Roll no:241801222
Name: Ram kumar S.S

1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

4]:
```
df=pd.read_csv(r"C:\Users\SAI\Downloads\data_banknote_authentication..zip")
df
```

	3.6216	8.6661	-2.8073	-0.44699	0
0	4.54590	8.16740	-2.4586	-1.46210	0
1	3.86600	-2.63830	1.9242	0.10645	0
2	3.45660	9.52280	-4.0112	-3.59440	0
3	0.32924	-4.45520	4.5718	-0.98880	0
4	4.36840	9.67180	-3.9606	-3.16250	0
1366	0.40614	1.34920	-1.4501	-0.55949	1
1367	-1.38870	-4.87730	6.4774	0.34179	1
1368	-3.75030	-13.45860	17.5932	-2.77710	1
1369	-3.56370	-8.38270	12.3930	-1.28230	1
1370	-2.54190	-0.65804	2.6842	1.19520	1

1371 rows x 5 columns

Roll no:241801222
Name: Ram kumar S.S

-2.4586
-1.4621

```
[5]: X = df.iloc[:, :-1].values
     X
```

```
[5]: array([[  4.5459 ,   8.1674 ,  -2.4586 ,  -1.4621 ],
            [  3.866  ,  -2.6383 ,   1.9242 ,   0.10645],
            [  3.4566 ,   9.5228 ,  -4.0112 ,  -3.5944 ],
            ...,
            [ -3.7503 , -13.4586 ,  17.5932 ,  -2.7771 ],
            [ -3.5637 ,  -8.3827 ,  12.393  ,  -1.2823 ],
            [ -2.5419 ,  -0.65804,   2.6842 ,   1.1952 ]])
```

```
[6]: y = df.iloc[:, -1].values
     y
```

```
[6]: array([0, 0, 0, ..., 1, 1, 1])
```

```
[9]: from sklearn.model_selection import train_test_split
     xtrain,xtest,ytrain,ytest=train_test_split(X,y,test_size=0.2)
```

```
[12]: from sklearn.neural_network import MLPClassifier
      model=MLPClassifier(hidden_layer_sizes=(10,10),activation='relu',solver='adam',max_iter=500,early_stopping=True,validation_fraction=0.
      model.fit(xtrain,ytrain)
```

```
[12]: MLPClassifier
      MLPClassifier(early_stopping=True, hidden_layer_sizes=(10, 10), max_iter=500,
                    random_state=42)
```

```
[15]: ypred=model.predict(xtest)
```

```
[16]: from sklearn.metrics import confusion_matrix, accuracy_score, precision_score,recall_score,f1_score
```

```
[18]: cm=confusion_matrix(ytest,ypred)
```

1.9242 e.
le645], -4. e112 -

3.5944],

17.5932 -2.7771
12.393 -1.2823
2.6842 1.1952]])

```
acc = accuracy_score(ytest,ypred)
pre = precision_score(ytest,ypred)
rec = recall_score(ytest,ypred)
f1 = f1_score(ytest,ypred)
print("Confusion Matrix: ")
print(cm)
print(f"Accuracy :{acc}")
print(f"Precision :{pre}")
print(f"Recall :{rec}")
print(f"F1 Score :{f1}")
```

1, random state=42)

Confusion matrix:

: {acc}")
:{pre}")
; {rec '

[6 118]]
Accuracy :0.9781818181818182
Precision : l.e

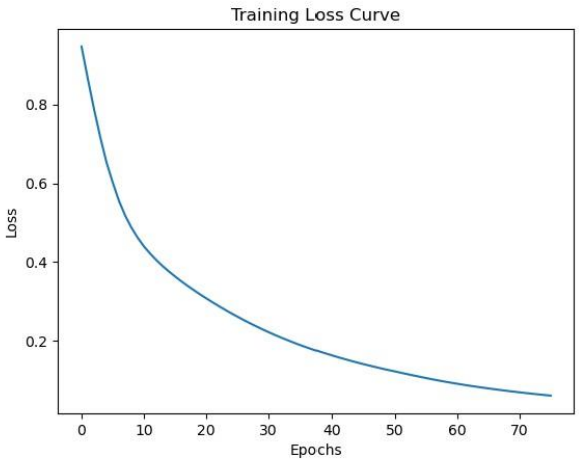
Roll no:241801222
Name: Ram kumar S.S

0]:

Recall:0.9482758620689655

Fl Score 20.9734513274336283

[22]:
```
plt.plot(model.loss_curve_)
plt.title("Training Loss Curve")
plt.xlabel("Epochs")
plt.ylabel("Loss")
plt.show()
```



26]:
```
for act in ['tanh', 'logistic', 'identity']:
    model_alt = MLPClassifier(hidden_layer_sizes=(10,10),activation=act,solver='adam',max_iter=500,early_stopping=True,validation_fraction=0.1,random_state
    model_alt.fit(xtrain, ytrain)
```

model alt. fit(xtrain, ytrain) ypred_alt = model_alt . predict (xtest) print(f" \nActivation: {act}")

```
    print("Accuracy:", accuracy_score(ytest, ypred_alt))
```

alt))

Activation : tanh
Accuracy: .9927272727272727

Activation : logistic
Accuracy: .5781818181818181

Activation : identity
Accuracy: a.930909agø9ø9age9