Credit Card Approval Prediction System

Problem statement:

To predict whether an application for Credit card is approved or not based on gender, age, debt, married, bank customer, education level, ethnicity, no of years employed, prior default, employed, credit score, citizenship and income using **Logistic Regression** and **Decision Tree** and compare them.

Introduction:

A large number of credit card applications are received by commercial banks. Many of them are turned down for a variety of reasons, such as large debt balances, insufficient income, or too many inquiries on a person's credit report. Manually assessing these programmes is tedious, time-consuming, and error-prone. Fortunately, with the use of machine learning, this work can be automated, and almost every commercial bank does so nowadays. In this System, we'll use machine learning techniques to create an automatic credit card approval predictor.

Data set information:

LINK: http://archive.ics.uci.edu/ml/datasets/credit+approval

We find that since this data is confidential, the contributor of the dataset has anonymized the feature names to protect privacy.

- First, we will start off by loading and viewing the dataset.
- We will see that the dataset has a mixture of both numerical and non-numerical features, that it contains values from different ranges, plus that it contains a number of missing entries.
- We will have to preprocess the dataset to ensure the machine learning model we choose can make good predictions.
- After our data is in good shape, we will do some exploratory data analysis to build our intuitions.
- Finally, we will build a machine learning model that can predict if an individual's application for a credit card will be accepted

| Gender | Ag | De | Ma | Ban | Edu | Eth | Year | Pri | Em | Cre | Driv | Citi | Zip | Inc | Approved |
|--------|----|----|------|------|------|------|------|-----|------|------|------|------|-----|-----|----------|
| | e | bt | rrie | kCus | cati | nici | sEm | orD | ploy | ditS | ersL | zen | Cod | om | |
| | | | d | tom | onL | ty | ploy | efa | ed | cor | icen | | e | е | |
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| b | 21. 83 | 0.2 5 | u | g | d | h | 0.6 65 | t | f | 0 | t | g | 000 | 0 | + |

Code and output:

```
# Import pandas
import pandas as pd
# Load dataset
cc_apps = pd.read_csv("/content/credit_card_approval.data")
cc_apps.columns=['Gender','Age','Debt','Married','BankCustomer','Education
Level', 'Ethnicity', 'YearsEmployed', 'PriorDefault', 'Employed', 'CreditScore'
,'DriversLicense','Citizen','ZipCode','Income','Approved']
# Print summary statistics
cc apps description = cc apps.describe()
print(cc_apps_description)
print("\n")
# Print DataFrame information
cc apps info = cc apps.info()
print(cc_apps_info)
print("\n")
# Inspect missing values in the dataset
print(cc_apps.tail(50))
```

```
# Import numpy
import numpy as np# Impute the missing values with mean imputation
cc_apps = cc_apps.fillna(cc_apps.mean())
# Count the number of NaNs in the dataset to verify
print(cc_apps.isnull().values.sum())
# Inspect missing values in the dataset
print(cc apps.isnull().values.sum())
# Replace the '?'s with NaN
cc apps = cc apps.replace("?",np.NaN)
# Inspect the missing values again
print(cc apps.tail(50))
# Iterate over each column of cc_apps
for col in cc_apps.columns:
    # Check if the column is of object type
    if cc apps[col].dtypes == 'object':
        # Impute with the most frequent value
        cc apps[col] =
cc apps[col].fillna(cc apps[col].value counts().index[0])
# Count the number of NaNs in the dataset and print the counts to verify
print(cc apps.isnull().values.sum())
# Import LabelEncoder
from sklearn.preprocessing import LabelEncoder
# Instantiate LabelEncoder
le = LabelEncoder()
# Iterate over all the values of each column and extract their dtypes
for col in cc_apps.columns:
    # Compare if the dtype is object
    if cc apps[col].dtype=='object':
```

```
# Use LabelEncoder to do the numeric transformation
        cc_apps[col]=le.fit_transform(cc_apps[col])
# Import MinMaxScaler
from sklearn.preprocessing import MinMaxScaler
# Drop features 10 and 13 and convert the DataFrame to a NumPy array
cc_apps = cc_apps.drop([cc_apps.columns[11],cc_apps.columns[13]], axis=1)
print(cc apps)
cc apps = cc apps.values
# Segregate features and labels into separate variables
X,y = cc apps[:,0:13], cc apps[:,13]
# Instantiate MinMaxScaler and use it to rescale
scaler = MinMaxScaler(feature range=(0,1))
rescaledX = scaler.fit transform(X)
rescaledX
# Import train test split
from sklearn.model_selection import train_test_split
# Split into train and test sets
X train, X test, y train, y test = train test split(rescaledX,
                                                    У,
                                                    test size=0.33,
                                                    random state=42)
# Import LogisticRegression
from sklearn.linear model import LogisticRegression
# Instantiate a LogisticRegression classifier with default parameter
values
logreg = LogisticRegression()
# Fit logreg to the train set
logreg.fit(X_train,y_train)
# Import confusion matrix
from sklearn.metrics import confusion matrix
# Use logreg to predict instances from the test set and store it
```

```
y pred = logreg.predict(X test)
# Get the accuracy score of logreg model and print it
print("Accuracy of logistic regression classifier: ", logreg.score(X_test,
y test))
# Print the confusion matrix of the logreg model
confusion_matrix(y_test, y_pred)
import seaborn as sns
import matplotlib.pyplot as plt
ax = sns.heatmap(confusion_matrix(y_test, y_pred), annot=True,
cmap='Blues')
ax.set title('Credit Card Approval Confusion Matrix by Logistic
Regression\n\n');
ax.set xlabel('\nPredicted Values')
ax.set ylabel('Actual Values ');
## Ticket labels - List must be in alphabetical order
ax.xaxis.set ticklabels(['False','True'])
ax.yaxis.set_ticklabels(['False','True'])
## Display the visualization of the Confusion Matrix.
plt.show()
from sklearn.tree import DecisionTreeClassifier
from sklearn.metrics import accuracy score, confusion matrix
model = DecisionTreeClassifier(max depth=12,
                               min samples split=8,
                               random_state=1024)
model.fit(X train, y train)
y predict = model.predict(X test)
print('Accuracy Score is {:.5}'.format(accuracy_score(y_test, y_predict)))
print(pd.DataFrame(confusion_matrix(y_test,y_predict)))
ax = sns.heatmap(confusion_matrix(y_test, y_predict), annot=True,
cmap='Blues')
ax.set title('Credit Card Approval Confusion Matrix by Decision
Tree\n\n');
```

```
ax.set xlabel('\nPredicted Values')
ax.set_ylabel('Actual Values ');
## Ticket labels - List must be in alphabetical order
ax.xaxis.set ticklabels(['False','True'])
ax.yaxis.set ticklabels(['False','True'])
## Display the visualization of the Confusion Matrix.
plt.show()
!pip install colorama
from colorama import Fore, Back
gender=input("Are you male?\n\n")
age=input("\n\nWhat is your age?\n\n")
Debt=input("\n\nWhat is your Debt?\n\n")
Married=input("\n\nAre you married?\n\n")
BankCustomer=input("\n\nAre you a bank customer?\n\n")
EducationLevel=input("\n\nWhat is your Education Level?\n\n")
Ethnicity=input("\n\nWhat is your Ethnicity?\n\n")
YearsEmployed=input("\n\nHow many years were you employed?\n\n")
PriorDefault=input("\n\nDo you have any Prior defaults?\n\n")
Employed=input("\n\nAre you Employed?\n\n")
CreditScore=input("\n\nWhat is your Credit Score?\n\n")
Citizen=input("\n\nWhat is your Citizenship?\n\n")
Income=input("\n\nWhat is your Income?\n\n")
new input=[[gender, age, Debt, Married,
BankCustomer, EducationLevel, Ethnicity, YearsEmployed, PriorDefault, Employed,
CreditScore,Citizen,Income]]
new output=logreg.predict(new input)
print(new_output)
print("By Logistic Regression")
if (new output==1):
  print(Fore.WHITE, Back.GREEN +"Congratulations your credit card
application has been approved")
else:
  print(Fore.RED +"We regret to inform you that your credit card
application is declined.")
```

```
NEW_output=model.predict(new_input)
print(NEW_output)
print("By Decision Tree")
if (NEW_output==1):
    print(Fore.WHITE, Back.GREEN +"Congratulations your credit card
application has been approved")
else:
    print(Fore.RED +"We regret to inform you that your credit card
application is declined.")
```

Output:

| Out | put | • | | | | | |
|--------------|-----|-----|-------|----------------------------------|--------------------------------|-------------|---------------|
| | | | | Debt | YearsEmployed | CreditScore | Income |
| Q | | | count | | 690.000000 | 690.00000 | 690.000000 |
| | | ••• | mean | 4.758725 | 2.223406 | 2.40000 | 1017.385507 |
| (v) | | | std | 4.978163 | 3.346513 | 4.86294 | 5210.102598 |
| { <i>x</i> } | | | min | 0.000000 | 0.000000 | 0.00000 | 0.000000 |
| | | | 25% | 1.000000 | 0.165000 | 0.00000 | 0.000000 |
| | | | 50% | 2.750000 | 1.000000 | 0.00000 | 5.000000 |
| | | | 75% | 7.207500 | 2.625000 | 3.00000 | 395.500000 |
| | | | max | 28.000000 | 28.500000 | 67.00000 | 100000.000000 |
| | | | | | .frame.DataFrameries, 0 to 689 | ne'> | |
| | | | _ | columns (total | | | |
| | | | | Column | Non-Null Cour | nt Dtype | |
| | | | | | | | |
| | | | 0 | Gender | 690 non-null | object | |
| | | | 1 | Age | 690 non-null | object | |
| | | | 2 | Debt | 690 non-null | float64 | |
| | | | 3 | Married | 690 non-null | object | |
| | | | 4 | BankCustomer | 690 non-null | object | |
| | | | 5 | EducationLevel | 690 non-null | object | |
| | | | | Ethnicity | 690 non-null | object | |
| | | | | YearsEmployed | | float64 | |
| | | | 8 | PriorDefault | 690 non-null | object | |
| | | | | Employed | 690 non-null | object | |
| | | | | CreditScore | 690 non-null | int64 | |
| | | | | DriversLicense | | object | |
| | | | | Citizen | 690 non-null | object | |
| <> | | | | ZipCode | 690 non-null | object | |
| ` ' | | | | Income | 690 non-null | int64 | |
| = | | | | Approved | 690 non-null | object | |
| | | | | s: float64(2), y usage: 86.4+ | int64(2), obje | ect(12) | |
| >_ | | | None | y usage, 00.41 | - KD | | |

| Gender Age Debt Married BankCustomer EducationLevel Ethnicity 640 b 34.17 2.750 u g i bb 641 33.17 2.250 y p cc v 642 b 31.58 0.750 y p aa v 643 a 52.50 7.000 u g aa h 644 b 36.17 0.420 y p p w v 645 b 37.33 2.665 u g cc v 646 a 20.83 8.500 u g c v 647 b 24.08 9.000 u g aa v 648 b 25.58 0.335 u g k h 649 a 35.17 3.750 u g ff ff 650 b 48.08 3.750 u g ff ff 651 a 15.83 7.625 u g q v 652 a 22.50 0.415 u g i v 653 b 21.50 11.500 u g i v 655 a 21.08 5.000 y p ff ff 656 b 25.67 3.250 u g aa v 657 a 38.92 1.665 u g c c v 660 b 22.25 9.000 u g c c v 661 b 32.83 8.500 u g c c v 662 a 23.50 1.500 u g c c c 663 b 32.08 4.000 y p p ff 666 a 21.75 11.750 u g c c v 667 a 17.92 0.540 u g c c v 668 b 30.33 9.500 u g c c v 669 b 51.83 0.040 y p p m v 666 a 21.75 11.750 u g c c v 667 a 17.92 0.540 u g c c v 668 b 30.33 0.500 u g c c v 669 b 51.83 1.500 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 50.25 0.835 u g c c v 667 a 50.25 0.835 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 17.92 0.540 u g c c v 667 a 50.25 0.835 u g c c v 667 a 50.25 0.835 u g c c v 667 a 50.25 0.835 u g c c v 667 a 50.25 0.835 u g aa v 673 c 29.50 2.000 y p e h | | | | | | | | | |
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| 669 b 51.83 2.040 y p ff ff 670 b 47.17 5.835 u g w v 671 b 25.83 12.835 u g cc v 672 a 50.25 0.835 u g aa v | 668 | b | 30.33 | 0.500 | u | | d | h | |
| 670 b 47.17 5.835 u g w v 671 b 25.83 12.835 u g cc v 672 a 50.25 0.835 u g aa v | 669 | b | 51.83 | 2.040 | у | | ff | ff | |
| 671 b 25.83 12.835 u g cc v 672 a 50.25 0.835 u g aa v | 670 | b | 47.17 | 5.835 | | g | W | V | |
| 672 a 50.25 0.835 u g aa v | 671 | b | 25.83 | 12.835 | u | | CC | V | |
| | 672 | a | 50.25 | 0.835 | u | g | aa | V | |
| | 673 | 5 | 29.50 | 2.000 | У | р | е | h | |

| | | | | | | | | | | | | _ |
|-----|-----|--------|---------|---------|-------|----------|----------|---------|---------|----------|--------|---|
| 0. | 674 | a | 37.33 | 2.500 | | u | g | | i | h | | |
| | 675 | a | 41.58 | 1.040 | | u | g | | aa | V | | |
| ••• | 676 | a | 30.58 | 10.665 | | u | g | | q | h | | |
| | 677 | b | 19.42 | 7.250 | | u | g | | m | V | | |
| | 678 | a | 17.92 | 10.210 | | u | g | | ff | ff | | |
| | 679 | a | 20.08 | 1.250 | | u | g | | C | V | | |
| | 680 | b | 19.50 | 0.290 | | u | g | | k | V | | |
| | 681 | b | 27.83 | 1.000 | | У | р | | d | h | | |
| | 682 | b | 17.08 | 3.290 | | u | g | | i | V | | |
| | 683 | b | 36.42 | 0.750 | | У | р | | d | V | | |
| | 684 | b | 40.58 | 3.290 | | u | g | | m | V | | |
| | 685 | b | 21.08 | 10.085 | | y | р | | e | h | | |
| | 686 | a | 22.67 | 0.750 | | u | g | | C | V | | |
| | 687 | a | 25.25 | 13.500 | | У | р | | ff | ff | | |
| | 688 | b | 17.92 | 0.205 | | u | g | | aa | V | | |
| | 689 | b | 35.00 | 3.375 | | u | g | | C | h | | |
| | | | | | | | | | | | | |
| | | YearsE | mployed | PriorDe | fault | Employed | CreditSc | ore Dri | versLic | ense Cit | izen ' | \ |
| | 640 | | 2.500 | | f | f | | 0 | | t | g | |
| | 641 | | 3.500 | | f | f | | 0 | | t | g | |
| | 642 | | 3.500 | | f | f | | 0 | | t | g | |
| | 643 | | 3.000 | | f | f | | 0 | | f | g | |
| | 644 | | 0.290 | | f | f | | 0 | | t | g | |
| | 645 | | 0.165 | | f | f | | 0 | | t | g | |
| | 646 | | 0.165 | | f | f | | 0 | | f | g | |
| | 647 | | 0.250 | | f | f | | 0 | | t | g | |
| | 648 | | 3.500 | | f | f | | 0 | | t | g | |
| | 649 | | 0.000 | | f | t | | 6 | | f | g | |
| | 650 | | 1.000 | | f | f | | 0 | | f | g | |
| | 651 | | 0.125 | | f | t | | 1 | | t | g | |
| | 652 | | 0.335 | | f | f | | 0 | | t | S | |
| | 653 | | 0.500 | | t | f | | 0 | | t | g | |
| | 654 | | 0.415 | | f | t | | 1 | | t | g | |
| | 655 | | 0.000 | | f | f | | 0 | | f | g | |
| | 656 | | 2.290 | | f | t | | 1 | | t | g | |
| | | | | | - | - | | | | - | | |

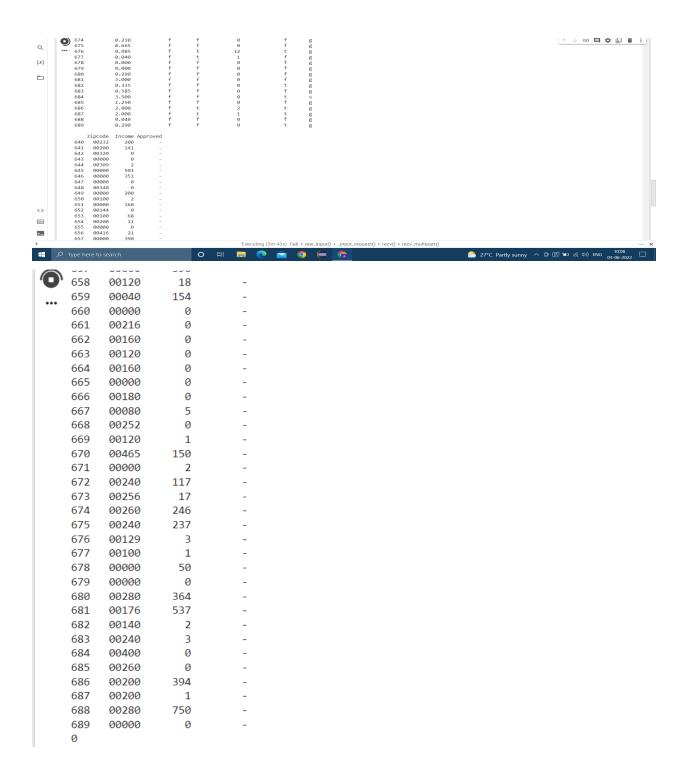
| | 657 | 0.250 | f | f | 0 | f | g |
|-----|-----|-------|---|---|----|---|---|
| | 658 | 1.000 | f | f | 0 | f | g |
| ••• | 659 | 0.250 | f | t | 1 | t | g |
| | 660 | 0.085 | f | f | 0 | f | g |
| | 661 | 0.165 | f | f | 0 | f | g |
| | 662 | 0.875 | f | f | 0 | t | g |
| | 663 | 1.500 | f | f | 0 | t | g |
| | 664 | 0.040 | f | f | 0 | f | S |
| | 665 | 0.040 | f | f | 0 | f | g |
| | 666 | 0.250 | f | f | 0 | t | g |
| | 667 | 1.750 | f | t | 1 | t | g |
| | 668 | 0.085 | f | f | 0 | t | S |
| | 669 | 1.500 | f | f | 0 | f | g |
| | 670 | 5.500 | f | f | 0 | f | g |
| | 671 | 0.500 | f | f | 0 | f | g |
| | 672 | 0.500 | f | f | 0 | t | g |
| | 673 | 2.000 | f | f | 0 | f | g |
| | 674 | 0.210 | f | f | 0 | f | g |
| | 675 | 0.665 | f | f | 0 | f | g |
| | 676 | 0.085 | f | t | 12 | t | g |
| | 677 | 0.040 | f | t | 1 | f | g |
| | 678 | 0.000 | f | f | 0 | f | g |
| | 679 | 0.000 | f | f | 0 | f | g |
| | 680 | 0.290 | f | f | 0 | f | g |
| | 681 | 3.000 | f | f | 0 | f | g |
| | 682 | 0.335 | f | f | 0 | t | g |
| | 683 | 0.585 | f | f | 0 | f | g |
| | 684 | 3.500 | f | f | 0 | t | S |
| | 685 | 1.250 | f | f | 0 | f | g |
| | 686 | 2.000 | f | t | 2 | t | g |
| | 687 | 2.000 | f | t | 1 | t | g |
| | 688 | 0.040 | f | f | 0 | f | g |
| | 689 | 8.290 | f | f | 0 | t | g |
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| | | ZipCode | Income | Approved |
|-----|-----|---------|--------|----------|
| | 640 | 00232 | 200 | - |
| ••• | 641 | 00200 | 141 | - |
| | 642 | 00320 | 0 | - |
| | 643 | 00000 | 0 | - |
| | 644 | 00309 | 2 | - |
| | 645 | 00000 | 501 | - |
| | 646 | 00000 | 351 | - |
| | 647 | 00000 | 0 | - |
| | 648 | 00340 | 0 | - |
| | 649 | 00000 | 200 | - |
| | 650 | 00100 | 2 | - |
| | 651 | 00000 | 160 | - |
| | 652 | 00144 | 0 | - |
| | 653 | 00100 | 68 | - |
| | 654 | 00200 | 11 | - |
| | 655 | 00000 | 0 | - |
| | 656 | 00416 | 21 | - |
| | 657 | 00000 | 390 | - |
| | 658 | 00120 | 18 | - |
| | 659 | 00040 | 154 | - |
| | 660 | 00000 | 0 | - |
| | 661 | 00216 | 0 | - |
| | 662 | 00160 | 0 | - |
| | 663 | 00120 | 0 | - |
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| | 669 | 00120 | 1 | _ |
| | 670 | 00465 | 150 | - |
| | 671 | 00000 | 2 | _ |
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| | 673 | 00256 | 17 | _ |
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| 659 | a 28. | 3.750 | u | g | c | v | |
| 660 | b 22. | 9.000 | u | g | aa | v | |
| 661 | b 29. | 3.500 | u | g | c | V | |
| 662 | a 23. | 1.500 | u | g | W | v | |
| 663 | b 32. | 4.000 | У | р | cc | V | |
| 664 | b 31. | 1.500 | У | Р | W | v | |
| 665 | b 31. | 0.040 | У | р | m | v | |
| 666 | a 21. | | u | g | c | v | |
| 667 | a 17. | 0.540 | u | g | c | · · | |
| 668 | ь зо. | 0.500 | u | g | d ff | h ff | |
| 669 | b 51. | 2.040 | У | р | | | |
| 670 | b 47. | 5.835 | u | g | W | V | |
| 671 | b 25. | 2.835 | u | g | CC | v | |
| 672 | a 50. | 0.835 2.000 | u | g | aa | v | |
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| 683 | b 36. | 0.750 | | 8 | ď | v | |
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| 685 | b 21. | 3.290 0.085 | | R | III P | h | |
| 686 | a 22. | 0.750 | y u | P | | V | |
| 687 | a 25. | 3.500 | | 8 | ff | ff | |
| 688 | b 17. | 0.205 | y u | P | aa | v | |
| 689 | b 35. | 3.375 | u | g | dd C | h | |
| 009 | 0 33. | 3.373 | u | 5 | _ | | |
| | | | | | Executing (3) | n 26s) Cell > ra | put() > _input_request() > recv() > recv_multipart() |

| | YearsEmployed | PriorDefault | Employed | CreditScore | DriversLicense | Citizen | \ |
|-----|---------------|--------------|----------|-------------|----------------|---------|---|
| 540 | 2.500 | f | f | 0 | t | g | |
| 541 | 3.500 | f | f | 0 | t | g | |
| 542 | 3.500 | f | f | 0 | t | g | |
| 543 | 3.000 | f | f | 0 | f | g | |
| 544 | 0.290 | f | f | 0 | t | g | |
| 545 | 0.165 | f | f | 0 | t | g | |
| 546 | 0.165 | f | f | 0 | f | g | |
| 547 | 0.250 | f | f | 0 | t | g | |
| 548 | 3.500 | f | f | 0 | t | g | |
| 549 | 0.000 | f | t | 6 | f | g | |
| 550 | 1.000 | f | f | 0 | f | g | |
| 551 | 0.125 | f | t | 1 | t | g | |
| 552 | 0.335 | f | f | 0 | t | S | |
| 553 | 0.500 | t | f | 0 | t | g | |
| 554 | 0.415 | f | t | 1 | t | g | |
| 555 | 0.000 | f | f | 0 | f | g | |
| 556 | 2.290 | f | t | 1 | t | g | |
| 557 | 0.250 | f | f | 0 | f | g | |
| 558 | 1.000 | f | f | 0 | f | g | |
| 559 | 0.250 | f | t | 1 | t | g | |
| 660 | 0.085 | f | f | 0 | f | g | |
| 61 | 0.165 | f | f | 0 | f | g | |
| 62 | 0.875 | f | f | 0 | t | g | |
| 663 | 1.500 | f | f | 0 | t | g | |
| 64 | 0.040 | f | f | 0 | f | S | |
| 65 | 0.040 | f | f | 0 | f | g | |
| 666 | 0.250 | f | f | 0 | t | g | |
| 67 | 1.750 | f | t | 1 | t | g | |
| 68 | 0.085 | f | f | 0 | t | S | |
| 69 | 1.500 | f | f | 0 | f | g | |
| 570 | 5.500 | f | f | 0 | f | g | |
| 571 | 0.500 | f | f | 0 | f | g | |
| 572 | 0.500 | f | f | 0 | t | g | |
| 573 | 2.000 | f | f | 0 | f | g | |



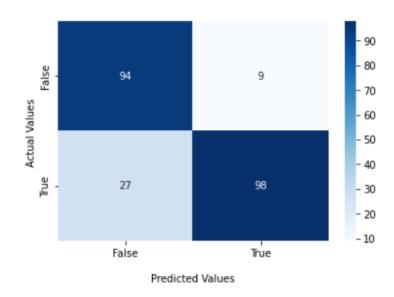


[690 rows x 14 columns]

Accuracy of logistic regression classifier: 0.8421052631578947

[[94 9] [27 98]]

/usr/local/lib/python3.7/dist-packages/ipykernel_launcher.py:26: FutureWarning: Droppi Credit Card Approval Confusion Matrix by Logistic Regression

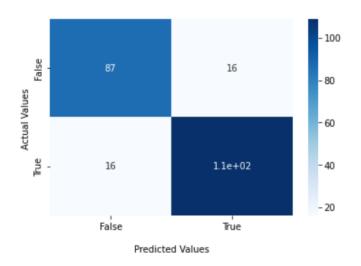


Accuracy Score is 0.85965

0 1

0 87 16 1 16 109

Credit Card Approval Confusion Matrix by Decision Tree



Predicted Values

Looking in indexes: https://us-python.pkg.dev/colab-wheels/public/simple/ Collecting colorama

Downloading colorama-0.4.4-py2.py3-none-any.whl (16 kB)

Installing collected packages: colorama

Successfully installed colorama-0.4.4 Are you male?

What is your age?

0

What is your Debt?

Are you married?

Are you a bank customer?

0

```
What is your Education Level?
What is your Ethnicity?
How many years were you employed?
Do you have any Prior defaults?
Are you Employed?
What is your Credit Score?
0
What is your Citizenship?
What is your Income?
[1.]
By Logistic Regression
 Congratulations your credit card application has been approved
Congratulations your credit card application has been approved
/usr/local/lib/python3.7/dist-packages/sklearn/base.py:566: FutureWarning: Arrays of bytes/strings is being converted to
  X = check_array(X, **check_params)
```

Conclusion:

After preprocessing the given dataset to add missing values by mean imputation, label encoding non numeric values into numeric, scaling the dataset and training, testing the dataset to create a model that predicts whether the application is approved or not after taking inputs from the user. We conclude that we have implemented this system using Logistic Regression and Decision Tree.

The Accuracy of this program using Logistic Regression is 84%. The Accuracy of this program using the Decision Tree is 85%.

References:

https://www.geeksforgeeks.org/understanding-logistic-regression/

https://www.geeksforgeeks.org/decision-tree-introduction-example/

https://www.geeksforgeeks.org/confusion-matrix-machine-learning/

https://www.geeksforgeeks.org/how-to-split-a-dataset-into-train-and-test-sets-using-python/

 $\underline{\text{http://rstudio-pubs-static.s3.amazonaws.com/73039}\underline{9946de135c0a49daa7a0a9eda4a67a72.ht}$

ml#classification-and-regression-tree