20XX

Adult Income Prediction

Machine Learning Project

Data Exploration and Visualization

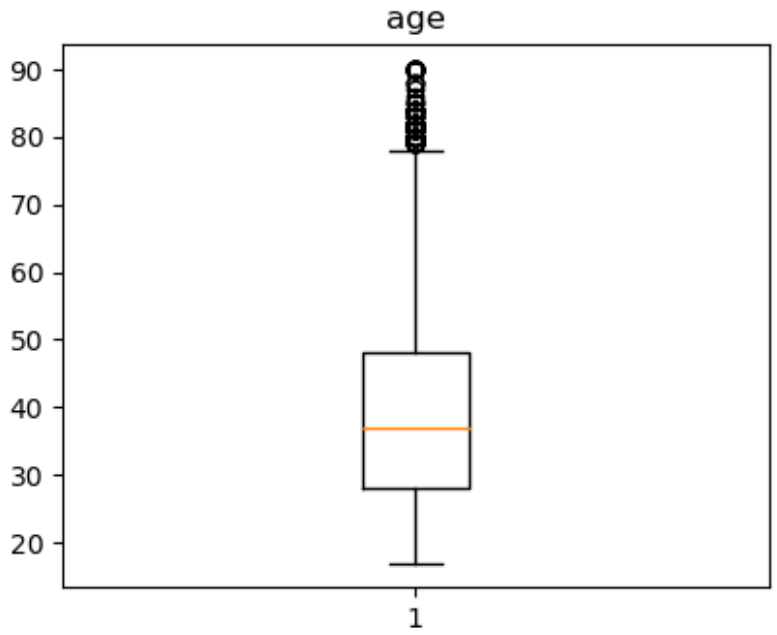
Individuals income if they are below or above a certain threshold (50,000) based on several characteristics

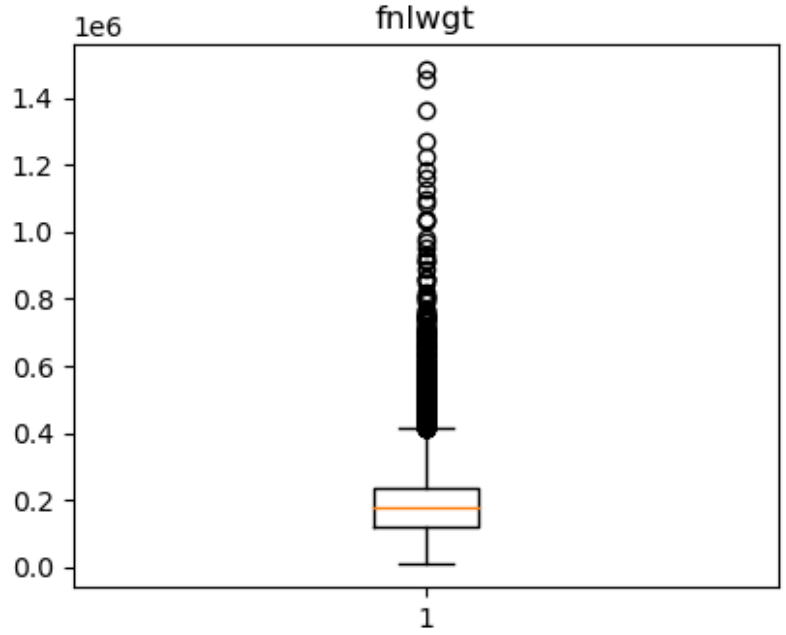
Adult Dataset

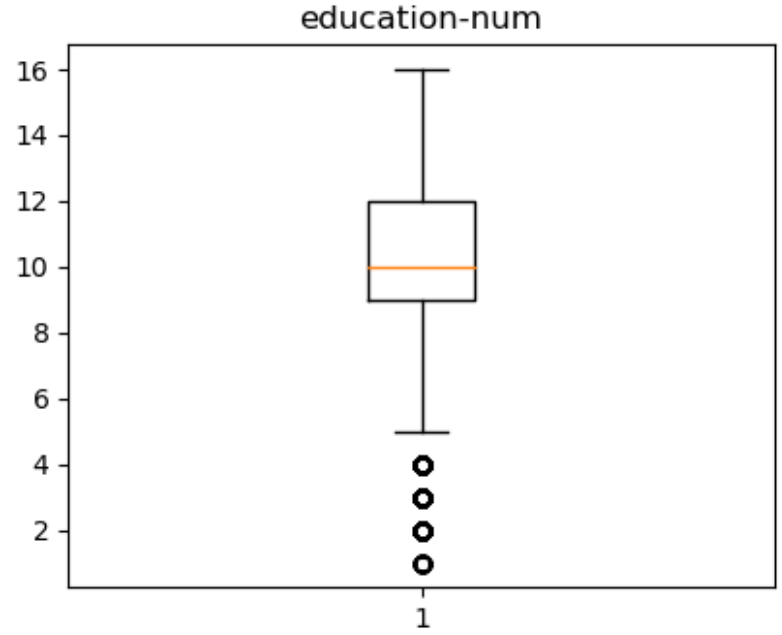
From UCI, about 49000 samples

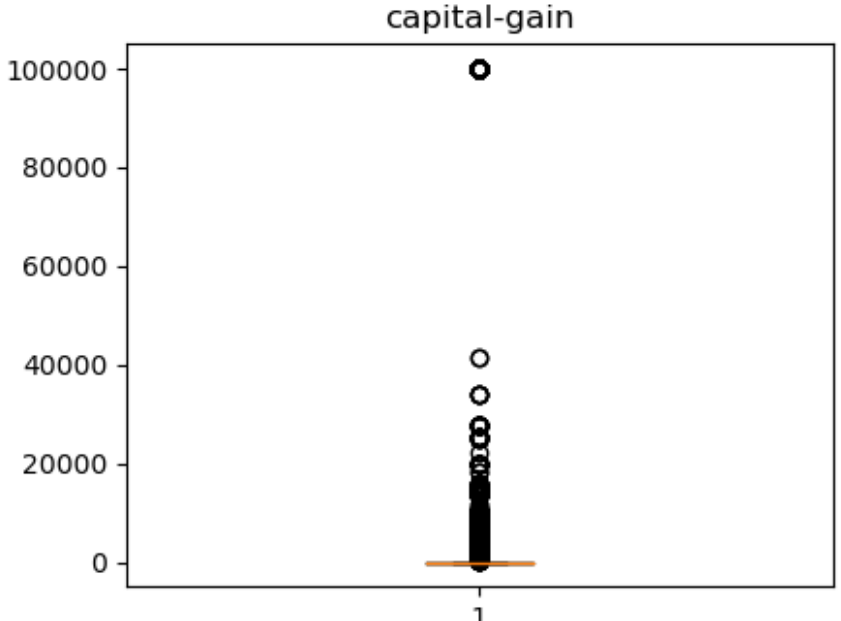
Id	Feature	Type
1	Age	**numeric**
2	workclass	categorical
3	fnlwgt	**numeric**
4	education	categorical
5	education_num	**numeric**
6	martial_status	categorical
7	occupation	categorical
8	relationship	categorical
9	race	categorical
10	sex	categorical
11	capital_gain	**numeric**
12	capital_loss	**numeric**
13	hours_per_week	**numeric**
14	native country	categorical

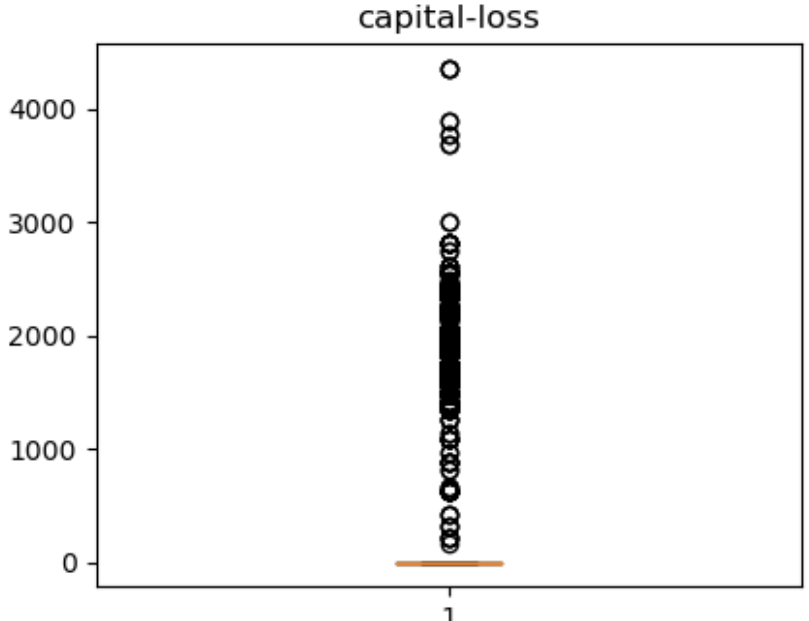
Boxplot for Numerical

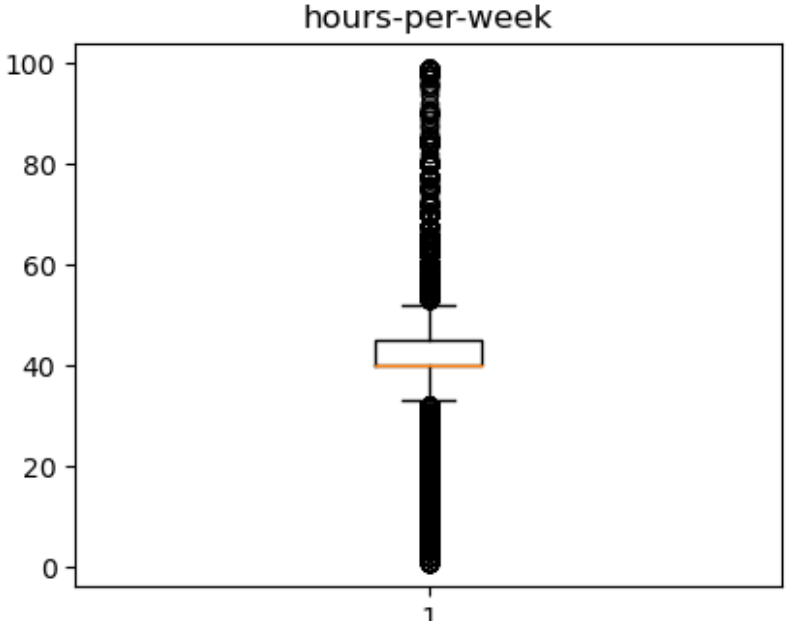




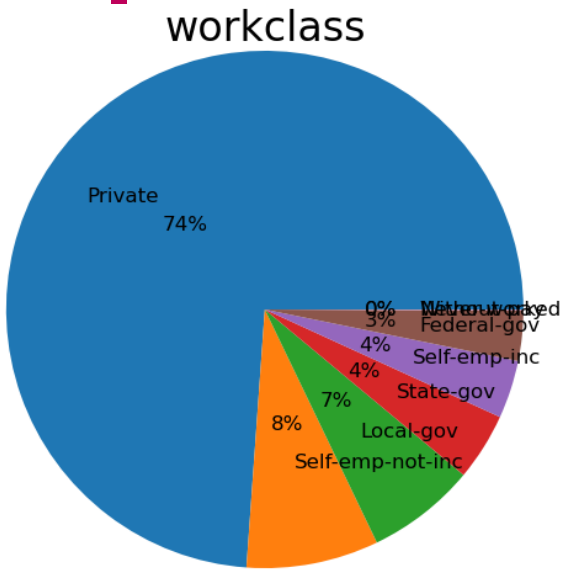


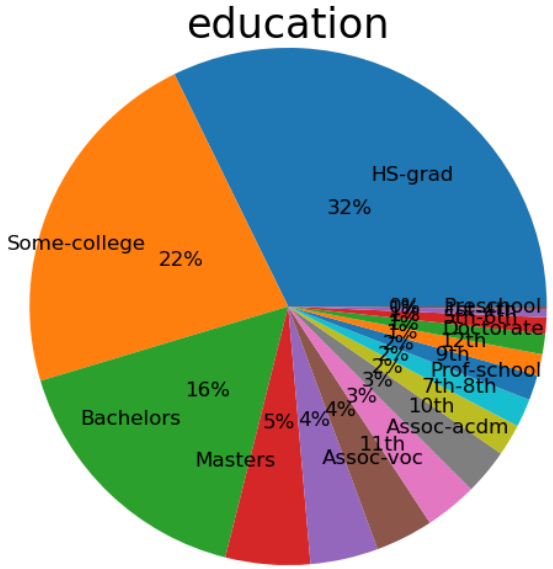


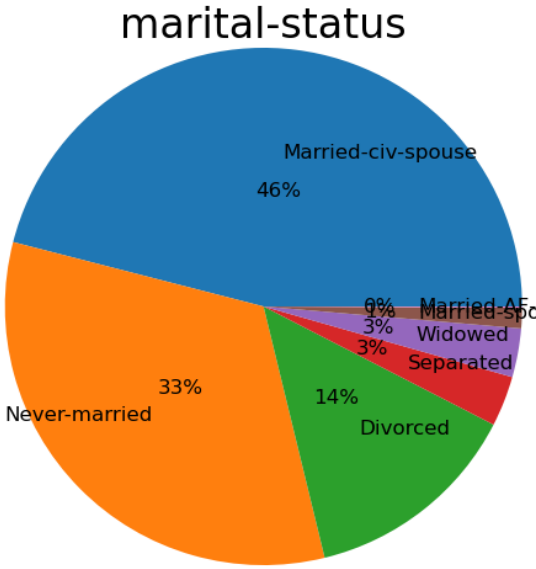


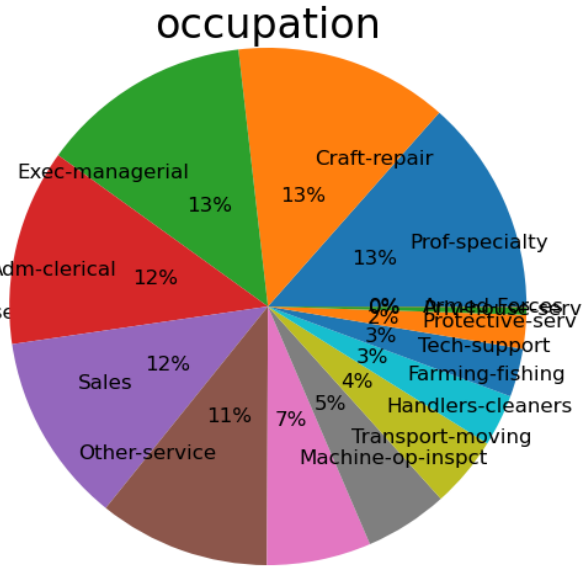


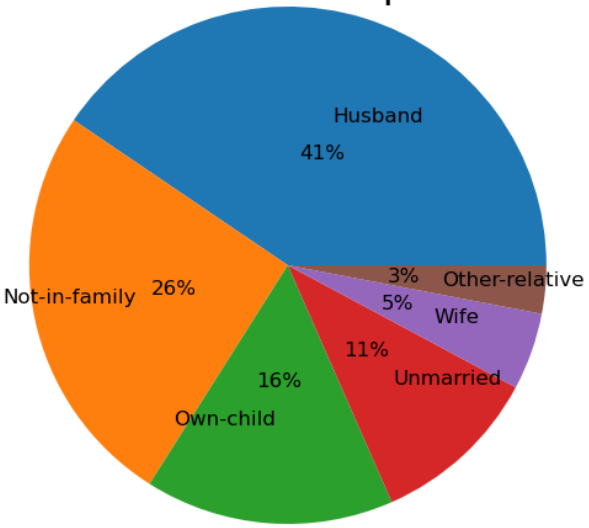
Pie Chart for Categorical

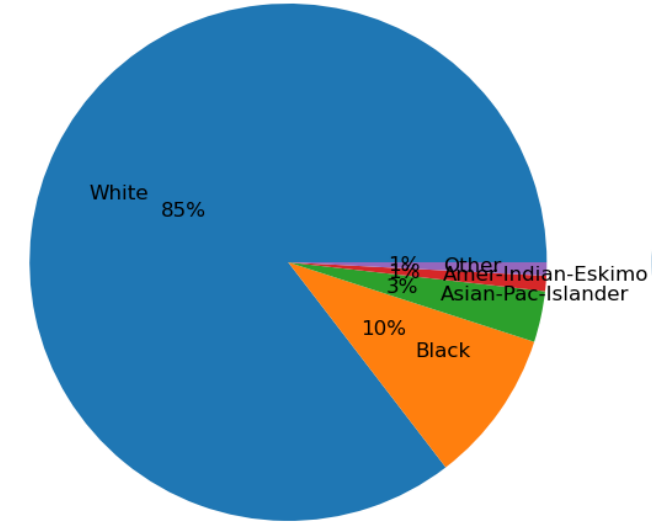


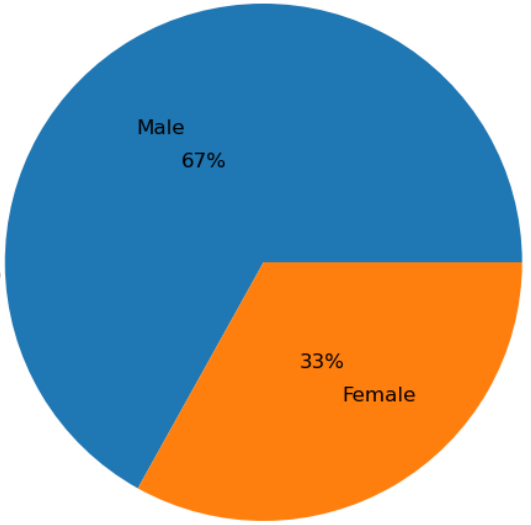


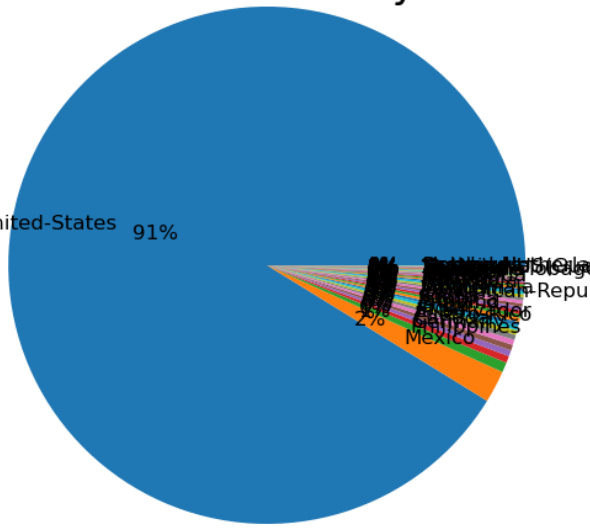






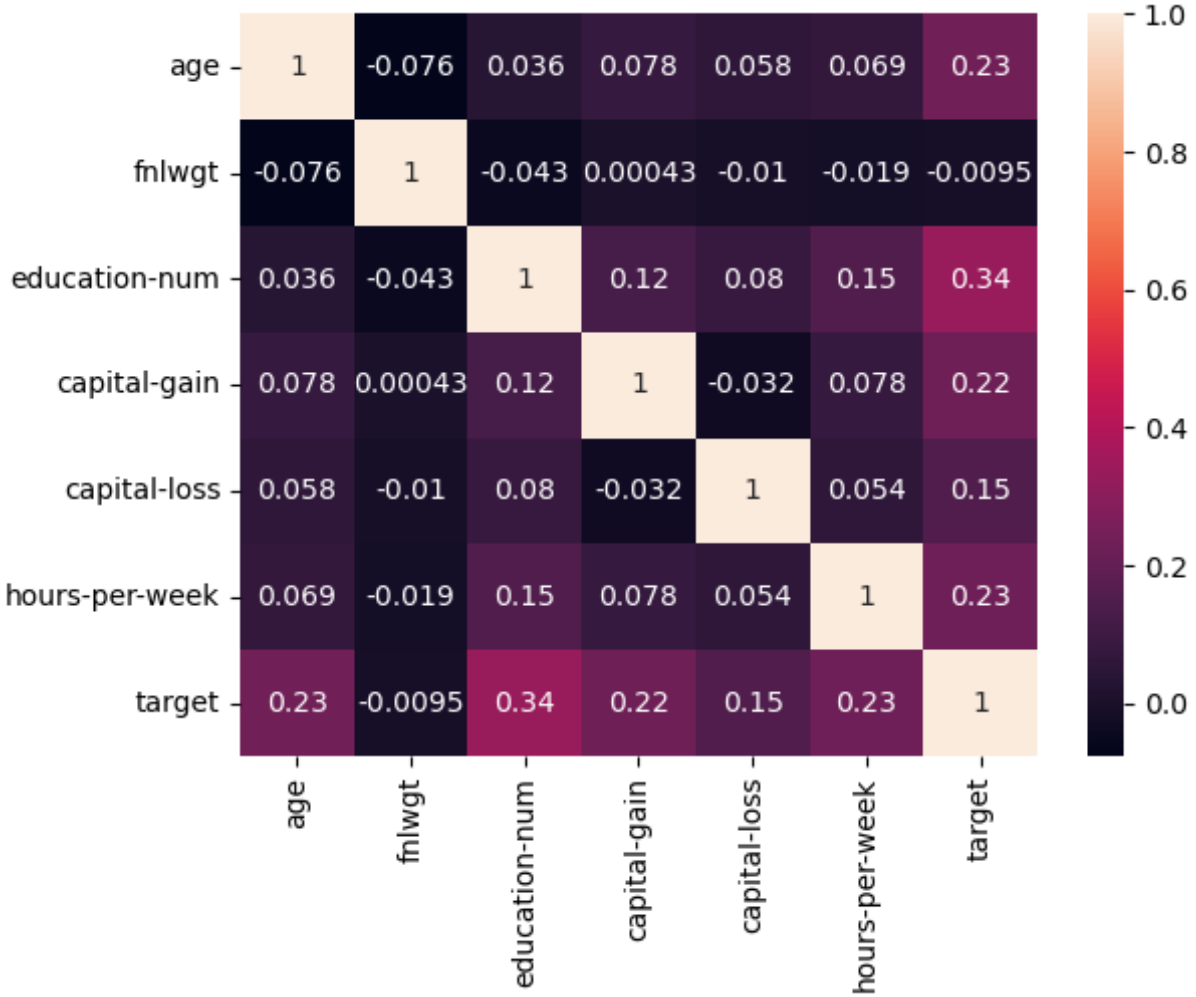






Data Mining

Correlations



Correlations for Numerical and Target

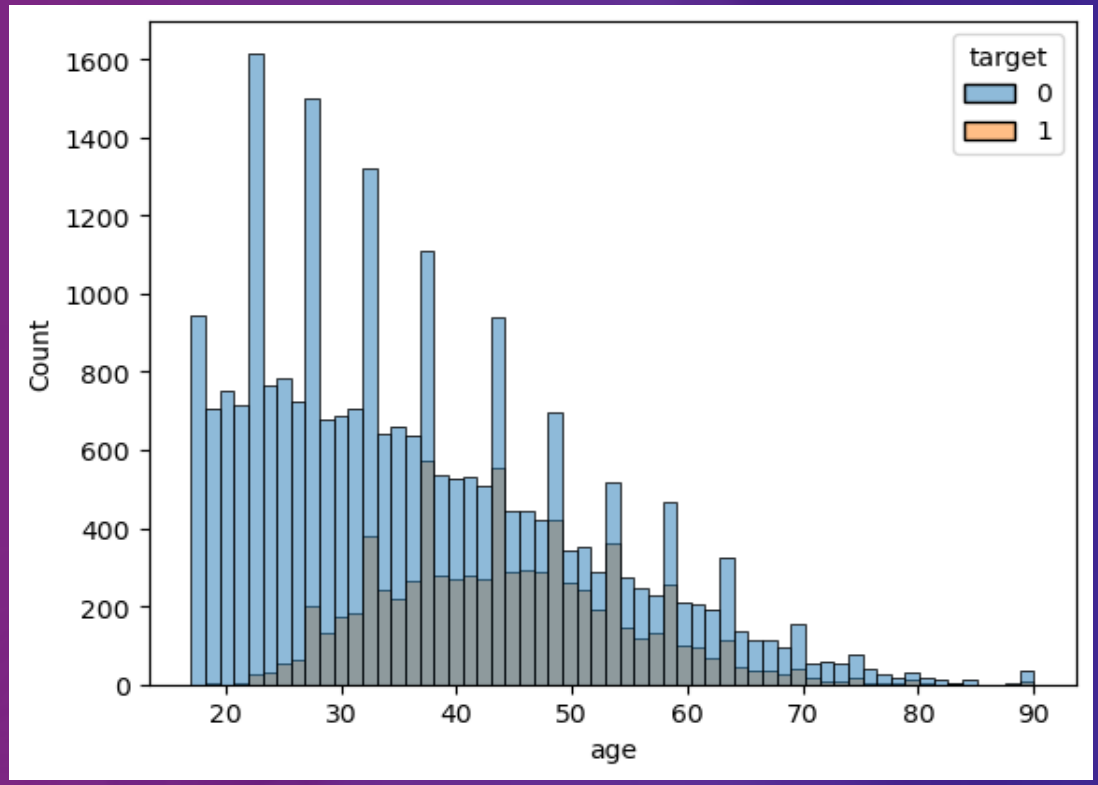
- numerical features have low correlation with each other.
- the fnlwgt feature has low correlation with the target.

Aage Feature

Explanation

when age increase, incom does. so there is a positive relatrion between age and target.

Histogram

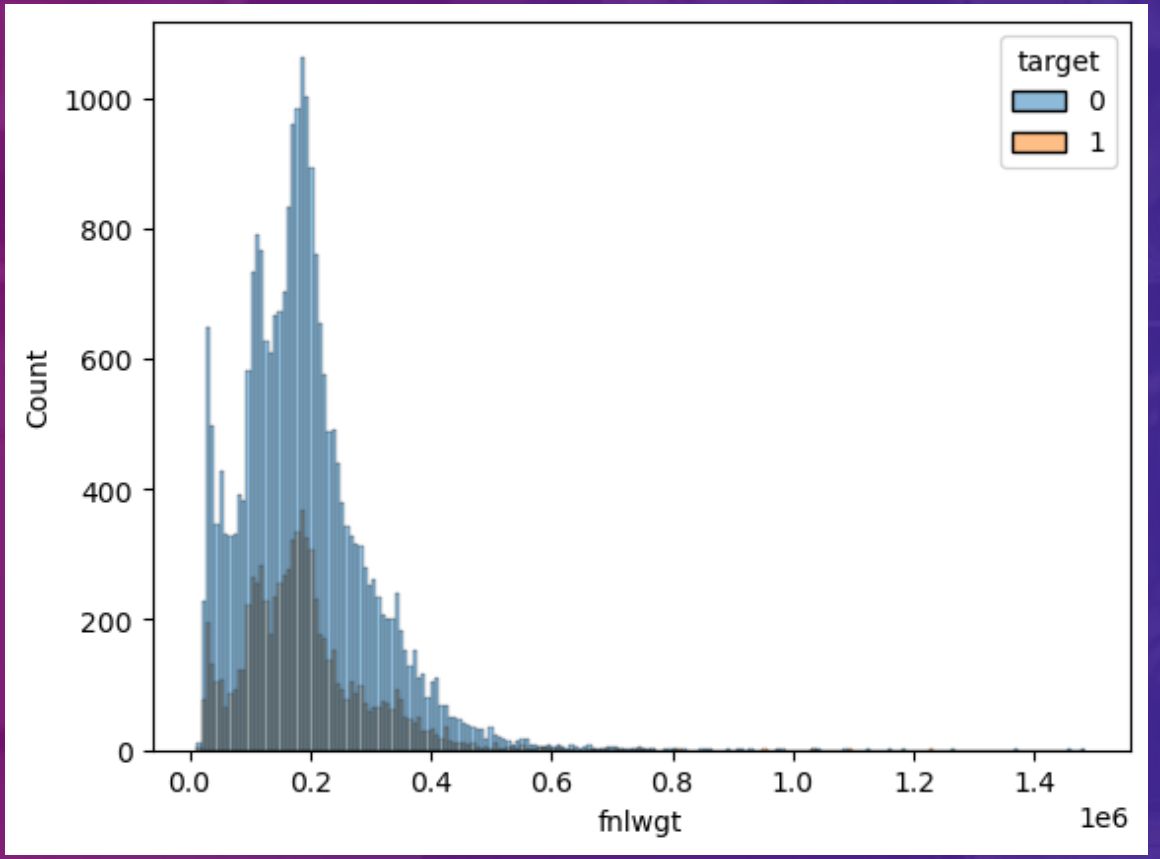


Final Weight

Explanation

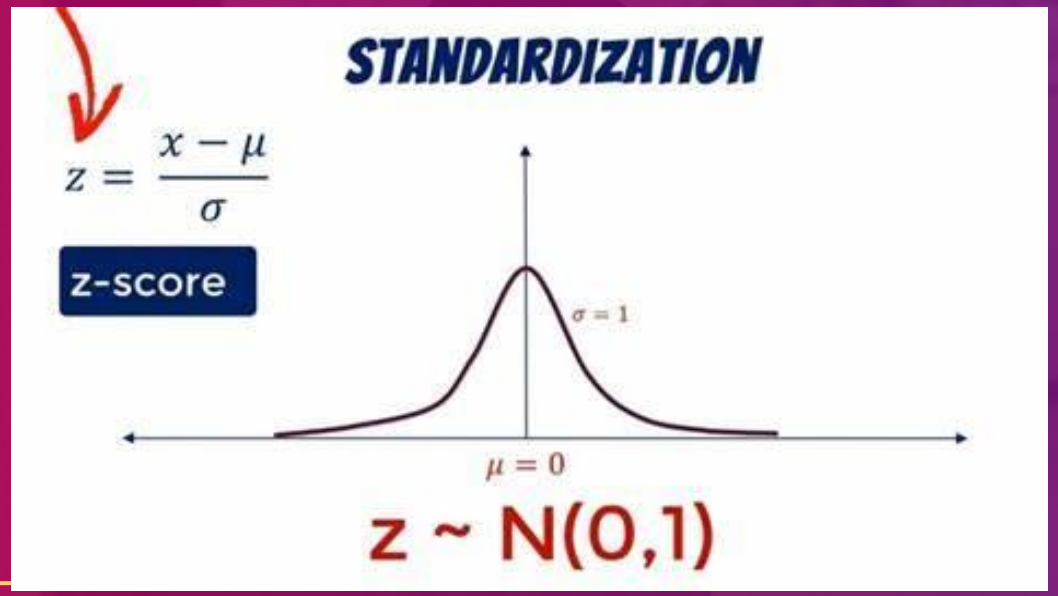
fnlwgt has similar variance for target classes which means it is not useful to make prediction.

Fraction = 1.07817

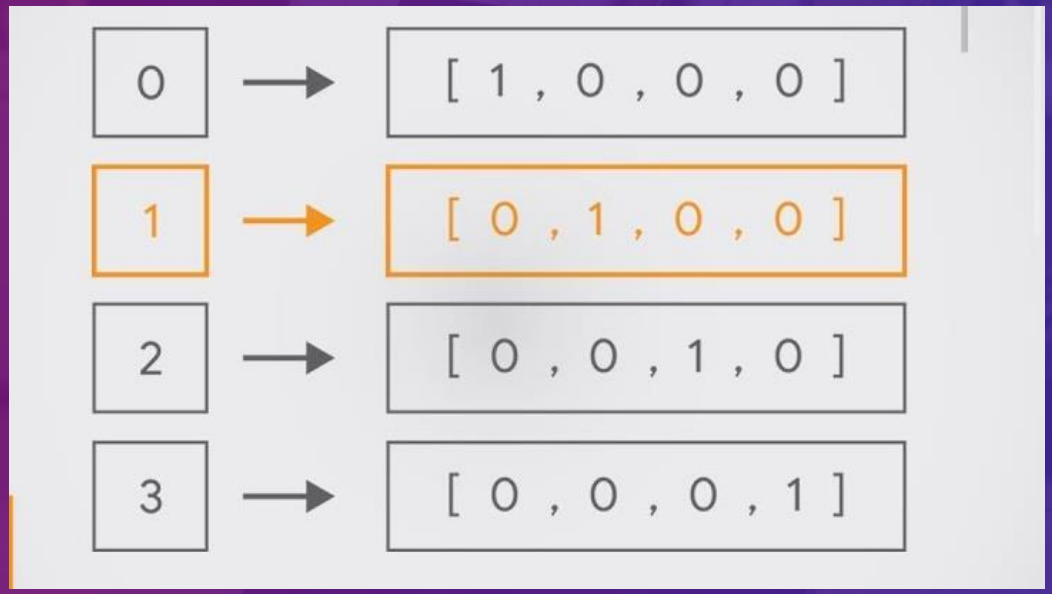


Preprocessing

Z-score scaling

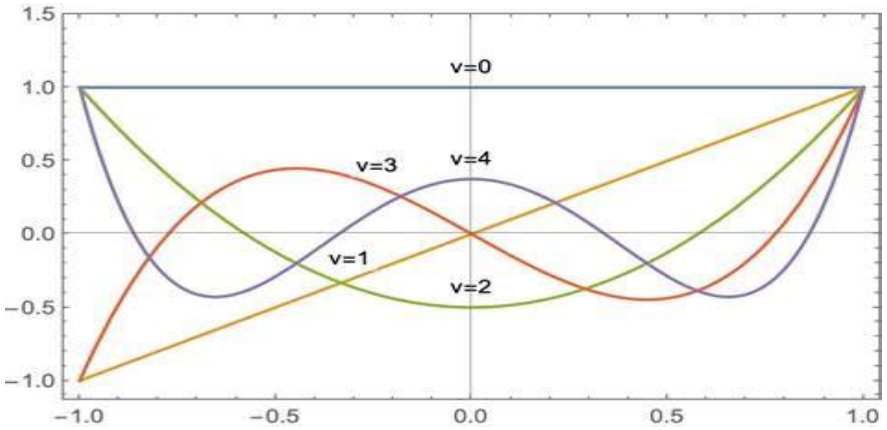


One Hot Encoding

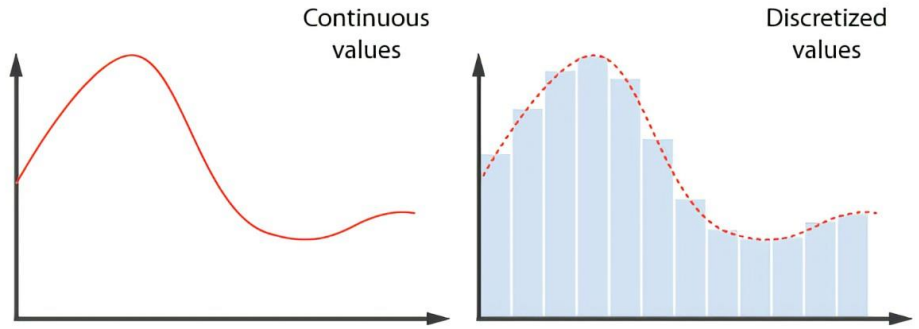


Feature Extraction

Polynomial features



Discretization continuous features



Training

Experiments

Considering AUC for Optimization

Model	accuracy	ROC
Dummy classifier	75%	-
Logistic regression	85%	0.911
K-nearest neighbor	85%	0.905
Decision tree	85%	0.896
AdaBoost	86.7%	0.926
Gradient Boosting	86.7%	0.929

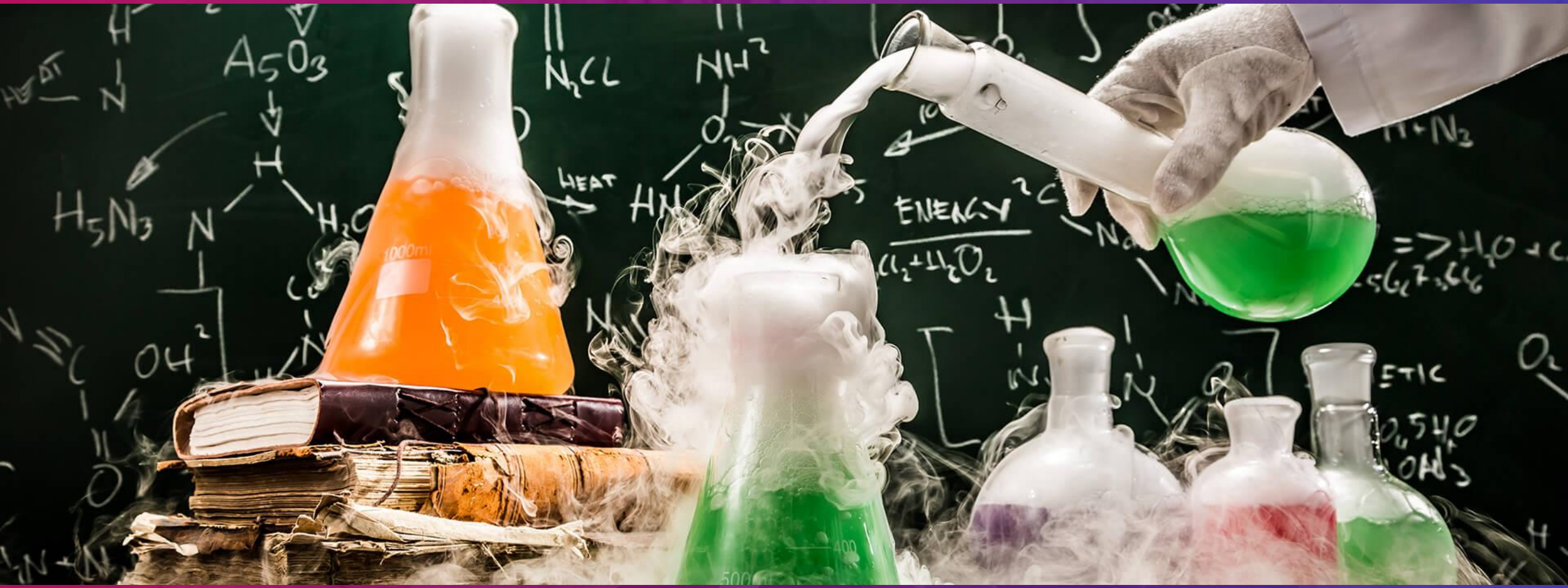
The Best Model

Gradient Boost Classifier

The best model with the highest accuracy and generalization is GBoost with a maximum depth of 4 and a number of estimators equal to 250.

AdaBoost model also achieved similar results.

Testing

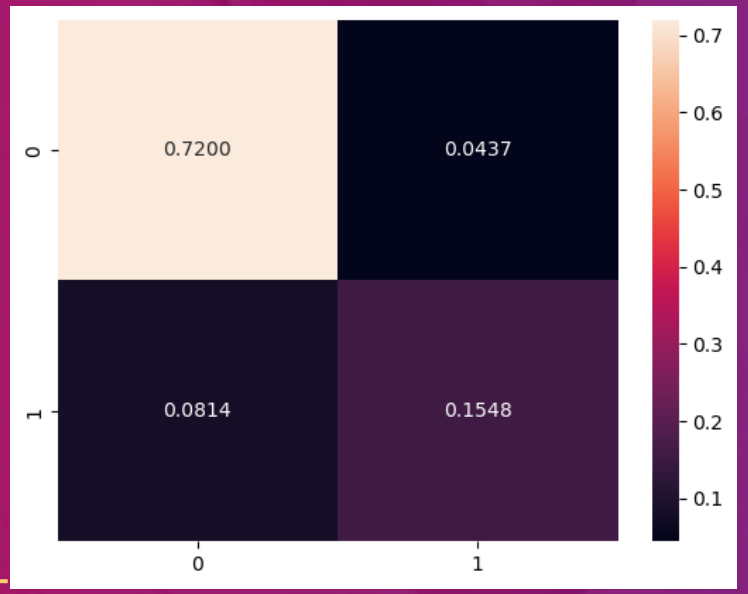


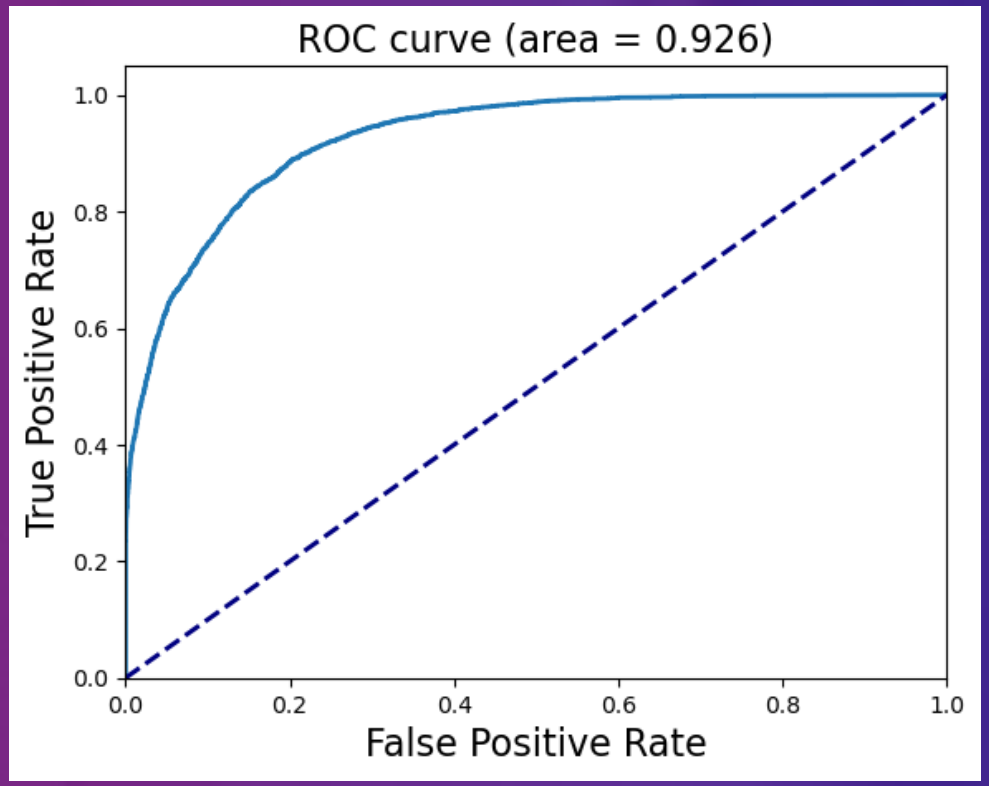
accuracy	recall	precision	auc
0.87488483	0.65548621	0.77977111	**0.92619429**

Testing Scores

ROC Curve

Confusion Matrix





20XX

THANK YOU!

ML Godfather