A PYTHON PROGRAM TO IMPLEMENT MULTI LAYER PERCEPTRON WITH BACK PROPOGATION

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Exp no: 5

Code:

```
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


bnotes = pd.read_csv("C:\\Users\\Shyam Ganesh\\Documents\\kaggle\\bank_note_data.csv")
print(bnotes.head(10))


x = bnotes.drop('Class', axis=1)
y = bnotes['Class']
print(x.head(2))
print(y.head(2))


# train_test ratio = 0.2
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.2)
```

```
# activation function : relu
mlp = MLPClassifier(max_iter=500, activation='relu')
mlp.fit(x_train, y_train)
pred = mlp.predict(x_test)
print(pred)
print(confusion_matrix(y_test, pred))
print(classification_report(y_test, pred))


# activation function : logistic
mlp = MLPClassifier(max_iter=500, activation='logistic')
mlp.fit(x_train, y_train)
pred = mlp.predict(x_test)
print(pred)
print(confusion_matrix(y_test, pred))
print(classification_report(y_test, pred))


# activation function : tanh
mlp = MLPClassifier(max_iter=500, activation='tanh')
mlp.fit(x_train, y_train)
pred = mlp.predict(x_test)
print(pred)
print(confusion_matrix(y_test, pred))
print(classification_report(y_test, pred))

# activation function : identity
mlp = MLPClassifier(max_iter=500, activation='identity')
mlp.fit(x_train, y_train)
pred = mlp.predict(x_test)
print(pred)
print(confusion_matrix(y_test, pred))
print(classification_report(y_test, pred))



# train_test ratio = 0.3
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.3)

# activation function : relu
mlp = MLPClassifier(max_iter=500, activation='relu')
mlp.fit(x_train, y_train)
pred = mlp.predict(x_test)
print(pred)
print(confusion_matrix(y_test, pred))
print(classification_report(y_test, pred))
```

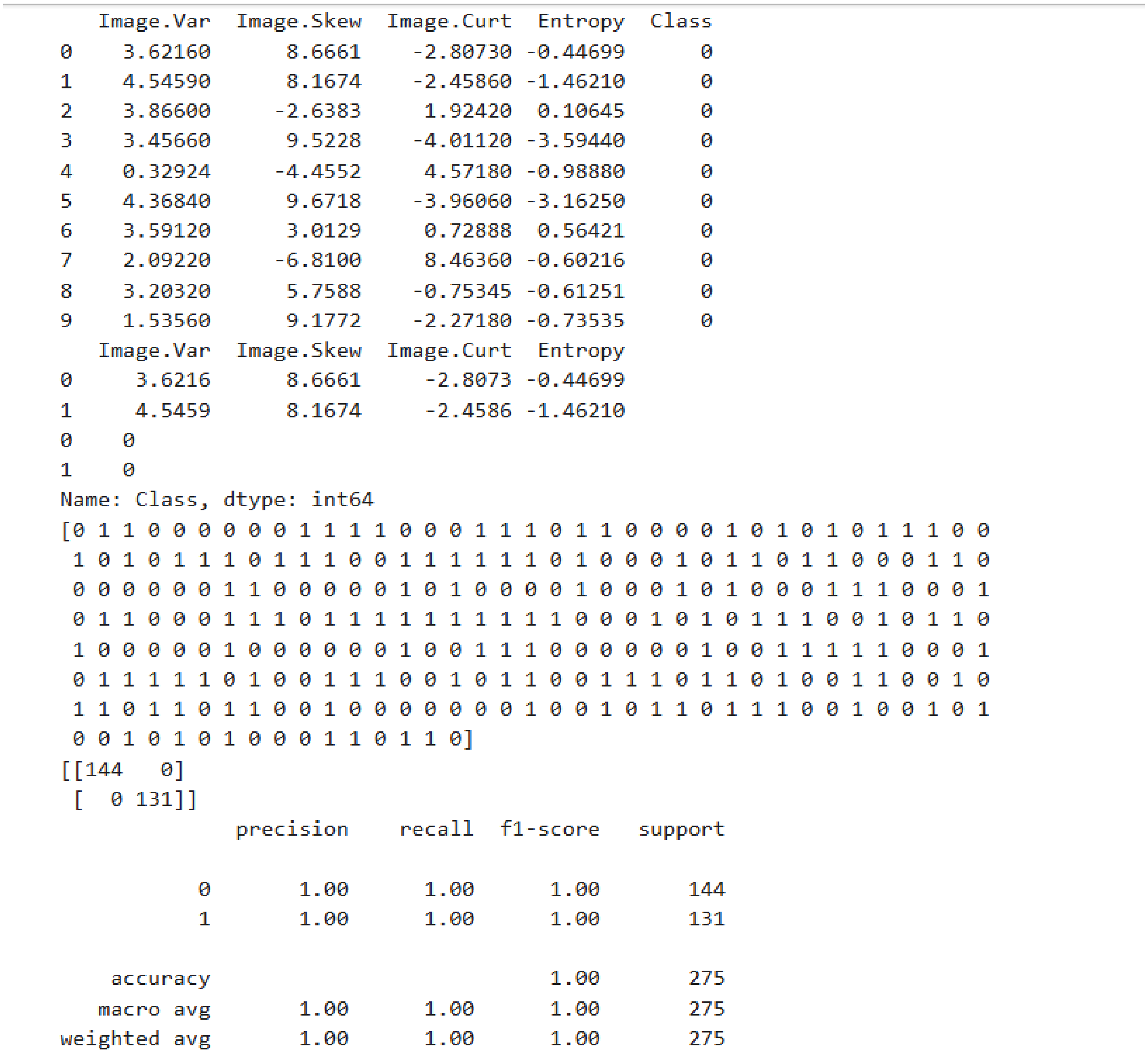
```
# activation function : logistic
mlp = MLPClassifier(max_iter=500, activation='logistic')
mlp.fit(x_train, y_train)
pred = mlp.predict(x_test)
print(pred)
print(confusion_matrix(y_test, pred))
print(classification_report(y_test, pred))


# activation function : tanh
mlp = MLPClassifier(max_iter=500, activation='tanh')
mlp.fit(x_train, y_train)
pred = mlp.predict(x_test)
print(pred)
print(confusion_matrix(y_test, pred))
print(classification_report(y_test, pred))


# activation function : identity
mlp = MLPClassifier(max_iter=500, activation='identity')
mlp.fit(x_train, y_train)
pred = mlp.predict(x_test)
print(pred)
print(confusion_matrix(y_test, pred))

print(classification_report(y_test, pred))
```

output:



```
   Image.Var  Image.Skew  Image.Curt  Entropy  Class
0    3.62160      8.6661    -2.80730 -0.44699      0
1    4.54590      8.1674    -2.45860 -1.46210      0
2    3.86600     -2.6383     1.92420  0.10645      0
3    3.45660      9.5228    -4.01120 -3.59440      0
4    0.32924     -4.4552     4.57180 -0.98880      0
5    4.36840      9.6718    -3.96060 -3.16250      0
6    3.59120      3.0129     0.72888  0.56421      0
7    2.09220     -6.8100     8.46360 -0.60216      0
8    3.20320      5.7588    -0.75345 -0.61251      0
9    1.53560      9.1772    -2.27180 -0.73535      0
   Image.Var  Image.Skew  Image.Curt  Entropy
0     3.6216      8.6661     -2.8073 -0.44699
1     4.5459      8.1674     -2.4586 -1.46210
0    0
1    0
Name: Class, dtype: int64
[0 1 1 0 0 0 0 0 0 1 1 1 1 0 0 0 1 1 1 0 1 1 0 0 0 0 1 0 1 0 1 0 1 1 1 0 0
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 0 0 1 0 1 0 1 0 0 0 1 1 0 1 1 0]
[[144   0]
 [  0 131]]
              precision    recall  f1-score   support

           0       1.00      1.00      1.00       144
           1       1.00      1.00      1.00       131

    accuracy                           1.00       275
   macro avg       1.00      1.00      1.00       275
weighted avg       1.00      1.00      1.00       275
```

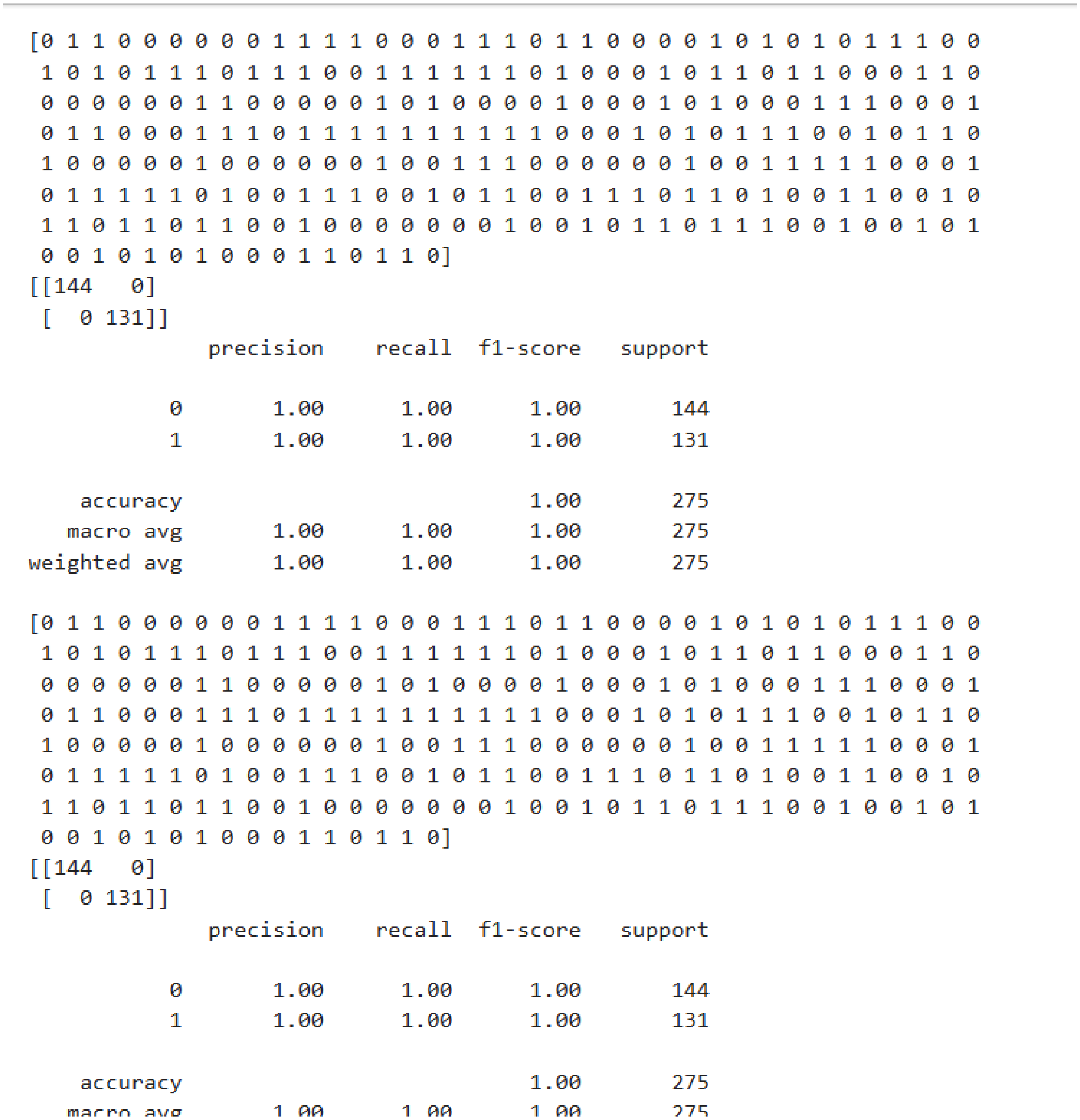

```
[0 1 1 0 0 0 0 0 0 1 1 1 1 0 0 0 1 1 1 0 1 1 0 0 0 0 1 0 1 0 1 0 1 1 1 0 0
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 0 0 1 0 1 0 1 0 0 0 1 1 0 1 1 0]
[[144   0]
 [  0 131]]
              precision    recall  f1-score   support

           0       1.00      1.00      1.00       144
           1       1.00      1.00      1.00       131

    accuracy                           1.00       275
   macro avg       1.00      1.00      1.00       275
weighted avg       1.00      1.00      1.00       275
```

```
[0 1 1 0 0 0 0 0 0 1 1 1 1 0 0 0 1 1 1 0 1 1 0 0 0 0 1 0 1 0 1 0 1 1 1 0 0
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 0 0 1 0 1 0 1 0 0 0 1 1 0 1 1 0]
[[144   0]
 [  0 131]]
              precision    recall  f1-score   support

           0       1.00      1.00      1.00       144
           1       1.00      1.00      1.00       131

    accuracy                           1.00       275
   macro avg       1.00      1.00      1.00       275
```

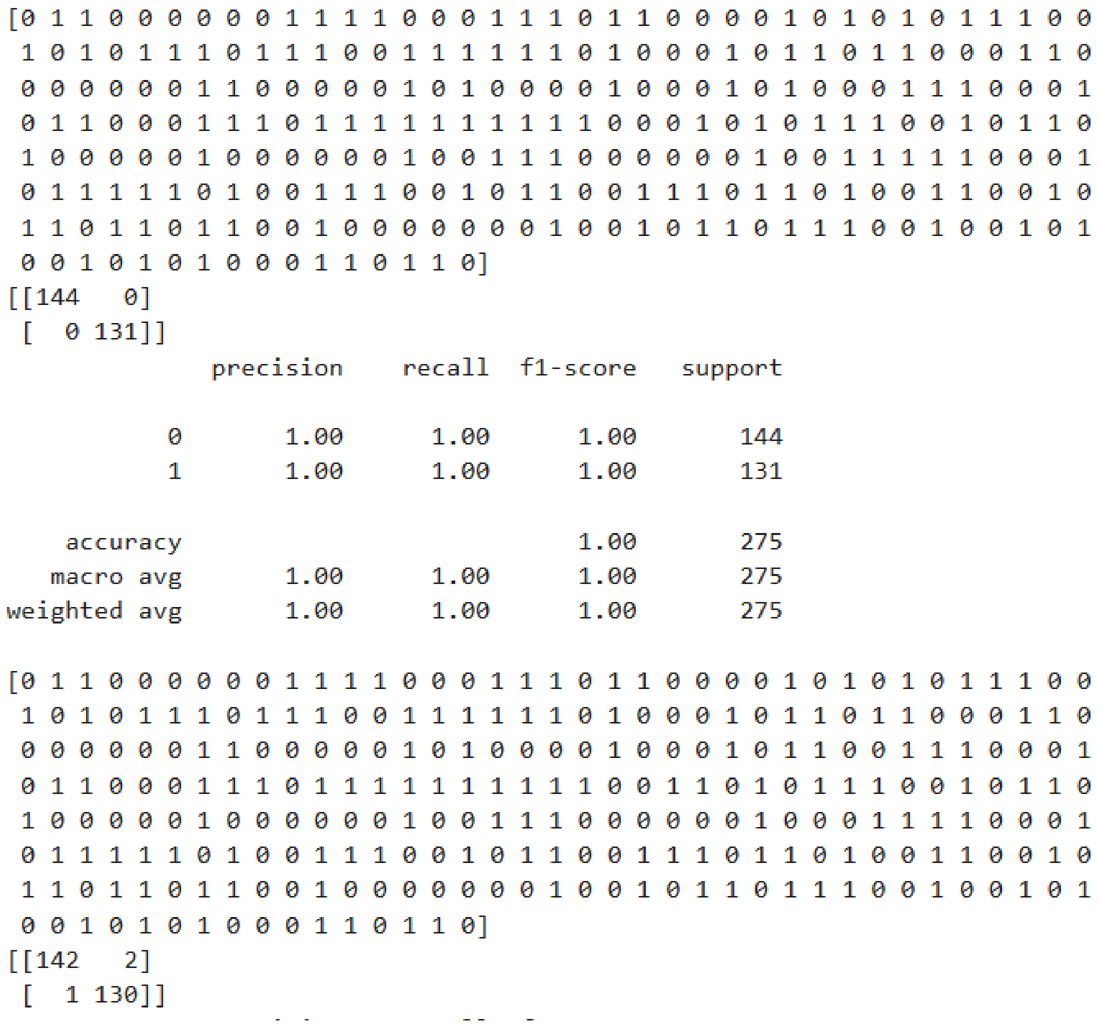

```
[0 1 1 0 0 0 0 0 0 1 1 1 1 0 0 0 1 1 1 0 1 1 0 0 0 0 1 0 1 0 1 0 1 1 1 0 0
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 0 1 1 0 0 0 1 1 1 0 1 1 1 1 1 1 1 1 1 1 0 0 0 1 0 1 0 1 1 1 0 0 1 0 1 1 0
 1 0 0 0 0 0 1 0 0 0 0 0 0 1 0 0 1 1 1 0 0 0 0 0 0 1 0 0 1 1 1 1 1 0 0 0 1
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 0 0 1 0 1 0 1 0 0 0 1 1 0 1 1 0]
[[144   0]
 [  0 131]]
              precision    recall  f1-score   support

           0       1.00      1.00      1.00       144
           1       1.00      1.00      1.00       131

    accuracy                           1.00       275
   macro avg       1.00      1.00      1.00       275
weighted avg       1.00      1.00      1.00       275

[0 1 1 0 0 0 0 0 0 1 1 1 1 0 0 0 1 1 1 0 1 1 0 0 0 0 1 0 1 0 1 0 1 1 1 0 0
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 0 0 1 0 1 0 1 0 0 0 1 1 0 1 1 0]
[[142   2]
 [  1 130]]
```

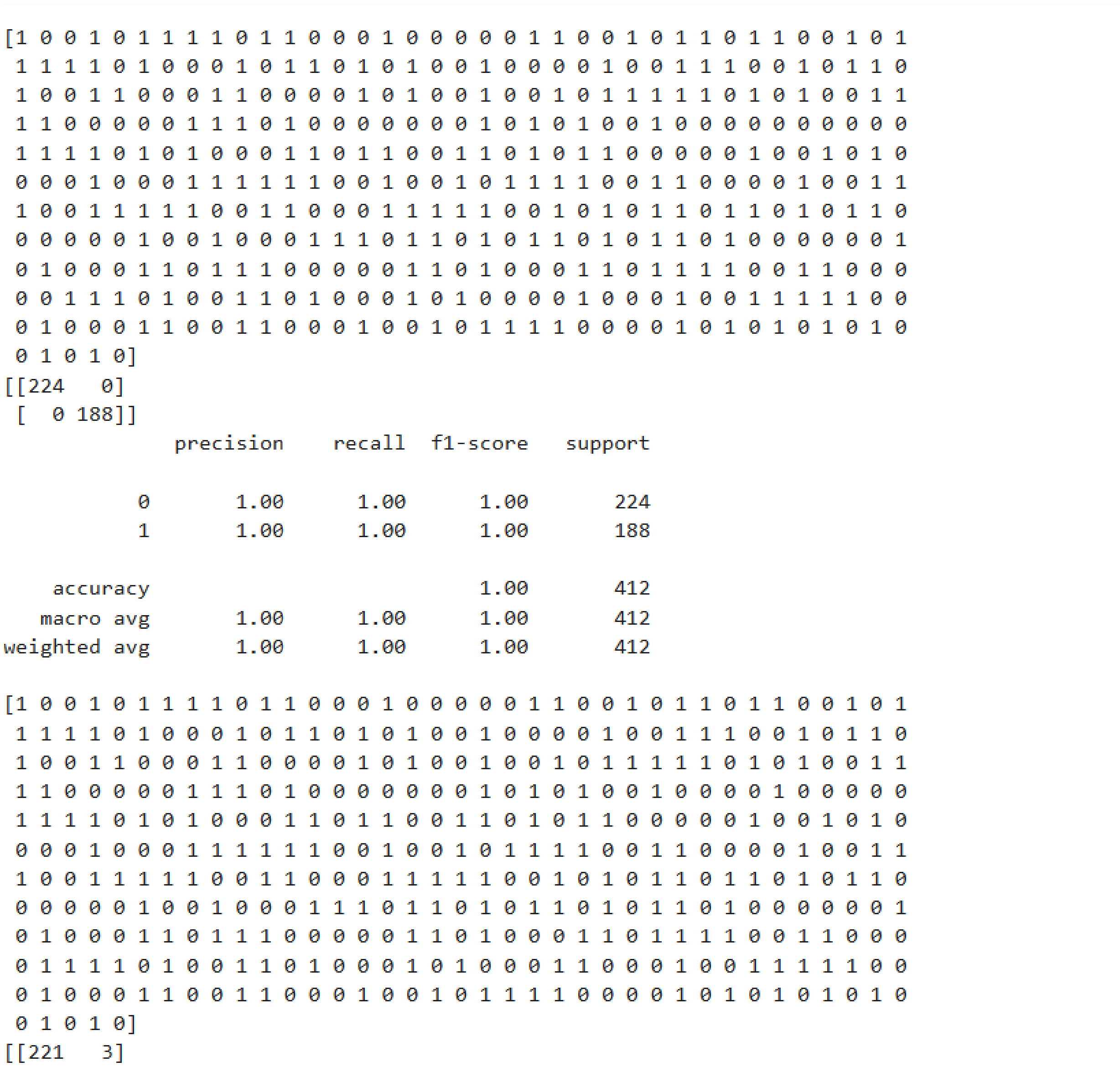

```
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 0 1 0 0 0 1 1 0 0 1 1 0 0 0 1 0 0 1 0 1 1 1 1 0 0 0 0 1 0 1 0 1 0 1 0 1 0
 0 1 0 1 0]
[[224   0]
 [  0 188]]
              precision    recall  f1-score   support

           0       1.00      1.00      1.00       224
           1       1.00      1.00      1.00       188

    accuracy                           1.00       412
   macro avg       1.00      1.00      1.00       412
weighted avg       1.00      1.00      1.00       412

[1 0 0 1 0 1 1 1 1 0 1 1 0 0 0 1 0 0 0 0 0 1 1 0 0 1 0 1 1 0 1 1 0 0 1 0 1
 1 1 1 1 0 1 0 0 0 1 0 1 1 0 1 0 1 0 0 1 0 0 0 0 1 0 0 1 1 1 0 0 1 0 1 1 0
 1 0 0 1 1 0 0 0 1 1 0 0 0 0 1 0 1 0 0 1 0 0 1 0 1 1 1 1 1 0 1 0 1 0 0 1 1
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 1 1 1 1 0 1 0 1 0 0 0 1 1 0 1 1 0 0 1 1 0 1 0 1 1 0 0 0 0 0 1 0 0 1 0 1 0
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 0 1 0 0 0 1 1 0 0 1 1 0 0 0 1 0 0 1 0 1 1 1 1 0 0 0 0 1 0 1 0 1 0 1 0 1 0
 0 1 0 1 0]
[[221   3]
```

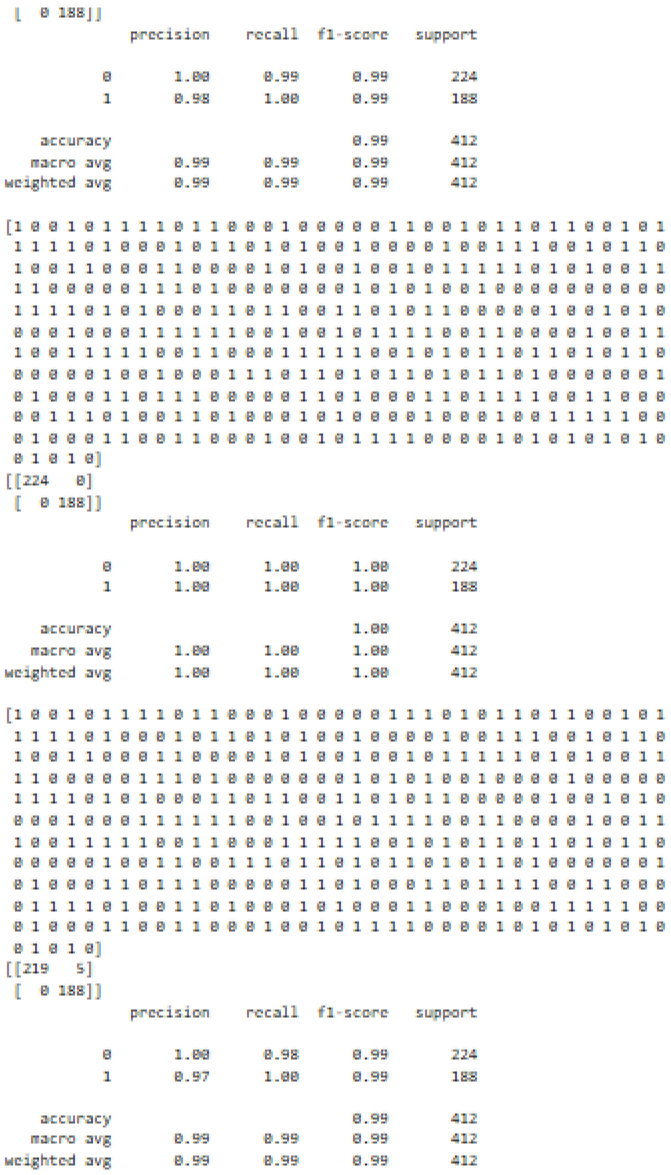

```
 [  0 188]]
              precision    recall  f1-score   support

           0       1.00      0.99      0.99       224
           1       0.98      1.00      0.99       188

    accuracy                           0.99       412
   macro avg       0.99      0.99      0.99       412
weighted avg       0.99      0.99      0.99       412

[1 0 0 1 0 1 1 1 1 0 1 1 0 0 0 1 0 0 0 0 0 1 1 0 0 1 0 1 1 0 1 1 0 0 1 0 1
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 0 1 0 1 0]
[[224   0]
 [  0 188]]
              precision    recall  f1-score   support

           0       1.00      1.00      1.00       224
           1       1.00      1.00      1.00       188

    accuracy                           1.00       412
   macro avg       1.00      1.00      1.00       412
weighted avg       1.00      1.00      1.00       412

[1 0 0 1 0 1 1 1 1 0 1 1 0 0 0 1 0 0 0 0 0 1 1 1 0 1 0 1 1 0 1 1 0 0 1 0 1
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 0 1 0 1 0]
[[219   5]
 [  0 188]]
              precision    recall  f1-score   support

           0       1.00      0.98      0.99       224
           1       0.97      1.00      0.99       188

    accuracy                           0.99       412
   macro avg       0.99      0.99      0.99       412
weighted avg       0.99      0.99      0.99       412
```