INCOME PREDICTIONS

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AGENDA

- Data Description
- Project Objective
- Exploratory Data Analysis
- Machine Learning Model
- Recommendation

DATA DESCRIPTION

- Classification Dataset
- The target is adult income levels based on various demographic attributes
- Each row in the dataset provides statistical record pertaining to income level
- Each column represents a demographic feature of an individual

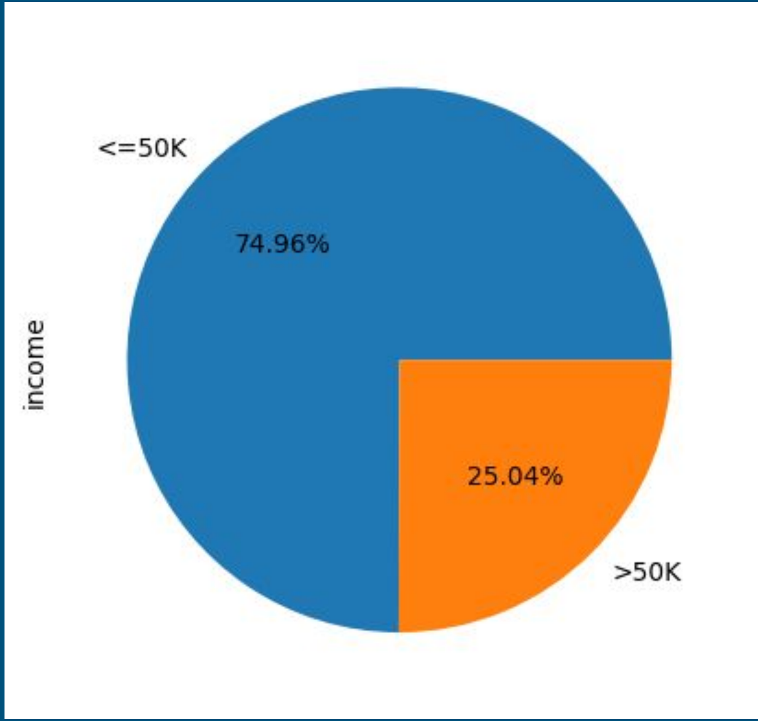
PROJECT OBJECTIVE

- EXPLORE DATA
- CREATE & RECOMMEND A MACHINE LEARNING MODEL THAT PREDICTS WHETHER AN ADULTS SALARY CROSSES A THRESHOLD OF $50K OR HIGHER
- CLASSIFYING YES OR NO FOR OUR TARGET “ADULT INCOME”

EXPLORATORY DATA ANALYSIS

age	workclass	fnlwgt	education	educational-num	marital-status	occupation	relationship	race	gender	capital-gain	capital-loss	hours-per-week	native-country	income
25	Private	226802	11th	7	Never-married	Machine-op-inspct	Own-child	Black	Male	0	0	40	United-States	<=50K
38	Private	89814	HS-grad	9	Married-civ-spouse	Farming-fishing	Husband	White	Male	0	0	50	United-States	<=50K
28	Local-gov	336951	Assoc-acdm	12	Married-civ-spouse	Protective-serv	Husband	White	Male	0	0	40	United-States	>50K
44	Private	160323	Some-college	10	Married-civ-spouse	Machine-op-inspct	Husband	Black	Male	7688	0	40	United-States	>50K
18	?	103497	Some-college	10	Never-married	?	Own-child	White	Female	0	0	30	United-States	<=50K
34	Private	198693	10th	6	Never-married	Other-service	Not-in-family	White	Male	0	0	30	United-States	<=50K
29	?	227026	HS-grad	9	Never-married	?	Unmarried	Black	Male	0	0	40	United-States	<=50K
63	Self-emp-not-inc	104626	Prof-school	15	Married-civ-spouse	Prof-specialty	Husband	White	Male	3103	0	32	United-States	>50K

age	workclass	education	marital_status	occupation	race	gender	hours-per-week	continent	income
25	Private	11th	Never-married	Machine-op-inspct	Black	Male	40	N_America	<=50K
38	Private	HS-grad	Married-civ-spouse	Farming-fishing	White	Male	50	N_America	<=50K
28	Government	Assoc-acdm	Married-civ-spouse	Protective-serv	White	Male	40	N_America	>50K
44	Private	Some-college	Married-civ-spouse	Machine-op-inspct	Black	Male	40	N_America	>50K
34	Private	10th	Never-married	Other-service	White	Male	30	N_America	<=50K

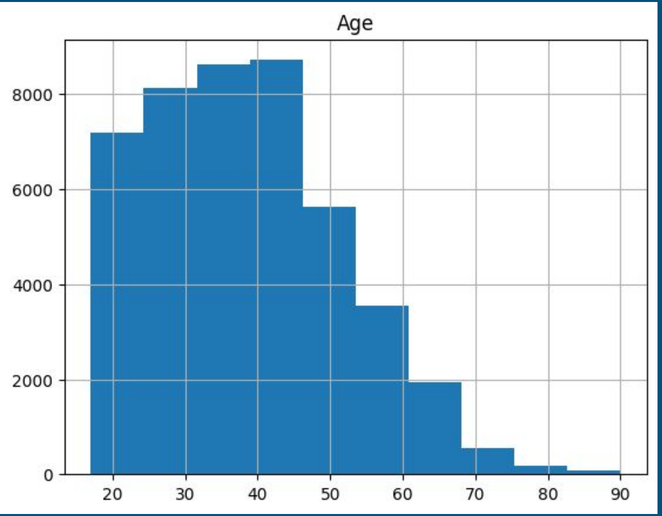


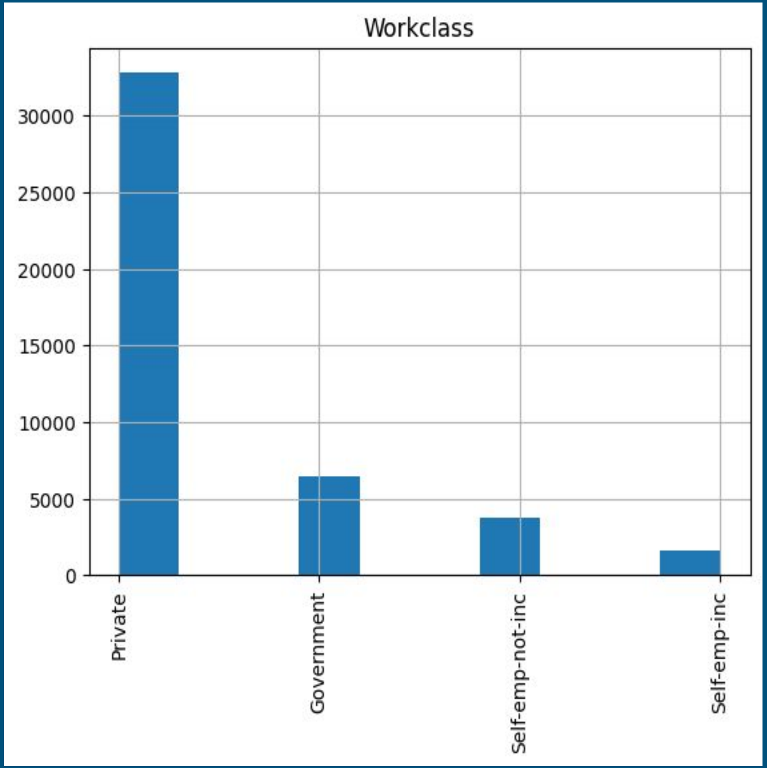
- ABOUT 75% OF ADULTS IN THE DATASET MAKE A SALARY EQUAL OR LESS THAN $50K
- REMAINING 25% MAKE A SALARY GREATER THAN $50K

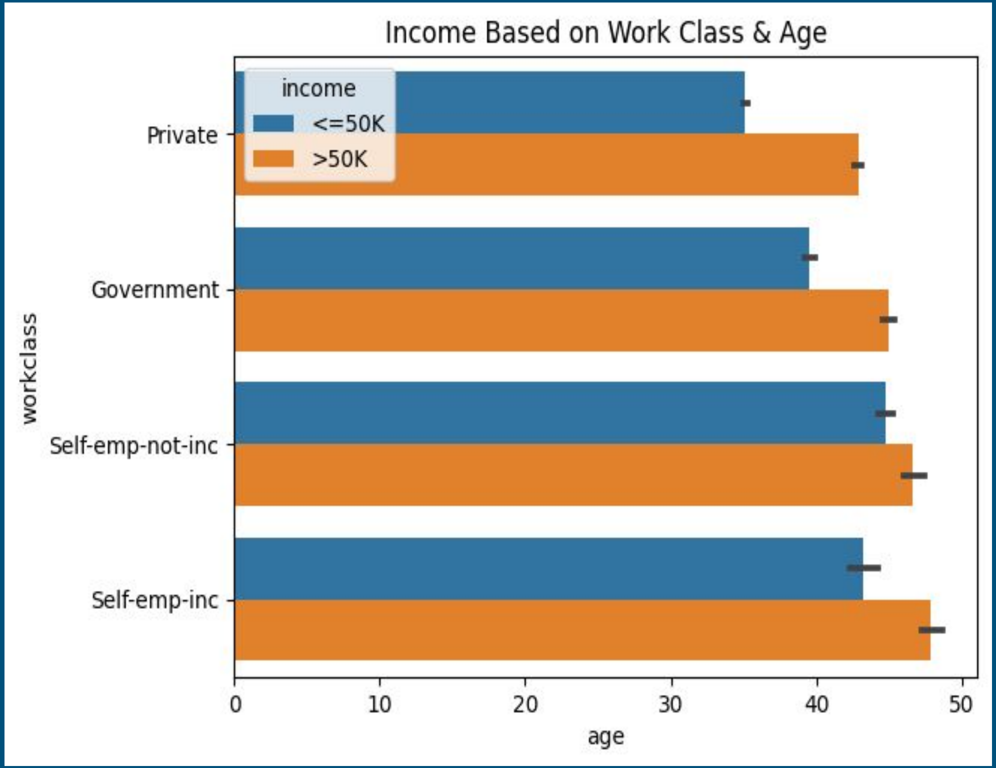
HIGHLY IMBALANCED

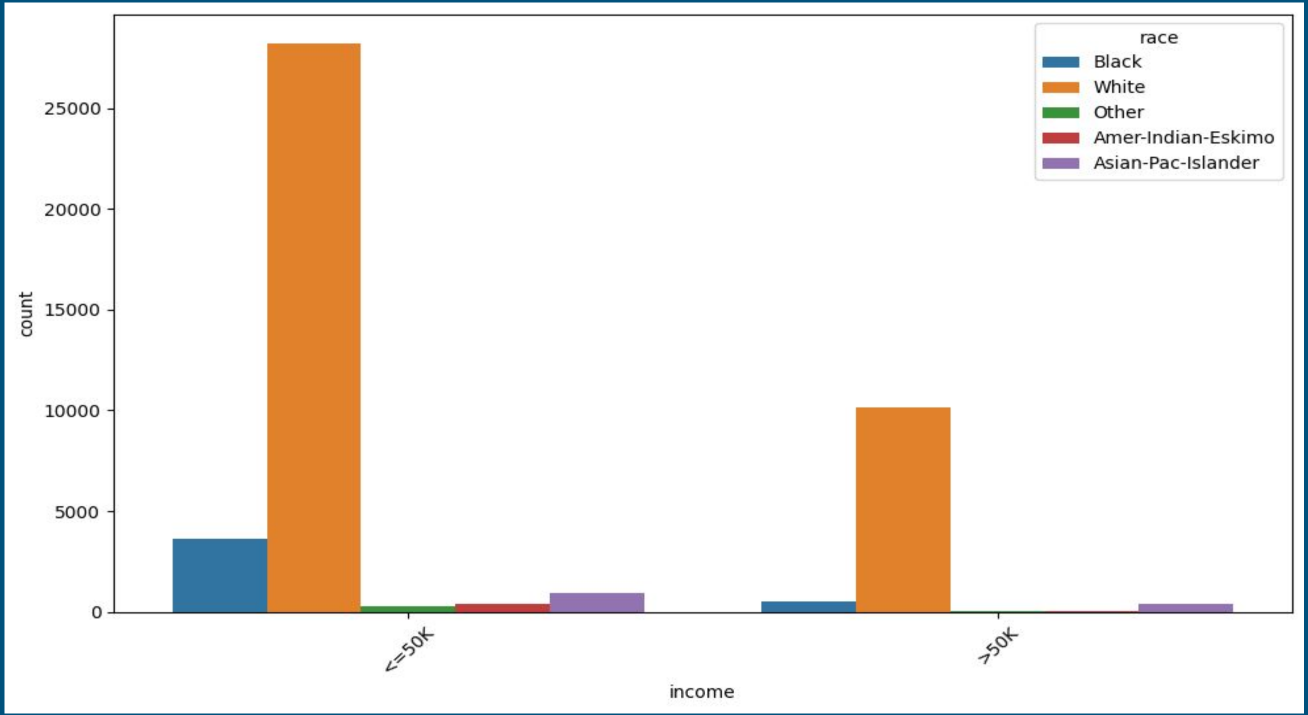
- THE "AGE" FEATURE APPEARS TO HAVE OUTLIERS FROM 47 YEARS OF AGE AND BEYOND 75.

- AGE 37 IS THE MEDIAN IN THE WHOLE DATASET




Workclass
30000
25000
20000
15000
10000
5000
0
Private
Government
Self-emp-not-inc
Self-emp-inc


Income Based on Work Class & Age
income
<=50K
>50K
Private
Government
Self-emp-not-inc
Self-emp-inc
workclass
0
10
20
30
40
50
age

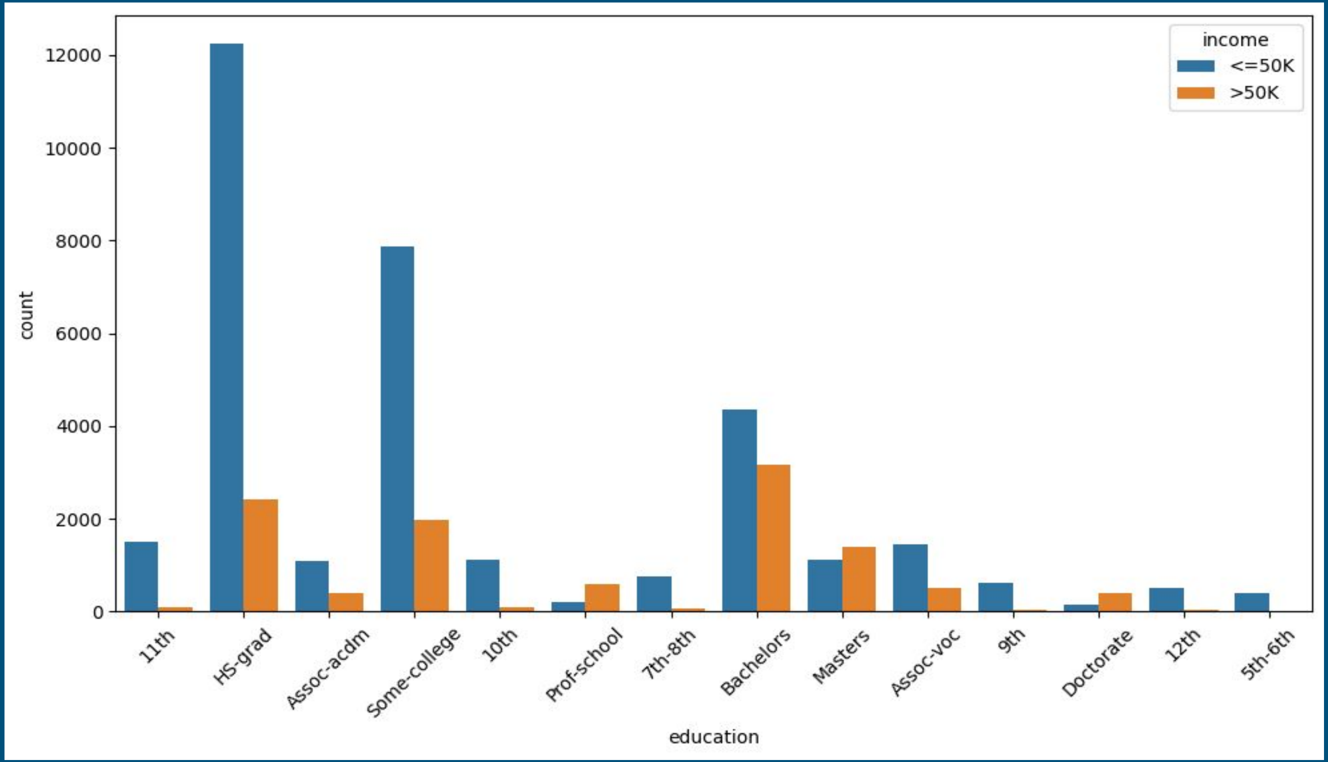


GREAT DISPARITY BETWEEN INCOME & RACE DISTINCTION

NOTABLE INFORMATION

CORRELATION OF INCOME RELATIVE TO EDUCATION

YIELDS SOME INTERESTING TRENDS



MACHINE LEARNING MODELS

	Train Accuracy	Train Recall	Train Precision	Train F1-Score	Test Accuracy	Test Recall	Test Precision	Test F1-Score
KNN Tuned Model	0.850558	0.661957	0.721496	0.690445	0.818223	0.611354	0.636605	0.623724

	Train Accuracy	Train Recall	Train Precision	Train F1-Score	Test Accuracy	Test Recall	Test Precision	Test F1-Score
Random Forest Tuned Model	0.83277	0.5	0.752771	0.600885	0.827459	0.495997	0.716614	0.586237

	Train Accuracy	Train Recall	Train Precision	Train F1-Score	Test Accuracy	Test Recall	Test Precision	Test F1-Score
RF PCA Model	0.959403	0.906792	0.930207	0.91835	0.805668	0.555677	0.617469	0.584945

	Train Accuracy	Train Recall	Train Precision	Train F1-Score	Test Accuracy	Test Recall	Test Precision	Test F1-Score
LREG PCA Model	0.822606	0.539064	0.688714	0.604769	0.823693	0.549491	0.67471	0.605696

	Train Accuracy	Train Recall	Train Precision	Train F1-Score	Test Accuracy	Test Recall	Test Precision	Test F1-Score
LREG Tuned Model	0.826702	0.552007	0.696688	0.615966	0.831316	0.568049	0.692239	0.624026

RECOMMENDATION

- **The Tuned Logistic Regression Model is the best production model for the business problem at hand.**

- **The model accuracy score being the highest at 83% implies it's the highest predictive model with the most number of samples that display out to be in the positive class.**

- **As this is a classification task of whether the income in the sample crosses a threshold of $50k or higher, yes or no, this metric yields the most value with fewer false positives.**