



**Data Glacier**

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# Exploratory Data Analysis

BANK MARKETING ANALYSIS USING  
MACHINE LEARNING

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SPECIALIZATION: DATA SCIENCE

# Agenda

Executive Summary

Problem Statement

Approach

EDA

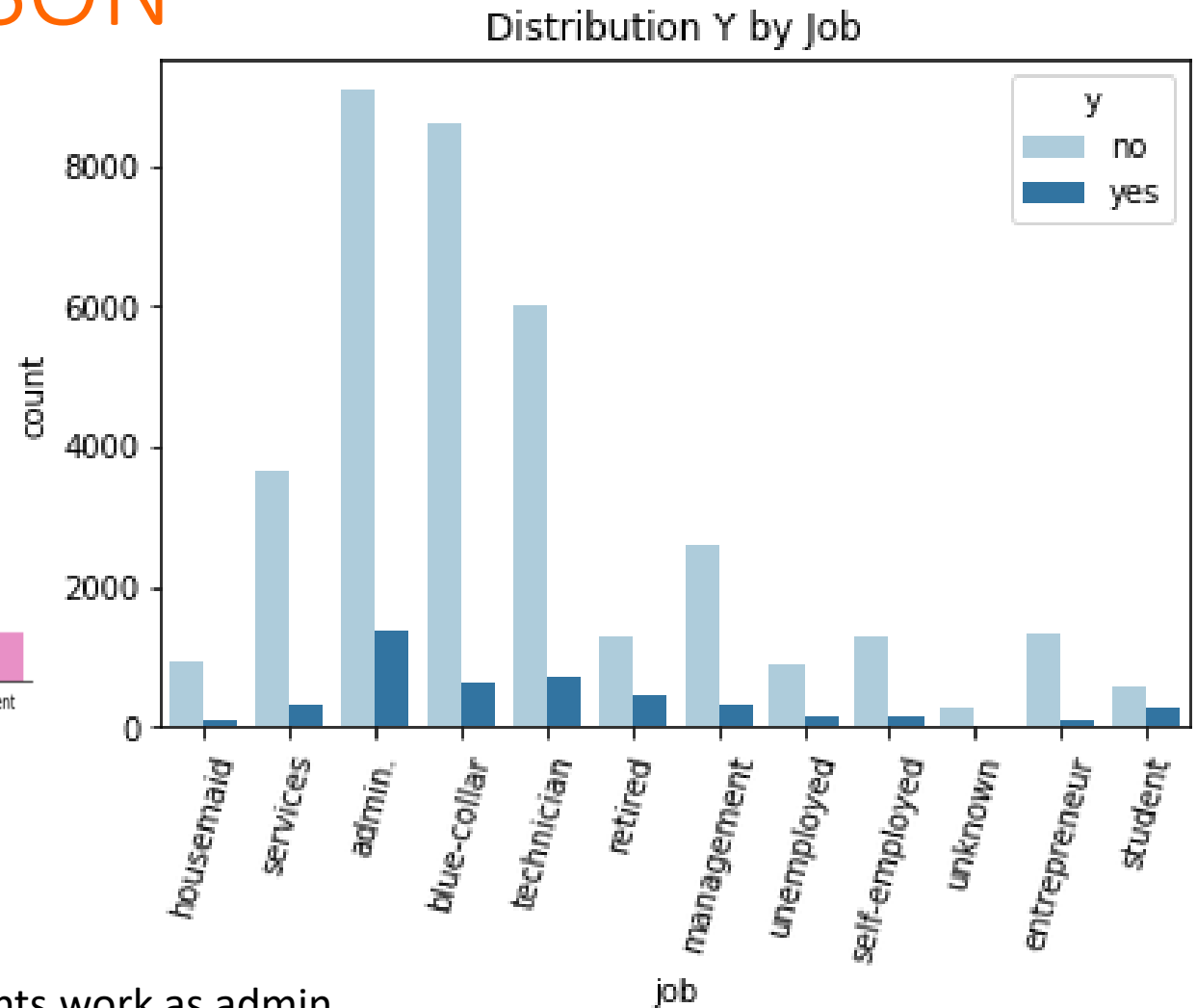
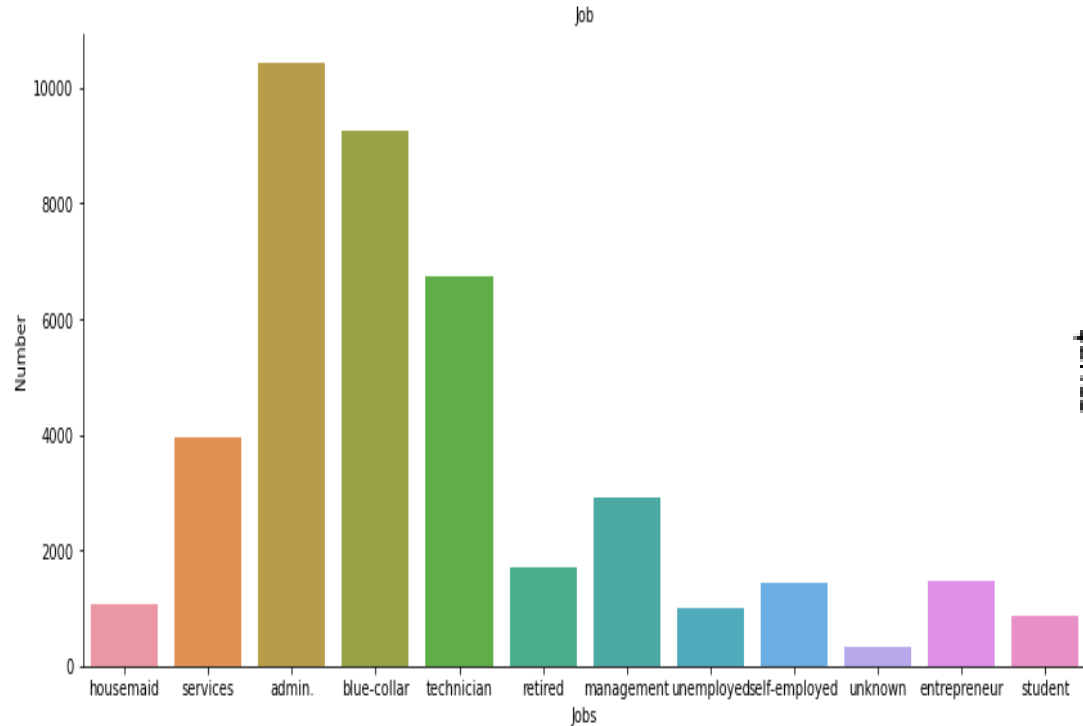
EDA Summary

Recommendations

# PROBLEM DESCRIPTION

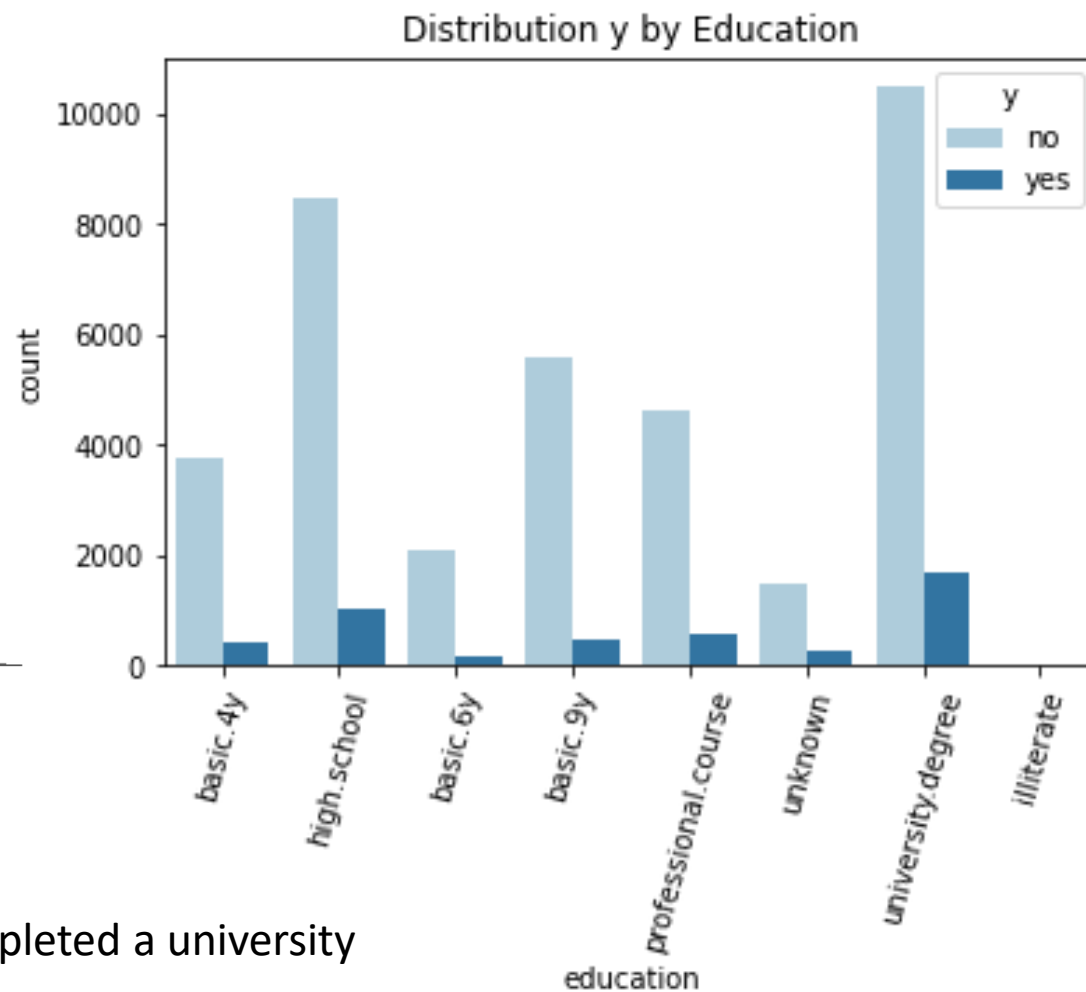
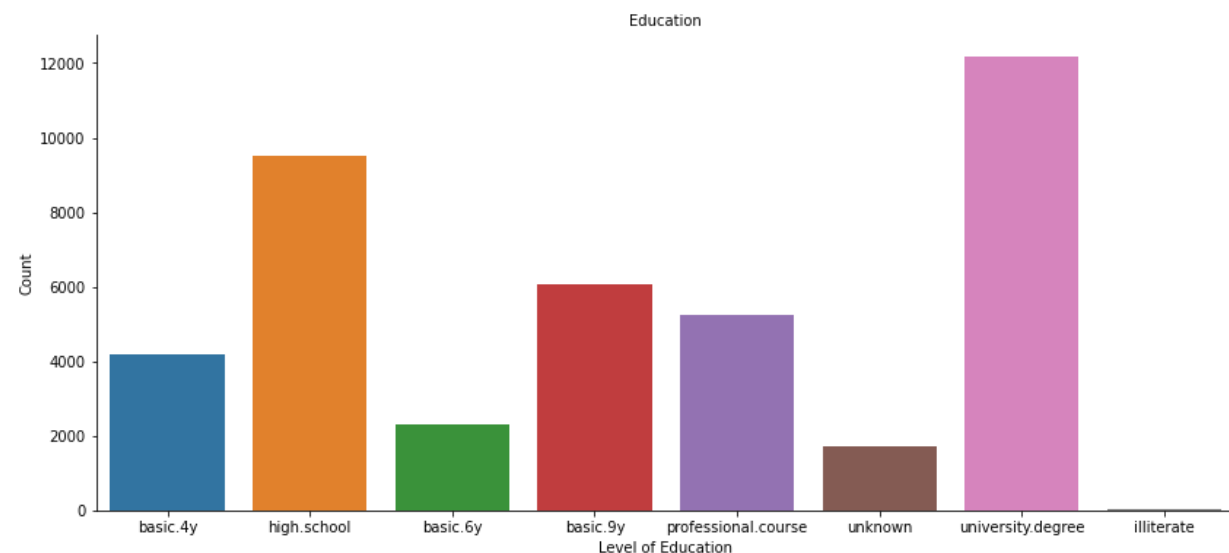
- We are given data related to direct marketing campaigns i.e. phone calls of a bank in Portugal.
- The classification goal is to predict whether a client will subscribe or not(yes/no) to a term deposit (variable  $y$ ).

# FEATURE COMPARISON



From the above we can see that majority of the clients work as admin. Equally those who work in admin subscribed more to the term deposit.

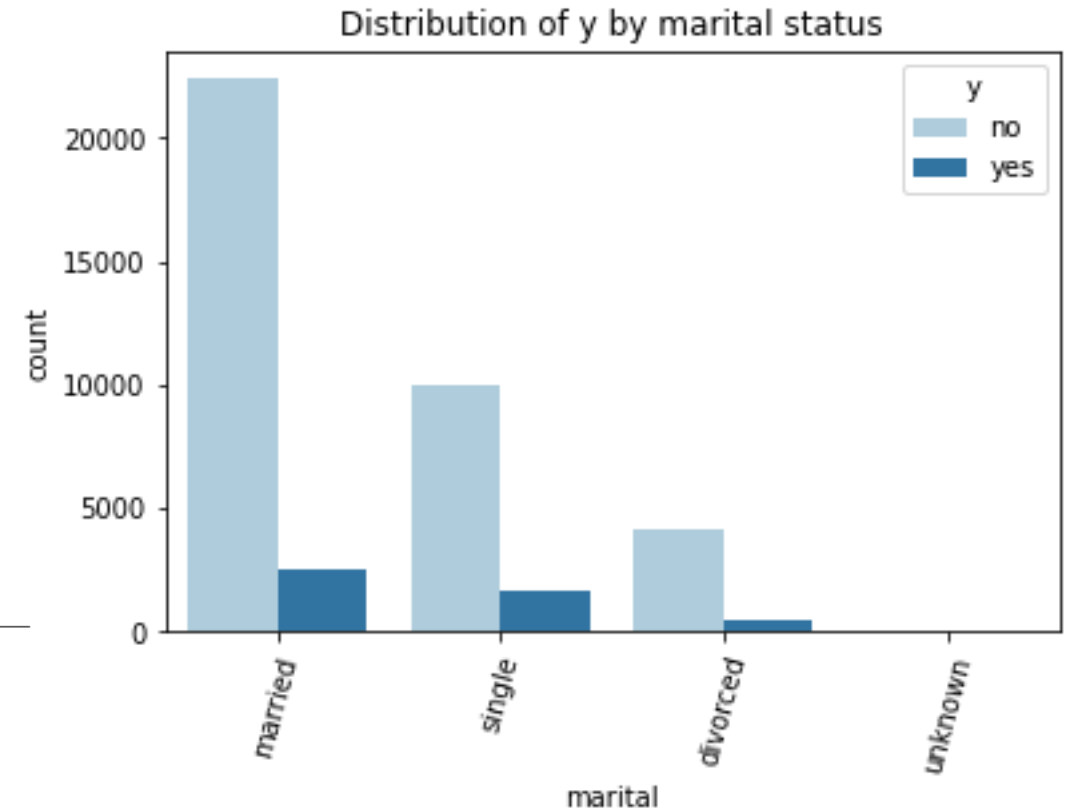
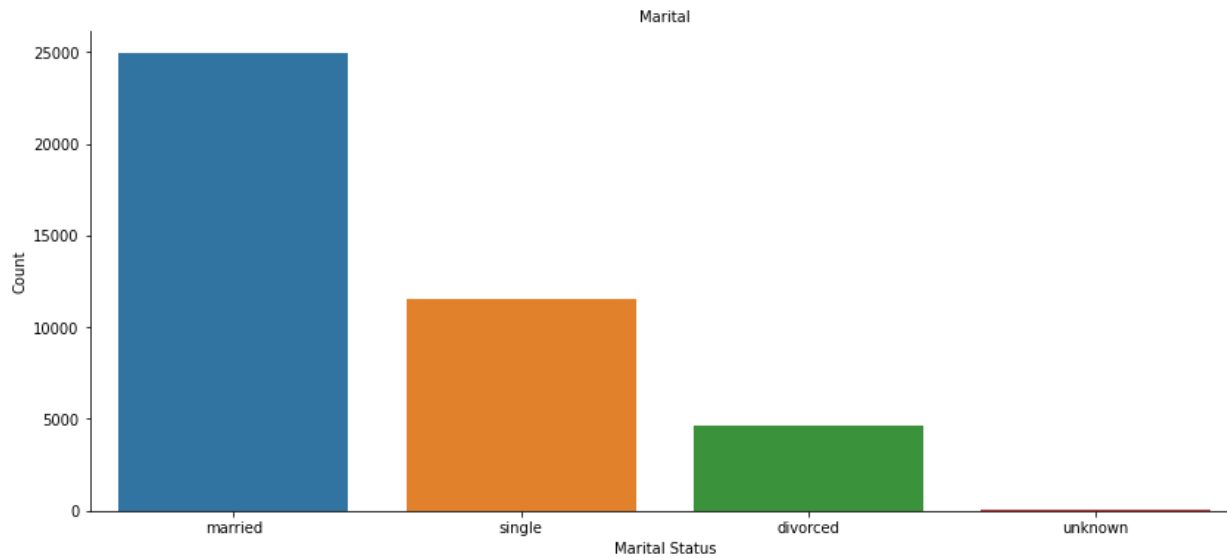
# EDUCATION



From the plot most of clients who were contacted completed a university degree.

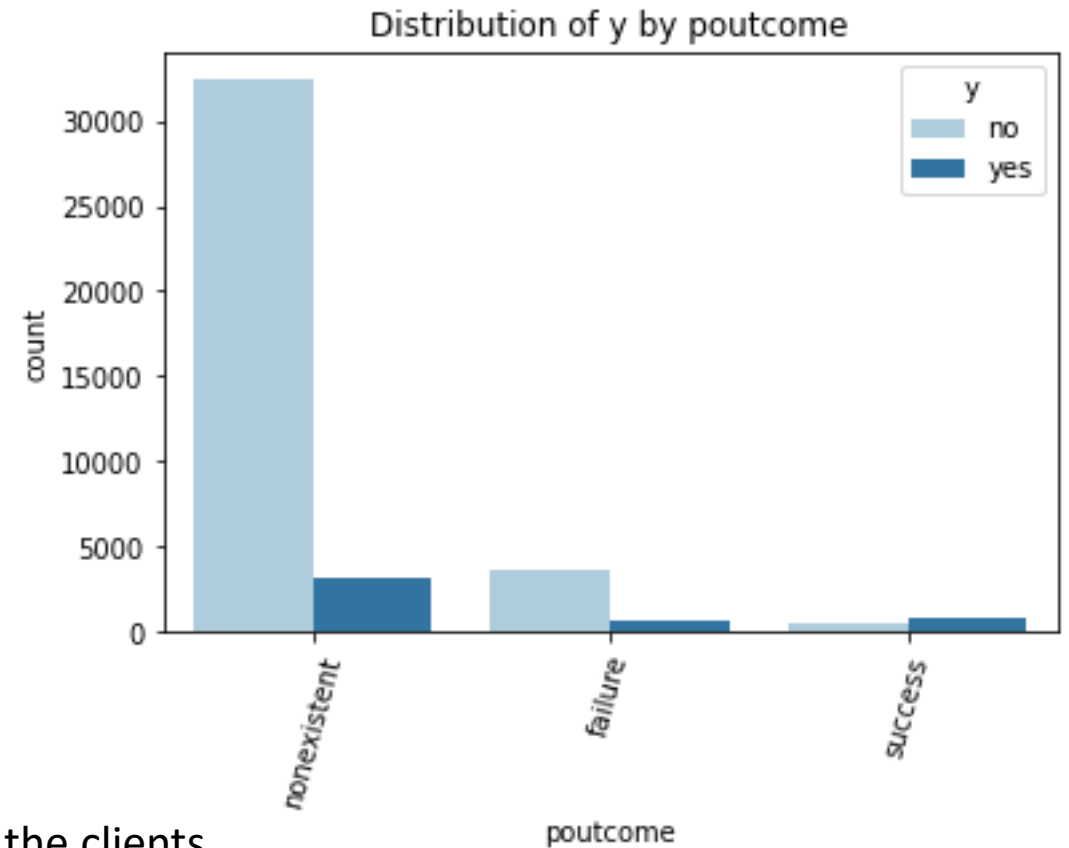
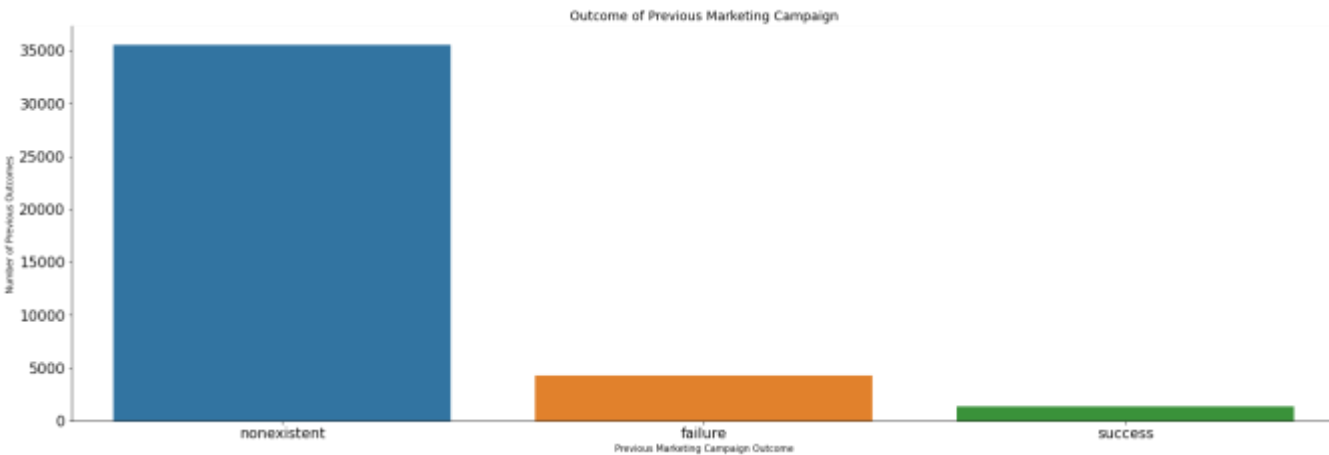
Most of those who subscribed completed a university degree .

# MARITAL



Majority of the clients were married and they subscribed slightly more than those who were single.

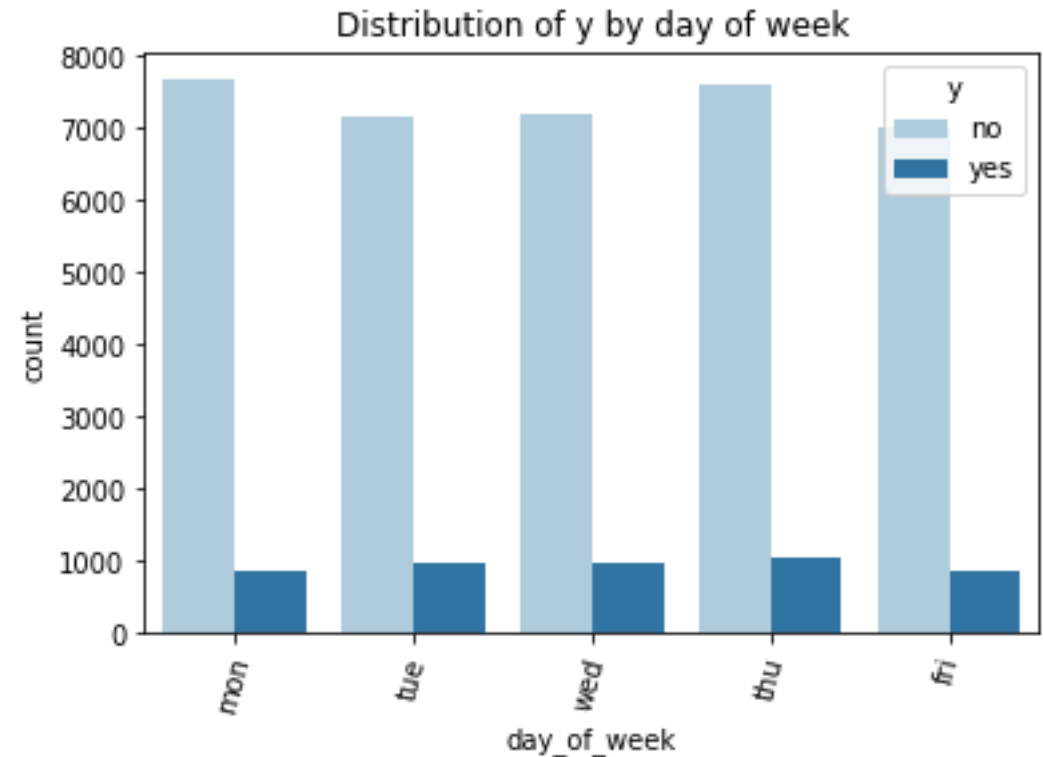
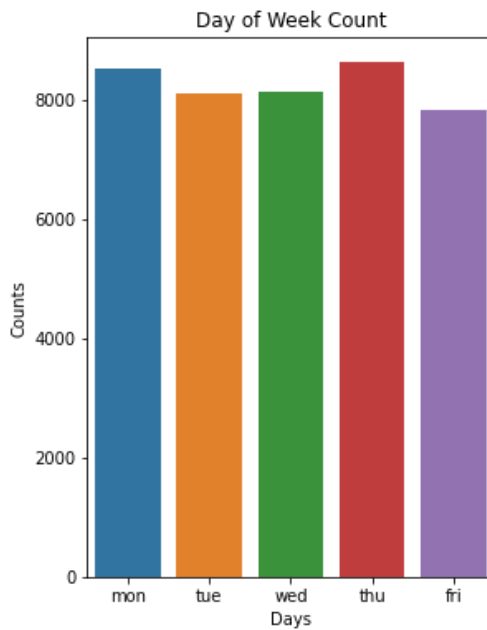
# POUTCOME



Considering the outcome of the previous campaign, majority of the clients contacted were new clients and they subscribed more compared to those who had been contacted before.

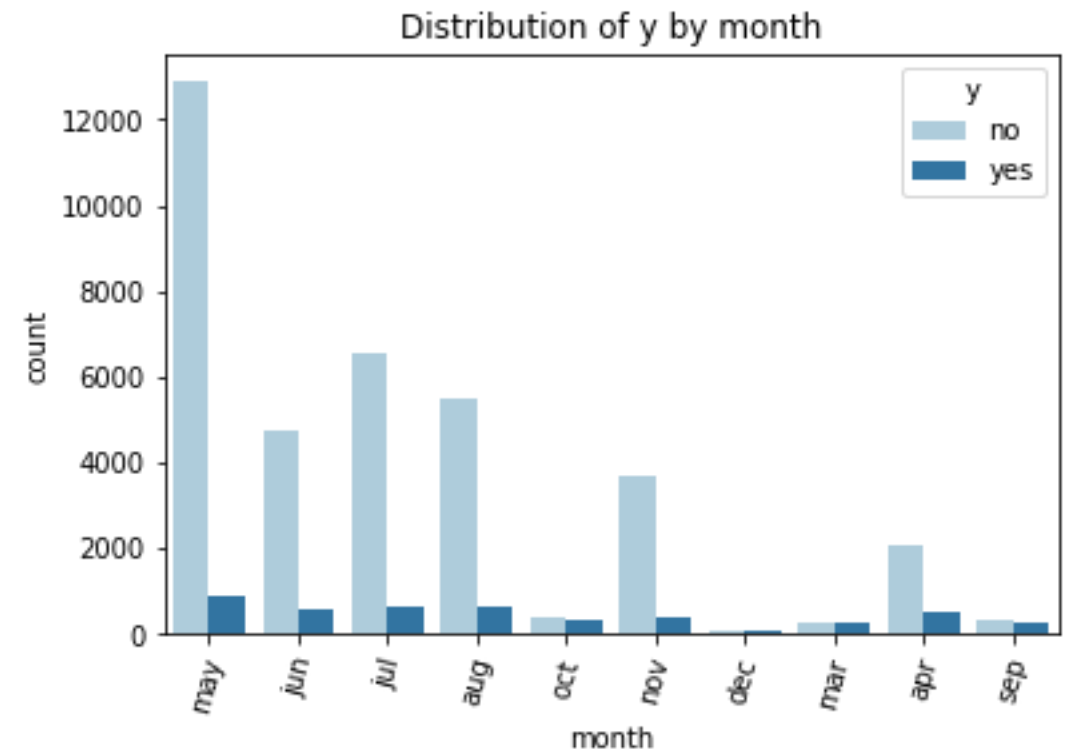
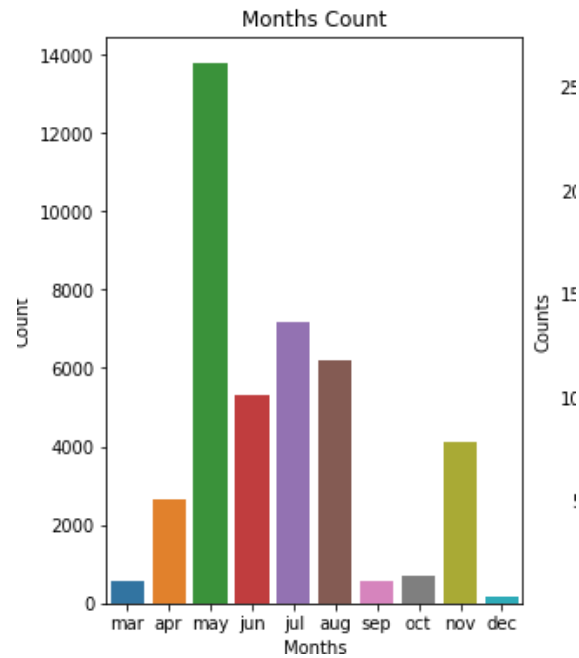


# DAY OF WEEK



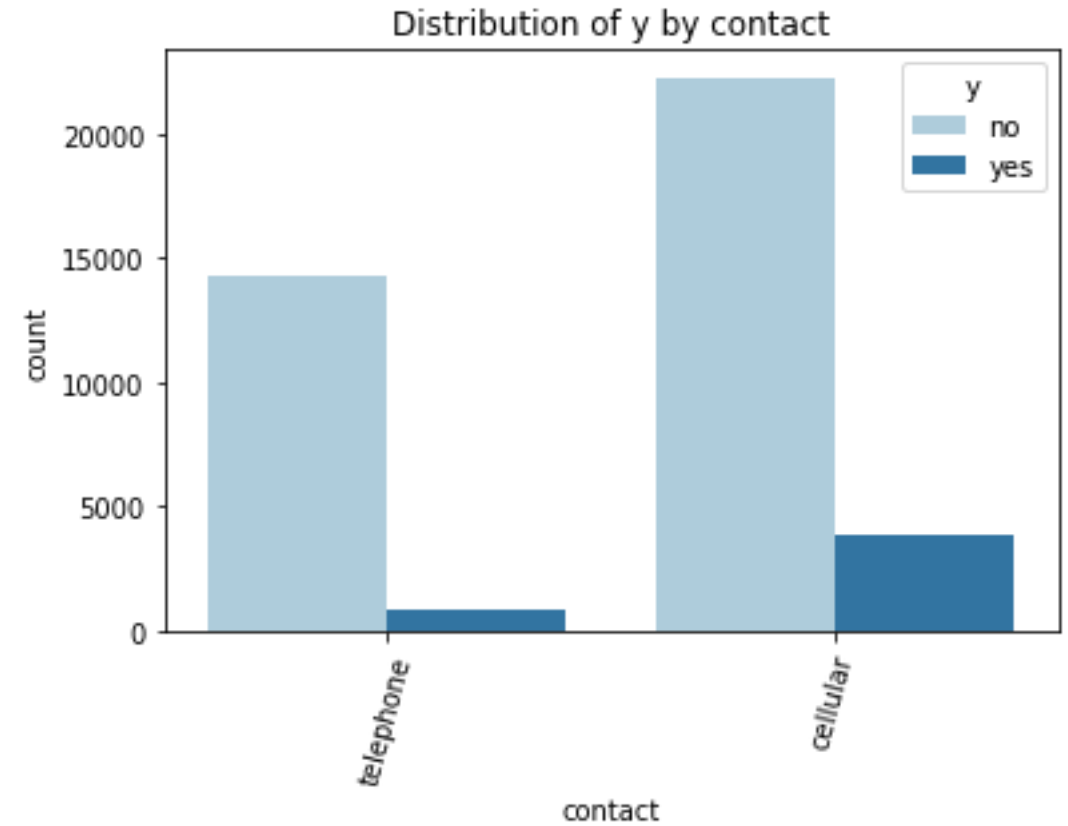
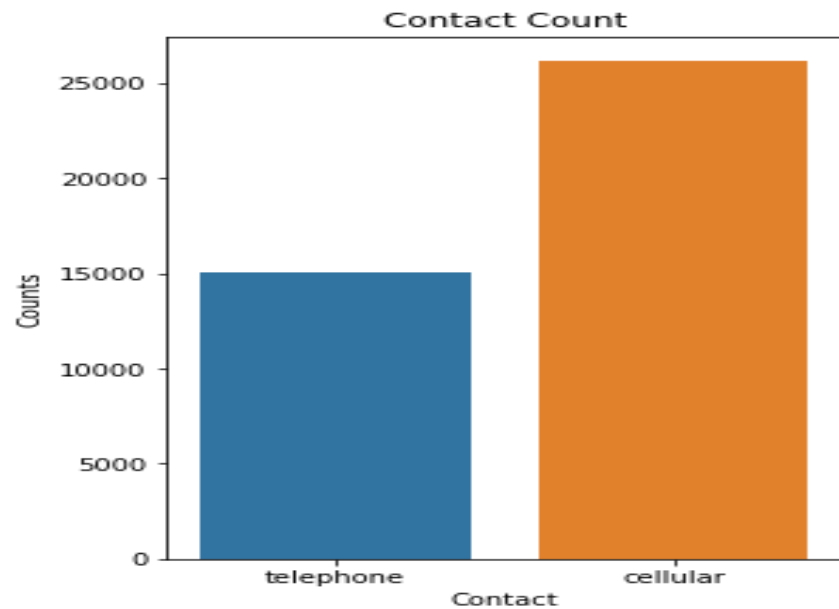
Clients were contacted on Monday, Tuesday, Wednesday, Thursday and Friday with the least number of clients being contacted on Friday. Almost an equal number of clients contacted subscribed .

# MONTH



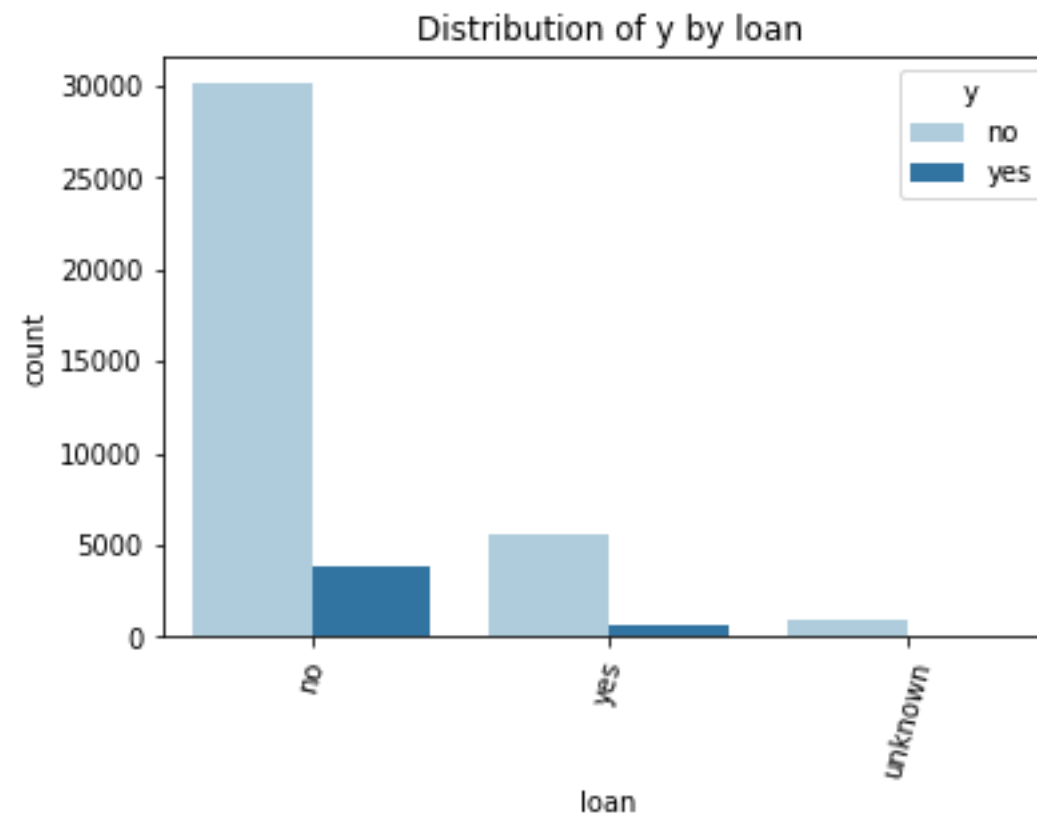
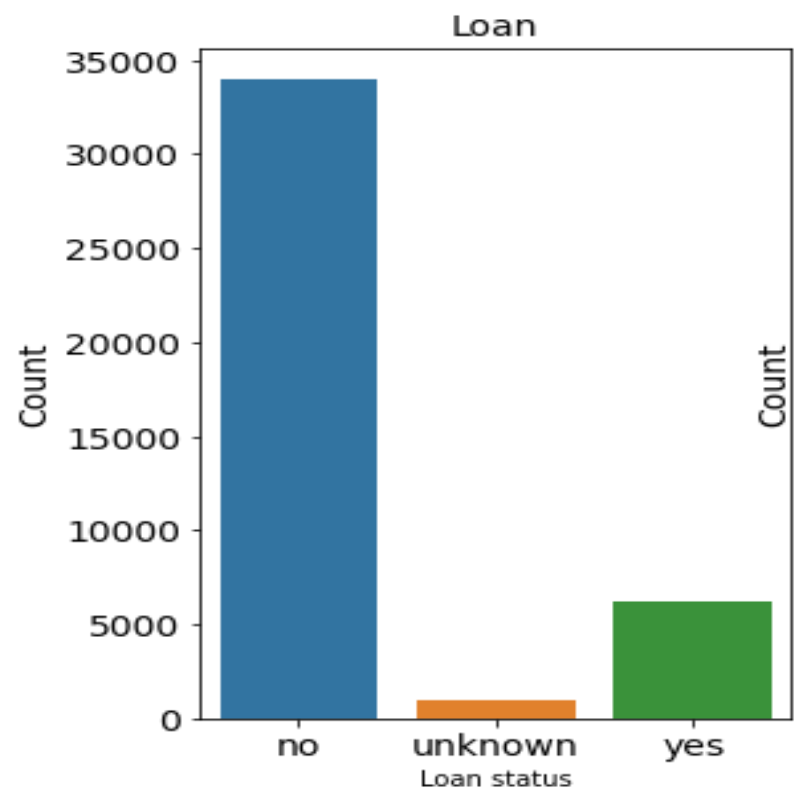
Clients were contacted most in the month of May and more clients equally subscribed in May.

# CONTACT



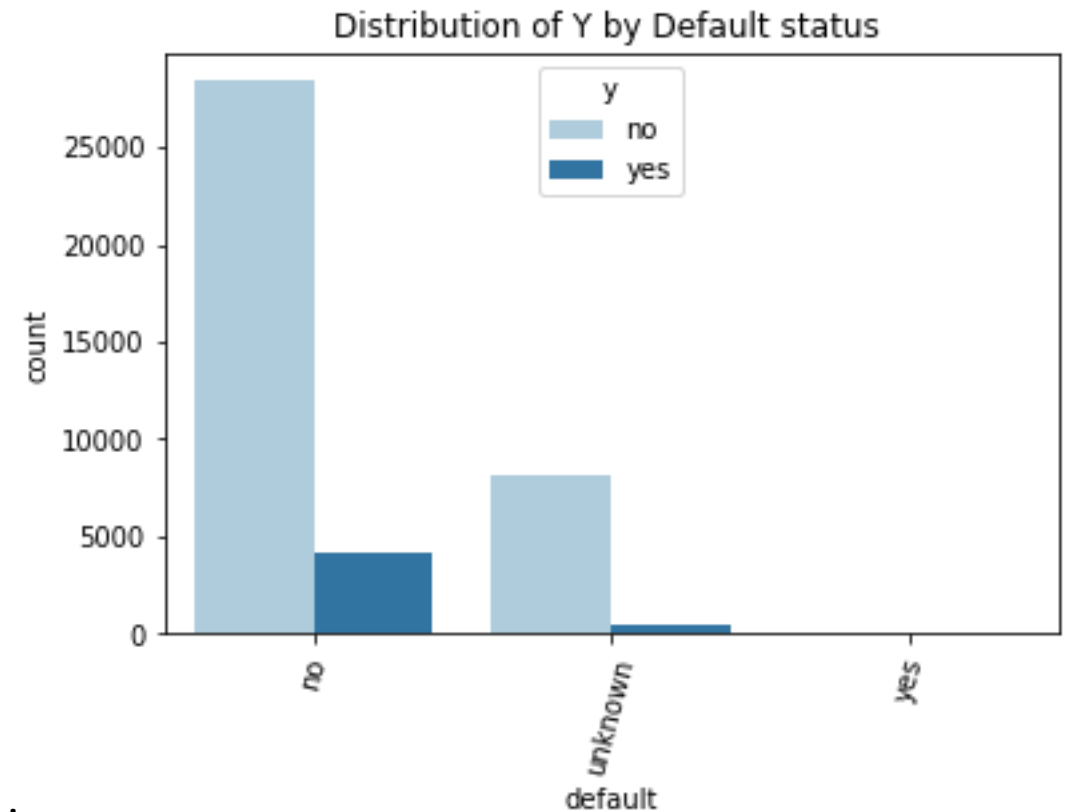
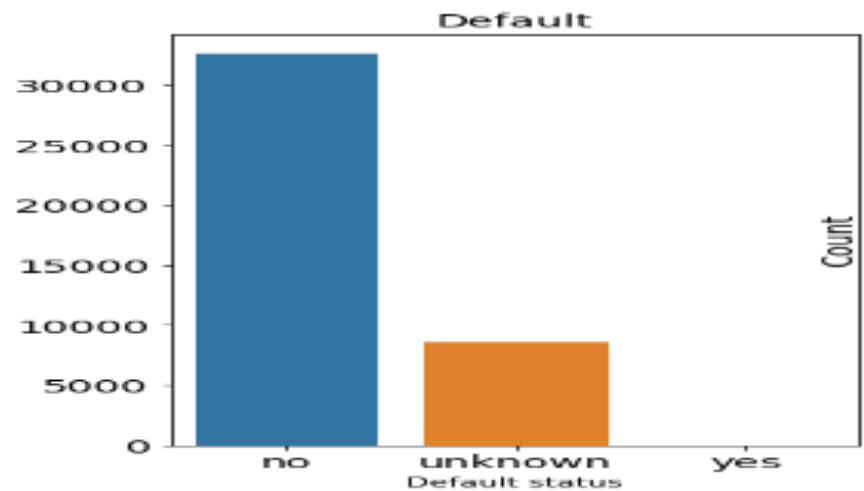
Majority of the clients were contacted by cellular and they subscribed more compared to those who used telephone.

# LOAN



The bank mostly contacted clients who did not have loans.

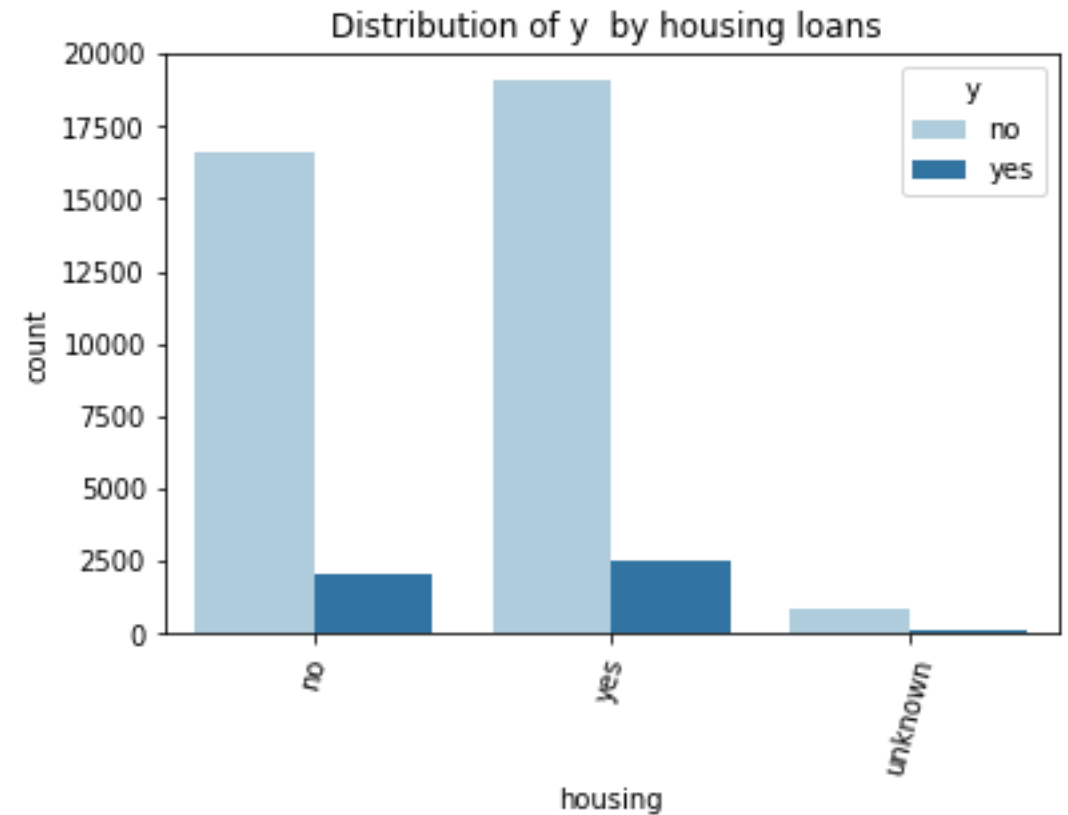
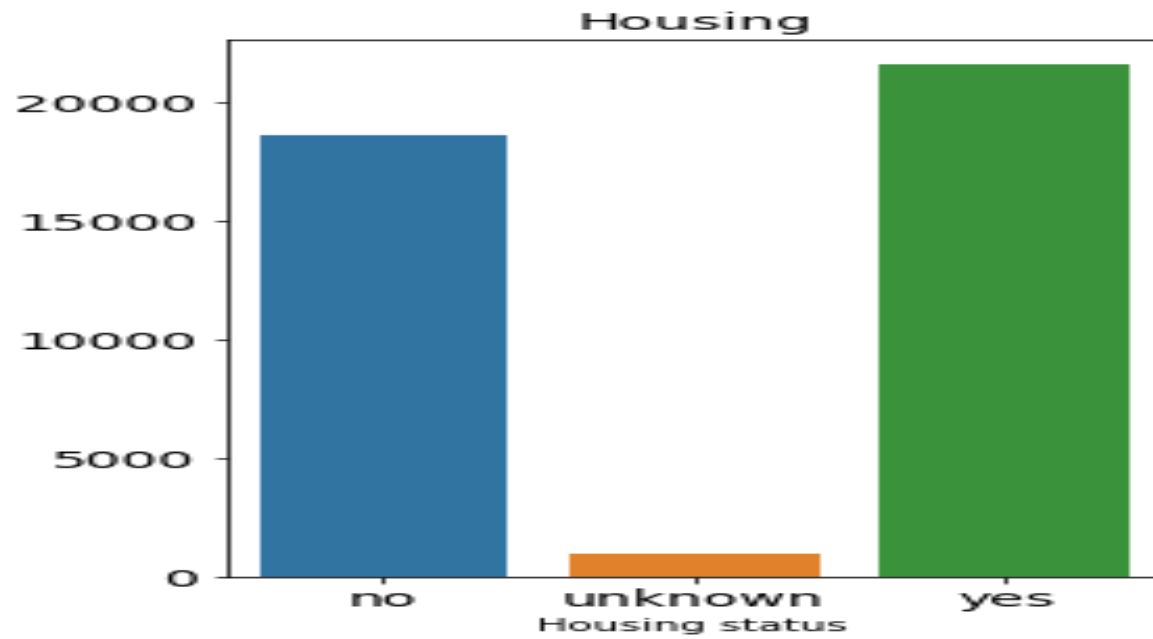
# DEFAULT



The contacted mostly clients who had not defaulted .

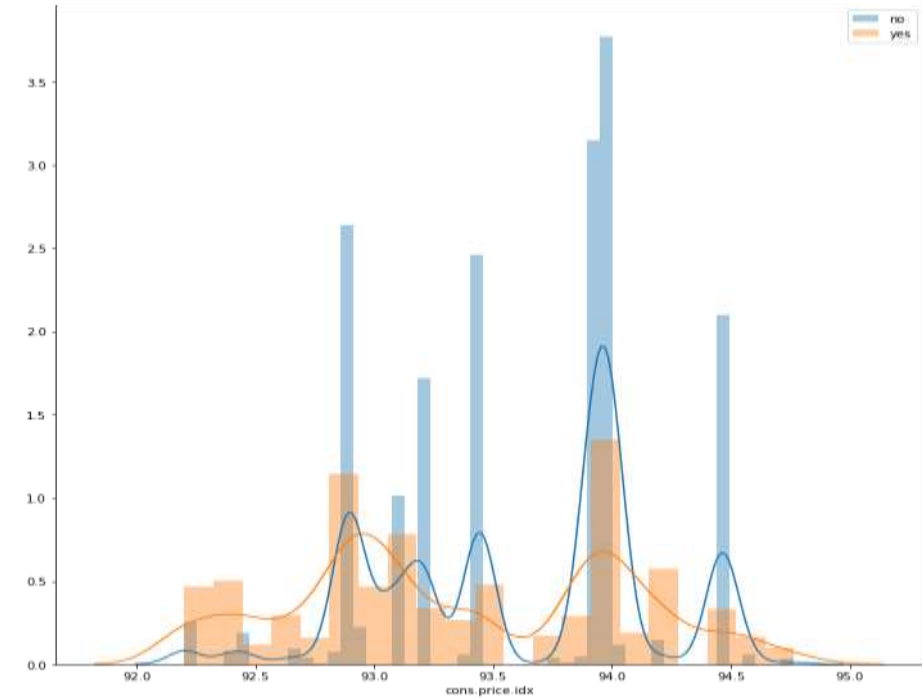
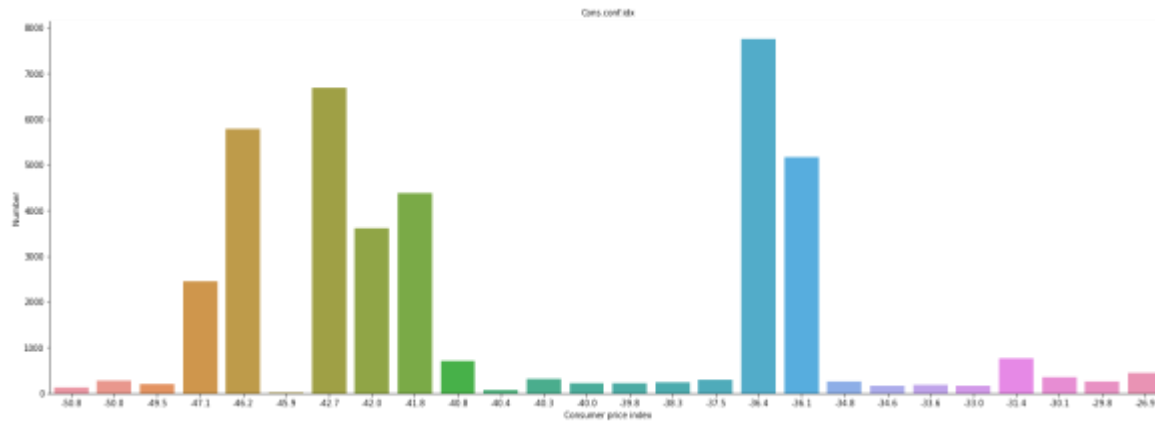
Most of the clients who had not defaulted in their credit and they subscribed more compared to those whose default status was unknown.

# HOUSING



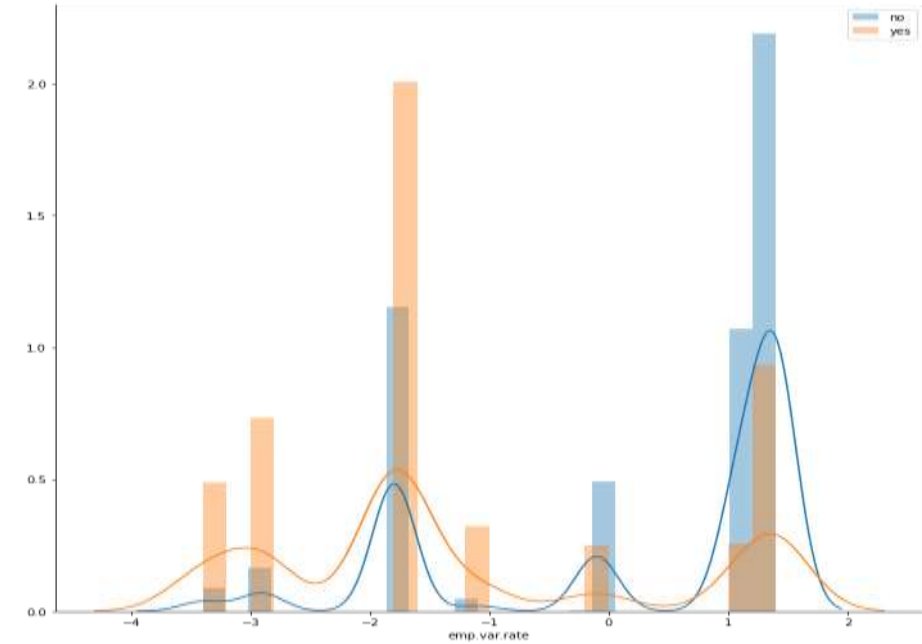
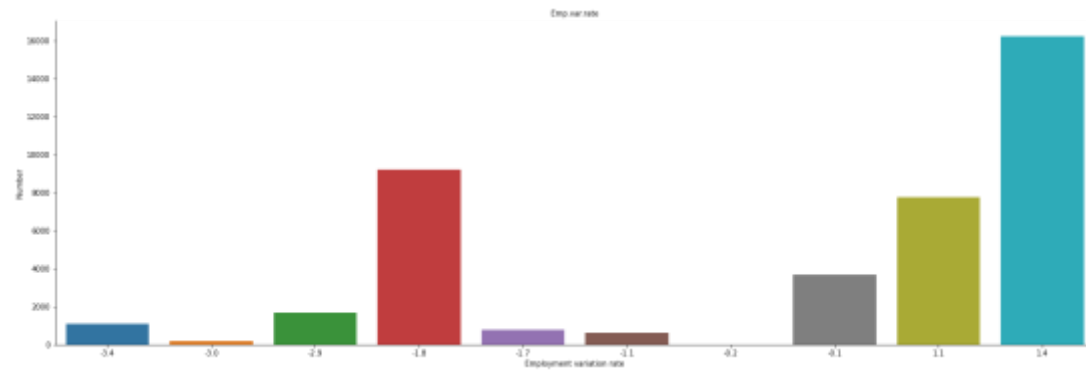
From the plots majority of clients had housing loans .  
Those who had loans subscribed slightly more than those who didn't have loans.

# CONS.PRICE.IDX



From the plot we can see cons.price.idx would be useful in prediction.

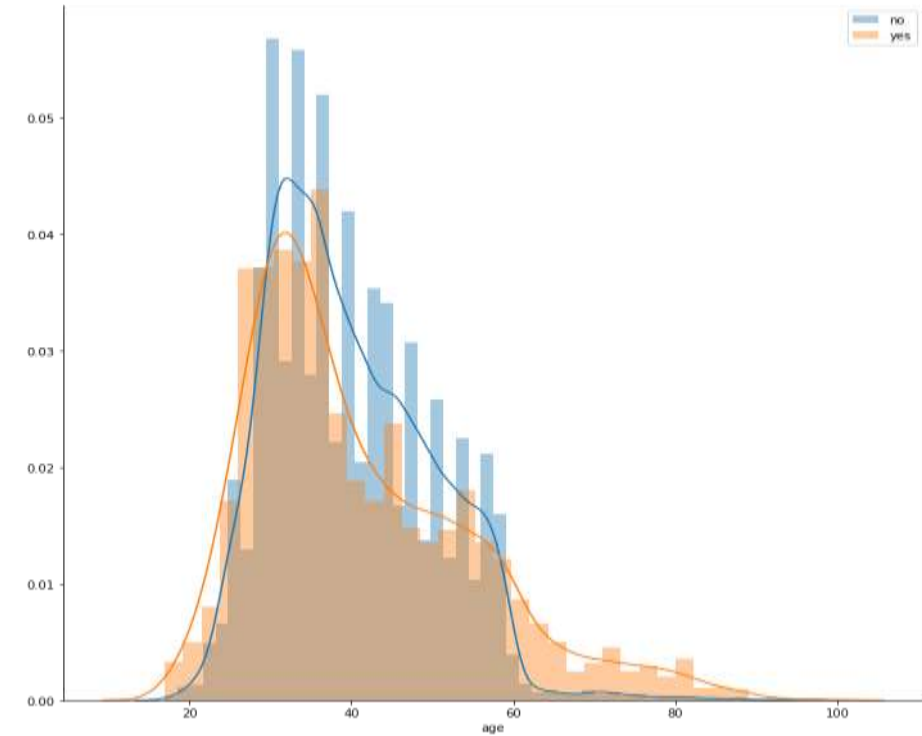
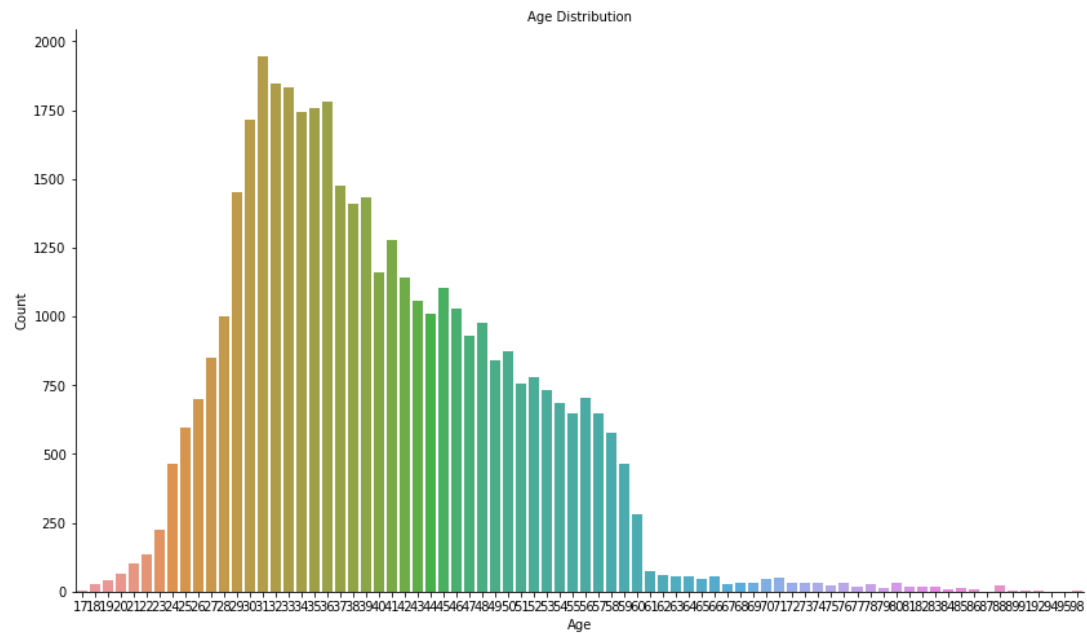
# EMP.VAR.RATE



From the plots we see that emp.var.rate would be very useful in prediction.

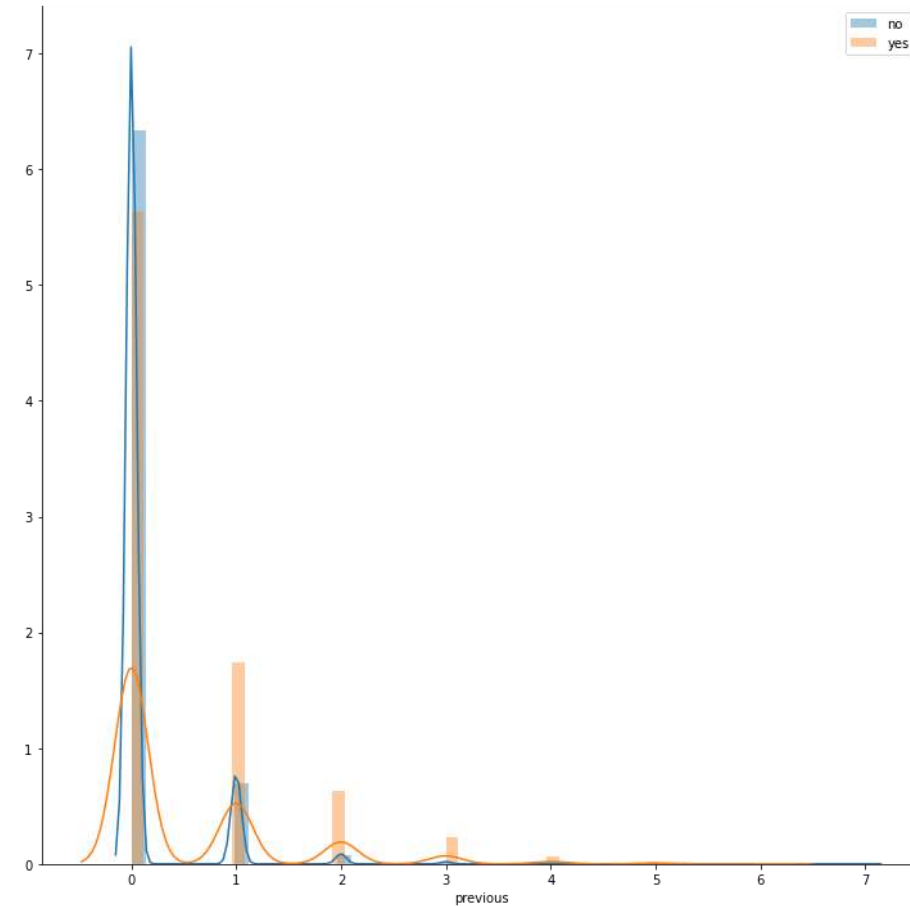
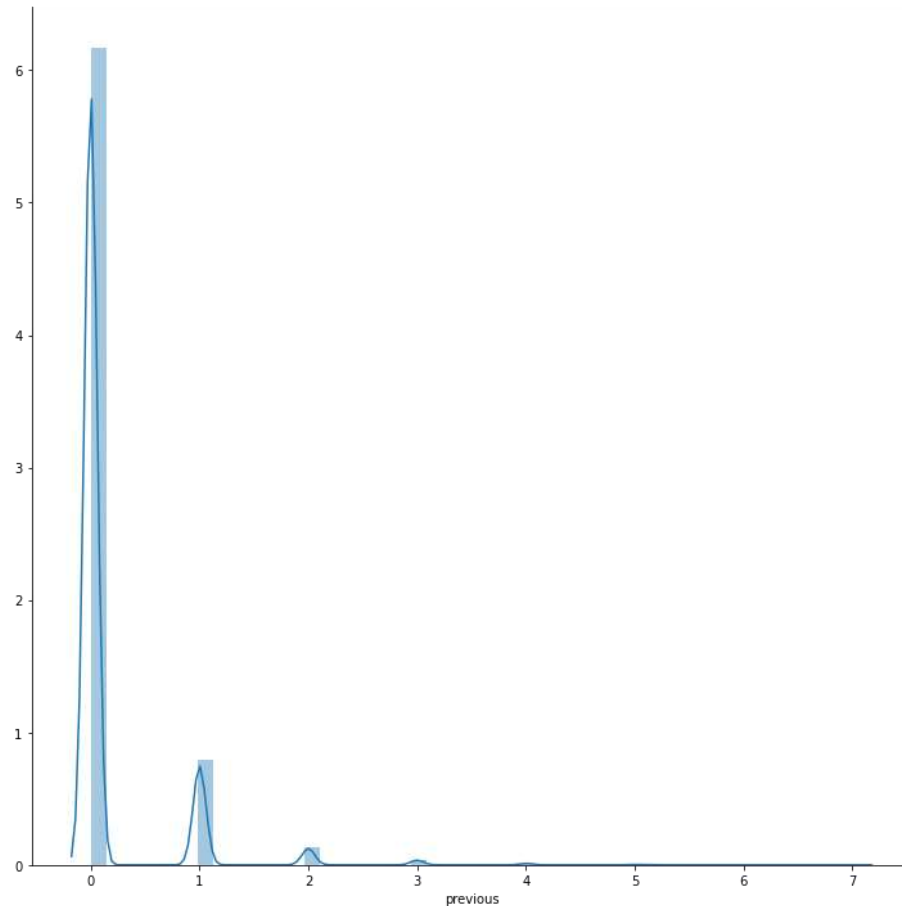


# AGE



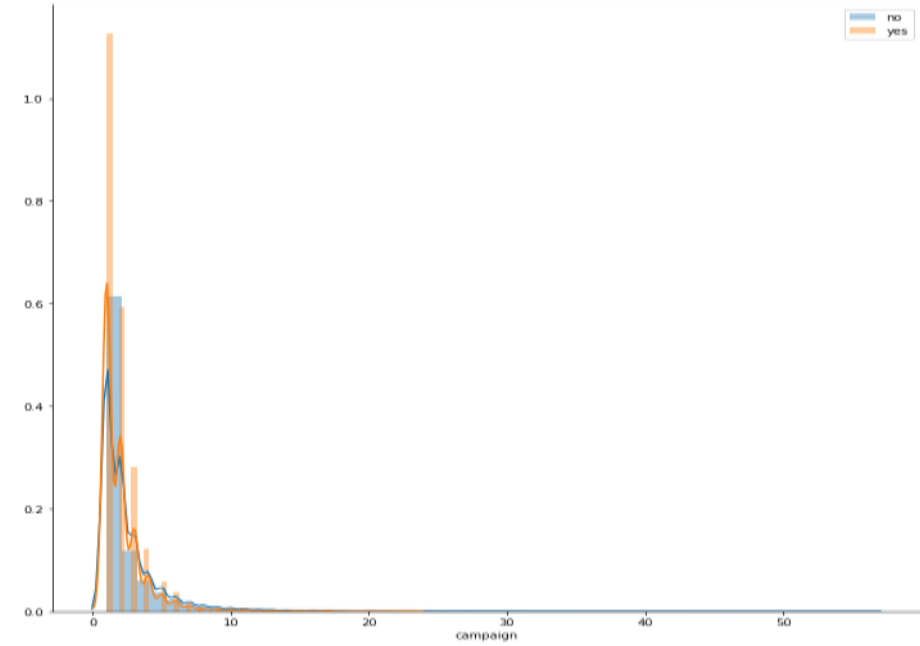
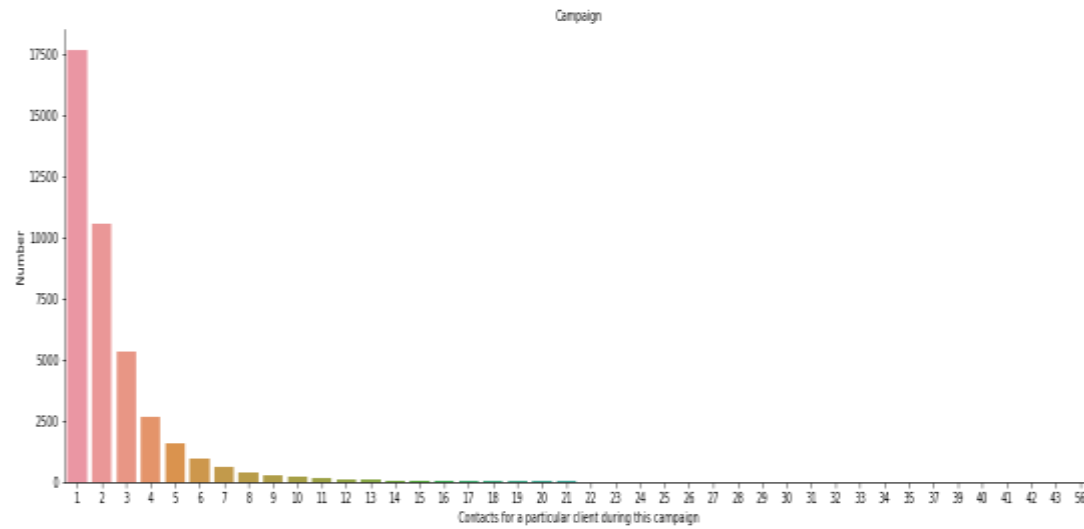
Clients age ranged from 17-98 yrs.

# PREVIOUS



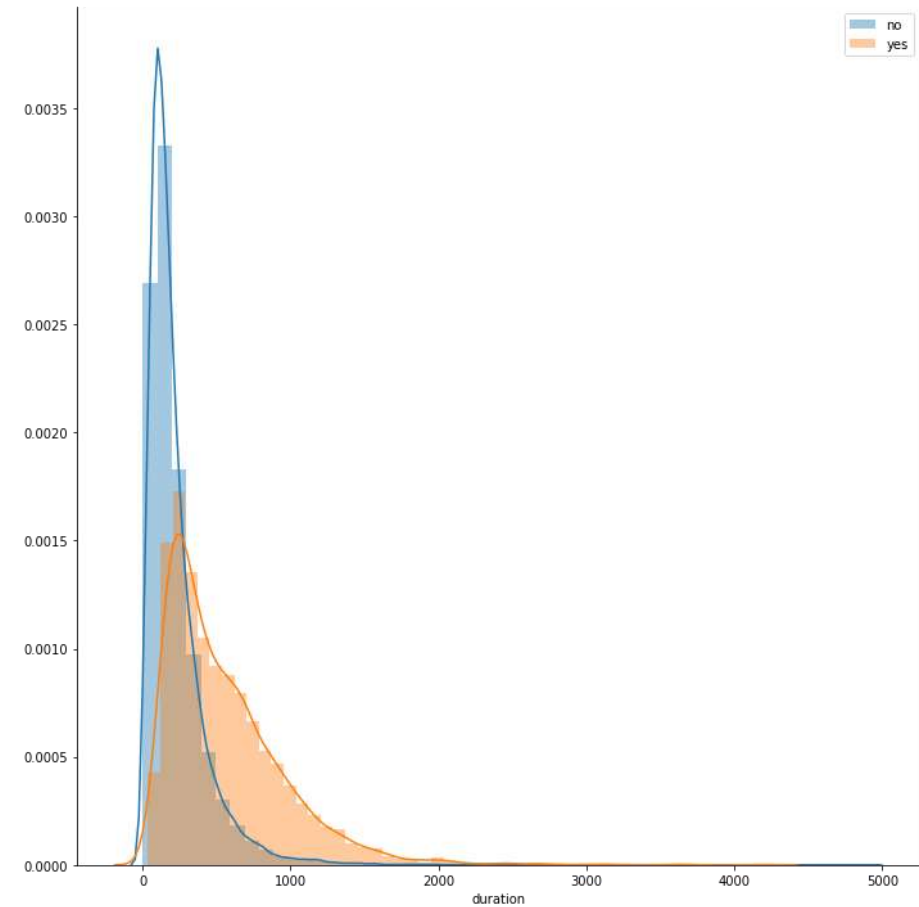
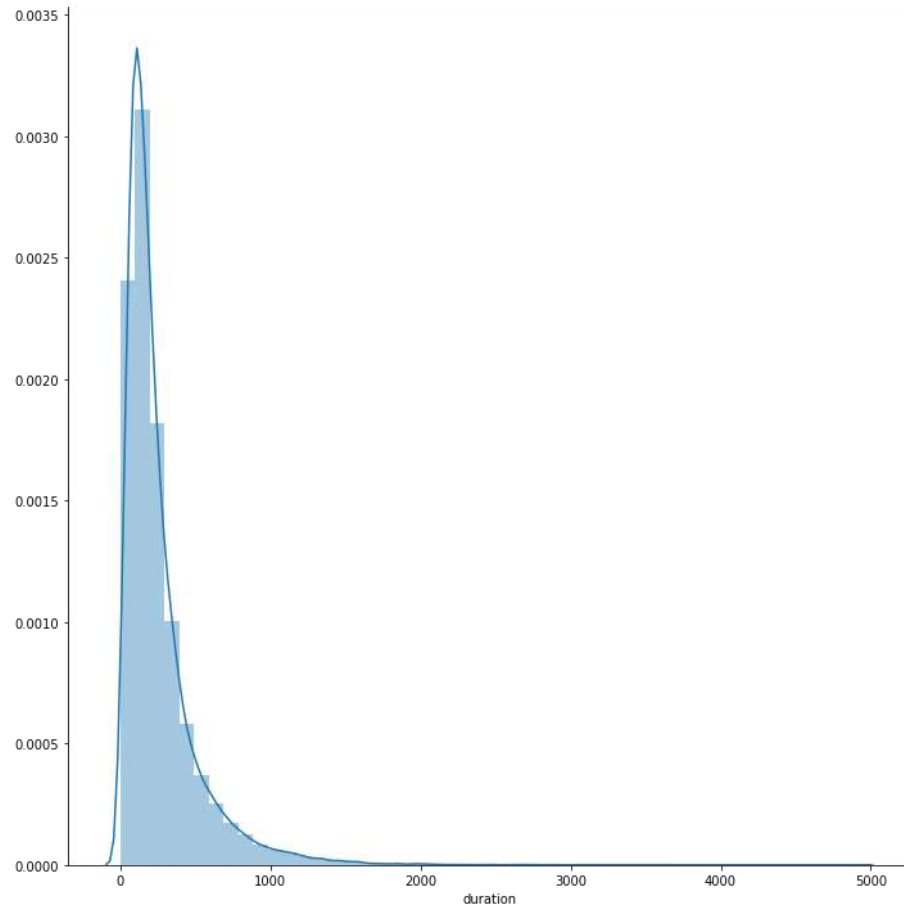
From the plot majority of the clients the bank contacted in this campaign had not been contacted in the last campaign.  
It is also clear that previous will be very useful in prediction.

# CAMPAIGN

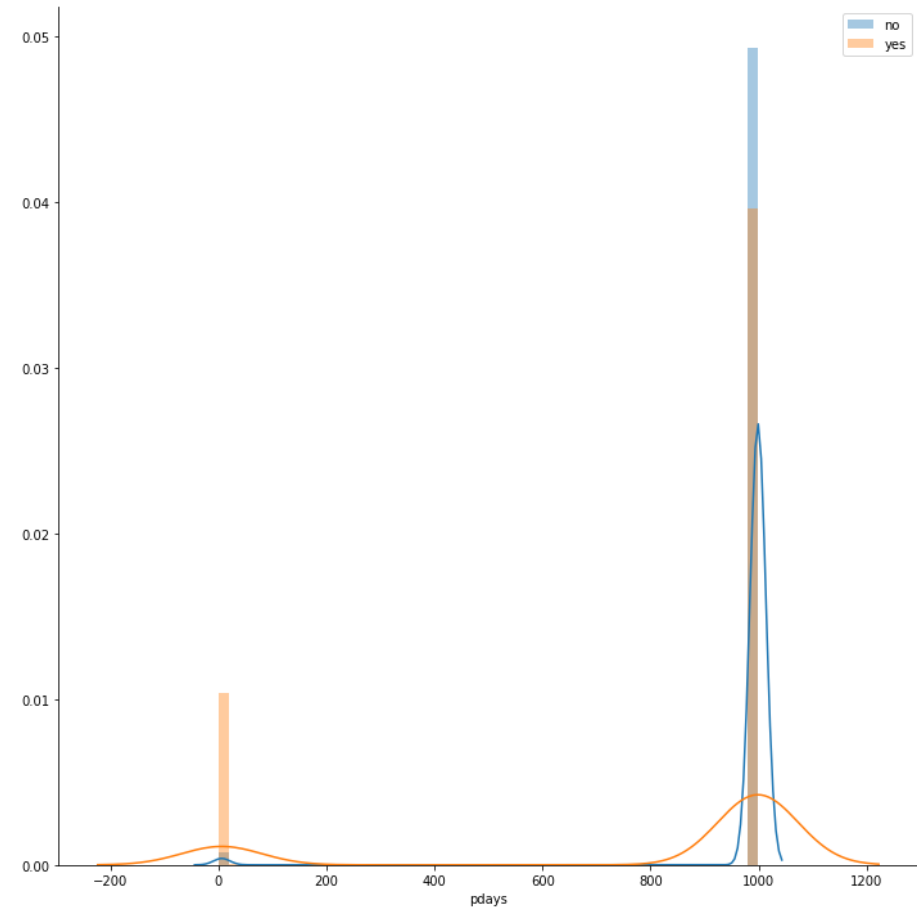
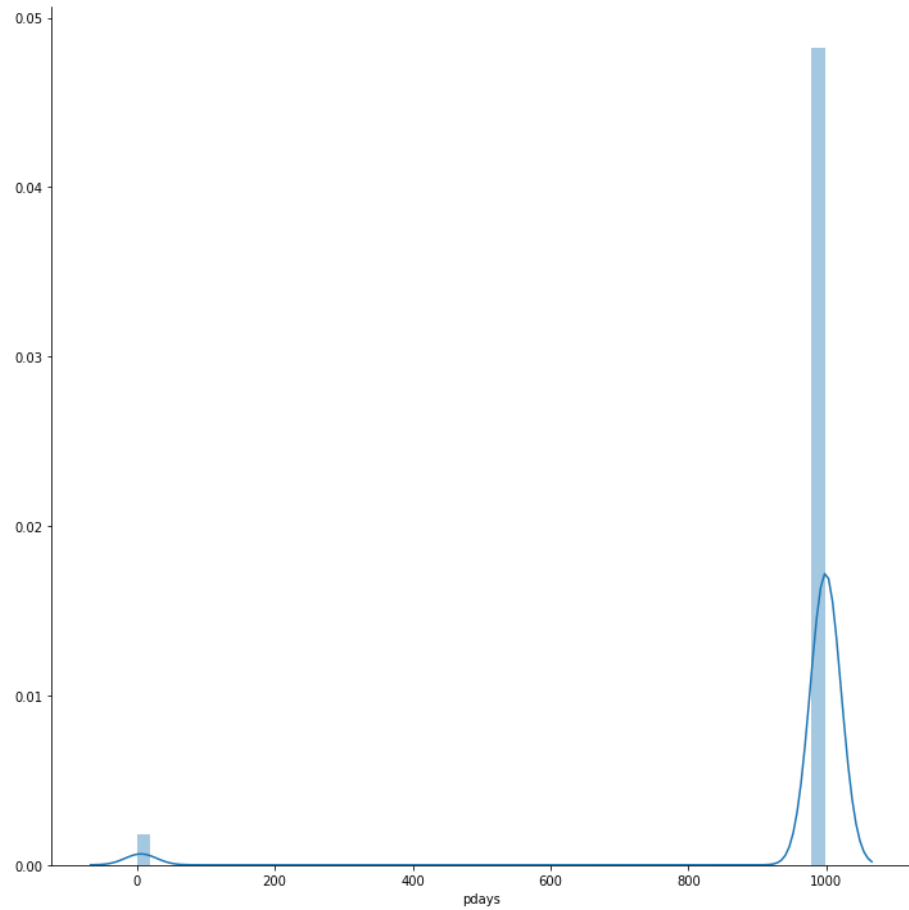


Majority of the clients were only contacted once during this campaign.

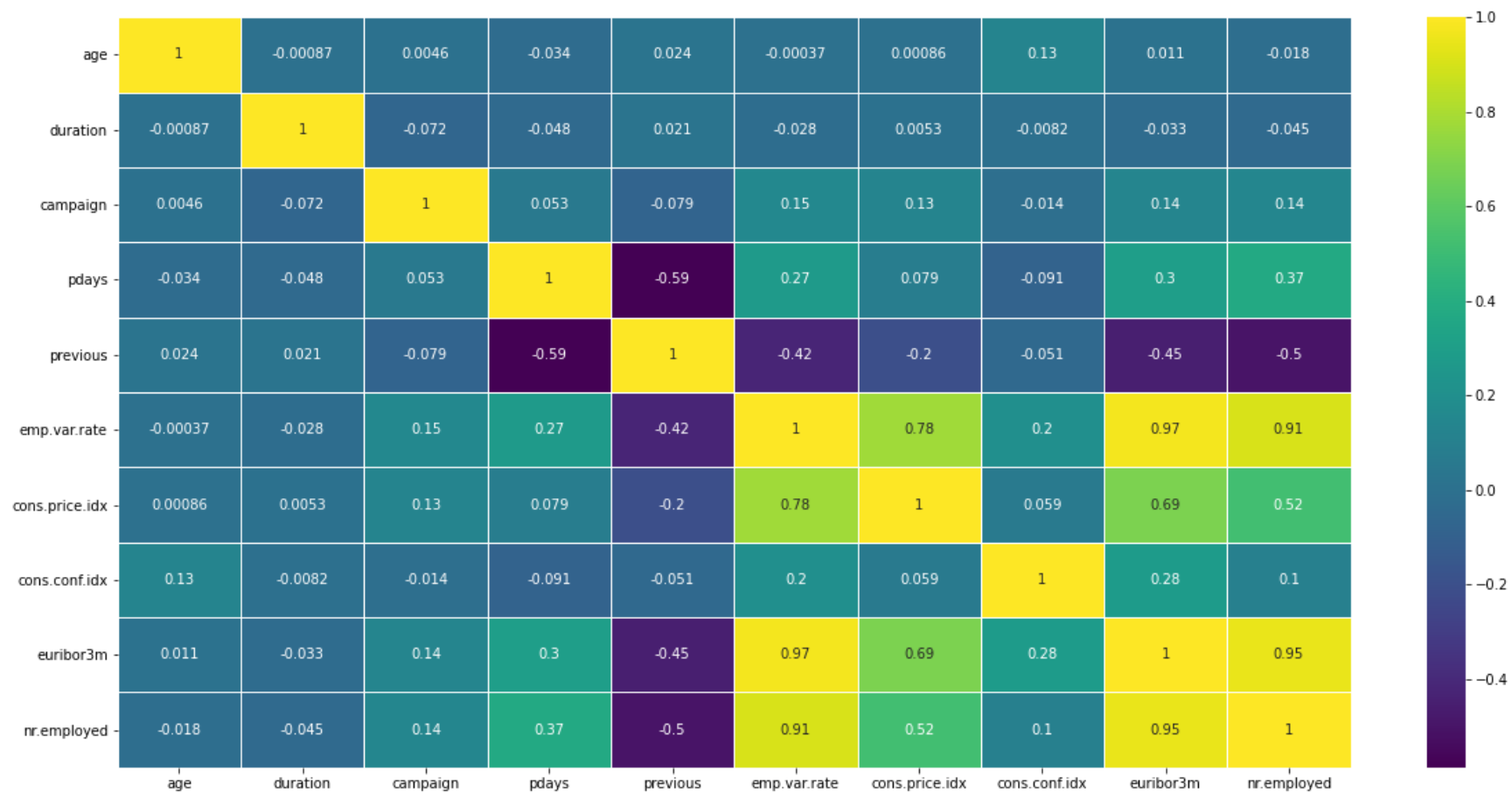
# DURATION



# PDAYS



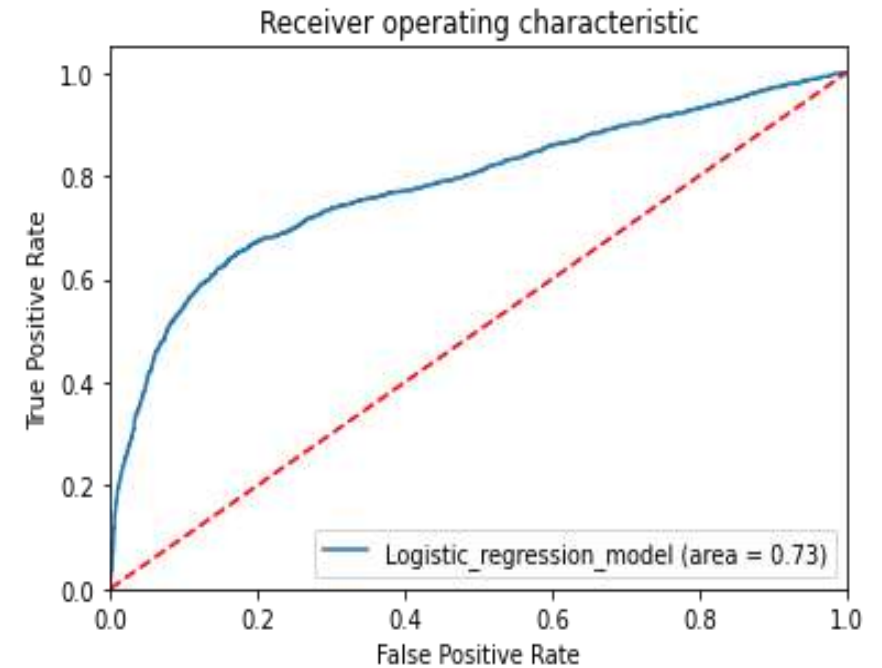
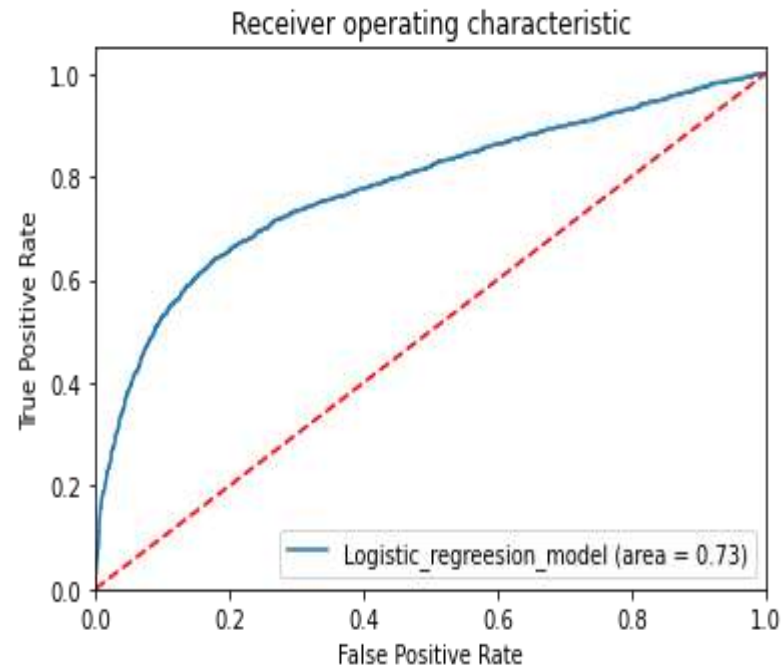
# CORRELATION MATRIX



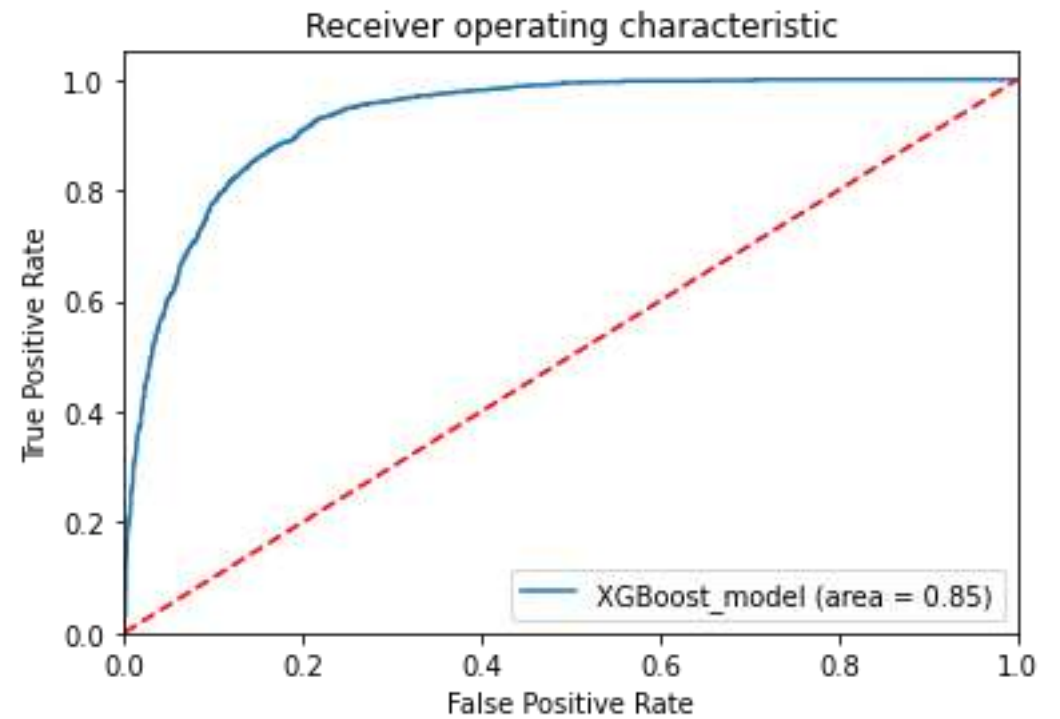
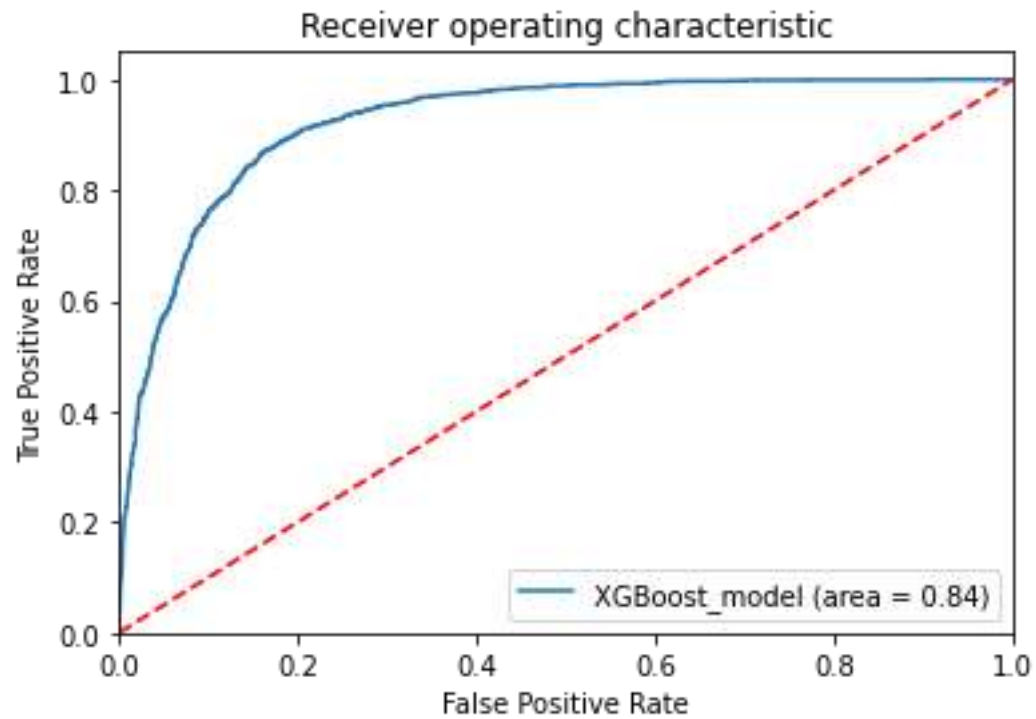
Emp.var. Rate, euribor3m, nr.employed and cons.price.idx have very high correlation

# MODELS

## LOGISTIC REGRESSION

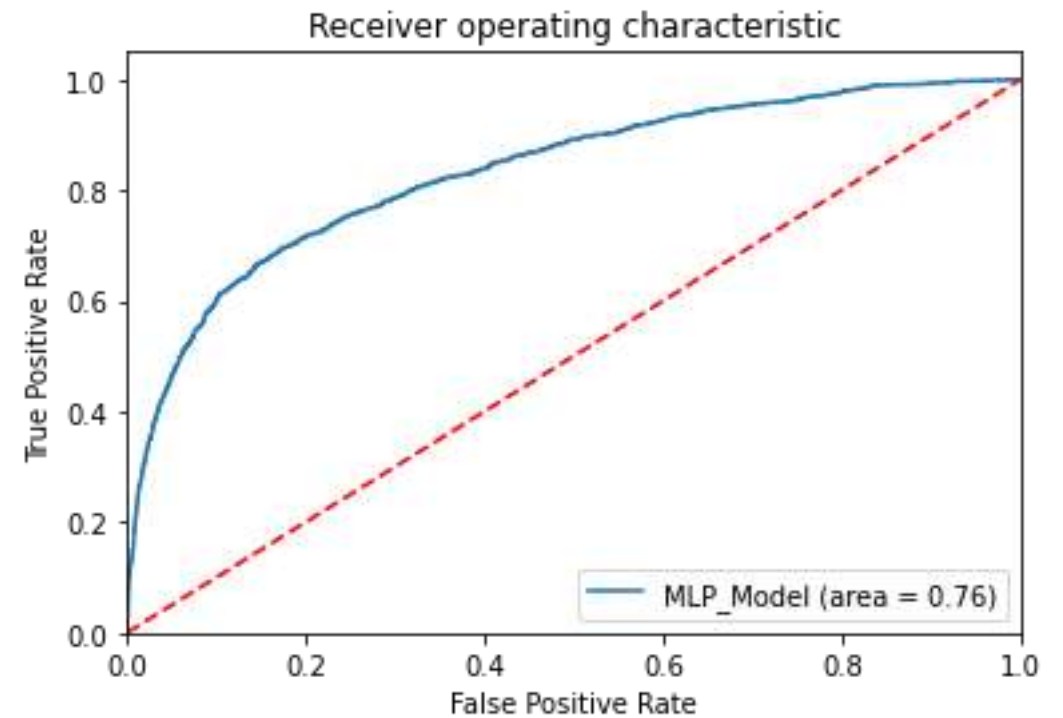
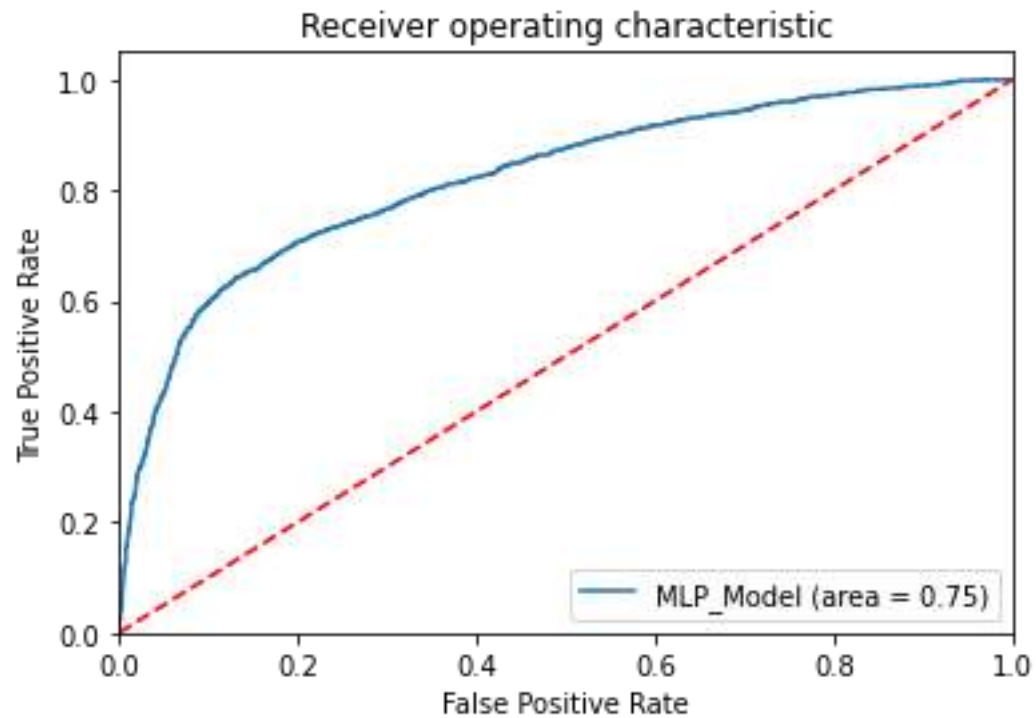


# XGBoost Model

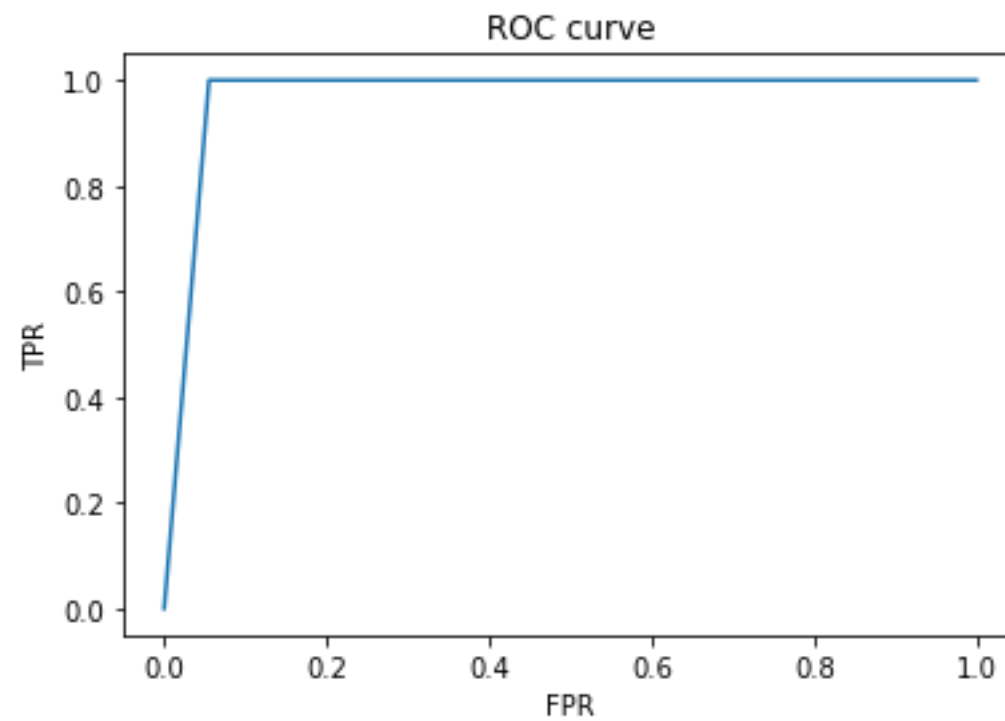




# MULTILAYER PERCEPTRON



# RANDOM FOREST



# FINAL RECOMMENDATION

- The most influential variables are duration,nr.employed,euribor3m and emp.var.rate
- Duration has a positive effect of people saying yes since the longer conversation the more inclined the client will be to the term deposit.
- Euribor3m denotes the Euribor 3 month rate which is an indicator of the average interbank interest rates. The higher the interest rates the more a client will be inclined to the term deposit.
- Emp.var.rate which is the change of the employment rate has a negative impact of the term deposits since a change in the employment rate will make the clients less likely to subscribe to term deposits.
- The bank should target clients above 60years of age.
- The bank should also prioritize those who were part of the previous campaigns.

# Thank You