Viswambhara Educational Society

VAAGDEVI ENGINEERING COLLEGE

Approved by AICTE & Affliated to JNTUH, Hyderabad

Loan Prediction using Machine Learning

By
Pradeepthi durgaraju

Group Name: AIML
Group Members :
T.nithin
(18UK1A05N6)
Y.P.nikhil
(18UK1A05M9)
M.prashanth
(18UK1A05K9)

Content

- Introduction
- The classification problem
- Steps involved in machine learning
- Features
- Labels
- Visualizing data using jupiter
- Explanation of the Code using jupiter
- Models of training and testing the dataset

1. Loan prediction using logistic regression
2. Loan prediction using random forest classification
3. Loan prediction using decision tree classification

- Loan Prediction models Comparison

INTRODUCTION

- Loan-Prediction
- Understanding the problem statement is the first and foremost step. This would help you give an intuition of what you will face ahead of time. Let us see the problem statement.
- Dream Housing Finance company deals in all home loans. They have presence across all urban, semi urban and rural areas. Customer first apply for home loan after that company validates the customer eligibility for loan. Company wants to automate the loan eligibility process (real time) based on customer detail provided while filling online application form. These details are Gender, Marital Status, Education, Number of Dependents, Income, Loan Amount, Credit History and others. To automate this process, they have given a problem to identify the customers segments, those are eligible for loan amount so that they can specifically target these customers.

The Classification problem

- It is a classification problem where we have to predict whether a loan would be approved or not. In a classification problem, we have to predict discrete values based on a given set of independent variable(s). Classification can be of two types:
- Binary Classification : In this classification we have to predict either of the two given classes. For example: classifying the gender as male or female, predicting the result as win or loss, etc. Multiclass Classification : Here we have to classify the data into three or more classes. For example: classifying a movie's genre as comedy, action or romantic, classify fruits as oranges, apples, or pears, etc.
- Loan prediction is a very common real-life problem that each retail bank faces atleast once in its lifetime. If done correctly, it can save a lot of man hours at the end of a retail bank.

Steps involved in machine learning

1 - Data Collection

- The quantity & quality of your data dictate how accurate our model is
- The outcome of this step is generally a representation of data (Guo simplifies to specifying a table) which we will use for training
- Using pre-collected data, by way of datasets from Kaggle, UCI, etc., still fits into this step

2 - Data Preparation

- Wrangle data and prepare it for training
- Clean that which may require it (remove duplicates, correct errors, deal with missing values, normalization, data type conversions, etc.)
- Randomize data, which erases the effects of the particular order in which we collected and/or otherwise prepared our data.

Steps involved in machine learning

3 - Choose a Model

- Different algorithms are for different tasks; choose the right one
-

4 - Train the Model

- The goal of training is to answer a question or make a prediction correctly as often as possible
- Linear regression example: algorithm would need to learn values for m (or W) and b (x is input, y is output)
- Each iteration of process is a training step

Steps involved in machine learning

5 - Evaluate the Model

- Uses some metric or combination of metrics to "measure" objective performance of model
- Test the model against previously unseen data
- This unseen data is meant to be somewhat representative of model performance in the real world, but still helps tune the model (as opposed to test data, which does not)
- Good train/evaluate split 80/20, 70/30, or similar, depending on domain, data availability, dataset particulars, etc.

Steps involved in machine learning

6 - Parameter Tuning

- This step refers to *hyper-parameter* tuning, which is an "art form" as opposed to a science
- Tune model parameters for improved performance
- Simple model hyper-parameters may include: number of training steps, learning rate, initialization values and distribution, etc.

7 - Make Predictions

- Using further (test set) data which have, until this point, been withheld from the model (and for which class labels are known), are used to test the model; a better approximation of how the model will perform in the real world.

DATASETS

- Here we have two datasets. First is train_dataset.csv, test_dataset.csv.
- These are datasets of loan approval applications which are featured with annual income, married or not, dependents are there or not, educated or not, credit history present or not, loan amount etc.
- The outcome of the dataset is represented by loan status in the train dataset.
- This column is absent in test_dataset.csv as we need to assign loan status with the help of training dataset.

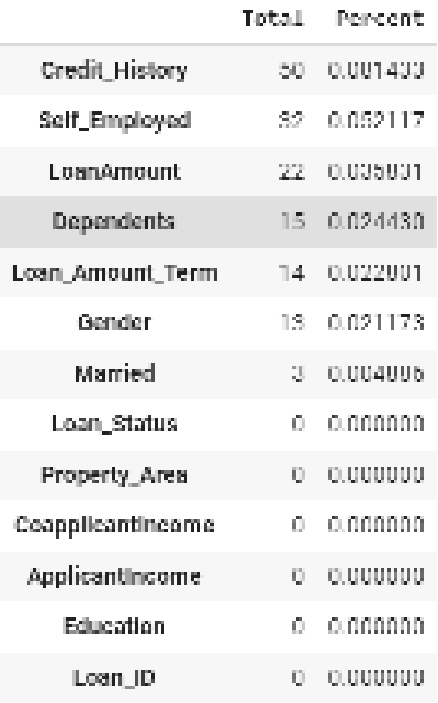
FEATURES PRESENT IN LOAN PREDICTION

- Loan_ID – The ID number generated by the bank which is giving loan.
- Gender – Whether the person taking loan is male or female.
- Married – Whether the person is married or unmarried.
- Dependents – Family members who stay with the person.
- Education – Educational qualification of the person taking loan.
- Self_Employed – Whether the person is self-employed or not.
- ApplicantIncome – The basic salary or income of the applicant per month.
- CoapplicantIncome – The basic income or family members.
- LoanAmount – The amount of loan for which loan is applied.
- Loan_Amount_Term – How much time does the loan applicant take to pay the loan.
- Credit_History – Whether the loan applicant has taken loan previously from same bank.
- Property_Area – This is about the area where the person stays (Rural/Urban).

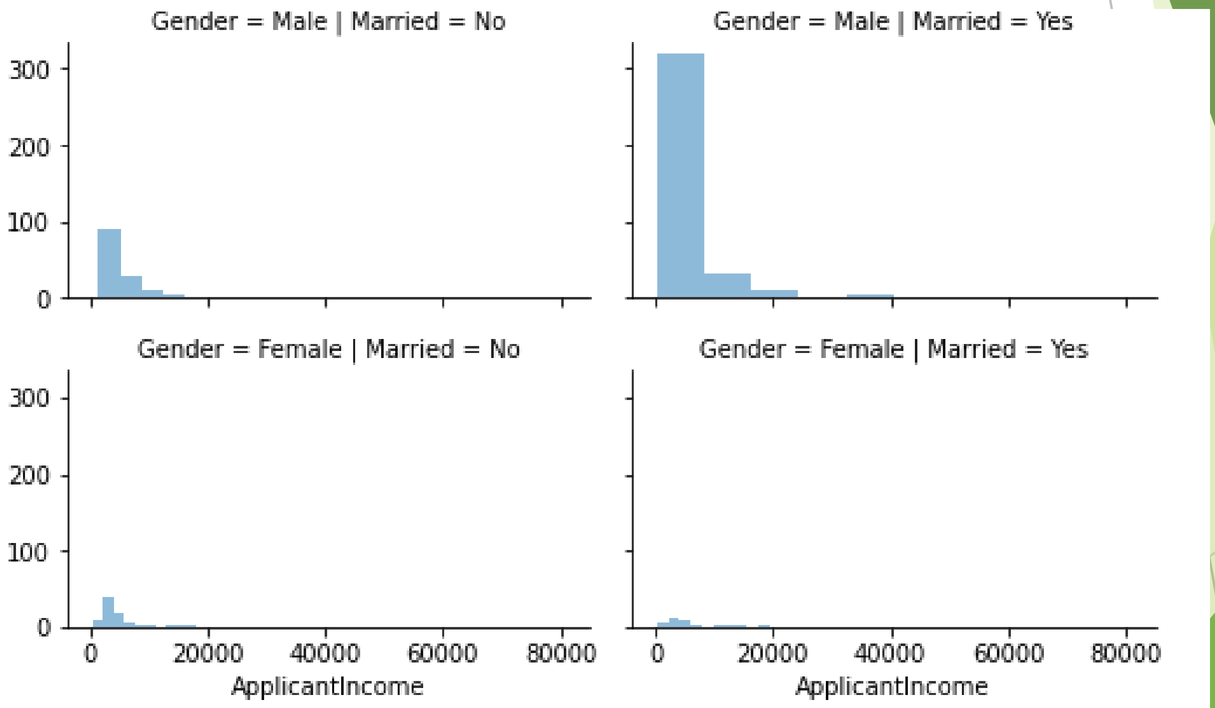
Labels

- LOAN_STATUS – Based on the mentioned features, the machine learning algorithm decides whether the person should be give loan or not.

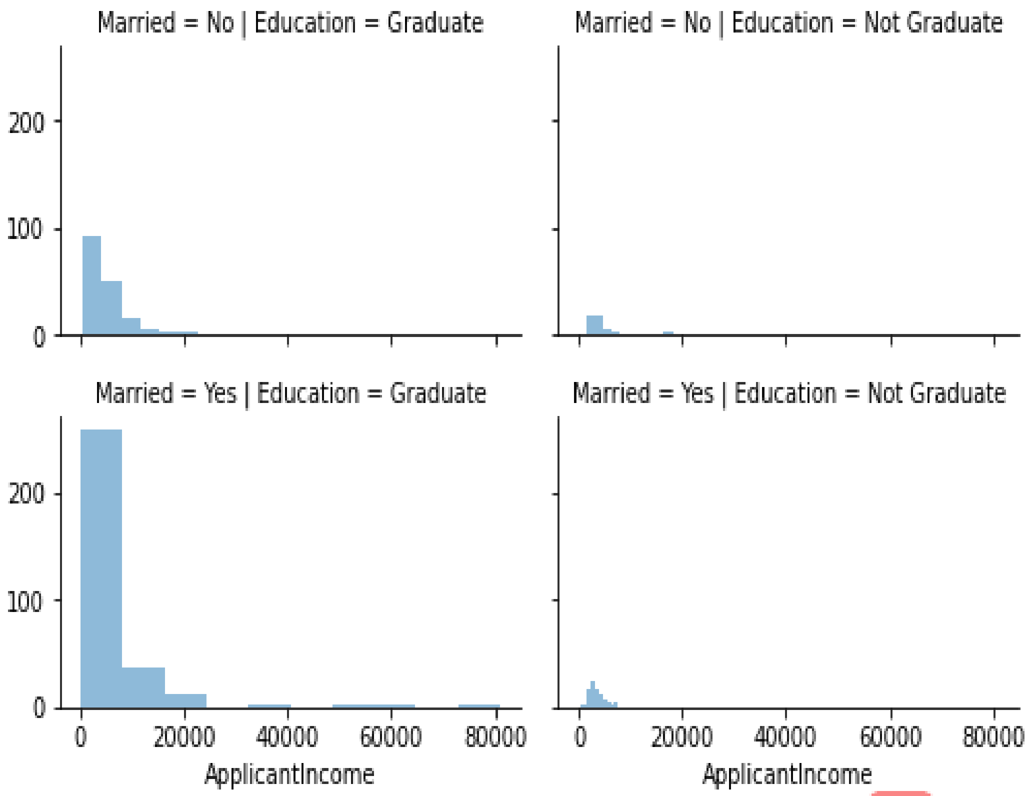
Visualizing data using google Colab

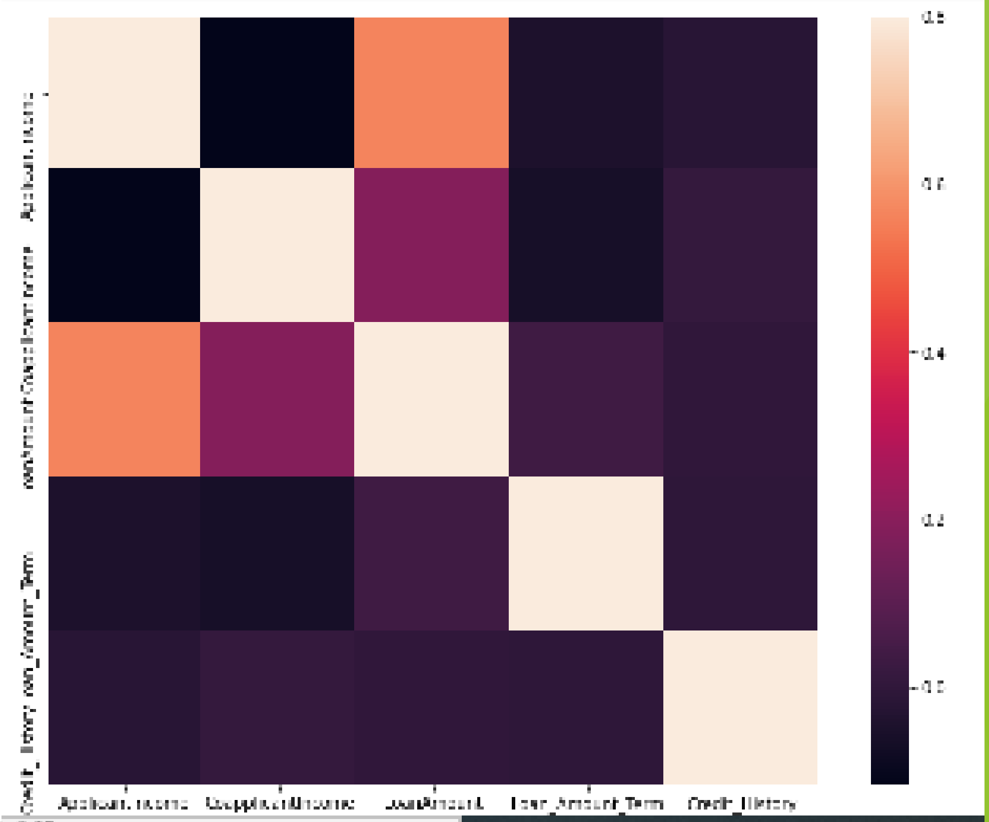


	Total	Percent
Credit_History	50	0.081433
Self_Employed	32	0.052117
LoanAmount	22	0.035831
Dependents	15	0.024430
Loan_Amount_Term	14	0.022801
Gender	13	0.021173
Married	3	0.004886
Loan_Status	0	0.000000
Property_Area	0	0.000000
CoapplicantIncome	0	0.000000
ApplicantIncome	0	0.000000
Education	0	0.000000
Loan_ID	0	0.000000

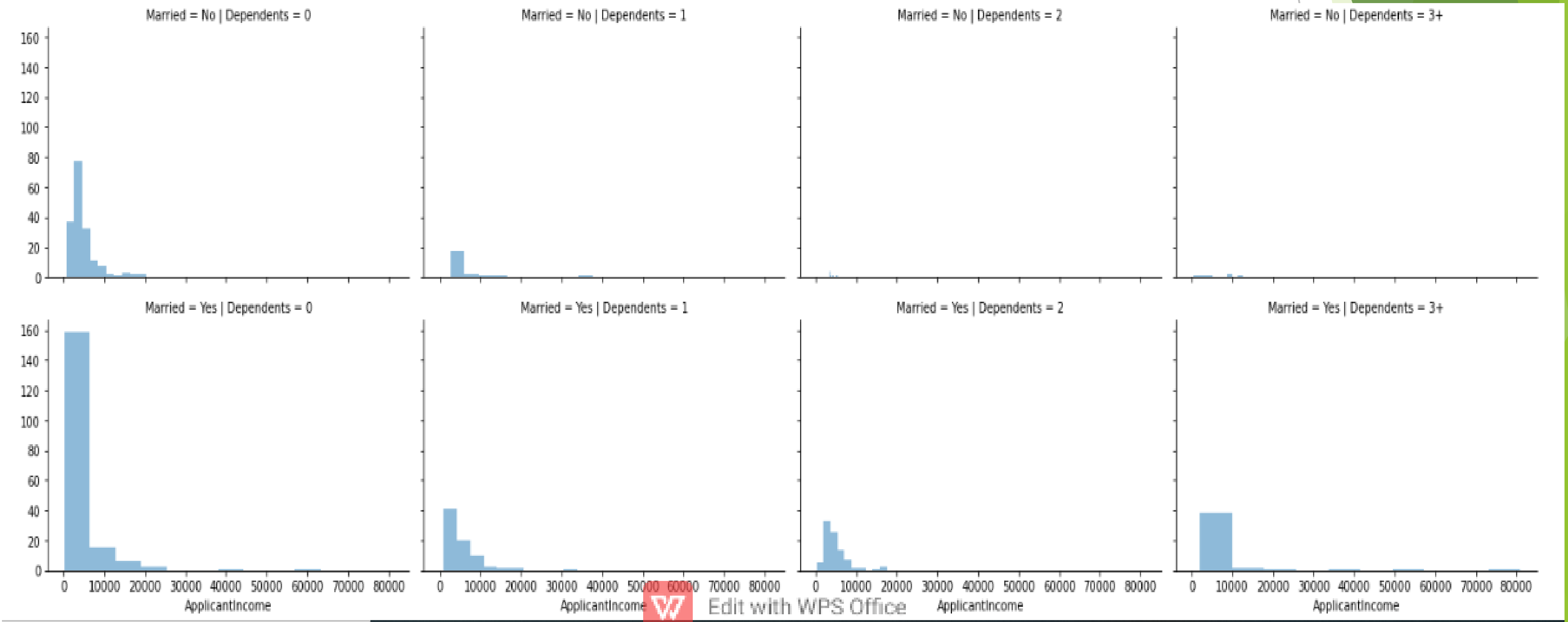


Visualizing data using google Colab

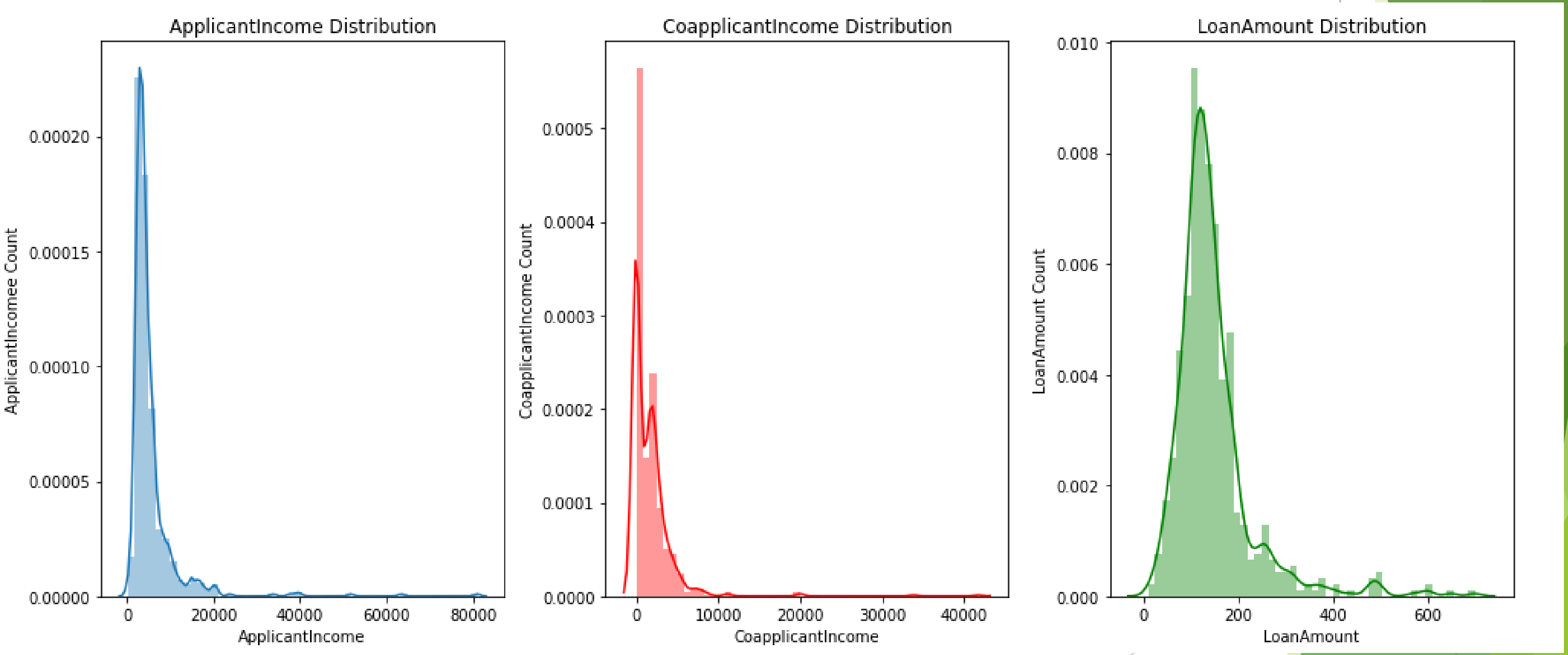




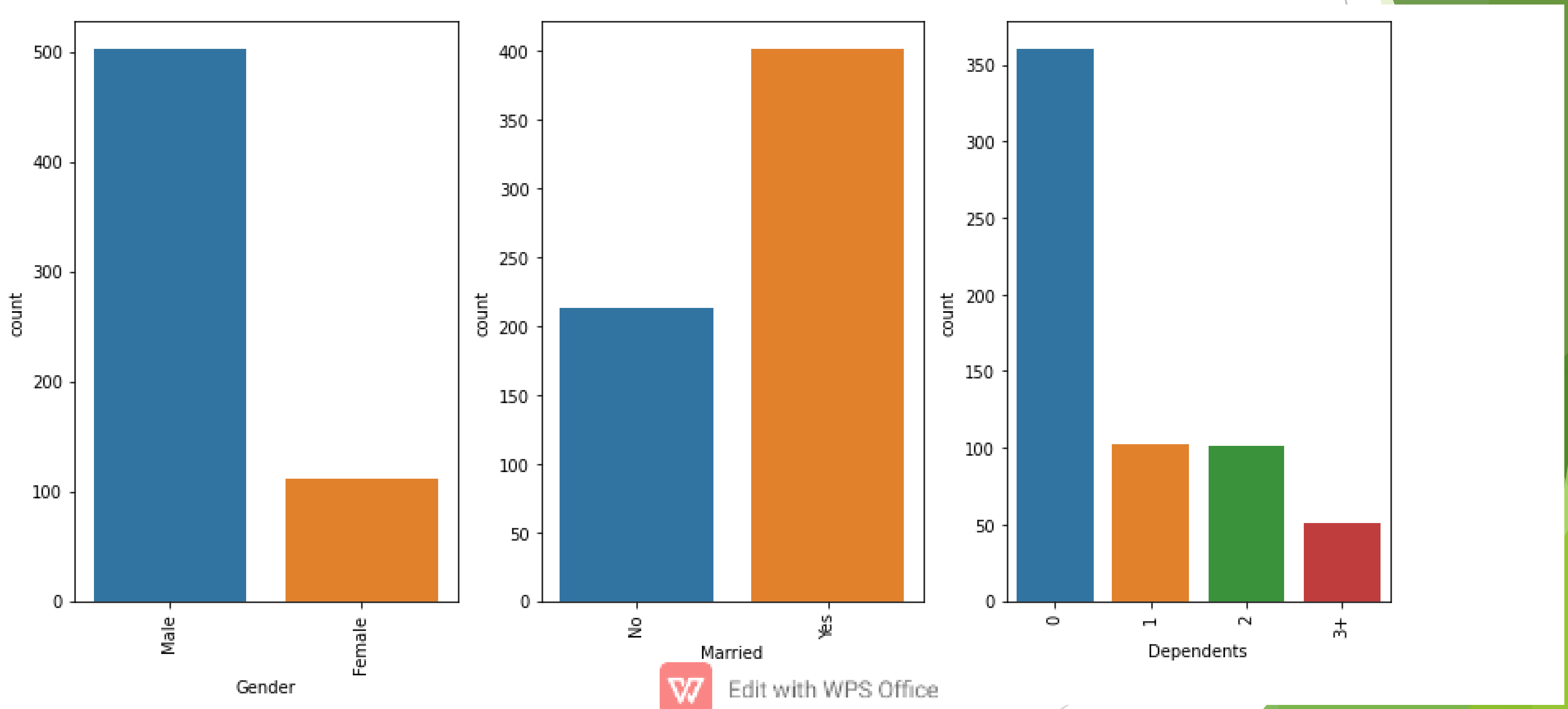
Visualizing data using google Colab



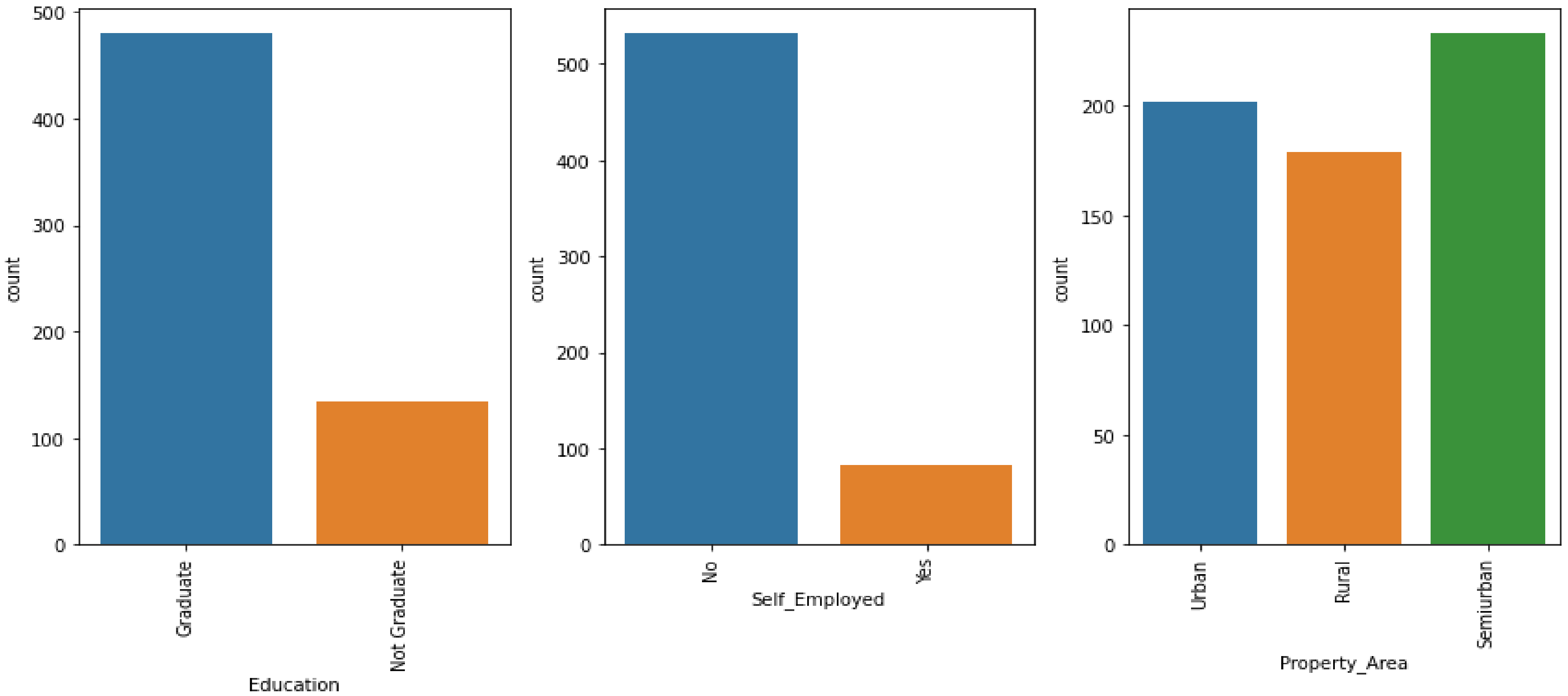
Visualizing data using google Colab



Visualizing data using google Colab



Visualizing data using google Colab



Explanation of the Code using Google Colab

- The dataset is trained and tested with 3 methods

1. Loan prediction using logistic regression
2. Loan prediction using random forest classification
3. Loan prediction using decision tree classification

Loan prediction using Logistic Regression

- # take a look at the top 5 rows of the train set, notice the column "Loan_Status"
- train.head()

Loan_ID	Gender	Married	Dependents	Education	Self_Employed	ApplicantIncome	CoapplicantIncome	LoanAmount	Loan_Amount_Term	Credit_History	Property_Area	Loan_Status
LP001002	Male	No	0	Graduate	No	5849	0.0	NaN	360.0	1.0	Urban	Y
LP001003	Male	Yes	1	Graduate	No	4583	1508.0	128.0	360.0	1.0	Rural	N
LP001005	Male	Yes	0	Graduate	Yes	3000	0.0	66.0	360.0	1.0	Urban	Y
LP001006	Male	Yes	0	Not Graduate	No	2583	2358.0	120.0	360.0	1.0	Urban	Y
LP001008	Male	No	0	Graduate	No	6000	0.0	141.0	360.0	1.0	Urban	Y

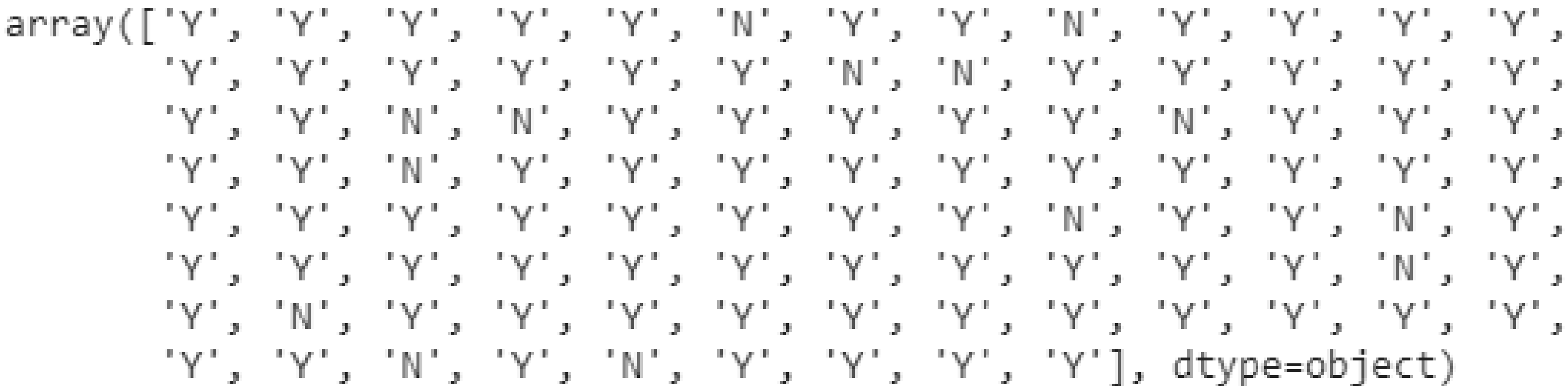
Loan prediction using Logistic Regression

- # take a look at the top 5 rows of the test set, notice the absense of "Loan_Status" that we will predict
- test.head()

Loan_ID	Gender	Married	Dependents	Education	Self_Employed	ApplicantIncome	CoapplicantIncome	LoanAmount	Loan_Amount_Term	Credit_History	Property_Area
LP001015	Male	Yes	0	Graduate	No	5720	0	110.0	360.0	1.0	Urban
LP001022	Male	Yes	1	Graduate	No	3076	1500	126.0	360.0	1.0	Urban
LP001031	Male	Yes	2	Graduate	No	5000	1800	208.0	360.0	1.0	Urban
LP001035	Male	Yes	2	Graduate	No	2340	2546	100.0	360.0	NaN	Urban
LP001051	Male	No	0	Not Graduate	No	3276	0	78.0	360.0	1.0	Urban

Loan prediction using Logistic Regression

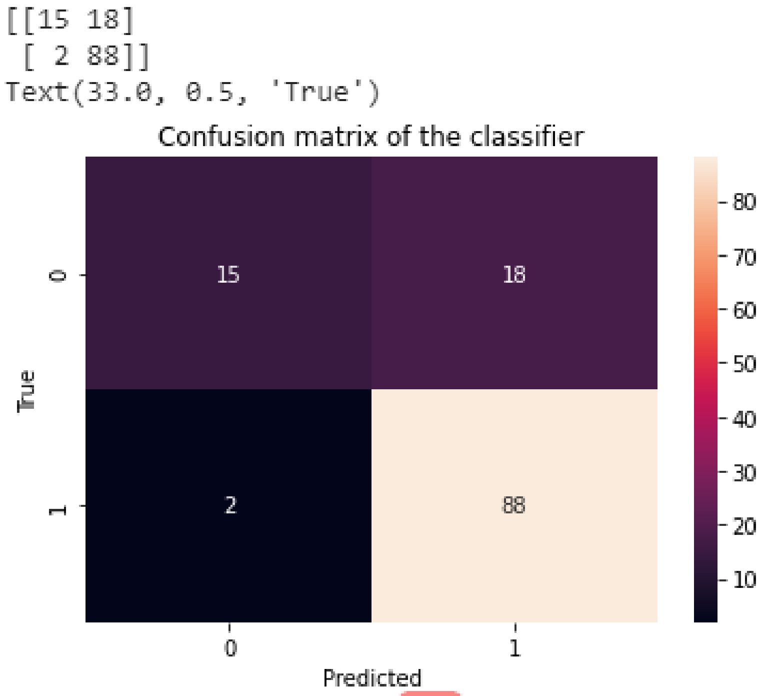
- # Printing values of whether loan is accepted or rejected
- y_pred [:100]



```
array(['Y', 'Y', 'Y', 'Y', 'Y', 'N', 'Y', 'Y', 'N', 'Y', 'Y', 'Y', 'Y',
       'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'N', 'N', 'Y', 'Y', 'Y', 'Y', 'Y',
       'Y', 'Y', 'N', 'N', 'Y', 'Y', 'Y', 'Y', 'Y', 'N', 'Y', 'Y', 'Y',
       'Y', 'Y', 'N', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y',
       'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'N', 'Y', 'Y', 'N', 'Y',
       'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'N', 'Y',
       'Y', 'N', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y',
       'Y', 'Y', 'N', 'Y', 'N', 'Y', 'Y', 'Y', 'Y'], dtype=object)
```

Loan prediction using Logistic Regression

- Confusion Matrix



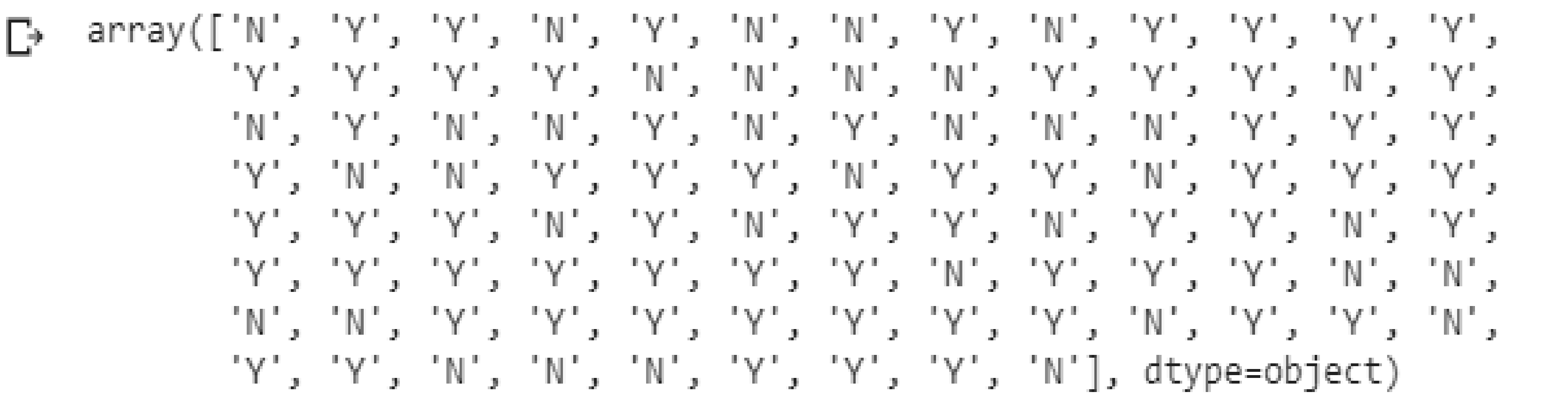
```
[[15 18]
 [ 2 88]]
Text(33.0, 0.5, 'True')
```

Loan prediction using Logistic Regression

```
# Check Accuracy
   from sklearn.metrics import accuracy_score
   accuracy_score(y_test,y_pred)

   0.8373983739837398

# Applying k-Fold Cross Validation
   from sklearn.model_selection import cross_val_score
   accuracies = cross_val_score(estimator = classifier, X = X_train, y = y_train, cv = 10)
   accuracies.mean()
   # accuracies.std()

   0.8024081632653062
```

Loan prediction using random forest classification

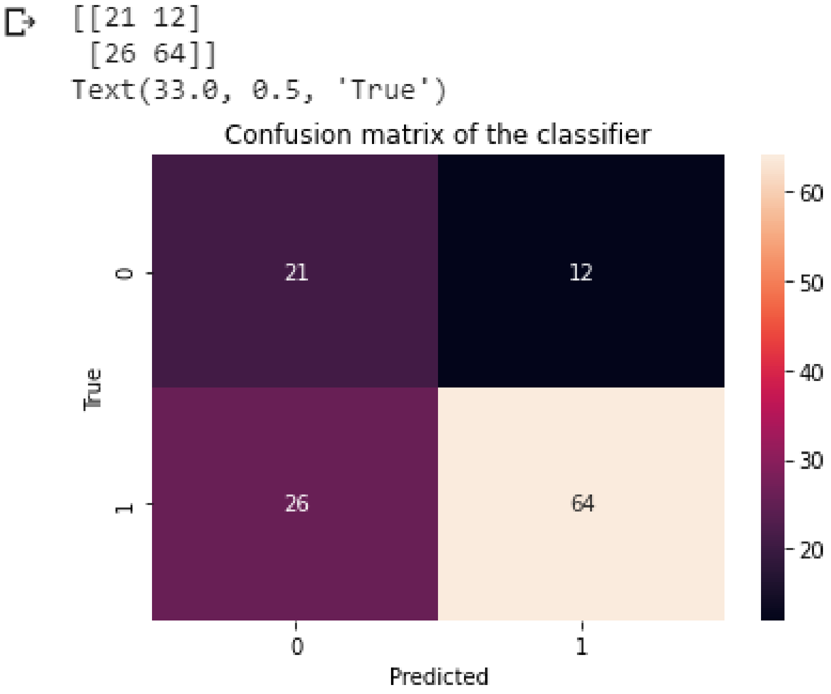
- # Printing values of whether loan is accepted or rejected
- y_pred [:100]



```
array(['N', 'Y', 'Y', 'N', 'Y', 'N', 'N', 'Y', 'N', 'Y', 'Y', 'Y', 'Y',
       'Y', 'Y', 'Y', 'Y', 'N', 'N', 'N', 'N', 'Y', 'Y', 'Y', 'N', 'Y',
       'N', 'Y', 'N', 'N', 'Y', 'N', 'Y', 'N', 'N', 'N', 'Y', 'Y', 'Y',
       'Y', 'N', 'N', 'Y', 'Y', 'Y', 'N', 'Y', 'Y', 'N', 'Y', 'Y', 'Y',
       'Y', 'Y', 'Y', 'N', 'Y', 'N', 'Y', 'Y', 'N', 'Y', 'Y', 'N', 'Y',
       'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'N', 'Y', 'Y', 'Y', 'N', 'N',
       'N', 'N', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'N', 'Y', 'Y', 'N',
       'Y', 'Y', 'N', 'N', 'N', 'Y', 'Y', 'Y', 'N'], dtype=object)
```

Loan prediction using random forest classification

- Confusion matrix



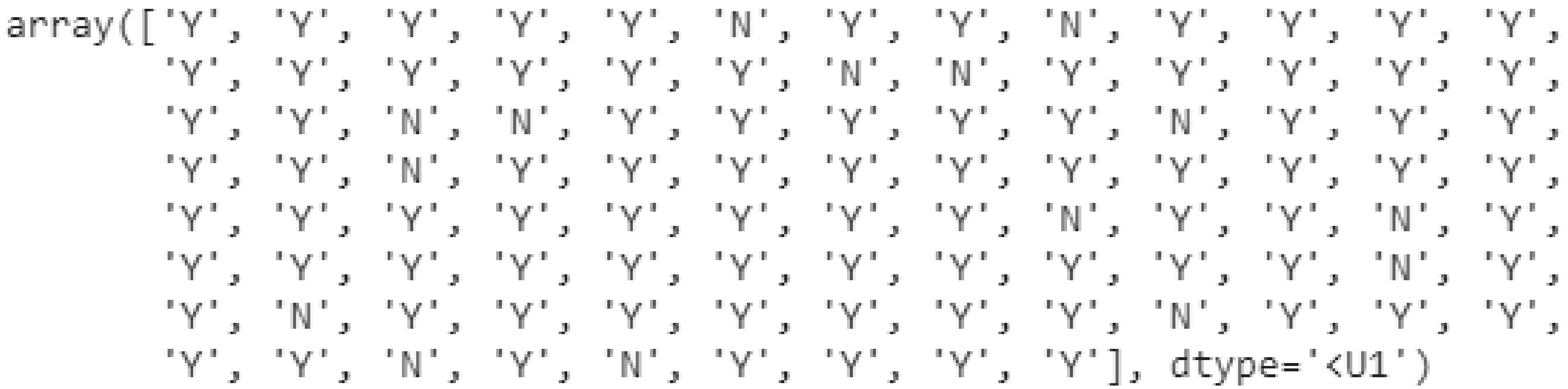
```
[[21 12]
 [26 64]]
Text(33.0, 0.5, 'True')
```

Loan prediction using random forest classification

```
# Check Accuracy
  from sklearn.metrics import accuracy_score
  accuracy_score(y_test,y_pred)


  0.6910569105691057
# Applying k-Fold Cross Validation
  from sklearn.model_selection import cross_val_score
  accuracies = cross_val_score(estimator = classifier, X = X_train, y = y_train, cv = 10)

  accuracies.mean()
  # accuracies.std()


 0.7148163265306122
```

Loan Prediction using Decision Tree Classification

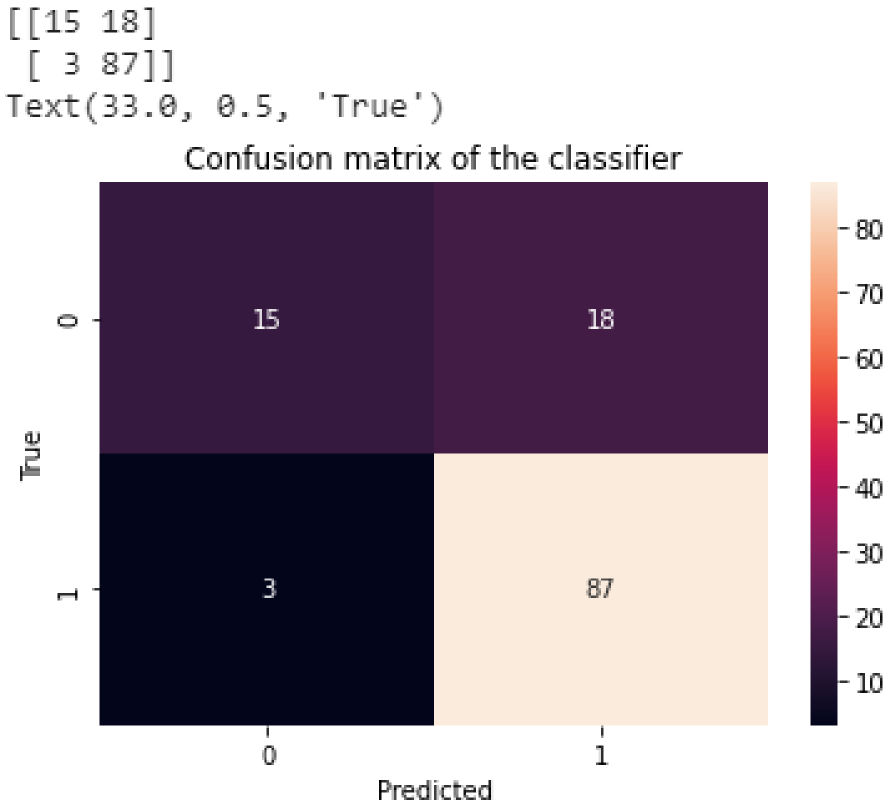
- # Printing values of whether loan is accepted or rejected
- y_pred[:100]



```
array(['Y', 'Y', 'Y', 'Y', 'Y', 'N', 'Y', 'Y', 'N', 'Y', 'Y', 'Y', 'Y',
       'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'N', 'N', 'Y', 'Y', 'Y', 'Y', 'Y',
       'Y', 'Y', 'N', 'N', 'Y', 'Y', 'Y', 'Y', 'Y', 'N', 'Y', 'Y', 'Y',
       'Y', 'Y', 'N', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y',
       'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'N', 'Y', 'Y', 'N', 'Y',
       'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'N', 'Y',
       'Y', 'N', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'Y', 'N', 'Y', 'Y', 'Y',
       'Y', 'Y', 'N', 'Y', 'N', 'Y', 'Y', 'Y', 'Y'], dtype='<U1')
```

Loan Prediction using Decision Tree Classification

- Confusion Matrix



```
[[15 18]
 [ 3 87]]
Text(33.0, 0.5, 'True')
```

Loan Prediction using Decision Tree Classification

```
# Check Accuracy
 from sklearn.metrics import accuracy_score
 accuracy_score(y_test,y_pred)


 0.8292682926829268
 # Applying k-Fold Cross Validation
 from sklearn.model_selection import cross_val_score
 accuracies = cross_val_score(estimator = classifier, X = X_train, y = y_train, cv = 10)

 accuracies.mean()
# accuracies.std()


 0.7922448979591836
```

Loan prediction models comparison

Loan Prediction	Accuracy	Accuracy using K-fold Cross Validation
Using Logistic Regression	0.8373983739837398	0.8024081632653062
Using Random Forest Classification	0.6910569105691057	0.7148163265306122
Using Decision Tree Classification	0.8292682926829268	0.7922448979591836

This means that from the above accuracy table, we can conclude that logistic regression is best model for the loan prediction problem.

THANK YOU