An Assessment Report

on

“Problem Statement”

submitted as partial fulfillment for the award of

BACHELOR OF TECHNOLOGY DEGREE

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in

CSEAI

By

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Introduction

In the modern financial ecosystem, lending institutions face significant risks when providing loans to individuals. One of the critical challenges is predicting whether a borrower is likely to default on a loan. Accurately identifying such risks not only safeguards financial institutions but also contributes to the health of the economy.

This project focuses on building a machine learning model that predicts loan default using various borrower-related features like income, credit score, employment status, loan purpose, and more.

Methodology

Our approach followed these major steps:

1. Data Exploration
   - Dataset includes borrower data such as CreditScore, Income, LoanAmount, etc.
   - The target variable is Default (1 for default, 0 for no default).
2. Data Preprocessing
   - Missing Values: Dropped for simplicity.
   - Encoding: Label Encoding was applied to categorical variables.
   - Splitting: Dataset split into 80% training and 20% testing sets.
3. Model Selection
   - Chose Random Forest Classifier due to its efficiency on tabular datasets and ability to handle both linear and non-linear relationships.

4. Evaluation Metrics

- Accuracy, Precision, and Recall were used to evaluate performance.

5. Confusion Matrix

- Used a heatmap to visualize true positives, false positives, true negatives, and false negatives.

Code

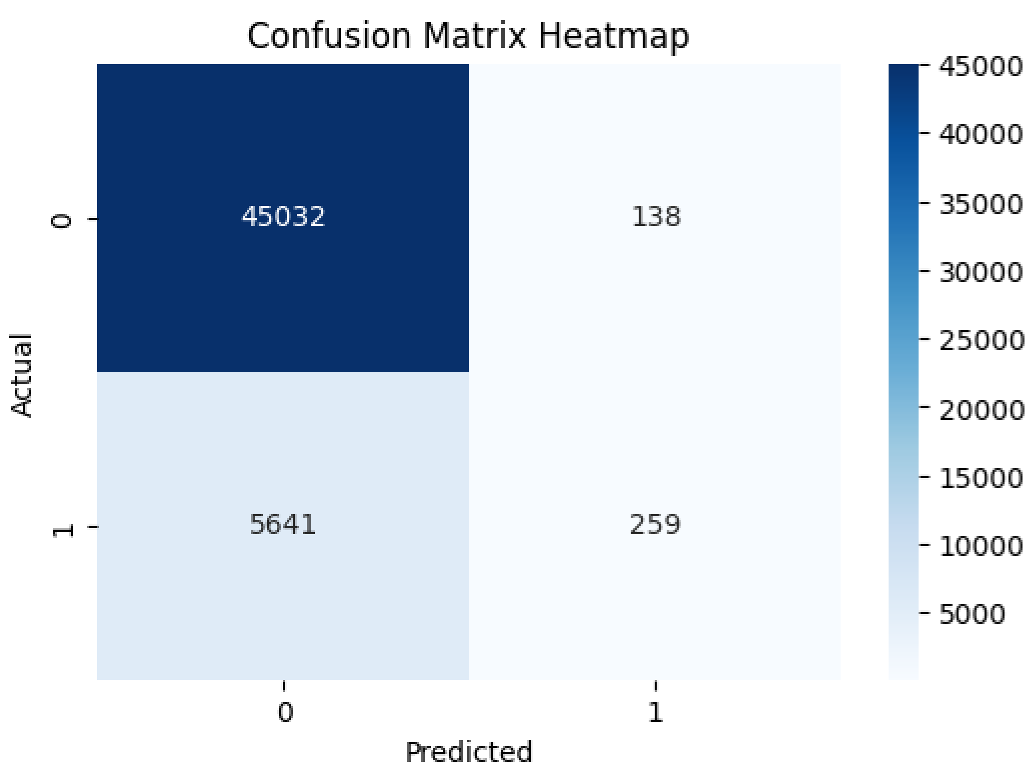
```
from google.colab import files
uploaded = files.upload()
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder
from sklearn.ensemble import RandomForestClassifier
from sklearn.metrics import confusion_matrix, accuracy_score, precision_score, recall_score

# 1. Load dataset
df = pd.read_csv("Predict Loan Default.csv")
print("First 5 rows:\n", df.head())

# 2. Data Info
print("\nBasic Info:")
print(df.info())

# 3. Handle missing values (drop or fill)
df = df.dropna()  # for simplicity

# 4. Encode categorical variables (if any)
le = LabelEncoder()
for col in df.select_dtypes(include=['object']).columns:
    df[col] = le.fit_transform(df[col])
# 5. Separate features and target
```

```
X = df.drop('Default', axis=1)  # replace 'Loan_Default' with actual column name if different
y = df['Default']

# 6. Split data into train and test
X_train, X_test, y_train, y_test = train_test_split(X, y, test_size=0.2, random_state=42)

# 7. Train a classifier
model = RandomForestClassifier(random_state=42)
model.fit(X_train, y_train)

# 8. Predict and Evaluate
y_pred = model.predict(X_test)
acc = accuracy_score(y_test, y_pred)
prec = precision_score(y_test, y_pred)
rec = recall_score(y_test, y_pred)
print(f"\nAccuracy: {acc:.2f}")
print(f"Precision: {prec:.2f}")
print(f"Recall: {rec:.2f}")

# 9. Confusion Matrix
cm = confusion_matrix(y_test, y_pred)

# 10. Heatmap
plt.figure(figsize=(6,4))
sns.heatmap(cm, annot=True, fmt='d', cmap='Blues')
plt.title('Confusion Matrix Heatmap')
plt.xlabel('Predicted')
plt.ylabel('Actual')
plt.show()
```

Output

```
First 5 rows:
       LoanID  Age  Income  LoanAmount  CreditScore  MonthsEmployed  \
0  I38PQUQS96   56   85994       50587          520              80   
1  HPSK72WA7R   69   50432      124440          458              15   
2  C1OZ6DPJ8Y   46   84208      129188          451              26   
3  V2KKSFM3UN   32   31713       44799          743               0   
4  EY08JDHTZP   60   20437        9139          633               8   

   NumCreditLines  InterestRate  LoanTerm  DTIRatio    Education  \
0               4         15.23        36      0.44   Bachelor's   
1               1          4.81        60      0.68     Master's   
2               3         21.17        24      0.31     Master's   
3               3          7.07        24      0.23  High School   
4               4          6.51        48      0.73   Bachelor's   

  EmploymentType MaritalStatus HasMortgage HasDependents LoanPurpose  \
0      Full-time      Divorced         Yes           Yes       Other   
1      Full-time       Married          No            No       Other   
2     Unemployed      Divorced         Yes           Yes        Auto   
3      Full-time       Married          No            No    Business   
4     Unemployed      Divorced          No           Yes        Auto   

  HasCoSigner  Default  
0         Yes        0  
1         Yes        0  
2          No        1  
3          No        0  
4          No        0  
```

```
Basic Info:
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 255347 entries, 0 to 255346
Data columns (total 18 columns):
 #   Column          Non-Null Count   Dtype  
---  ------          --------------   -----  
 0   LoanID          255347 non-null  object 
 1   Age             255347 non-null  int64  
 2   Income          255347 non-null  int64  
 3   LoanAmount      255347 non-null  int64  
 4   CreditScore     255347 non-null  int64  
 5   MonthsEmployed  255347 non-null  int64  
 6   NumCreditLines  255347 non-null  int64  
 7   InterestRate    255347 non-null  float64
 8   LoanTerm        255347 non-null  int64  
 9   DTIRatio        255347 non-null  float64
 10  Education       255347 non-null  object 
 11  EmploymentType  255347 non-null  object 
 12  MaritalStatus   255347 non-null  object 
 13  HasMortgage     255347 non-null  object 
 14  HasDependents   255347 non-null  object 
 15  LoanPurpose     255347 non-null  object 
 16  HasCoSigner     255347 non-null  object 
 17  Default         255347 non-null  int64  
dtypes: float64(2), int64(8), object(8)
memory usage: 35.1+ MB
None

Accuracy: 0.89
Precision: 0.65
Recall: 0.04
```



References / Credits

- Dataset Source: Provided for academic use (uploaded by project author).
- Libraries Used: pandas, numpy, matplotlib, seaborn, sklearn