

Tipping the Scales of Justice: Machine Bias in Recidivism

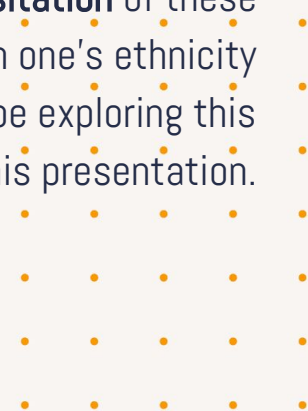
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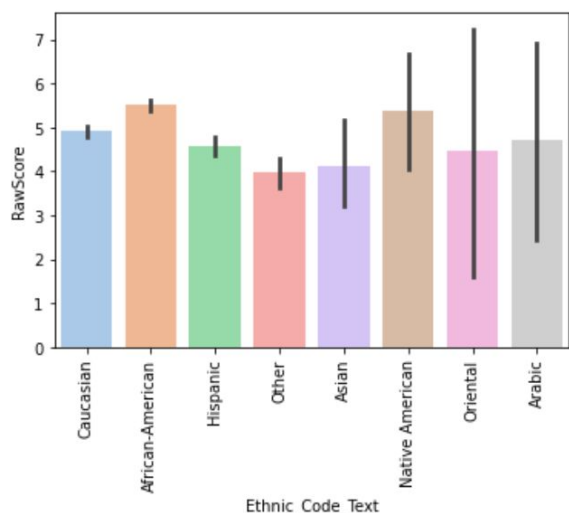
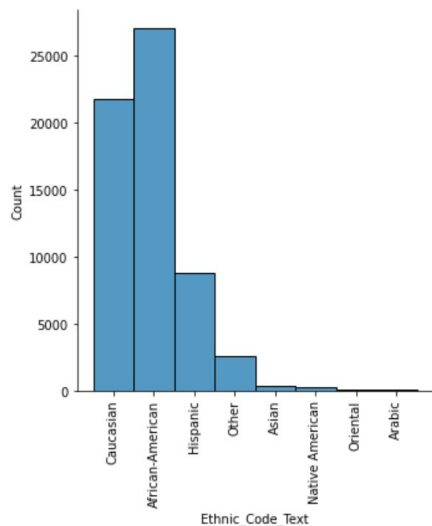


Introduction

With the recent rise of the **Black Lives Matter** movement in the United States, the public has called for greater **transparency** in police investigations and the judicial system. Over the past few years, there has been a more prominent use of computer **algorithms** to determine whether a criminal is to reoffend, and has been used to sentence criminals for longer durations due to the algorithm's scores. Amongst this call for greater transparency should be the **revisitation** of these algorithms - many of them having a great dependency on one's ethnicity to predict an individual's likelihood to reoffend. We will be exploring this claim in more-depth throughout this presentation.



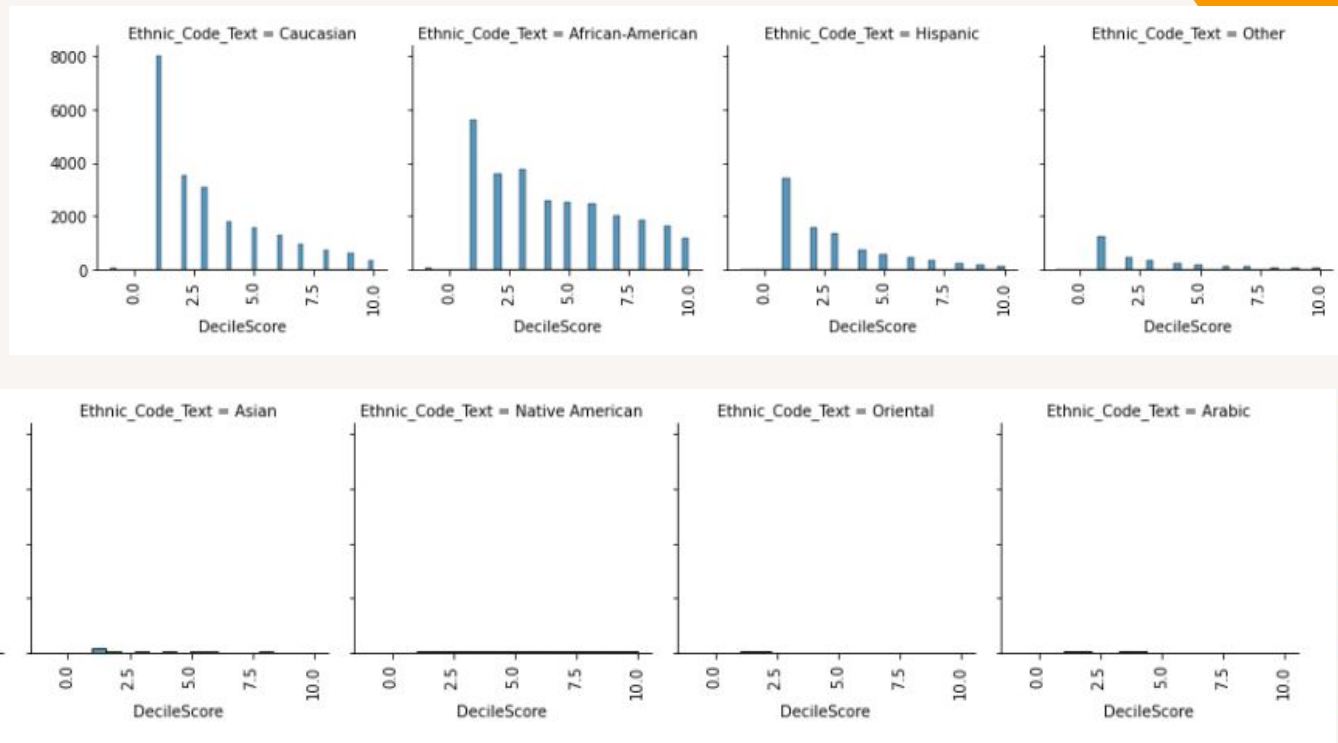
A Deeper Look at the Role Ethnicity Plays In These Algorithms



Although the **mean** raw score from these algorithms are roughly similar with all ethnicities (in fact amongst Caucasians this score is third highest amongst all groups), it shies away from showing the number of people from each ethnicity incarcerated. African Americans comprise of 13.4% of the population, whereas Caucasians comprise over 60% of the population (US Census Bureau). The fact more African Americans are brought to trial despite Caucasians making up **four times** the population shows a concerning trend about our judicial system.

Distribution of Decile Scores Amongst Ethnicities

Through this pairplot, it is clear to see that African Americans (as well as Hispanics and Native Americans) have a **higher distribution** of decile scores in the higher range. With there already being judicial bias in convicting ethnicities that are not Caucasian, the fact that the distribution of scores amongst ethnicities is so staggering presents an issue to the use of these algorithms for sentencing.

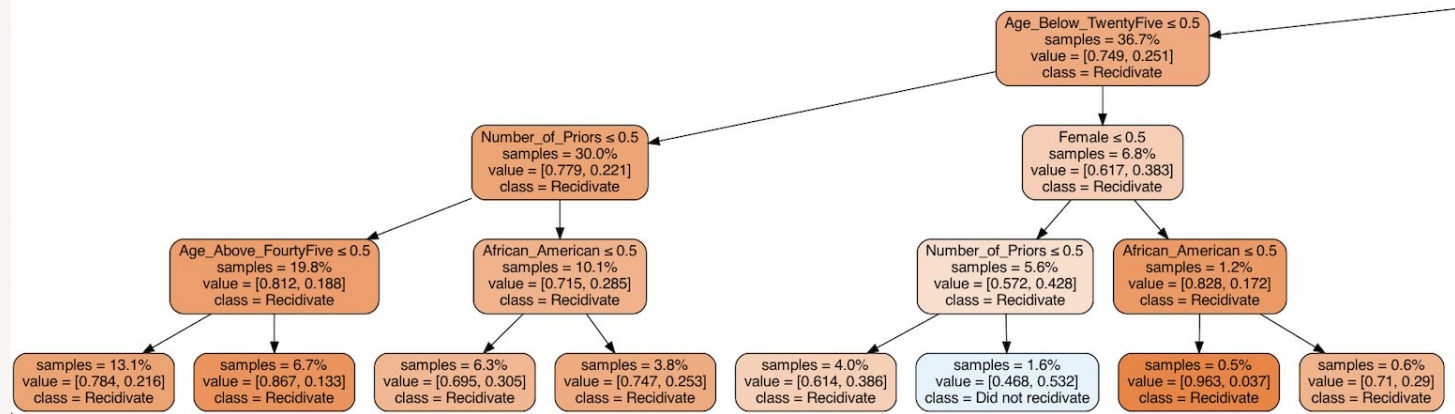


Logistic Regression - Looking at the Impact of Ethnicity

	Variables	Coefficients
0	Number_of_Priors	0.138156
1	score_factor	0.707332
2	Age_Above_FourtyFive	-0.460720
3	Age_Below_TwentyFive	0.575966
4	African_American	0.062135
5	Asian	-0.324265
6	Hispanic	-0.064035
7	Native_American	-0.271544
8	Other	-0.052116
9	Female	-0.431702
10	Misdemeanor	-0.224029

The higher dependence of ethnicity as a factor, as seen amongst being Asian or Native American, or even biological sex (being female), as compared to factors such as number of priors should raise concern on the reliability of the COMPAS algorithm.

Decision Tree Classifiers - Looking at the Impact of Ethnicity



There is a high dependence of being African American as a factor on whether criminals recidivate on this Decision Tree Classifier (with a max depth of 5).

Prediction Accuracy of The Algorithms

	fit_time	score_time	test_score	train_score
grid_tree	0.007048	0.004353	0.679125	0.759190
random_tree	0.006052	0.004181	0.678549	0.766628
random_log	0.011914	0.004702	0.712279	0.715473
random_knn	0.006648	0.012657	0.674567	0.776134

The highest accuracy using the COMPAS dataset that these machine learning models predicted for two year recidivism was ~71%, which is not an acceptable margin to use these algorithms to sentence criminals. With the unreliable dependency of ethnicity being used to predict recidivism, it is clear these algorithms must be reexamined.

Reference Links

- ProPublica. (2016, May 23). Machine Bias. Retrieved from <https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing>
- United States Census Bureau. (2020). Quick Facts United States Population. Retrieved from <https://www.census.gov/quickfacts/fact/table/US/PST045219>