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ACCURATE LOAN APPROVAL PREDICTION BASED ON MACHINE LEARNING APPROACH

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ABSTRACT

Loan approval is a very important process for banking organizations. Banking Industry always needs a more accurate predictive modeling system for many issues. Predicting credit defaulters is a difficult task for the banking industry. The system approved or rejects the loan applications. Recovery of loans is a major contributing parameter in the financial statements of a bank. It is very difficult to predict the possibility of payment of loan by the customer. Machine Learning (ML) techniques are very useful in predicting outcomes for large amount of data. In this paper three machine learning algorithms, Logistic Regression (LR), Decision Tree (DT) and Random Forest (RF) are applied to predict the loan approval of customers. The experimental results conclude that the accuracy of Decision Tree machine learning algorithm is better as compared to Logistic Regression and Random Forest machine learning approaches.

Keywords:- Loan, Machine Learning, Training, Testing, Prediction.

I. INTRODUCTION

Bank credit risk assessment is widely used at banks around the world. As credit risk evaluation is very crucial, a variety of techniques are used for risk level calculation. In addition, credit risk is one of the main functions of the banking community[1][12][3].

Distribution of the loans is the core business part of almost every banks. The main portion the bank's asset is directly came from the profit earned from the loans distributed by the banks[4][5]. The prime objective in banking environment is to invest their assets in safe hands where it is. Today many banks/financial companies approves loan after a regress process of verification and validation but still there is no surety whether the chosen applicant is the deserving right applicant out of all applicants[6][7][8]. Through this system we can predict whether that particular applicant is safe or not and the whole process of validation of features is automated by machine learning technique [46] [47]. The disadvantage of this model is that it emphasize different weights to each factor but in real life sometime loan can be approved on the basis of single strong factor only, which is not possible through this system[9][10][11].

Loan Prediction is very helpful for employee of banks as well as for the applicant also. The aim of this Paper is to provide quick, immediate and easy way to choose the deserving applicants [48]. It can provide special advantages to the bank [12][13][14]. The Loan Prediction System can automatically calculate the weight of each features taking part in loan processing and on new test data same features are processed with respect to their associated weight[15][16][17].A time limit can be set for the applicant to check whether his/her loan can be sanctioned or not. Loan Prediction System allows jumping to specific application so that it can be check on priority basis [18][19]. This Paper is exclusively for the managing authority of Bank/finance company, whole process of prediction is done privately no stakeholders would be able to alter the processing [20][21]. Result against particular Loan Id can be send to various department of banks so that they can take appropriate action on application. This helps all others department to carried out other formalities [22][23].

II. DATA SET

The training data set is now supplied to machine learning model, on the basis of this data set the model is trained[24][25]. Every new applicant details filled at the time of application form acts as a test data set. After the operation of testing, model predict whether the new applicant is a fit case for approval of the loan or not based upon the inference it conclude on the basis of the training data sets.

Variable Name	Description of Variable	Data Type
Loan ID	Unique Loan ID	Integer
Gender	Male/ Female	Character
Married	Applicant married (Y/N)	Character
Dependents	Number of dependents	Integer
Education	Graduate/ Under Graduate	String
Self_Employed	Self Imployed (Y/N)	Character
ApplicantIncome	Applicant income	Integer
CoapplicantIncome	Coapplicant income	Integer
Loan_Amount	Loan amount in thousands	Integer
Loan_Amount_Term	Term of loan in months	Integer
Credit_History	credit history meets guidelines	Integer
Property_Area	Urban/ Semi Urban/ Rural	String
Loan_Status	Loan Approved(Y/N)	String

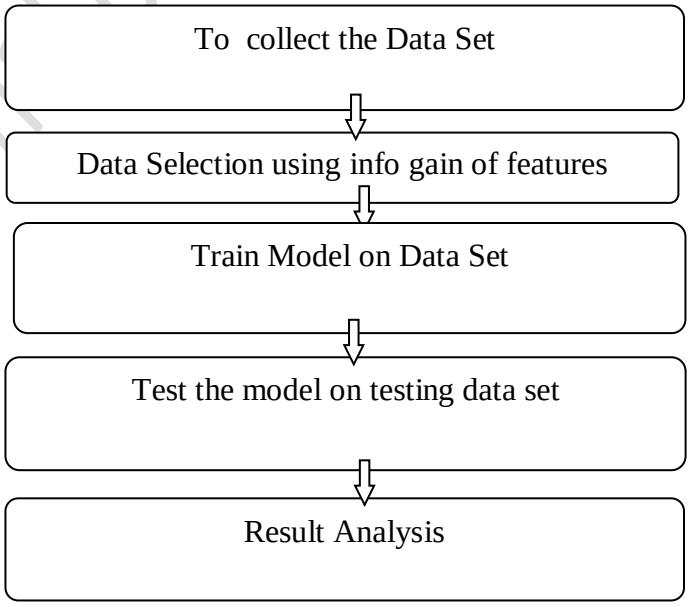
2.1. MACHINE LEARNING METHODS:

Six machine learning classification models have been used for prediction of androidapplications .The models are availablein R open source software.[26] R is licensed under GNU GPL. The briefdetails of each model is described below.

2.1.1. Decision Trees (C5.0):

The basic algorithm of decision tree [27] requires all attributes or features should be discretized. Feature selection is based on greatest information gain of features. The knowledge depicted in decision tree can represented in the form of IF-THEN rules[28][29]. This model is an extension of C4.5 classification algorithms described by Quinlan.

2.1.2. Loan Prediction Methodology



2.1.3. Random Forest (RF):

Random forests [30] are a group learning system for characterization (and relapse) that work by building a large number of Decision trees at preparing time and yielding the class that is the mode of the classes yield by individual trees[33].

2.1.4. Support Vector Machine (SVM):

Support vector machines are administered learning models that uses association r learning algorithm which analyze features and identified pattern knowledge, utilized for application classification. SVM can productively perform a regression utilizing the kernel trick, verifiably mapping their inputs into high-dimensional feature spaces [31].

2.1.5 Linear Models (LM):

The Linear Model [32][34] is numerically indistinguishable to a various regression analysis yet burdens its suitability for both different qualitative and numerous quantitative variables.

2.1.6 Neural Network (Nnet):

Neural networks [35] are non-linear statistical data modeling tools. T hey are usually used to model complex relationships between inputs and outputs, to find patterns in data, or to capture the statistical structure in an unknown joint probability distribution between observed variables[36].

2.1.7. Adaboost (ADB):

Adaboost short for " Adaptive Boosting ". It is delicate to noisy information data and outliers. It is different from neural systems and SVM[37][38] because Adaboost preparing methodology chooses just those peculiarities known to enhance the divining power of the model, decreasing dimensionality and conceivably enhancing execution time as potentially features don't have to be processed.[40]

2.1.8. Pandas:

Pandas is a Python package providing fast, flexible, and expressive data structures designed to make working with structured (tabular, multidimensional, potentially heterogeneous) and time series data both easy and intuitive [42] [43]. It aims to be the fundamental high-level building block for doing practical**,** real world data analysis in Python [44] [45]. Additionally, it has the broader goal of becoming the most powerful and flexible open source data analysis / manipulation toolavailable in any language**.** It is already well on its way toward this goal.

III. CODING

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    "Married              611 non-null object\n",
    "Dependents           599 non-null object\n",
    "Education            614 non-null object\n",
    "Self_Employed        582 non-null object\n",
    "ApplicantIncome      614 non-null int64\n",
    "CoapplicantIncome    614 non-null float64\n",
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IV. RESULT

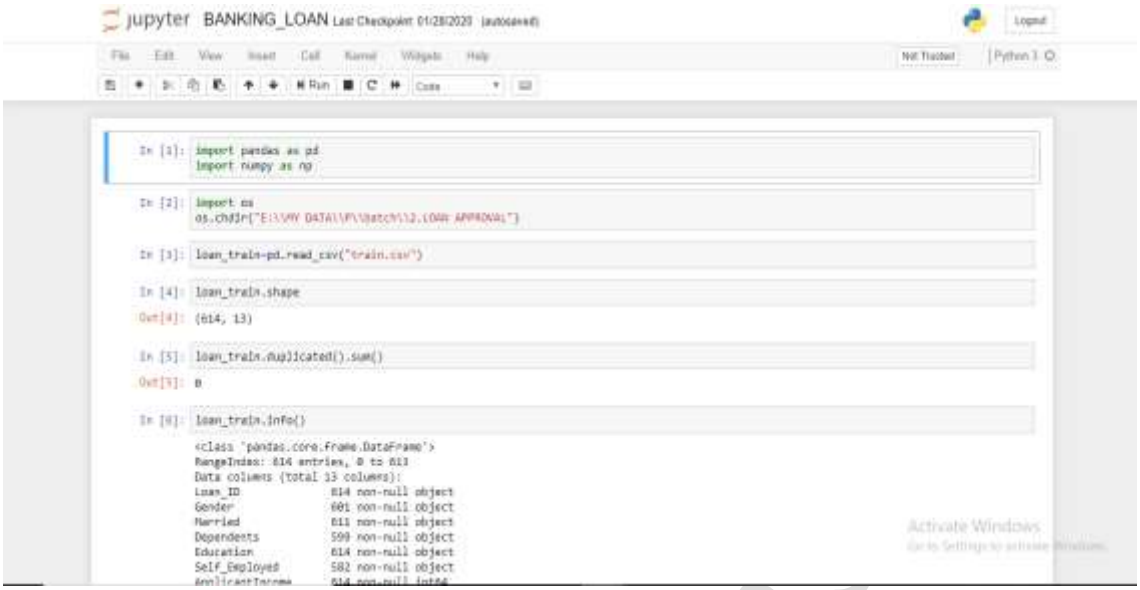

Figure 1: Loan Train Data set

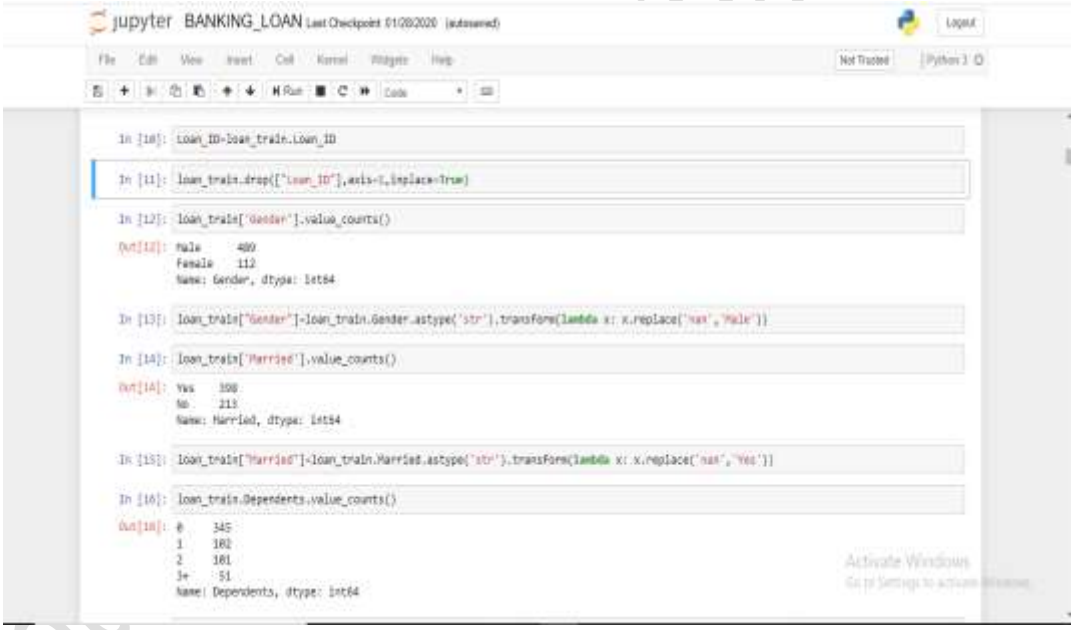

Figure 2: Loan Train Data set on gender and Dependents

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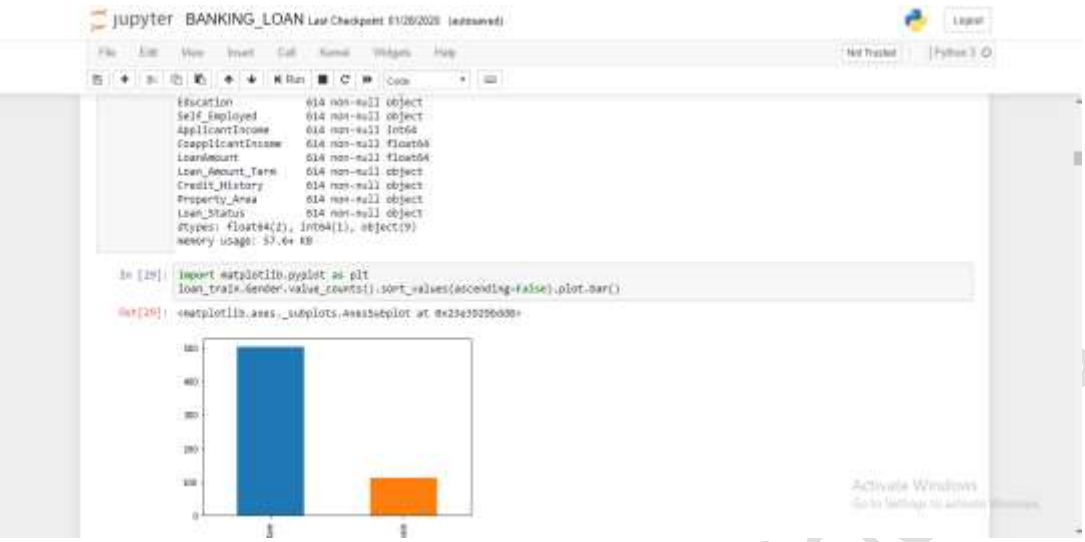

Figure 3: Loan Train Data set with Bar Chats

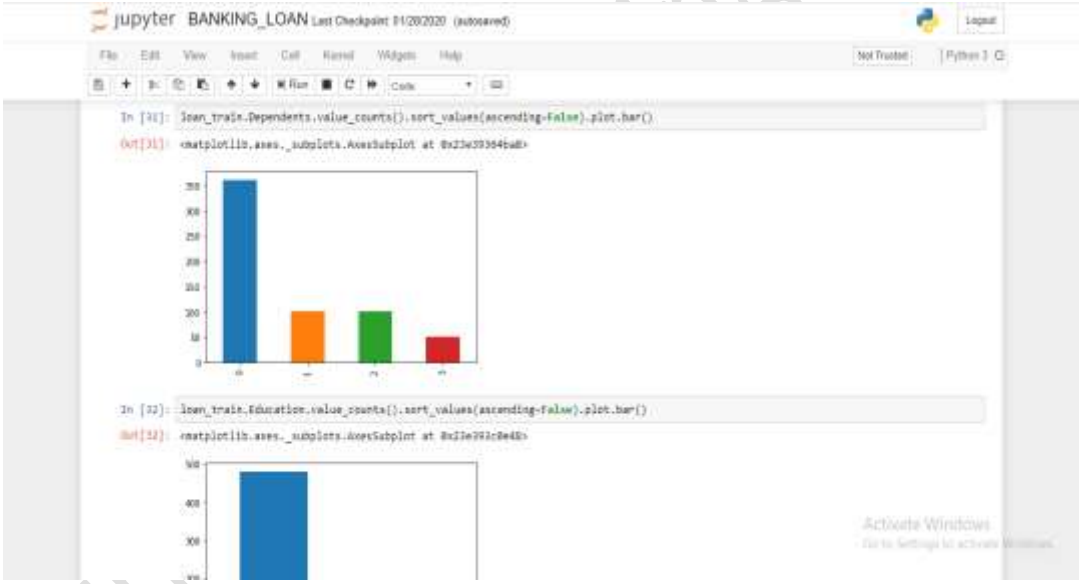

Figure 4: Loan Train Data set on dependent and education with Bar Chats

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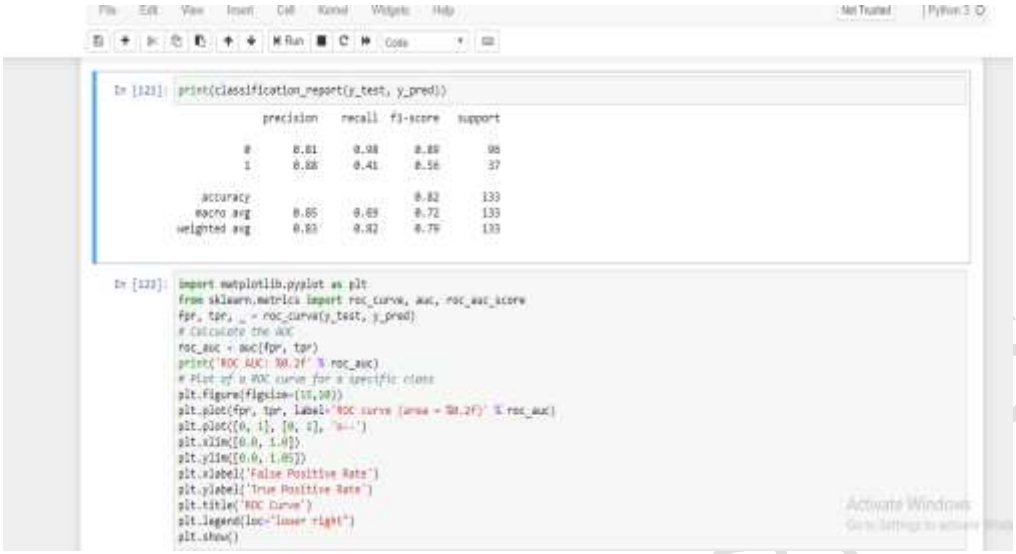

Figure 5: Loan Train Data set accuracy precision and recall

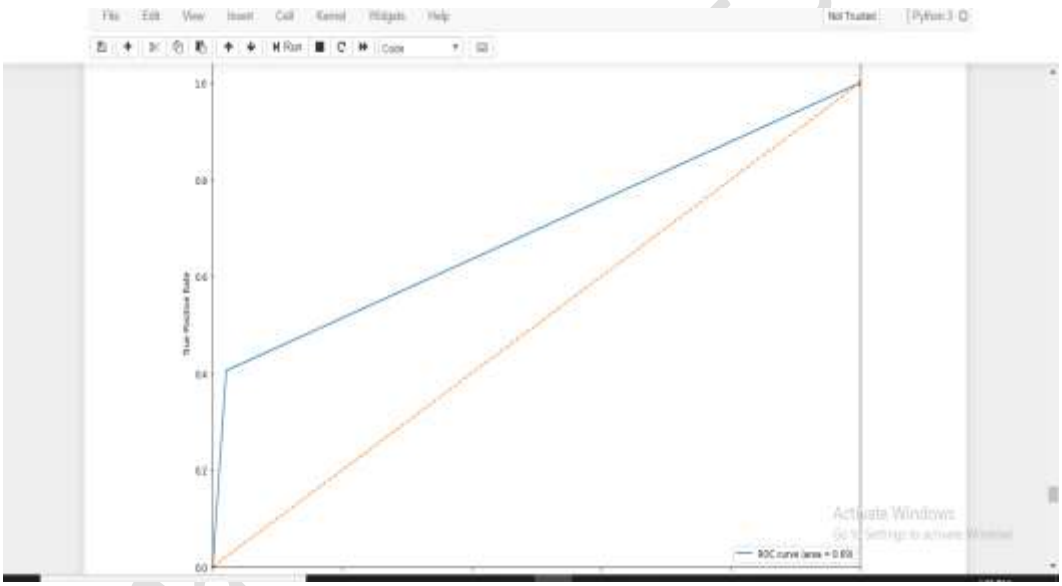

Figure 6: Loan Train Data set accuracy precision and recall line graph

V. CONCLUSION

From a proper analysis of positive points and constraints on the component, it can be safely concluded that the product is a highly efficient component. This application is working properly and meeting to all Banker requirements. This component can be easily plugged in many other systems.

There have been numbers cases of computer glitches, errors in content and most important weight of features is fixed in automated prediction system, So in the near future the so – called software could be made more secure, reliable and dynamic weight adjustment .In near future this module of prediction can be integrate with the module of automated processing system. the system is trained on old training dataset in future software can be made such that new testing date should also take part in training data after some fix time.

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