1 INTRODUCTION

1.1 Overview

A brief description about your project

1.2 Purpose

The use of this project. What can be achieved using this. **2 Problem Definition & Design Thinking**

2.1 Empathy Map

Paste the empathy map screenshot

2.2 Ideation & Brainstorming Map

Paste the Ideation & brainstorming map screenshot

3 RESULT

Final findings (Output) of the project along with screenshots.

4 ADVANTAGES & DISADVANTAGES

List of advantages and disadvantages of the proposed solution

5 APPLICATIONS

The areas where this solution can be applied

6 CONCLUSION

Conclusion summarizing the entire work and findings.

7 FUTURE SCOPE

Enhancements that can be made in the future.

8 APPENDIX

9 A. SOURCE CODE

Attach the code for the solution built.

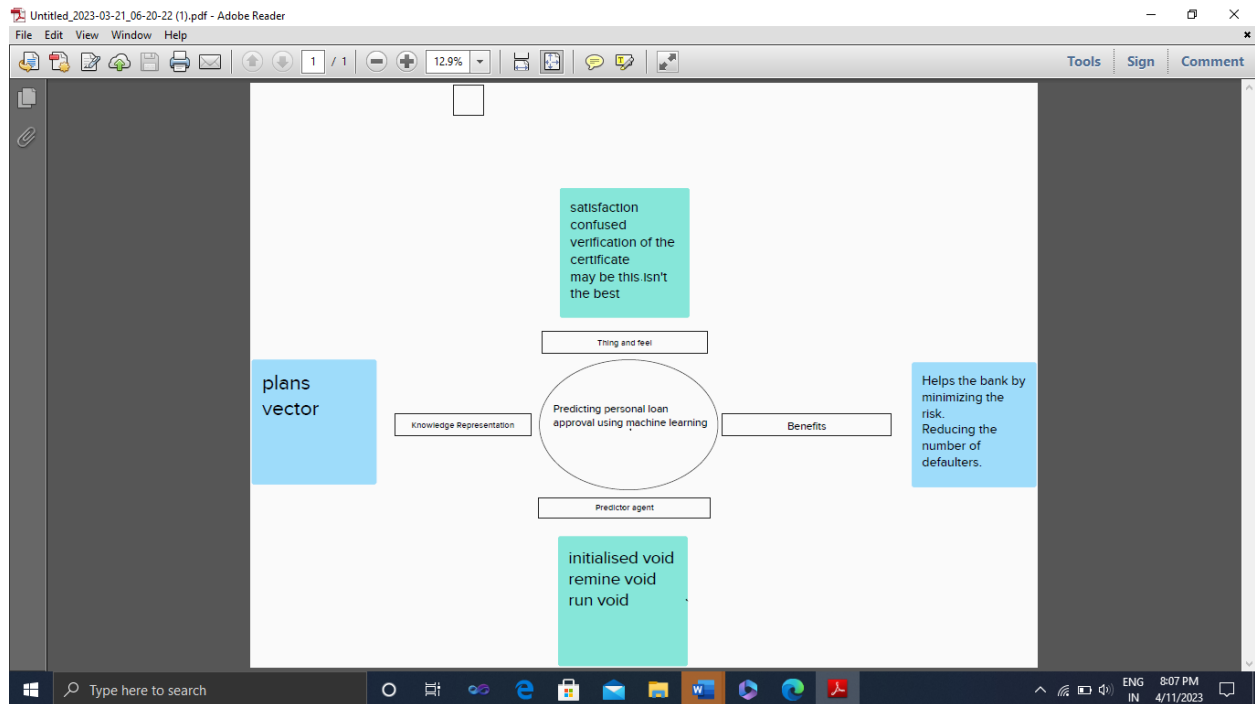# 1 INTRODUCTION

1.1 Overview

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- ✓ A bank's profit or a loss depends to a large extent on loans i.e., whether the customers are paying back the loan or defaulting. By predicting the loan defaulters, the bank can reduce its Non- Performing Assets.
- ✓ This makes the study of this phenomenon very important. Previous research in this era has shown that there are so many methods to study the problem of controlling loan default.
- ✓ But as the right predictions are very important for the maximization of profits, it is essential to study the nature of the different methods and their comparison. A very important approach in predictive analytics is used to study the problem of predicting loan defaulters: The Logistic regression model.
- ✓ The data is collected from the Kaggle for studying and prediction. Logistic Regression models have been performed and the different measures of performances are computed. The models are compared on the basis of the performance measures such as sensitivity and specificity.
- ✓ The final results have shown that the model produce different results. Model is marginally better because it includes variables (personal attributes of customer like age, purpose, credit history, credit amount, credit duration, etc.) other than checking account information (which shows wealth of a customer) that should be taken into account to calculate the probability of default on loan correctly.
- ✓ Therefore, by using a logistic regression approach, the right customers to be targeted for granting loan can be easily detected by evaluating their likelihood of default on loan.
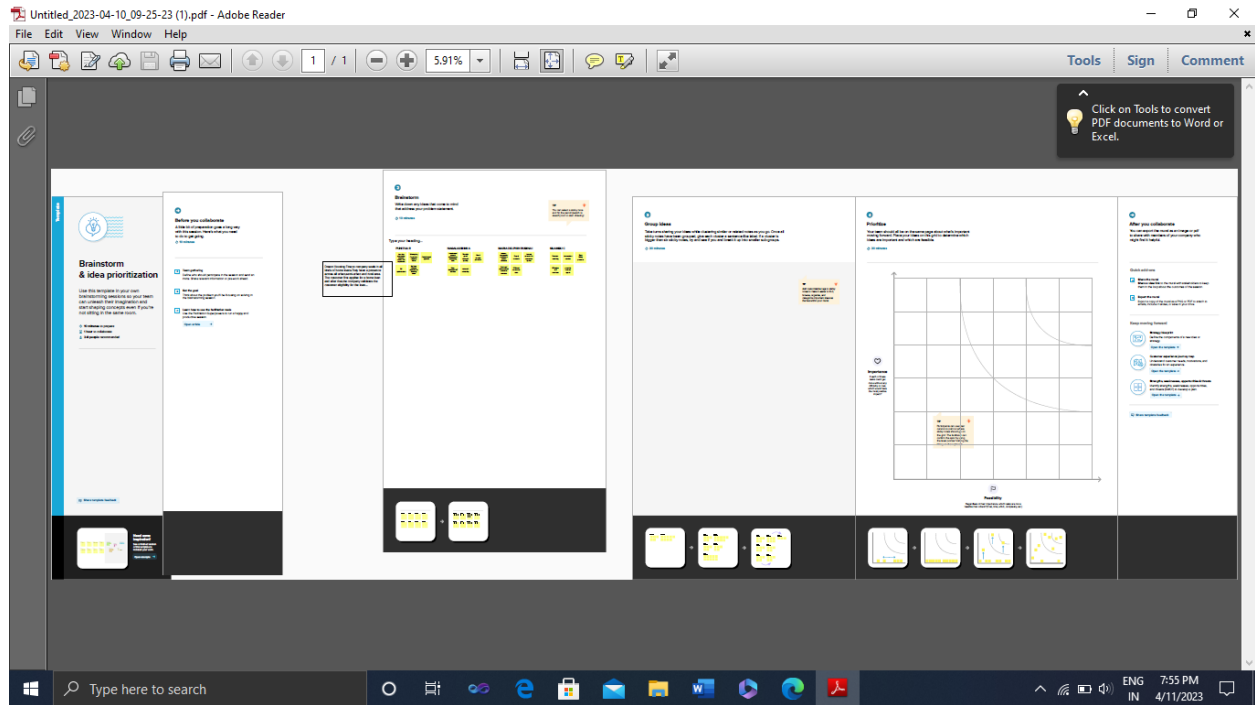
1.2 Purpose

- ✓ With the enhancement in the banking sector lots of people are applying for bank loans but the bank has its limited assets which it has to grant to limited people only, so finding out to whom the loan can be granted which will be a safer option for the bank is a typical process.

- ✓ So in this paper we try to reduce this risk factor behind selecting the safe person so as to save lots of bank efforts and assets. This is done by mining the Big Data of the previous records of the people to whom the loan was granted before and on the basis of these records/experiences the machine was trained using the machine learning model which give the most accurate result.

- ✓ The main objective of this paper is to predict whether assigning the loan to particular person will be safe or not. This paper is divided into four sections (i)Data Collection (ii) Comparison of machine learning models on collected data (iii) Training of system on most promising model (iv) Testing.

- ✓ Modern technology such as machine learning models can improve the speed, efficacy, and accuracy of loan approval processes.

- ✓ This paper presents six (6) machine learning algorithms (Random Forest, Gradient Boost, Decision Tree, Support Vector Machine, K-Nearest Neighbor, and Logistic Regression) for predicting loan eligibility.
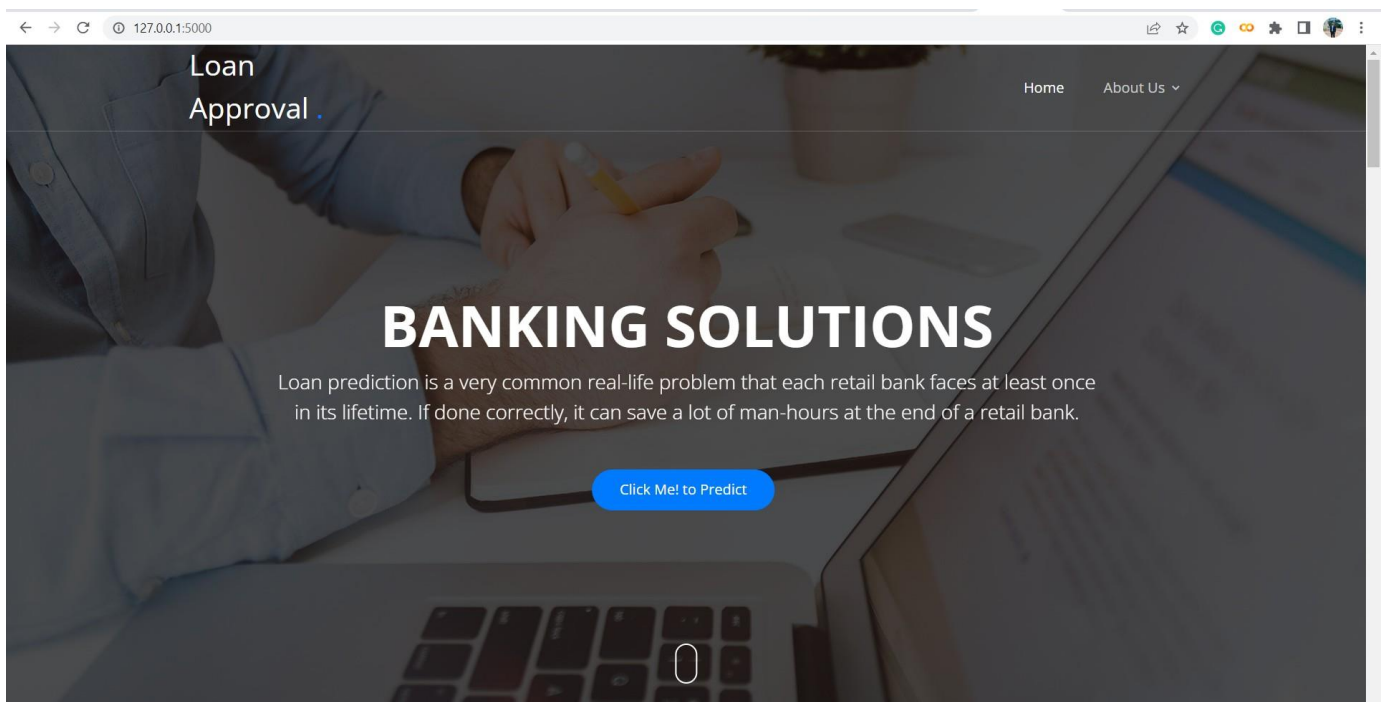
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2.1 Empathy map

2.2 Ideation and Brainstorming Map

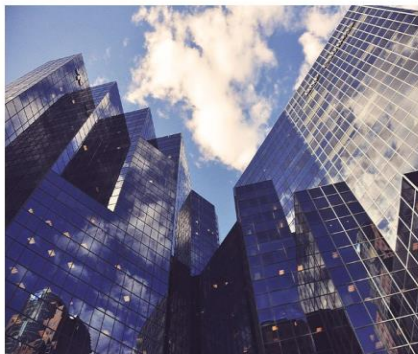# 3 RESULT

Loan
Approval .

About

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KEY TAKEAWAYS : A loan is when money is given to another party in exchange for repayment of the loan principal amount plus interest. Lenders will consider a prospective borrower's income, credit score, and debt levels before deciding to offer them a loan. A loan may be secured by collateral such as a mortgage or it may be unsecured such as a credit card.

Revolving loans or lines can be spent, repaid, and spent again, while term loans are fixed-rate, fixed-payment loans. Lenders may charge higher interest rates to risky borrowers.A small river named Duden flows by their place and supplies it with the necessary regelialia.

Loan
Approval .

Loan Approval How it works ?

Credit Information Bureau India Limited (CIBIL) score plays a critical role in the loan approval process for Indian banking industry. An individual customer's credit score provides loan providers with an indication of how likely it is that they will pay back a loan based on their respective credit history. This article is an attempt to discuss basics Loan Approval Process and working principles of CIBIL score in Indian finance industry keeping a view of individual customer benefits.

Learn More

Loan
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About Us

SMARTBRIDGE is an edTech organization with a vision to bridge the gap between academia & industry. Our outcome-based experiential learning programs on emerging technologies (Internet of Things, Machine Learning, Data Science, Artificial Intelligence, Robotics) are building skilled entry - level engineers, for the corporate world.

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Loan
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Loan Approval Predcition Form

Fill the Form for Prediction

Gender

-- select gender --

Married Status

select married status

Dependents

-- select dependents --

Education

-- select education --

Self Employed

-- select Self_Employed --

Credit_History

select Credit History

Loan
Approval .

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-- select education --

Self Employed

-- select Self_Employed --

Credit_History

-- select Credit_History --

Property Area

-- select Property_Area --

Enter Applicant Income

ApplicantIncome

Enter Loan Amount

LoanAmount

Enter Co-Applicant Income

CoapplicantIncome

Enter Loan Amount term

Loan_Amount_Term

submit

Loan
Approval .

-- select Property_Area --

Enter Applicant Income

ApplicantIncome

Enter Loan Amount

LoanAmount

Enter Co-Applicant Income

CoapplicantIncome

Enter Loan Amount term

Loan_Amount_Term

submit

Loan will be Approved

4 ADVANTAGES & DISADVANTAGES

Advantages

- ✓ **The flexibility of use**: Can be used in multipurpose. They can be used for various different types of purposes, ranging from travel expenses, medical expenses, purchasing the latest jewelry to electronic gizmos or even house/car improvements.

- ✓ **Quick availability**: Getting personal loans is very quick and easy. In some cases, you can get the loan even within 24 hours. So if you are looking for emergency funds, personal loans are your best bet.

- ✓ **Minimal documentation required**: Normally, personal loans don't need much documentation or paperwork, as compared to a home loan or car loan. Hence the processing time is quicker and easier**.**

- ✓ **No collateral or security needed**: No need for security is required to obtain this loan and the loan time period is much shorter compared to a home loan or car loan. This has less risk for the borrower comparatively since if you are unable to repay the loan, your security is forfeited in case of other loans. As personal loan does not need any security, your assets are safe. This makes this kind of loan attractive to those who don't own any assets like cars, homes, shares, etc

Disadvantages

- ✓ **High-personal loan interest rates**: As it does not require any security, they are regarded as high risk by the lenders. In order to offset their risks, these loans carry very high-interest charges.
- ✓ **Need for good credit rating**: As these loans are quite risky, most lenders insist on their borrowers having a good credit rating. So if your credit rating is poor, due to failure to pay any loan, your application will be rejected. Hence this loan availability is subject to strict personal loan eligibility norms based on creditworthiness.
- ✓ **Variable loan and interest as per your credit rating**: Even those lenders, who offer loans to the borrowers with a poor rating, end up offering lower principal amounts and higher interest as compared to those given to borrowers with good ratings. They also impose stricter repayment terms on these borrowers.
- ✓ **No part payments**: Most lenders don't allow part payment of loans. This means you end up paying the loan for the entire tenure of the loan. It can work out quite expensive since your initial instalments go towards interest payments.

5 APPLICATIONS

1.No limitation on end use

The first and the most important benefit of personal loan is that unlike home loan it can be used for any purpose. There are no limitations on the end use of the personal loan. You have any urgent requirement of funds; personal loan can be one of the easiest ways to get cash.

2. Quick disbursal

If you meet the eligibility criteria and have a good credit score, you can get personal loan in 72 hours time. Infact some of the banks provide the facility of online approval of personal loans for existing customers.

3. No collateral required

You don't have to arrange for any collateral. It is an unsecured loan. Therefore, it is easy to get it.

4. Flexibility to choose the tenure

The tenure of the loan goes up to 7 years therefore you have the flexibility to choose a tenure which suits you best. Longer tenure means lower EMI and vice versa. Therefore you can decide you can decide tenure after calculating the EMI. Use our EMI Calculator to calculate the EMI.

5. Fixed rate of interest

Personal loan is generally available on fixed rate of interest. So the equated monthly installments will remain fixed for the entire loan tenure. Therefore you don't have to worry about the interest rate changes.

6. Tax benefit

If you use the personal loan for the construction, renovation of house or making down payment for the house, you can avail the tax deduction of up to Rs 2 lakh under Section 24B for the interest part in a financial year. But remember that you will have to provide enough documents to prove that the money has been utilized for that purpose only.

6 CONCLUSION

With these trends and predictions related to the future of personal loan apps and such online lending platforms, it is only safe to say that these platforms are here to stay.

They have not only made financing convenient but have also reached out to the remotest locations, and made borrowing seem like a convenient financing decision for everyone.

When borrowing the advance, all one would need to do is check if they are suitably eligible for it or not and go forward with the borrowing accordingly.

7 FUTURE SCOPES

- ✓ Personal loan have not only made instant loans accessible far and wide, but they have also revolutionized the entire process of financing.
- ✓ Today, availing an online loan is a matter of a few clicks.
- ✓ Your loan application receives instant approval and the disbursal happens within 24 to 48 hours. In addition to that, there is increased transparency, easy management and simple repayment.
- ✓ These apps are expected to play a pivotal role in the entire digital lending ecosystem of the country and are being widely adopted across financial institutions, typically for ease of accessibility.
- ✓ Given that online lending apps, including the ones dedicated to personal loans, are pretty new in the financial market, they have been pretty fast at gaining popularity across borrowers.
- ✓ Today, a borrower finds it only easy and convenient to run a few clicks on their mobile screen to complete an online loan application. Availing a loan through apps has thus become more like a simple financial decision as against the preconceptions that one earlier had.
- ✓ Channels of digital lending like personal loan apps have also been expected to have a continued demand in the financial market. Their increasingly convenient models of financing are typically the reason why they have gained a favoured in the heart of borrowers.

```python
import pandas as pd
import numpy as np
import pickle
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
import sklearn
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import GradientBoostingClassifier,RandomForestClassi
fier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import RandomizedSearchCV
import imblearn
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScalar
from sklearn.metrics import accuracy_score,classification_report,confusion
_matrix,f1_score
data=pd.read_csv('/content/test_Y3wMUE5_7gLdaTN.csv')
data
data.info()
#finding the sum of null values in each column
data.isnull().sum()
data['Gender']=data['Gender'].fillna(data['Gender'].mode()[0])

data['Married']=data['Married'].fillna(data['Married'].mode()[0])
#replacing + with space for filling the nan values
data['Dependents']=data['Dependents'].str.replace('+','')

data['Dependents']=data['Dependents'].fillna(data['Dependents'].mode()[0])

data['Self_employed']=data['self_Employed'].fillna(data['Self_Employed'].m
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data['LoanAmount']=data['LoanAmount'].fillna(data['LoanAmount'].mode()[0])

data['Loan_Amount_Term']=data['Loan_Amount_Term'].fillna(data['Loan_Amount
_Terms'].mode()[0])
```

```
data['Credit_History']=data['Credit_History'].fillna(data['Credit_History'
].mode()[0])

data['Gender']=data['Gender'].astype('int64')
data['Married']=data['Married'].astype('int64')
data['Dependents']=data['Dependents'].astype('int64')
data['Self_Employed']=data['Self_Employed'].astype('int64')
data['CoapplicantIncome']=data['CoapplicantIncome'].astype('int64')
data['LoanAmount']=data['LoanAmount'].astype('int64')
data['Loan_Amount_Term']=data['Loan_Amount_Term'].astype('int64')
data['Credit_History']=data['Credit_History'].astype('int64')
from imblearn.combine import SMOTETomek
smote=SMOTETomek(0.90)
```

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Smart **Internz**

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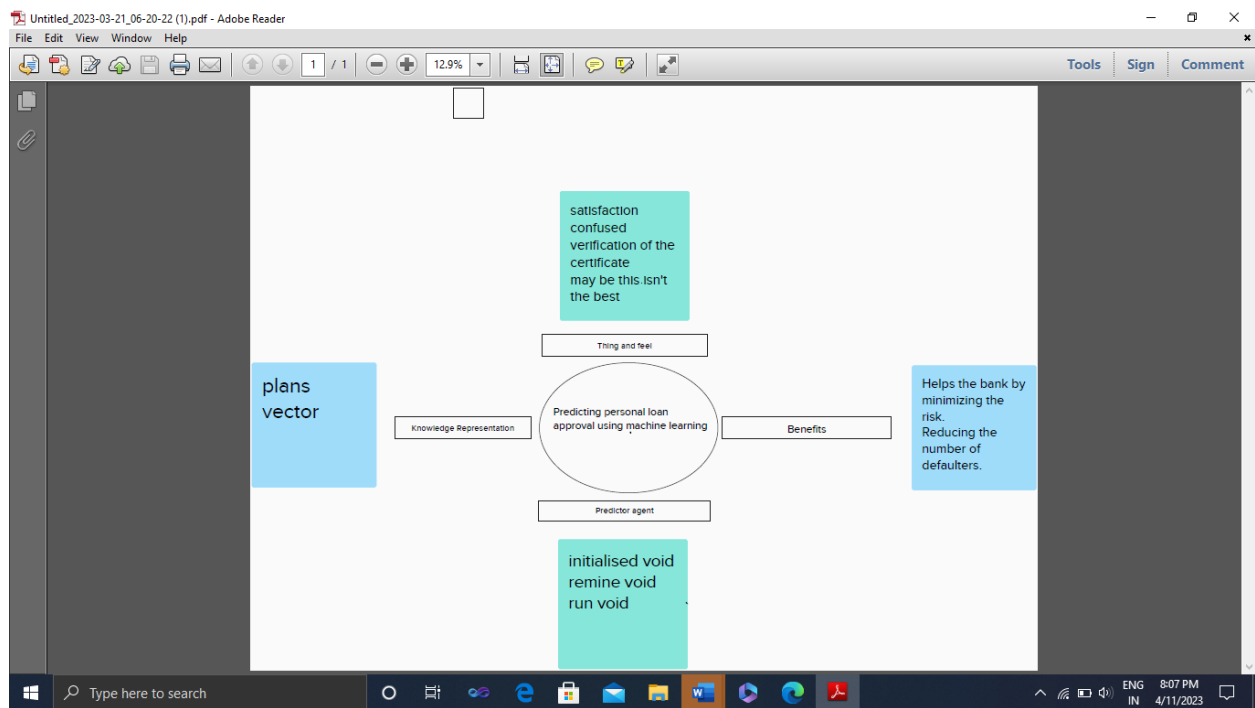
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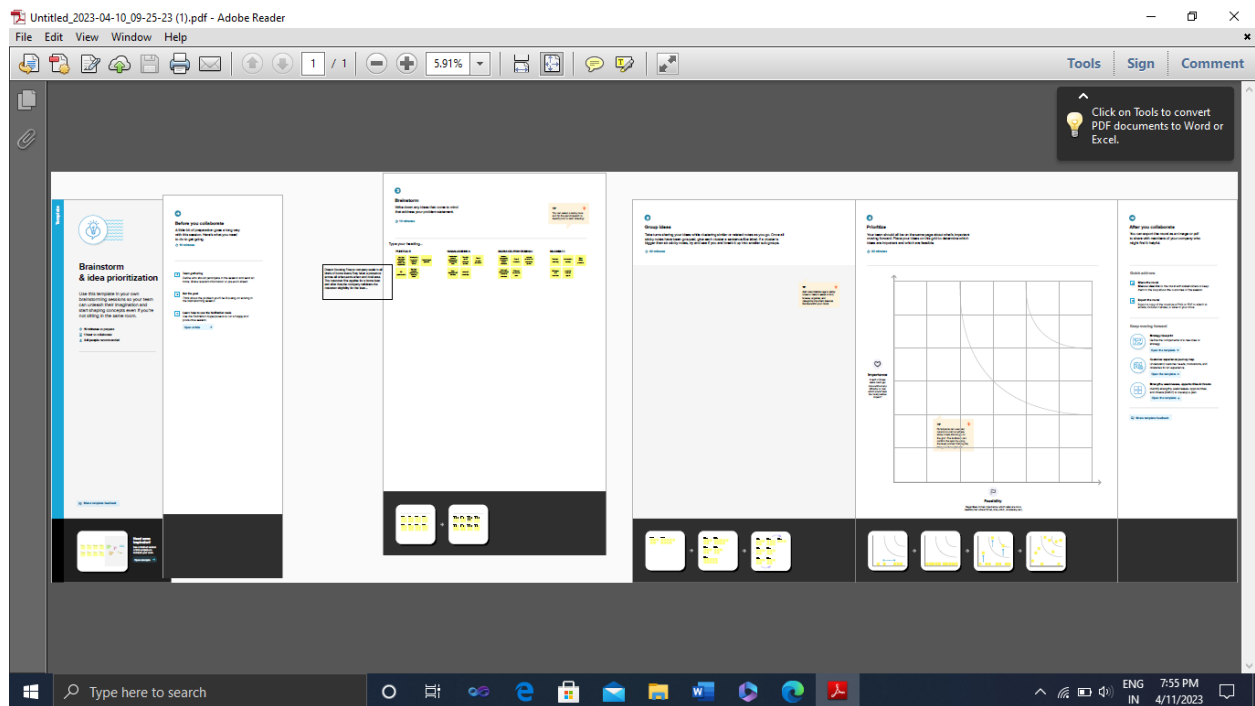
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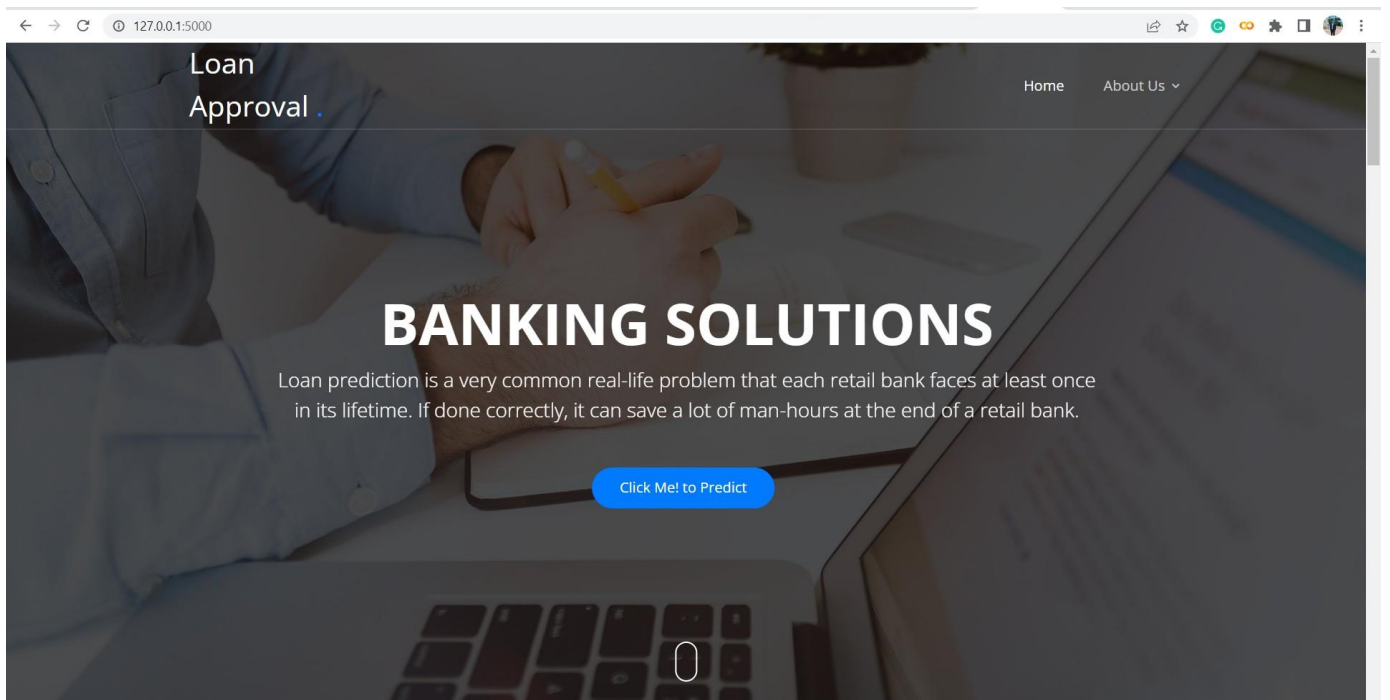
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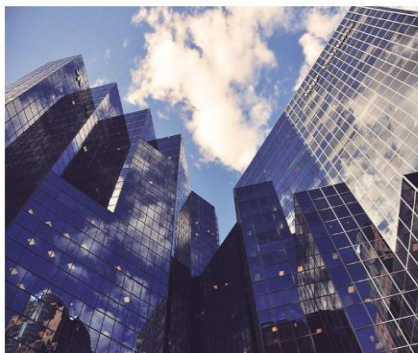# 3 RESULT

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entry - level engineers, for the corporate
world.

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Loan Approval Predcition Form

Fill the Form for Prediction

Gender

-- select gender --

Married Status

select married status

Dependents

-- select dependents --

Education

-- select education --

Self Employed

-- select Self_Employed --

Credit_History

select Credit History

Loan
Approval .

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-- select education --

Self Employed

-- select Self_Employed --

Credit_History

-- select Credit_History --

Property Area

-- select Property_Area --

Enter Applicant Income

ApplicantIncome

Enter Loan Amount

LoanAmount

Enter Co-Applicant Income

CoapplicantIncome

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Loan_Amount_Term

submit

Loan
Approval .

Home   About Us ˅   Contact

-- select Property_Area --

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- ✓ Channels of digital lending like personal loan apps have also been expected to have a continued demand in the financial market. Their increasingly convenient models of financing are typically the reason why they have gained a favoured in the heart of borrowers. Not to mention, their availability and lending remain regulated, which also vests the customers with confidence in the lenders and their digital apps.

```python
import pandas as pd
import numpy as np
import pickle
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns
import sklearn
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import GradientBoostingClassifier,RandomForestClassifier
from sklearn.neighbors import KNeighborsClassifier
from sklearn.model_selection import RandomizedSearchCV
import imblearn
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScalar
from sklearn.metrics import accuracy_score,classification_report,confusion_matrix,f1_score
data=pd.read_csv('/content/test_Y3wMUE5_7gLdaTN.csv')
data
data.info()
#finding the sum of null values in each column
data.isnull().sum()
data['Gender']=data['Gender'].fillna(data['Gender'].mode()[0])

data['Married']=data['Married'].fillna(data['Married'].mode()[0])
#replacing + with space for filling the nan values
data['Dependents']=data['Dependents'].str.replace('+','')
```

```python
data['Dependents']=data['Dependents'].fillna(data['Dependents'].mode()[0])

data['Self_employed']=data['self_Employed'].fillna(data['Self_Employed'].m
ode()[0])

data['LoanAmount']=data['LoanAmount'].fillna(data['LoanAmount'].mode()[0])

data['Loan_Amount_Term']=data['Loan_Amount_Term'].fillna(data['Loan_Amount
_Terms'].mode()[0])

data['Credit_History']=data['Credit_History'].fillna(data['Credit_History'
].mode()[0])

data['Gender']=data['Gender'].astype('int64')
data['Married']=data['Married'].astype('int64')
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data['Self_Employed']=data['Self_Employed'].astype('int64')
data['CoapplicantIncome']=data['CoapplicantIncome'].astype('int64')
data['LoanAmount']=data['LoanAmount'].astype('int64')
data['Loan_Amount_Term']=data['Loan_Amount_Term'].astype('int64')
data['Credit_History']=data['Credit_History'].astype('int64')
from imblearn.combine import SMOTETomek
smote=SMOTETomek(0.90)
#creating a new x and y variables for the balnced set
x_bal,y_bal=smote.fit_resample(x,y)
print(y.value_count())
print(y_bal.value_counts())
data.describe()
plt.figure(figsize=(12,5))
plt.subplot(121)
sns.distplot(data['ApplicantIncome'],color='r')
plt.subplot(122)
sns.distplot(data['credit_history'])
plt.show
#plotting the count plot
plt.figure(figsize=(18,4))
plt.subplot(1,4,1)
sns.countplot(data['Gender'])
plt.subplot(1,4,2)
sns.countplot(data['Education'])
plt.show()
plt.figure(figsize=(20,5))
plt.subplot(131)
sns.countplot(data['Married'],hue=data['Gender'])
```

```python
plt.subplot(132)
sns.countplot(data['Self-employed'],hue=data['Education'])
plt.subplot(133)
sns.countplot(data['Proporty_area'],hue=data['loan_amount_Term'])
sns.swarmplot(data['Gender'], data['ApplicantIncome'], hue['Loan_Status']
sc=StandardScaler()
x_bal=sc.fit_transform(x_bal)
x_bal=pd.DataFrame(x_bal,columns=names)
X_train, X_test, y_train, y_test = train_test_split(
    X_bal, y_bal, test_size=0.33, random_state=42)
def decisionTree(x_train, x_test, y_train, y_test):
    dt=DecisionTreeClassifier()
    dt.fit(x_train,y_train)
    yPred = dt.predict(x_test)
    print('***DecisionTreeClassifier***')
    print('Confusion matrix')
    print(confusion_matrix(y_test,yPred))
    print('Classification Report')
    print(classification_report(y_test,yPred))
def randomForest(x_train, x_test, y_train, y_test):
    rf = RandomForestClassifier()
    rf.fit(x_train,y_train)
    yPred = rf.predict(x_test)
    print('***RandomForestClassifier***')
    print('Confusion matrix')
    print(confusion_matrix(y_test,yPred))
    print('Classification report')
    print(classification_report(y_test,yPred))
def KNN(x_train, x_test, y_train, y_test):
    knn = KNeighborsClassifier()
    knn.fit(x_train,y_train)
    yPred = knn.predict(x_test)
    print('***KNeighborsClassifier***')
    print('Confusion matrix')
    print(confusion matrix(y_test,yPred))
    print('Classification report')
    print(classification_report(y_test,yPred))
def xgboost(x_train, x_test, y_train, y_test):
    xg = GradientBoostingClassifier()
    xg.fit(x_train,y_train)
    yPred = xg.predict(x_test)
    print('***GradientBoostingClassifier***')
    print('Confusion matrix')
    print(confusion_matrix(y_test,yPred))
    print('Classification report')
```

```python
    print(classification_report(y_test,yPred))
import tensorflow
from tensorflow.keras.models import Sequential
from tensorflow.keras.layers import Dense
classifier = Sequential()
classifier.add(Dense(units=100, activation='relu', input_dim=11))
classifier.add(Dense(units=50,activation='relu'))
classifier.add(Dense(units=1,activation='sigmoid'))
classifier.compile(optimizer='adam',
loss='binary_crossentropy',metrics=['accuracy'])
model_history = classifier.fit(X_train, y_train, batch_size=100, validatio
n_split=0.2 , epochs=100)
dtr.predict([[1,1,0,1,1,4276,1542,145,240,0,1]])
rfr.predict([[1,1,0,1,1,4276,1542,145,240,0,1]])
knn.predict([[1,1,0,1,1,4276,1542,145,240,0,1]])
xgb.predict([[1,1,0,1,1,4276, 1542,145, 240,0,1]])
classifier.save("loan.h5")
y_pred = classifier.predict(x_test)
y_pred
y_pred = (y_pred > 0.5)
y_pred
def predict_exit(sample_value):
    sample_value = np.array(sample_value)
    sample_value = sample_value.reshape(1,-1)
    sample_value = sc.transform(sample_value)

    return classifier.predict(sample.value)

sample_value = [[1,0,1,1,1,45,14,45,240,1,1]]
if predict_exit(sample_value)>0.5:
    print('Prediction: High chance of Loan Approval!')
else:
    print('Prediction: Low chance of Loan Approval.')
def compareModel(X_train,X_test,y_train,y_test):
  decisionTree(X_train,X_test,y_train,y_test)
  print('-'*100)
  RandomForest(X_train,X_test,y_train,y_test)
  print('-'*100)
  XGB(X_train,X_test,y_train,y_test)
  print('-'*100)
  KNN(X_train,X_test,y_train,y_test)
  print('-'*100)
compareModel(x_train, x_test, y_train, y_test)

yPred = classifier.predict(x_test)
```

```python
print(accuracy_score(y_pred,y_test))
print("ANN Model")
print("Confusion_Matrix")
print(confusion_matrix(y_test,y_pred))
print("Classification Report")
print(classification_report(y_test,y_pred))
from sklearn.model_selection import cross_val_score
rf = RandomForestClassifier()
rf.fit(x_train,y_train)
yPred = rf.predict(x_test)
pickle.dump(model,open('rdf.pk1','wb'))
from flask import Flask, render_template, request
import numpy as np
import pickle
app = Flask(__name__)
model = pickle.load(open(r'rdf.pkl', 'rb'))
scale = pickle.load(open(r'scale1.pkl', 'rb'))
@app.route('/')
def home():
    return render_template('home.html')
@app.route('/submit',methods=["POST","GET"])
def submit():
input_features=[int(x) for x in request.form.values() ]
input_features = np.transpose(input_feature)
input_features = [np.array(input_feature)]
print(input_feature)
names = ['Gender','Married', 'Dependents', 'Education', 'Self_employed', '
ApplicantIncome','CoapplicantIncome', 'Loan amount', 'Loan_Amount_Term','C
redit_History','Property_Area']
data = pandas.DataFrame(input_feature,column=names)
print(data)
prediction=model.predict(data)
print(prediction)
prediction = int(prediction)
print(type(prediction))
if (prediction == 0):
    return render_template("output.html",result = "loan will Not be Approv
ed")
else:
if __name__=="main":
    port=int(os.environ.get('PORT',5000))
    app.run(debug=False)
```