Predicting Successful Bank Campaign

Anastasia Kharina
Sisay Filate

October 2019

Objective:

Will a customer subscribe to a term deposit offered via phone calls?

Data & Context

41,176 Observation

14 features

Customer Data:

- Job
- Marital Status
- Education
- Age
- Whether they have loans (mortgage, etc)

Call Data:

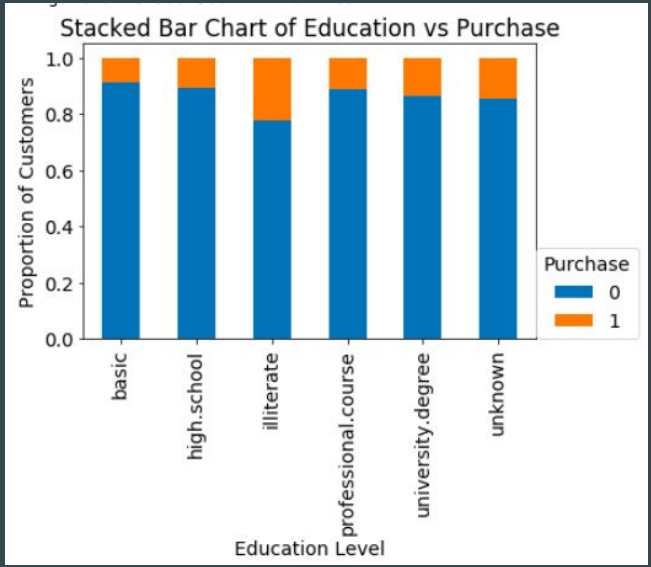
- Day of the Week
- Month of the Year
- Days after last call
- Number of calls for campaign

S. Moro, P. Cortez and P. Rita. A Data-Driven Approach to Predict the Success of Bank Telemarketing. Decision Support Systems, Elsevier, 62:22-31, June 2014

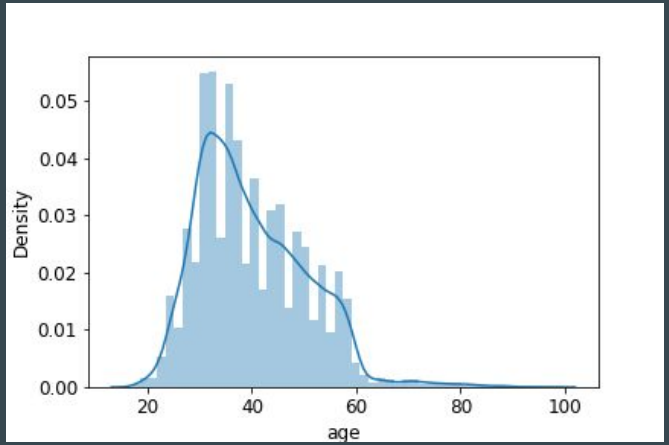
(UCI Machine Learning Repository - Bank Marketing Data Set)

Data Exploration

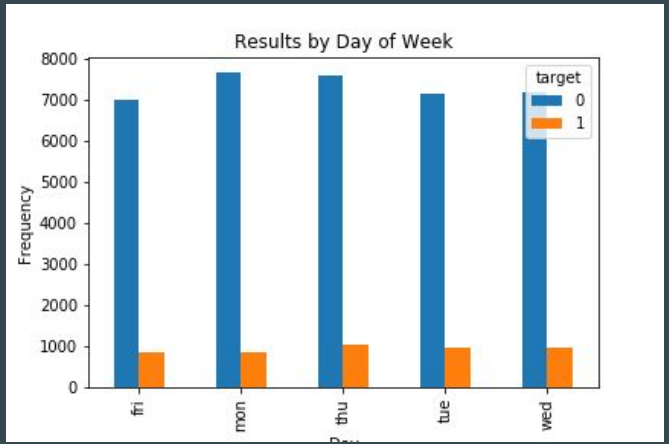
Subscription by education level



Age distribution

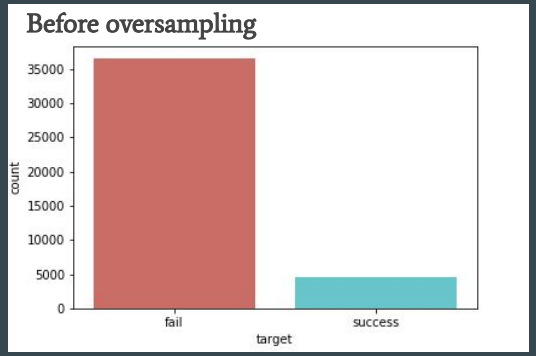


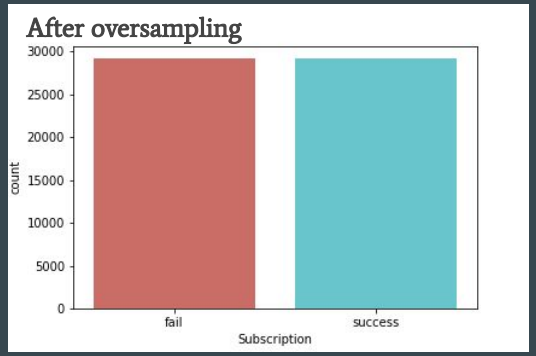
Subscription by Day of the Week



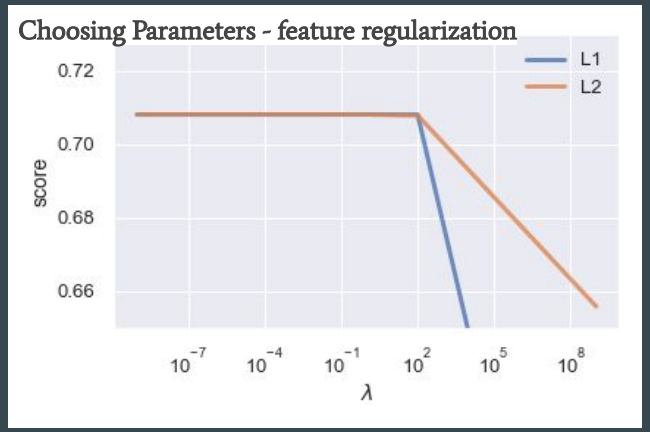
Logistic Regression Process

1. Synthetic Minority Oversampling Technique (SMOTE)





2. Choosing Parameters with K-Fold CV

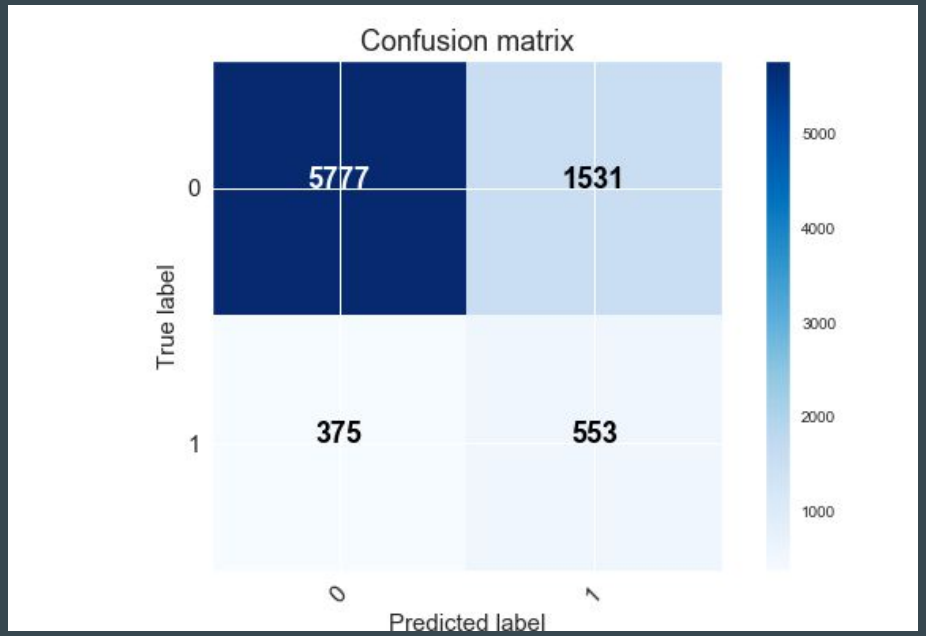


3. Optimizing Threshold

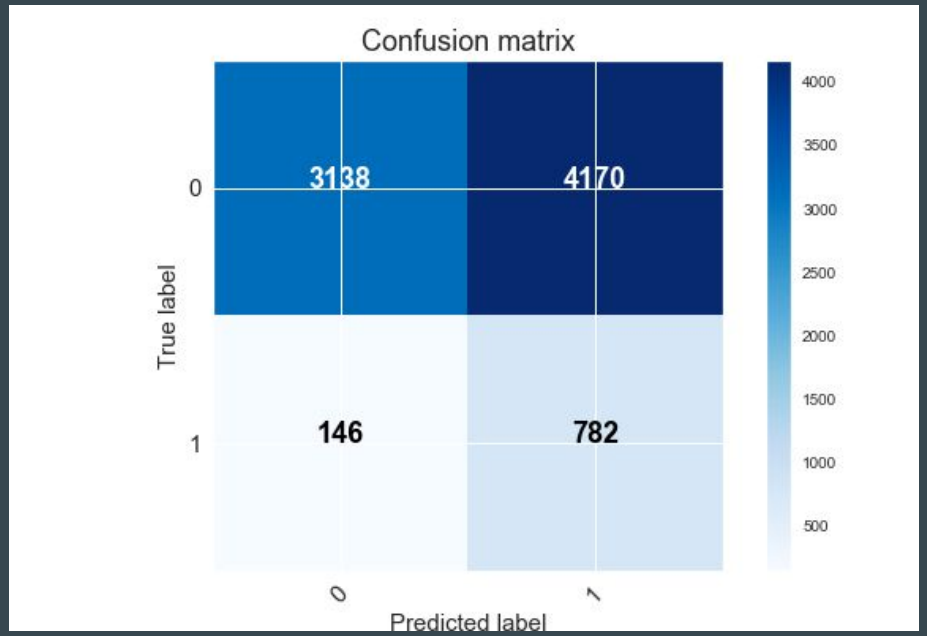
Modeling Results -1

	Threshold = 0.5	Threshold = 0.34
Score	0.769	0.769
Precision	0.265	0.158
Recall	0.596	0.843
Accuracy	0.265	0.158
F1-Score	0.367	0.266

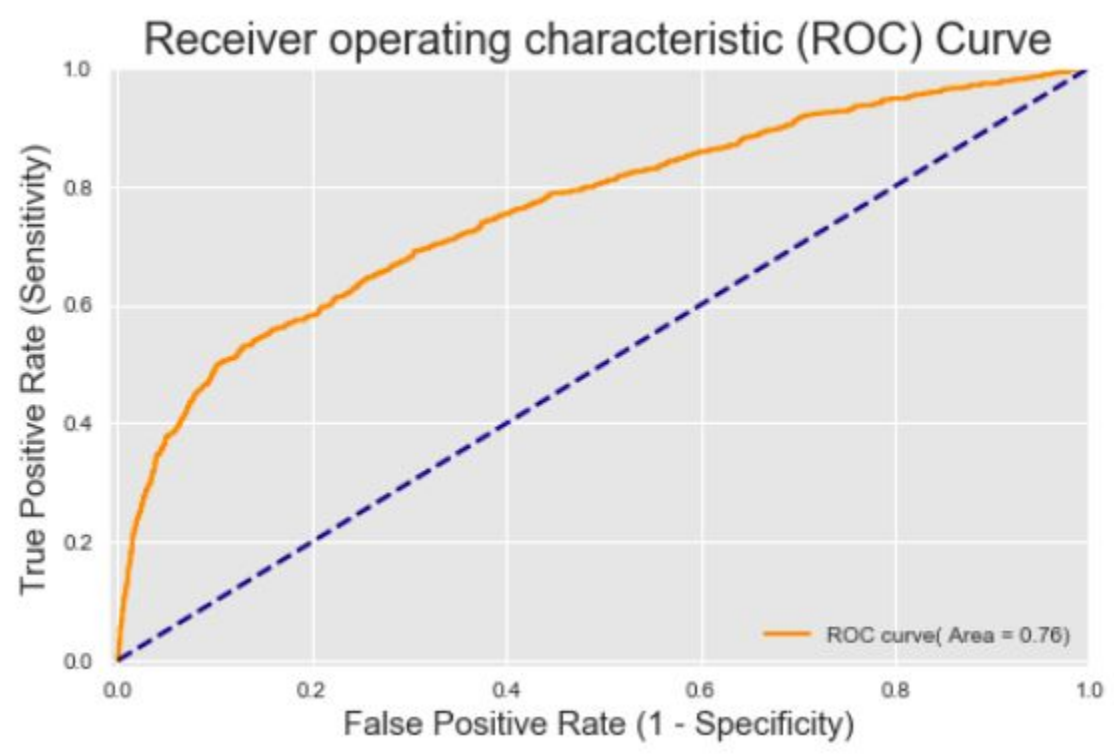
Threshold = 0.5



Threshold = 0.34



Modeling Result -2 : ROC Curve



Future Work

1. Investigate driving predictors
2. Try other prediction models (e.g. KNN, Random Forest, etc)

Additional Slides

Metric Scores

	Not-oversampled	Oversampled (SMOTE)	Undersampled	RFE-data
Score	0.803	0.708	0.701	0.694
Precision	0.302	0.754	0.767	0.745
Recall	0.572	0.617	0.578	0.591
Accuracy	0.302	0.754	0.767	0.745
F1-Score	0.395	0.679	0.659	0.569

k-Fold Cross Validation

Logistic regression with the three different regularizations

	Mean [train, validation]	Standard Deviation [train, validation]
Vanilla	0.70825, 0.70741	0.00044, 0.00296
Ridge (l2)	0.70826, 0.70748	0.00046, 0.00290
Lasso (l1)	0.70825, 0.70741	0.00044, 0.00296

CM with Threshold = 0.55

	Threshold = 0.5	Threshold = 0.55
Score	0.769	0.769
Precision	0.265	0.331
Recall	0.596	0.533
Accuracy	0.265	0.331
F1-Score	0.367	0.409