CSBB311: MACHINE LEARNING LAB

ASSIGNMENT 5 :- Logistic Regression

Submitted By:

Name: Kartik Mittal

Roll No: 221210056

Branch: CSE

Semester: 5th Sem

Group : 2

Submitted To: Dr. Preeti Mehta

Department of Computer Science and Engineering

NATIONAL INSTITUTE OF TECHNOLOGY DELHI

2024

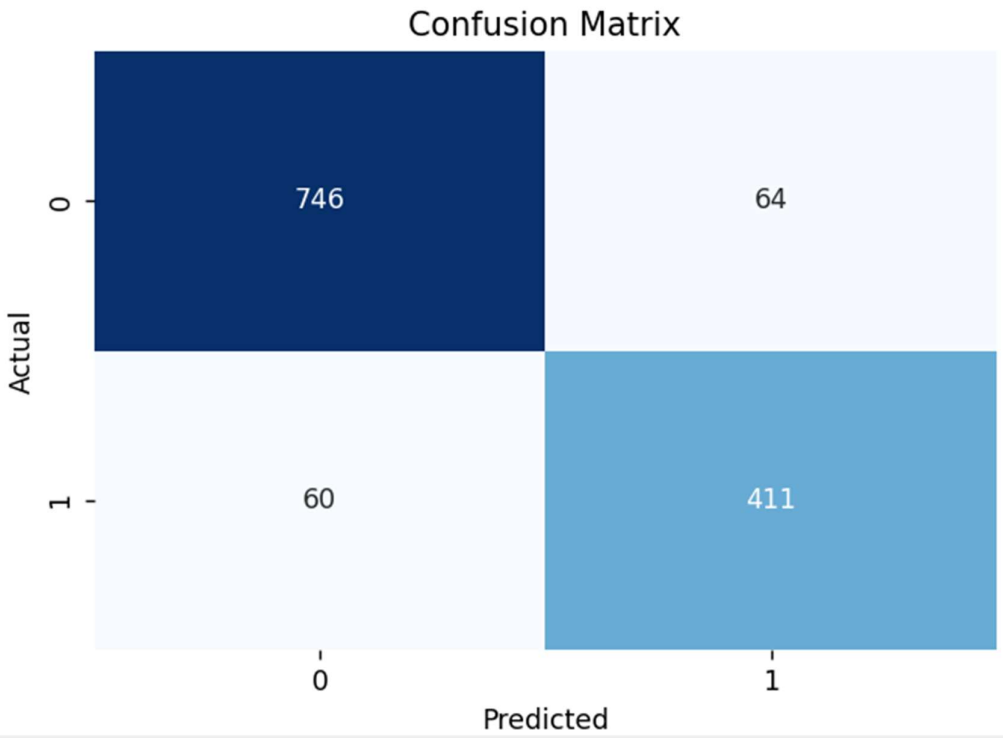
Code (Using Inbuilt Library):-

```python
import pandas as pd
import numpy as np
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder, StandardScaler
from sklearn.linear_model import LogisticRegression
from sklearn.metrics import accuracy_score, confusion_matrix
import matplotlib.pyplot as plt
import seaborn as sns

df = pd.read_csv('loanDataset.csv')


df.columns = df.columns.str.strip()

print(df.columns)

if 'education' not in df.columns:
    print("Error: 'education' column not found!")

label_encoder = LabelEncoder()

if 'education' in df.columns:
    df['education'] = label_encoder.fit_transform(df['education'])

df['self_employed'] = label_encoder.fit_transform(df['self_employed'])
df['loan_status'] = label_encoder.fit_transform(df['loan_status'])  # Approved/Rejected

df.fillna(df.median(), inplace=True)
```

```python
X = df.drop('loan_status', axis=1)
y = df['loan_status']

scaler = StandardScaler()
X_scaled = scaler.fit_transform(X)

X_train, X_test, y_train, y_test = train_test_split(X_scaled, y, test_size=0.3, random_state=42)

model = LogisticRegression()
model.fit(X_train, y_train)

y_pred = model.predict(X_test)

accuracy = accuracy_score(y_test, y_pred)
print(f'Accuracy: {accuracy * 100:.2f}%')

# Confusion matrix
cm = confusion_matrix(y_test, y_pred)

# Plotting the confusion matrix
plt.figure(figsize=(6,4))
sns.heatmap(cm, annot=True, fmt='d', cmap='Blues', cbar=False)
plt.title('Confusion Matrix')
plt.xlabel('Predicted')
plt.ylabel('Actual')
plt.show()
```

Output :-

```
PS C:\Users\HP\Desktop\college\sepython -u "c:\Users\HP\Desktop\college\semester 5\Mac
Index(['loan_id', 'no_of_dependents', 'education', 'self_employed',
       'income_annum', 'loan_amount', 'loan_term', 'cibil_score',
       'residential_assets_value', 'commercial_assets_value',
       'luxury_assets_value', 'bank_asset_value', 'loan_status'],
      dtype='object')
Accuracy: 90.32%
```



Code (Without Using Inbuilt Library):-

```python
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.preprocessing import LabelEncoder, StandardScaler
from sklearn.model_selection import train_test_split
from sklearn.metrics import accuracy_score

def sigmoid(z):
    return 1 / (1 + np.exp(-z))

class LogisticRegressionScratch:
    def __init__(self, learning_rate=0.01, n_iterations=1000):
        self.learning_rate = learning_rate
        self.n_iterations = n_iterations
        self.weights = None
        self.bias = None

    def fit(self, X, y):
        n_samples, n_features = X.shape
        self.weights = np.zeros(n_features)
        self.bias = 0

        for _ in range(self.n_iterations):
            linear_model = np.dot(X, self.weights) + self.bias
            y_pred = sigmoid(linear_model)

            dw = (1 / n_samples) * np.dot(X.T, (y_pred - y))
            db = (1 / n_samples) * np.sum(y_pred - y)
```

```python
            self.weights -= self.learning_rate * dw
            self.bias -= self.learning_rate * db

    def predict(self, X):
        linear_model = np.dot(X, self.weights) + self.bias
        y_pred = sigmoid(linear_model)
        y_pred_class = [1 if i > 0.5 else 0 for i in y_pred]
        return np.array(y_pred_class)

df = pd.read_csv('loan_dataset.csv')

df.columns = df.columns.str.strip()

label_encoder = LabelEncoder()
df['education'] = label_encoder.fit_transform(df['education'])
df['self_employed'] = label_encoder.fit_transform(df['self_employed'])
df['loan_status'] = label_encoder.fit_transform(df['loan_status'])

df.fillna(df.median(), inplace=True)

X = df.drop('loan_status', axis=1)
y = df['loan_status']

scaler = StandardScaler()
X_scaled = scaler.fit_transform(X)
```

```python
X_scaled = scaler.fit_transform(X)

X_train, X_test, y_train, y_test = train_test_split(X_scaled, y, test_size=0.3, random_state=42)

model = LogisticRegressionScratch(learning_rate=0.01, n_iterations=1000)
model.fit(X_train, y_train)

y_pred = model.predict(X_test)

accuracy = accuracy_score(y_test, y_pred)
print(f'Accuracy: {accuracy * 100:.2f}%')
```

Output :-

```
ne Learning\lab5 logistic regression\selfCode.py"
Accuracy: 91.73%
PS C:\Users\HP\Desktop\college\semester 5\Machine Learning\lab5 logistic regression>
```