EXPERIMENT -5

A python program to implement multi - layer perceptron with back propagation

AIM:

To code a python program to implement multi- layer perceptron with back propagation.

Code:

```
# Step 1: Import libraries

import pandas as pd

import numpy as np

from sklearn.model_selection import train_test_split

from sklearn.neural_network import MLPClassifier

from sklearn.metrics import classification_report,
confusion_matrix


# Step 2: Load dataset

bnotes = pd.read_csv('BankNote_Authentication.csv')

print(bnotes.head())
```

```
# Step 3: Separate features (x) and label (y)
x = bnotes.drop('class', axis=1)
y = bnotes['class']

# Step 4: Split data (80% train, 20% test)
x_train, x_test, y_train, y_test = train_test_split(x, y,
test_size=0.2, random_state=42)

# Step 5: Try different activation functions
activations = ['relu', 'logistic', 'tanh', 'identity']

for act in activations:
  print(f"\n=== Activation Function: {act} ===")
  mlp = MLPClassifier(max_iter=500, activation=act,
random_state=42)
  mlp.fit(x_train, y_train)
  pred = mlp.predict(x_test)
  print("\nConfusion Matrix:")
  print(confusion_matrix(y_test, pred))
  print("\nClassification Report:")
  print(classification_report(y_test, pred))
```

OUTPUT:

=== Activation Function: relu ===

Confusion Matrix:

[[153 2]

[0 120]]

Classification Report:

	precision	recall	f1-score	support
0	1.00	0.99	1.00	155
1	0.98	1.00	0.99	12
accuracy			0.99	275
macro avg	0.99	1.00	0.99	275
weighted avg	0.99	0.99	0.99	275

=== Activation Function: logistic ===

Confusion Matrix:

[[154 1]

[1 119]]

Classification Report:

	precision	recall	f1-score	support
0	0.99	0.99	0.99	155
1	0.99	0.99	0.99	120

accuracy			0.99	275

=== Activation Function: tanh ===

Confusion Matrix:

[[154 1]

[2 118]]

Classification Report:

	precision	recall	f1-score	support
0	0.99	0.99	0.99	155
1	0.99	0.98	0.99	120
accuracy			0.99	275
macro avg	0.99	0.99	0.99	275
weighted avg	0.99	0.99	0.99	275

=== Activation Function: identity ===

Confusion Matrix:

[[130 25]

[3 117]]

Classification Report:

	precision	recall	f1-score	support
0	0.98	0.84	0.90	155
1	0.82	0.97	0.89	120
accuracy			0.89	275
macro avg	0.90	0.91	0.89	275
weighted avg	0.91	0.89	0.89	275

RESULT:

Thus a python program to implement multi- layer perceptron with back propagation is written and output is verified successfully.