

LISBON

Real Estate Investment

Miho Hunter • June 15th 2022

Portugal Golden Visa

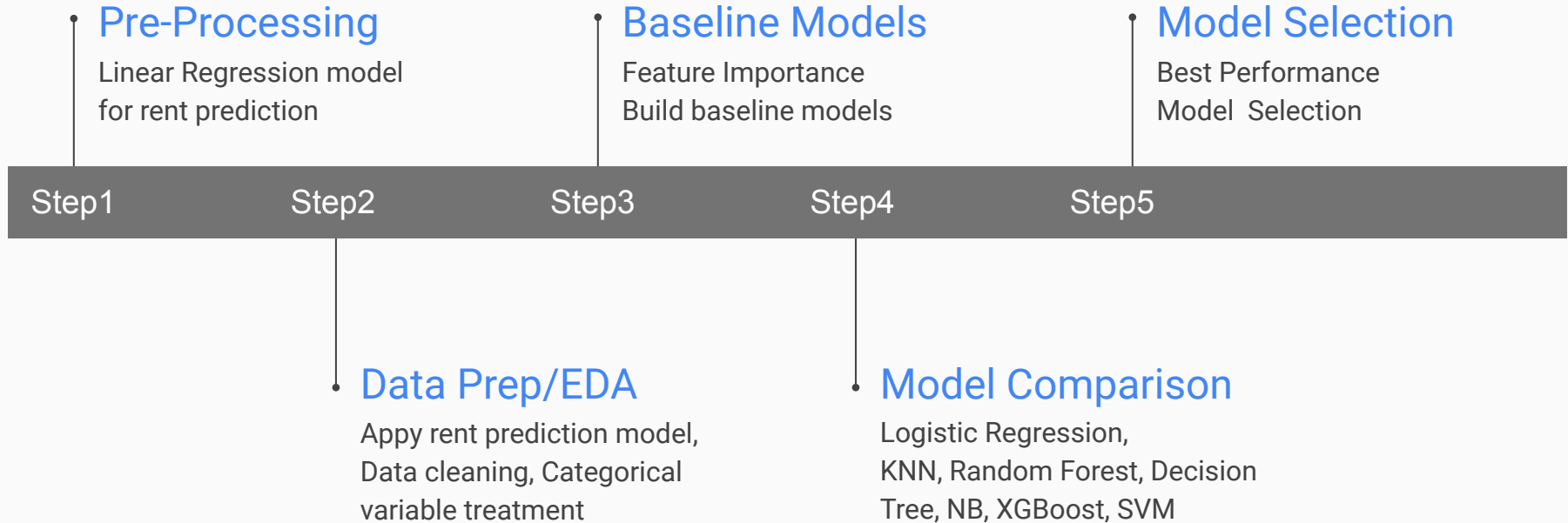
Qualify for residency
by investing €500,000
in real estate

A photograph of a narrow street in Lisbon, Portugal. A yellow tram is traveling away from the viewer on tracks. The street is lined with historic buildings, some with blue balconies. In the background, a church tower with a crenellated top is visible. The image is overlaid with a semi-transparent blue rectangle on the right side.

Question

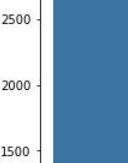
How do we identify a good property to invest in?

Methodology





Target: Rent Price



Good Property	Count
0	2800
1	2300

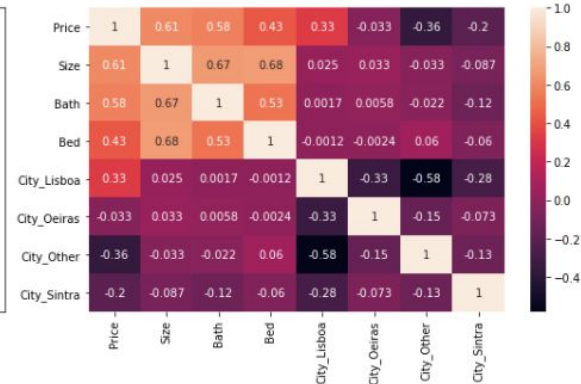
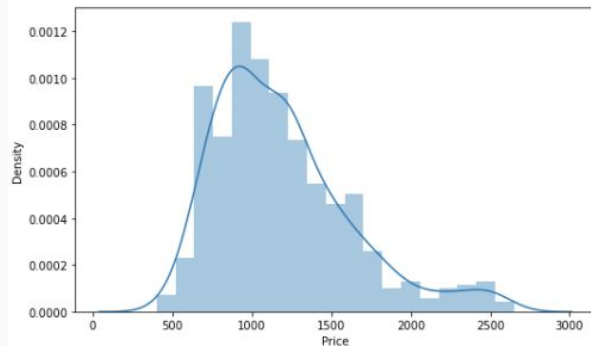
Target: Good for investment(1) or No(0)

30 year 4% fixed rate mortgage,
2% for property tax, insurance, and maintenance,
Good investment if less than €300 monthly expense

Rent Prediction

REGRESSION EQUATION

Rent = 451.24
+ 5.51 'size'
+ 169.34 'bath'
+ 29.12 'bed'
- 47.24 'if in_lisbon'
- 191.38 'if in Oeiras'
- 315.56 'if in Sintra'
- 369.66 'if in City
other than Cascais'



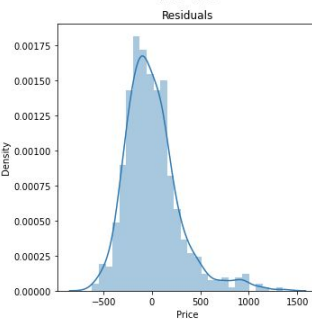
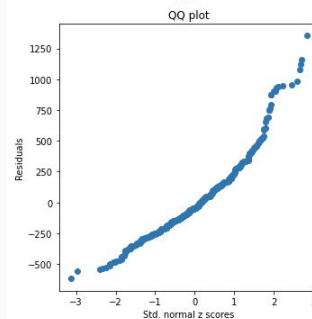
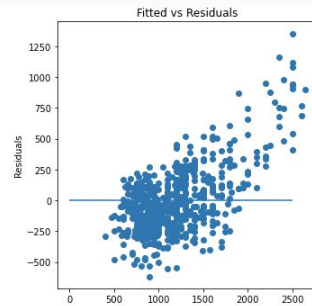
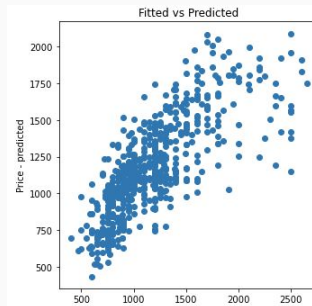
Features:

Size, #baths, #beds,
City (Lisbon, Oeiras,
Sintra, Other)

Final LR model:

MAE: 187.25

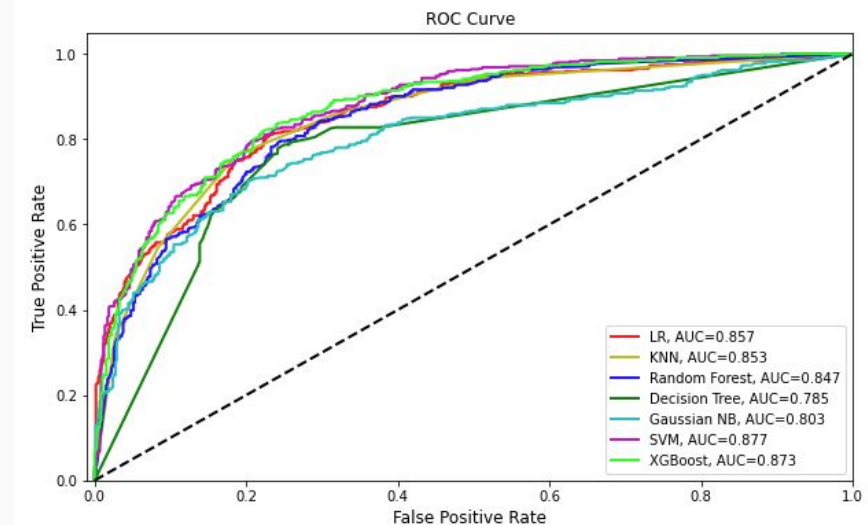
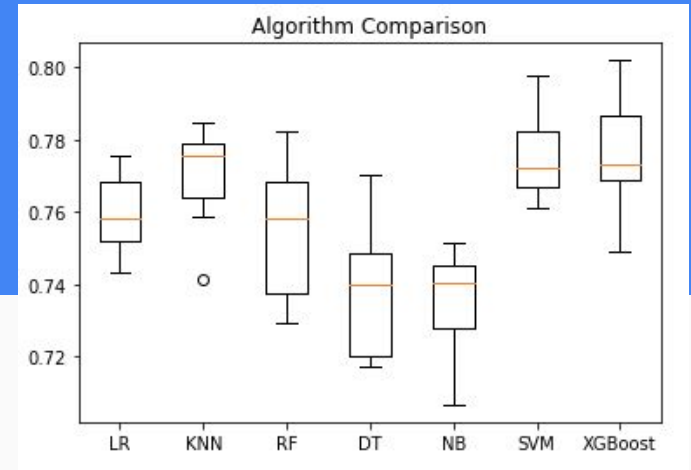
$R^2 = 0.61$



Baseline Model Comparison

Model	Train Accuracy	Test Accuracy	Precision	Recall	F1
LR	0.756	0.769	0.767	0.757	0.760
KNN	0.771	0.791	0.787	0.788	0.787
Random Forest	0.759	0.766	0.761	0.760	0.761
Dec Tree	0.747	0.755	0.751	0.747	0.748
Gaussian NB	0.735	0.749	0.749	0.735	0.738
SVM	0.774	0.790	0.787	0.783	0.785
XGBoost	0.784	0.794	0.791	0.788	0.789

XGBoost has the highest scores ➡ **OPTIMIZE**

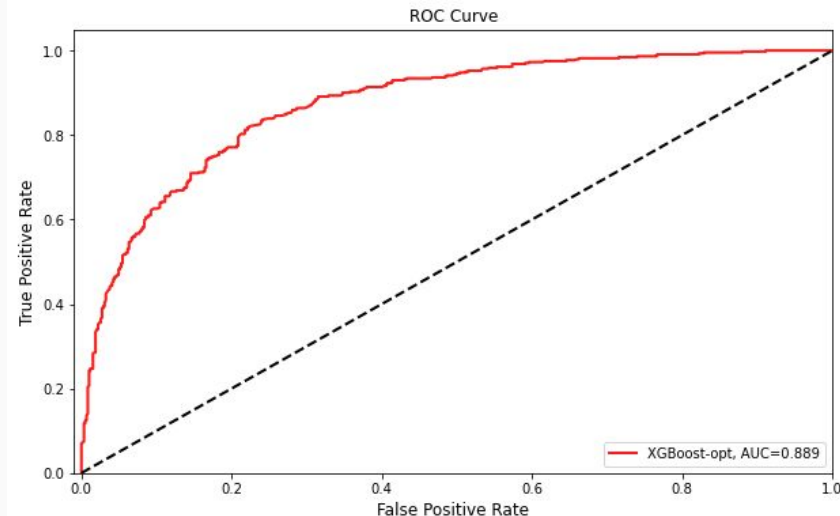
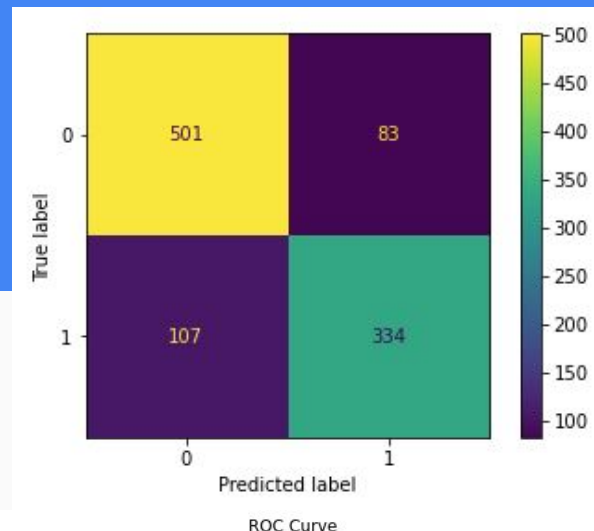


BEST Performance Model

Optimized XGBoost

6 parameters were tuned by Grid Search

Model	Train Accuracy	Test Accuracy	Precision	Recall	F1
XGBoost	0.784	0.794	0.791	0.788	0.789
XGBoost-opt	0.788	0.815	0.812	0.808	0.810



Future Studies

- Need more accurate rent prediction model
- More features
(e.g. year built, parking yes/no, elevator yes/no, floor, neighborhood info)



Thank you!

Miho Hunter

