```
from google.colab import drive
drive.mount('/content/drive')
```

```
Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).
```

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.model_selection import train_test_split
from sklearn.neural_network import MLPClassifier
from sklearn.metrics import confusion_matrix, classification_report, ConfusionMatrixDisplay
```

```
file_path='/content/drive/MyDrive/MACHINE LEARNING/BankNote_Authentication.csv'
```

```
df = pd.read_csv(file_path)
```

```
print(df.head())
```

```
   variance  skewness  curtosis  entropy  class
0   3.62160    8.6661   -2.8073 -0.44699      0
1   4.54590    8.1674   -2.4586 -1.46210      0
2   3.86600   -2.6383    1.9242  0.10645      0
3   3.45660    9.5228   -4.0112 -3.59440      0
4   0.32924   -4.4552    4.5718 -0.98880      0
```

```
X = df.drop('class', axis=1).values
y = df['class'].values
```

```
X_train, X_test, y_train, y_test = train_test_split(
      X, y, test_size=0.2, random_state=42
      )
```

```
mlp = MLPClassifier(
      hidden_layer_sizes=(10, 10),
      activation='relu',
      solver='adam',
      learning_rate_init=0.001,
      max_iter=500,
      early_stopping=True,
      validation_fraction=0.1,
      random_state=42
      )
```

```
mlp.fit(X_train, y_train)
```

```
▾                         MLPClassifier                          i ?

MLPClassifier(early_stopping=True, hidden_layer_sizes=(10, 10), max_iter=500,
              random_state=42)
```

```
y_pred = mlp.predict(X_test)
```

```
cm = confusion_matrix(y_test, y_pred)
print("Confusion Matrix:\n",cm)
```

```
Confusion Matrix:
 [[147   1]
 [ 26 101]]
```

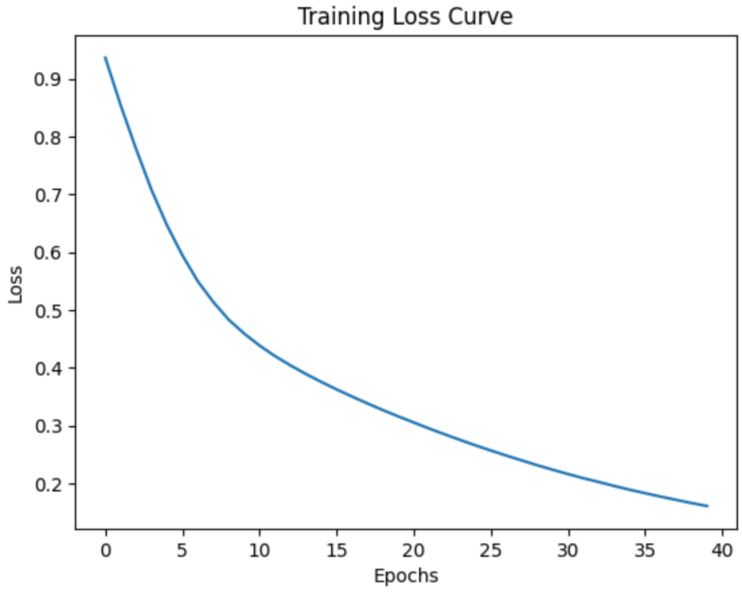
```
print("\nClassification Report:")
print(classification_report(y_test, y_pred))
```

```
Classification Report:
              precision    recall  f1-score   support
```

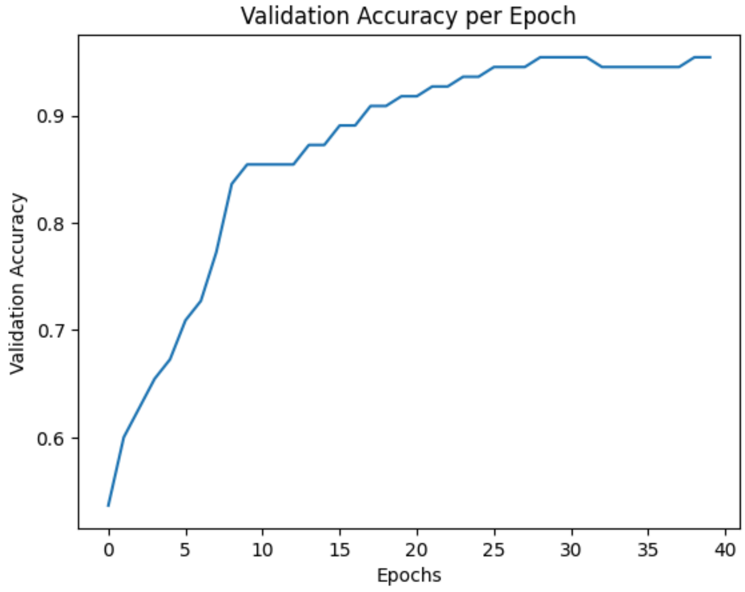
```
           0       0.85      0.99      0.92       148
           1       0.99      0.80      0.88       127

    accuracy                           0.90       275
   macro avg       0.92      0.89      0.90       275
weighted avg       0.91      0.90      0.90       275
```

```
plt.plot(mlp.loss_curve_)
plt.title("Training Loss Curve")
plt.xlabel("Epochs")
plt.ylabel("Loss")
plt.show()
```



```
if hasattr(mlp, 'validation_scores_'):
  plt.plot(mlp.validation_scores_)
  plt.title("Validation Accuracy per Epoch")
  plt.xlabel("Epochs")
  plt.ylabel("Validation Accuracy")
  plt.show()
```


Validation Accuracy per Epoch
Validation Accuracy
Epochs