 0
- Charge degree: Felony



Bias?

- Based on similar circumstances:

- Age between 25-45
- Priors: 0
- Juvenile priors: 0
- Charge degree: Felony



Our classifiers

- Normalize data : Feature => float

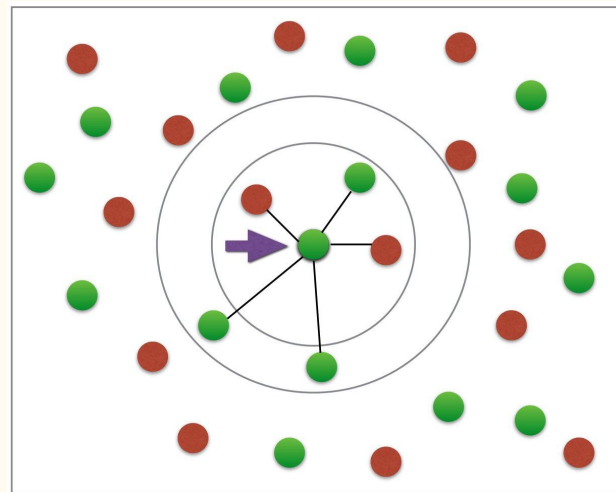
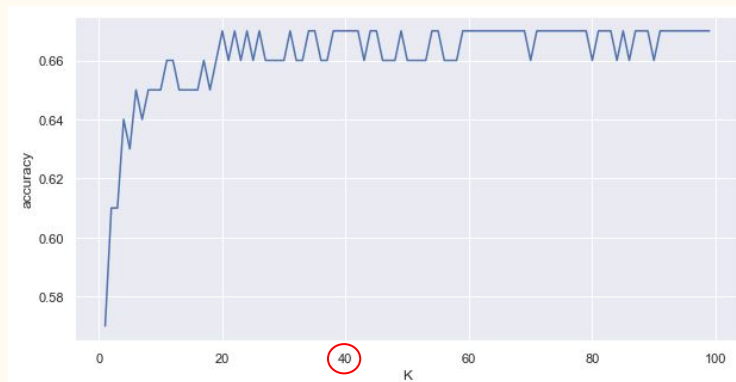
Categories for charge degrees

ID	Keyword	Recidivate Ratio	Count	Description
1.0	violence	-> 0.55% chance	(out of 132)	mostly violent action towards the police
0.875	possession	-> 0.54% chance	(out of 1109)	possession/delivery of drugs/weapons
0.75	theft	-> 0.53% chance	(out of 602)	minor or major thefts
0.625	burglary	-> 0.52% chance	(out of 285)	burglary of all kinds
0.5	arrest no chrg	-> 0.45% chance	(out of 784)	possible minor crimes ?
0.375	driving	-> 0.45% chance	(out of 465)	driving with invalid license or under drug influence
0.25	battery	-> 0.38% chance	(out of 1479)	battery of all kinds
0.125	assult	-> 0.35% chance	(out of 196)	assults and abuses
0.0	remaining	-> 0.43% chance	(out of 1320)	evidence tempering etc.

Our classifiers

K-Nearest Neighbors (KNN)

- how to choose k ?

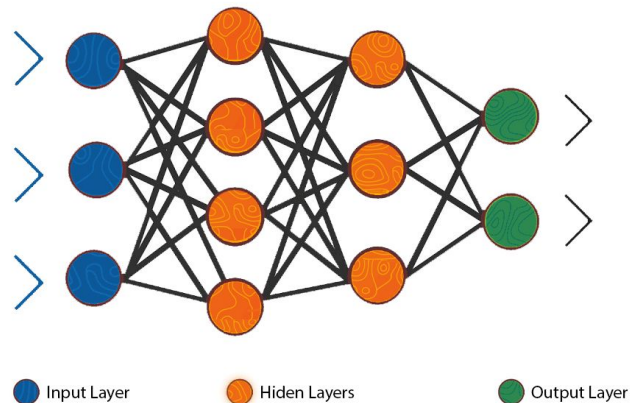
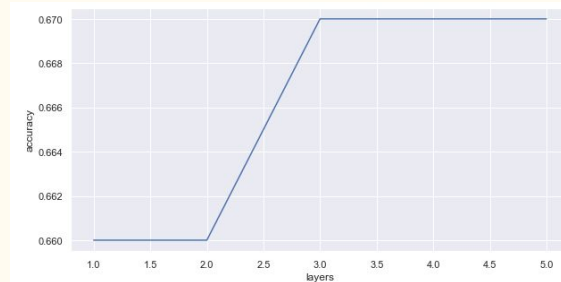
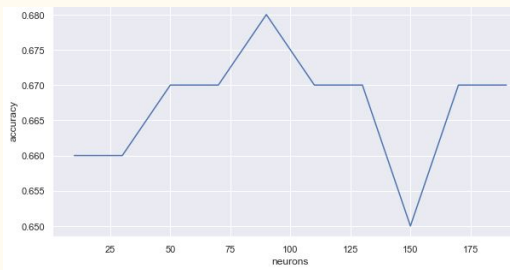


Our classifiers

Multilayer perceptron (MLP)

- How many layers, neurons per layer ?

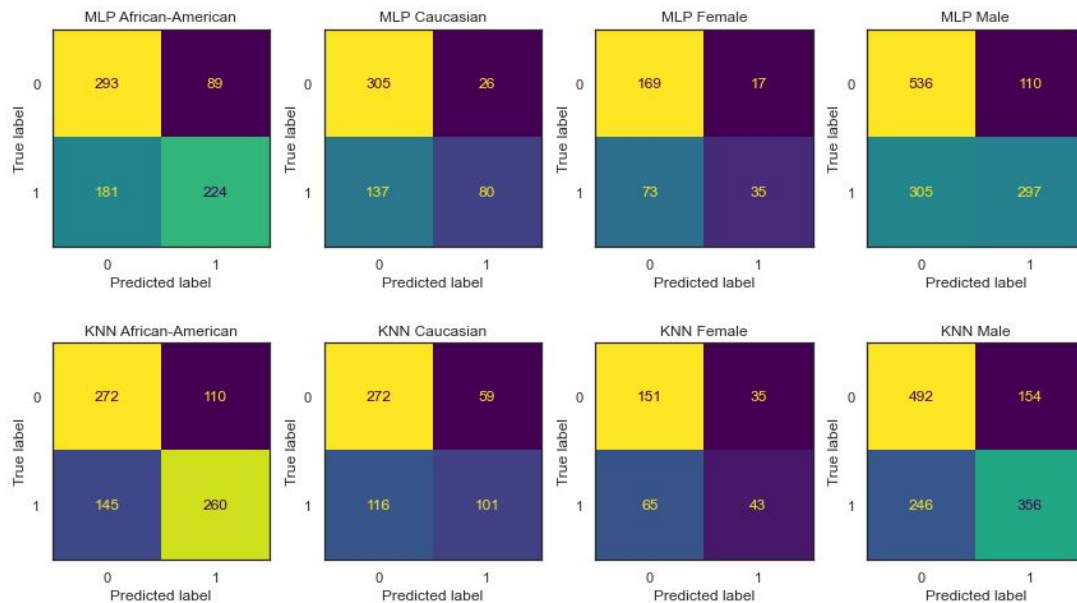
Fix a parameter to a reasonable amount $\Rightarrow$ iterate the other



Fairness

MLP Accuracy: 67.25%

KNN Accuracy: 67.57%



	accuracy	precision	recall
MLP African-American	65.69	71.57	55.31
MLP Caucasian	70.26	75.47	36.87
MLP Female	69.39	67.31	32.41
MLP Male	66.75	72.97	49.34
KNN African-American	67.6	70.27	64.2
KNN Caucasian	68.07	63.12	46.54
KNN Female	65.99	55.13	39.81
KNN Male	67.95	69.8	59.14

compas_results

	accuracy	precision	recall
COMPAS African-American	79.39	83.7	69.09
COMPAS Caucasian	78.17	70.0	21.47
COMPAS Female	80.31	75.0	42.86
COMPAS Male	78.35	82.28	52.99

Fairness (KNN)

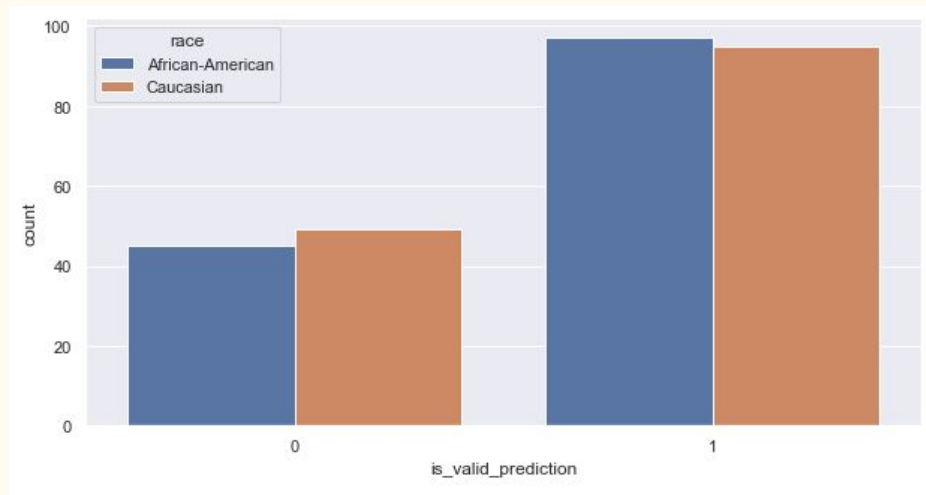
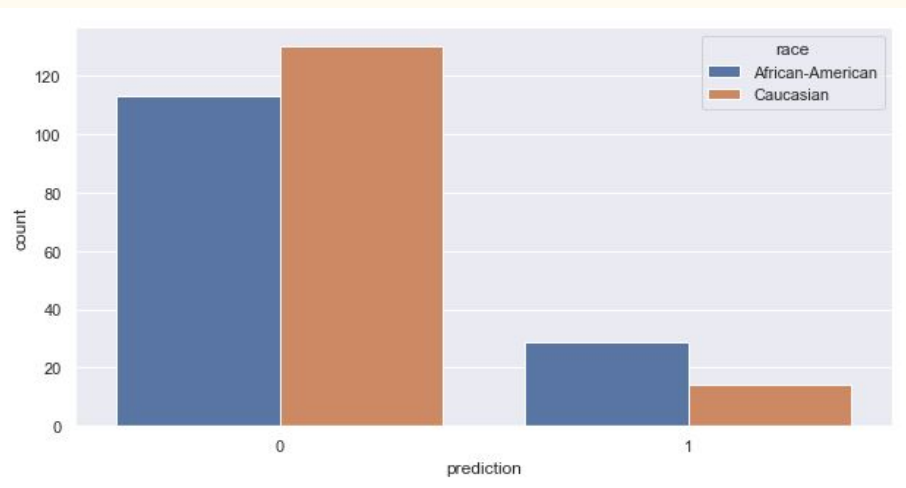
Similar circumstances metric:

crime_frequency < 0.02

priors_count < 0.2

juv_priors_count == 0

c_charge_desc == 0.25 # battery



some bias but also good accuracy

Fairness (KNN)

“equalize” data

count	
race	
African-American	3173
Asian	31
Caucasian	2100
Hispanic	509
Native American	11
Other	343



count	
race	
African-American	2100
Caucasian	2100

KNN African-American	67.6	70.27	64.2
KNN Caucasian	68.07	63.12	46.54

	accuracy	precision	recall
KNN African-American	66.4	69.77	59.52
KNN Caucasian	69.8	65.73	44.34

Fairness (KNN)

count	
sex	
Female	1173
Male	4994



count	
sex	
Female	1173
Male	1173

KNN Female	65.99	55.13	39.81
KNN Male	67.95	69.8	59.14

	accuracy	precision	recall
KNN Female	65.03	55.88	35.19
KNN Male	62.13	72.41	50.6

Conclusion

- The best we could make is based on KNN
- Accuracy is around 67%, but better at recall for Caucasians
- Fairness is difficult to reach
- The dataset has complex relations
- More features would be useful