Telemarketing Effectiveness for Banking Institutions

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Outline

Background

THE DATA IS RELATED TO TELEMARKETING CAMPAIGNS (PHONE CALLS) OF A PORTUGUESE BANKING INSTITUTION.

- Telemarketing require huge investment as large call centers are hired to execute these campaigns

- The marketing campaigns were based on phone calls to sell term deposits

- The datasets contain data about bank clients that has been subscribed ('yes') or not ('no') to the bank's term deposit because of the telemarketing.

THE ORIGINAL DATASETS CONTAINS 3 MAIN TYPES OF FEATURES

Client Personal Data

Age
Job
Marital
Education
Balance
Housing
Loan

Last Contact of the Telemarketer

Contact
Day
Month
Duration

Other Attributes

Campaign
Pdays
Previous
Poutcome

Questions

Which type of customers that will subscribe to the bank' term deposit because of the telemarketing?

What are the factors for a telemarketing campaign to be successful?

How do we predict whether a client will subscribe to a term deposit by telemarketing?
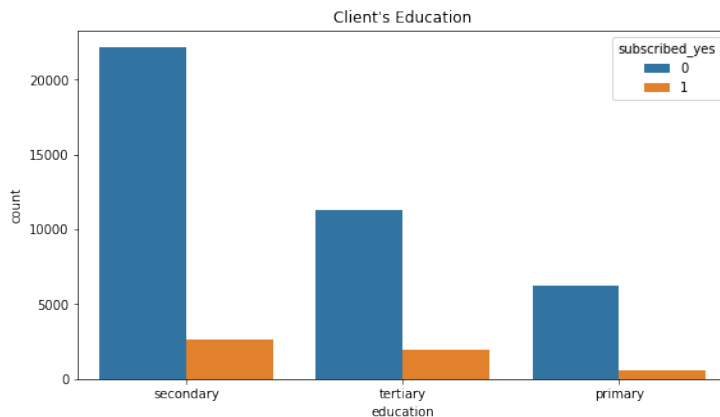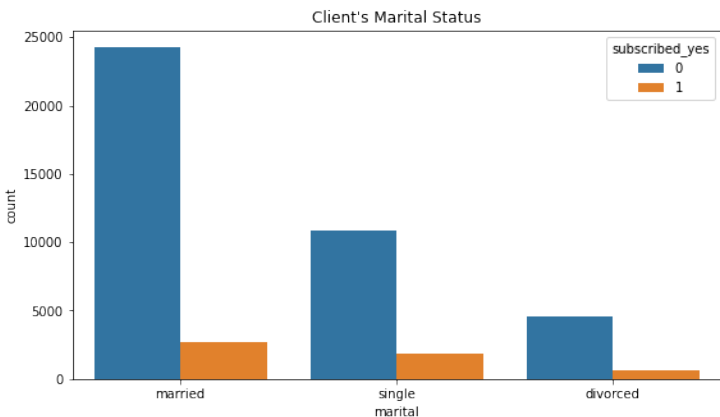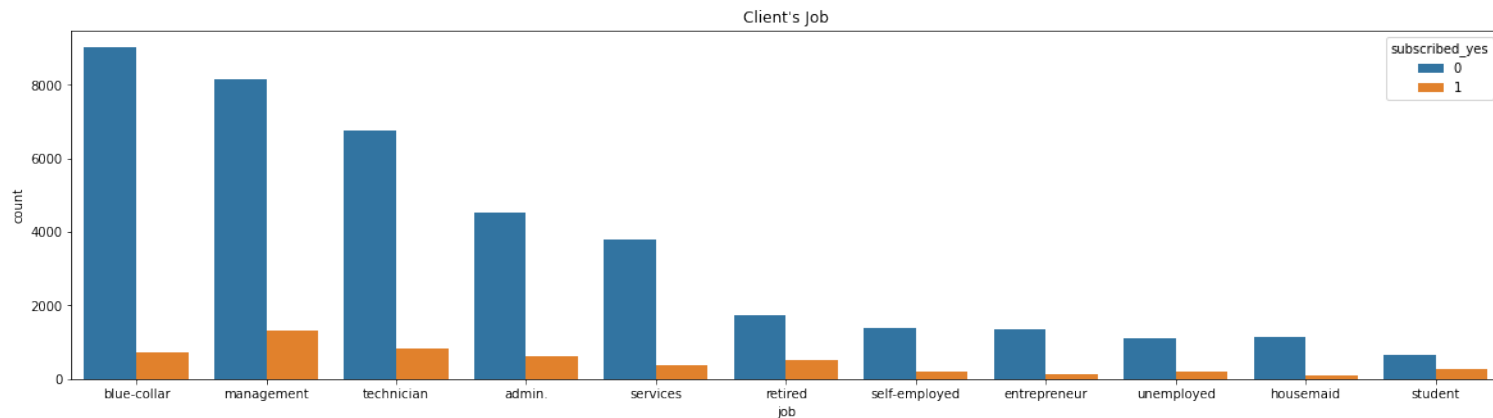
Data Features and Analysis

Most of the people reject the subscription offer in the first 2 minutes. The mostly targeted and accepting clients are aged between 30-50 years old. Other numerical features aren't too useful
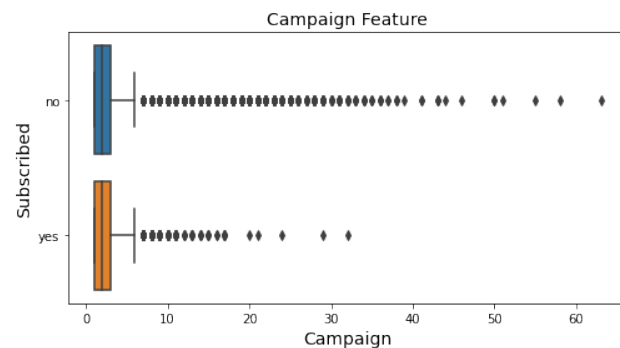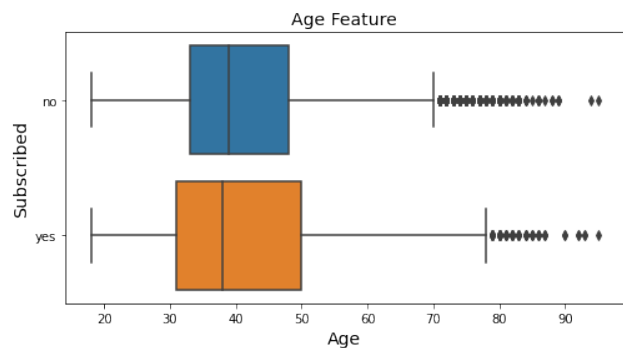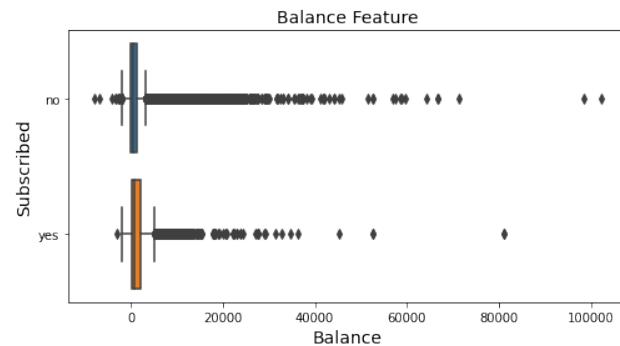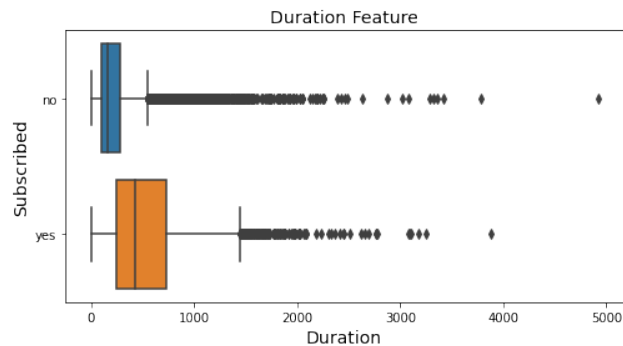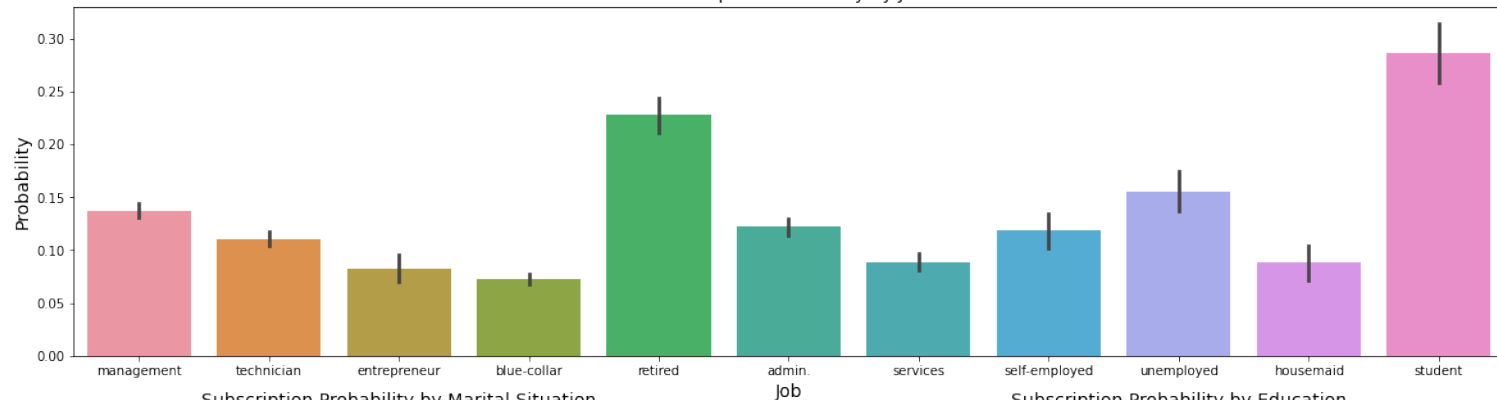
Most clients have professional jobs. Proportional to the sample, more married people and more educated people means more subscribers
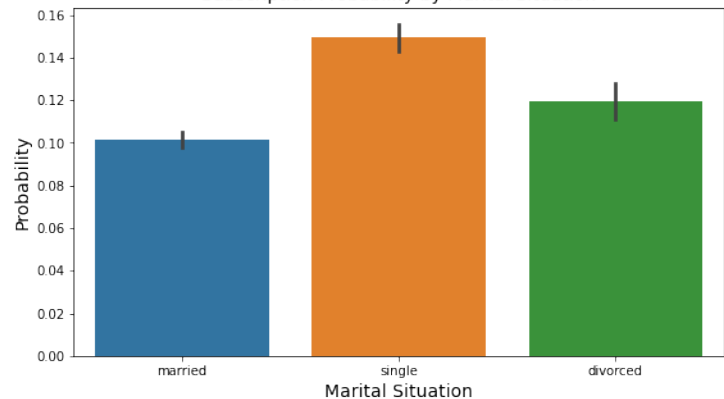
Groups of students and retired people, single, and people with higher education tend to subscribe the term deposit because of the telemarketing
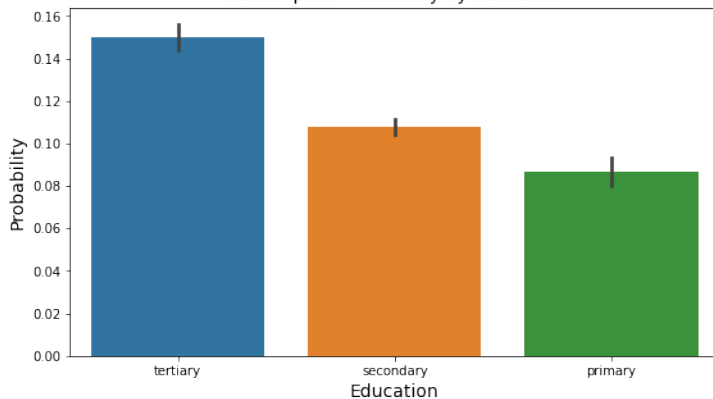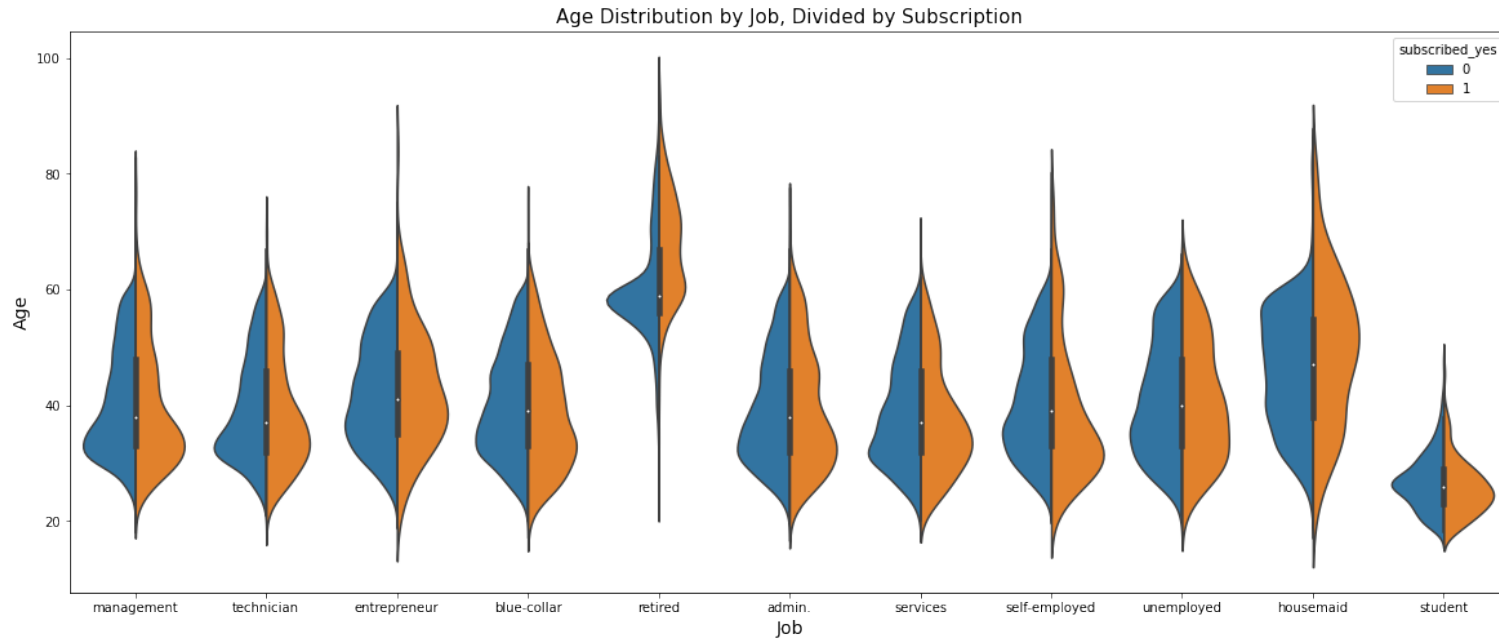
Older people tend to be more susceptible and accepting to telemarketing

Age Distribution by Job, Divided by Subscription

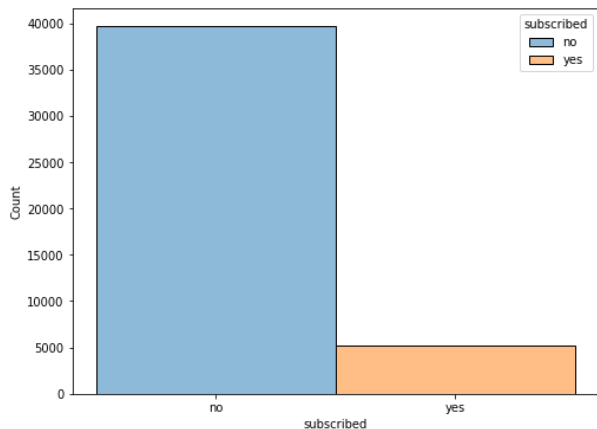# Machine Learning Model and Interpretation

The model is created with 80:20 train-test split, with SMOTE algorithm applied to address the imbalanced data

Using F1 Score as the main metric, LGBM and GradientBoosting Classifier will be chosen as the models for further processing

Trained Models

Term Deposit Subscribers by Telemarketing

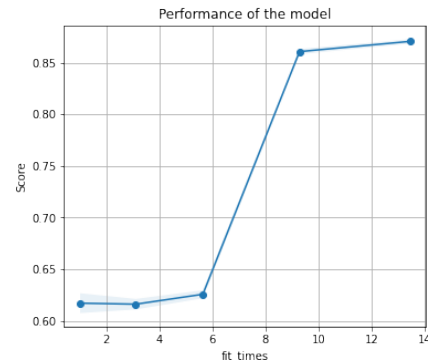| Models	Accuracy	F1 Score
LGBMClassifier	0.9182050151209677	0.49413808076422056
GradientBoostingClassifier	0.8716922883064516	0.4938941655359566
AdaBoostClassifier	0.8463016633064516	0.48271231957032557
RandomForestClassifier	0.9999842489919355	0.47257383966244726
SGDClassifier	0.7741462953629032	0.45668353676689494
KNeighborsClassifier	0.9189610635080645	0.4236453201970443
BaggingClassifier	0.994597404233871	0.41681901279707495
GaussianNB	0.7175214213709677	0.36209813874788493
ExtraTreeClassifier	0.9999842489919355	0.3613445378151261
DecisionTreeClassifier	0.9999842489919355	0.35620785402618

Gradient Boosting Classifier Model

Relatively good model with 0.83 accuracy and 0.49 F1 score and high recall, but with performance caveat

Model Learning Curve

Confusion Matrix
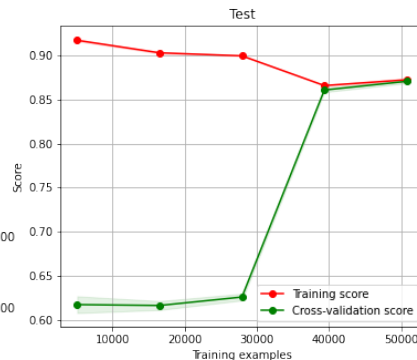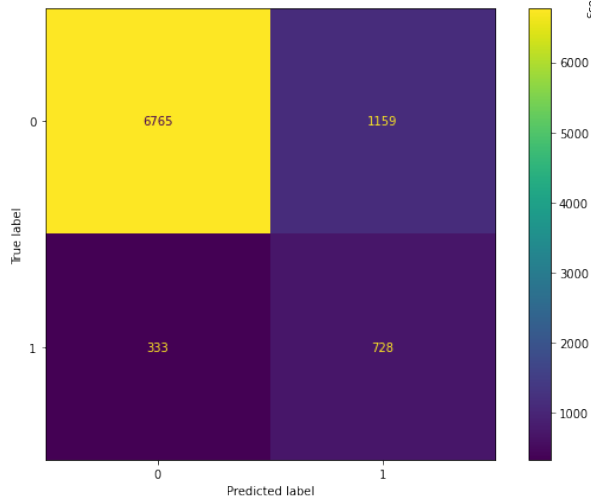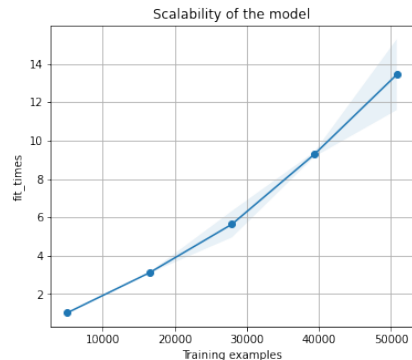
Classification Report

	precision	recall	f1-score	support
0	0.95	0.85	0.90	7924
1	0.39	0.69	0.49	1061
accuracy			0.83	8985
macro avg	0.67	0.77	0.70	8985
weighted avg	0.89	0.83	0.85	8985

Light GBM Classifier Model

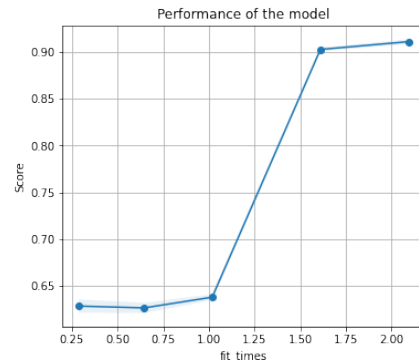Modelling with LightGBM Classifier give us pretty good result with 0.87 accuracy and 0.49 F1 score, with better performance

Model Learning Curve

Confusion Matrix
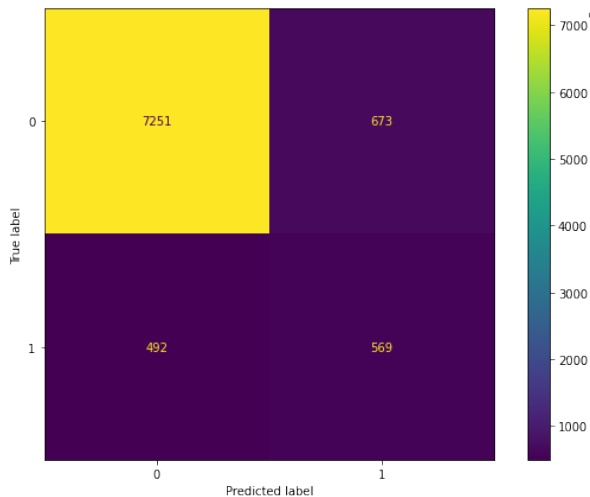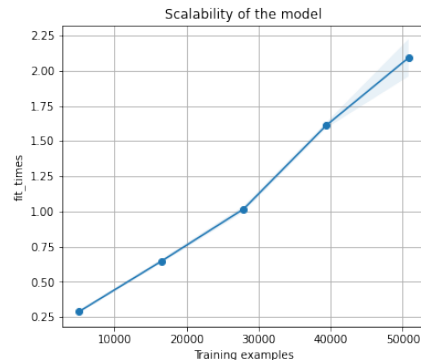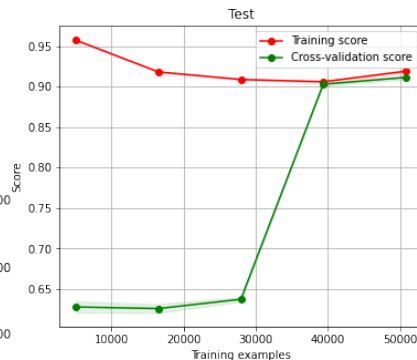
Classification Report

	precision	recall	f1-score	support
0	0.94	0.92	0.93	7924
1	0.46	0.54	0.49	1061
accuracy			0.87	8985
macro avg	0.70	0.73	0.71	8985
weighted avg	0.88	0.87	0.87	8985

Tuned Light GBM Classifier Model

With the adjustment on its hyperparameter, this model give us the best result possible

Confusion Matrix
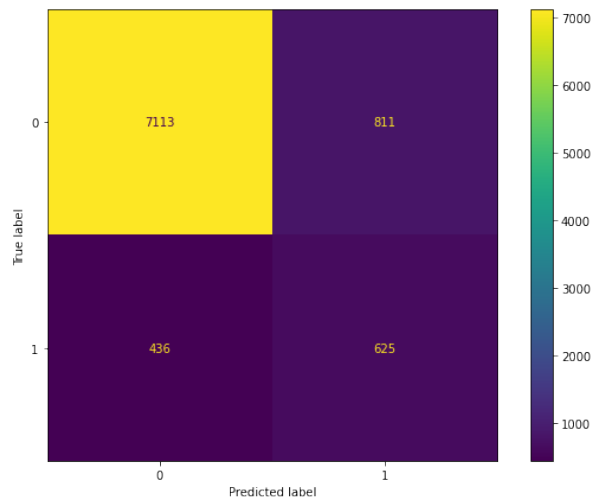
Feature importances
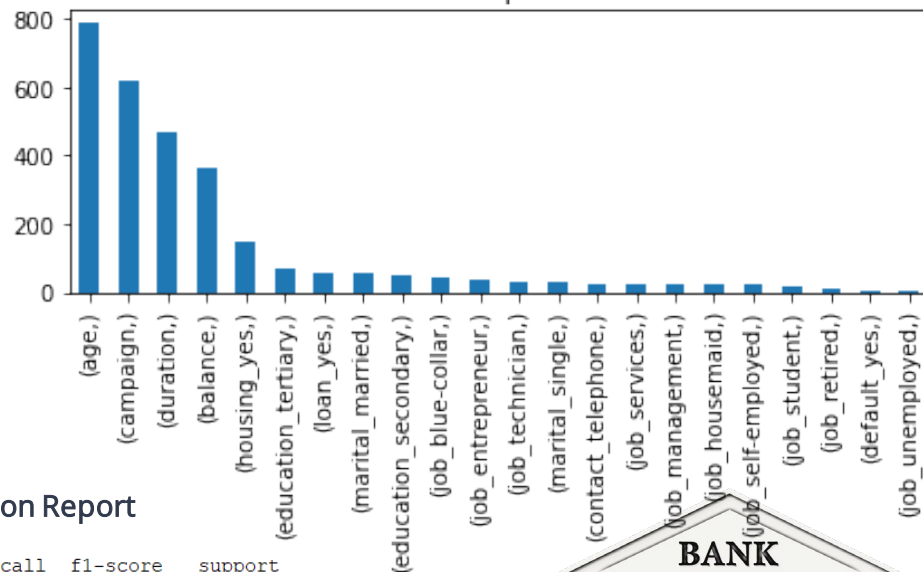
Classification Report

	precision	recall	f1-score	support
0	0.94	0.90	0.92	7924
1	0.44	0.59	0.50	1061
accuracy			0.86	8985
macro avg	0.69	0.74	0.71	8985
weighted avg	0.88	0.86	0.87	8985

Conclusions

Key Points

- Roughly **one-tenth of the clients** that's contacted by telemarketer **actually subscribes** to the bank' term deposit **(~11.7% conversion rate).**
- Client's **age** is the most important factor to predict whether they will be persuaded by the telemarketing or not, with **30-50 years old** being the most group willing to subscribe.
- **Campaign frequency** and the **duration of the call** are also important for the effectiveness of telemarketing campaign.

Business Recommendation

- If the investment is too big for the conversion rate, **explore other direct marketing approach**.
- **Target potential group** that are more willing to buy the product.
- Make clients **engaged** when cold calling (e.g.. small talks) so they are more willing to buy the product

Cold Calling can be fun!