act_uresti

August 29, 2025

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1 Actividad Modulo 2

1.1 Importamos librerias necesarias

[6]:
```
import numpy as np

from matplotlib import pyplot as plt

from sklearn.metrics import ConfusionMatrixDisplay, classification_report
from sklearn.datasets import make_classification

from NNMultiClass import NNMultiClass

%matplotlib inline
```

1.2 Data Creation

[ ]:
```
data = make_classification(
    n_classes=2,
    n_features=4,
    n_samples=1000,
    random_state=42
)

X = data[0]
y = data[1]
```

```
Pesos capa 0 (4 → 8):
[[ 0.15235854 -0.51999205  0.3752256   0.47028236 -0.97551759 -0.65108975
   0.0639202  -0.1581213 ]
 [-0.00840058 -0.42652196  0.43969899  0.38889597  0.03301535  0.5636206
   0.23375467 -0.42964623]
```

```
 [ 0.18437539 -0.4794413   0.43922515 -0.02496296 -0.09243118 -0.34046477
   0.61127067 -0.07726474]
 [-0.21416391 -0.17606678  0.26615459  0.18272203  0.20636631  0.2154105
   1.0708238  -0.20320751]]

Pesos capa 1 (8 → 2):
[[-0.18110515 -0.28771211]
 [ 0.21778161  0.39915198]
 [-0.04028651 -0.29704017]
 [-0.29149813  0.23001929]
 [ 0.26278003  0.19203403]
 [-0.23529321  0.08208142]
 [ 0.04125466  0.07731809]
 [ 0.3080966   0.07905296]]
```

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1.2.1 Train-Test Split

[ ]:
```
test_percentage = 0.2

X_train = X[:-int(test_percentage * X.shape[0])]
y_train = y[:-int(test_percentage * y.shape[0])]

X_test = X[-int(test_percentage * X.shape[0]):]
y_test = y[-int(test_percentage * y.shape[0]):]
```

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1.3 Neural Network Configuration

[ ]:
```
input_size = X_test.shape[1]
output_size = len(np.unique(y))
layers = 8

layer_sizes = [input_size] + [layers] + [output_size]
```

```
nn = NNMultiClass(layer_sizes=layer_sizes, hidden_activation="a", seed=42,␣
↪lr=3e-1)
nn.show_weights()
y_pred = nn.predict(X_test)
```

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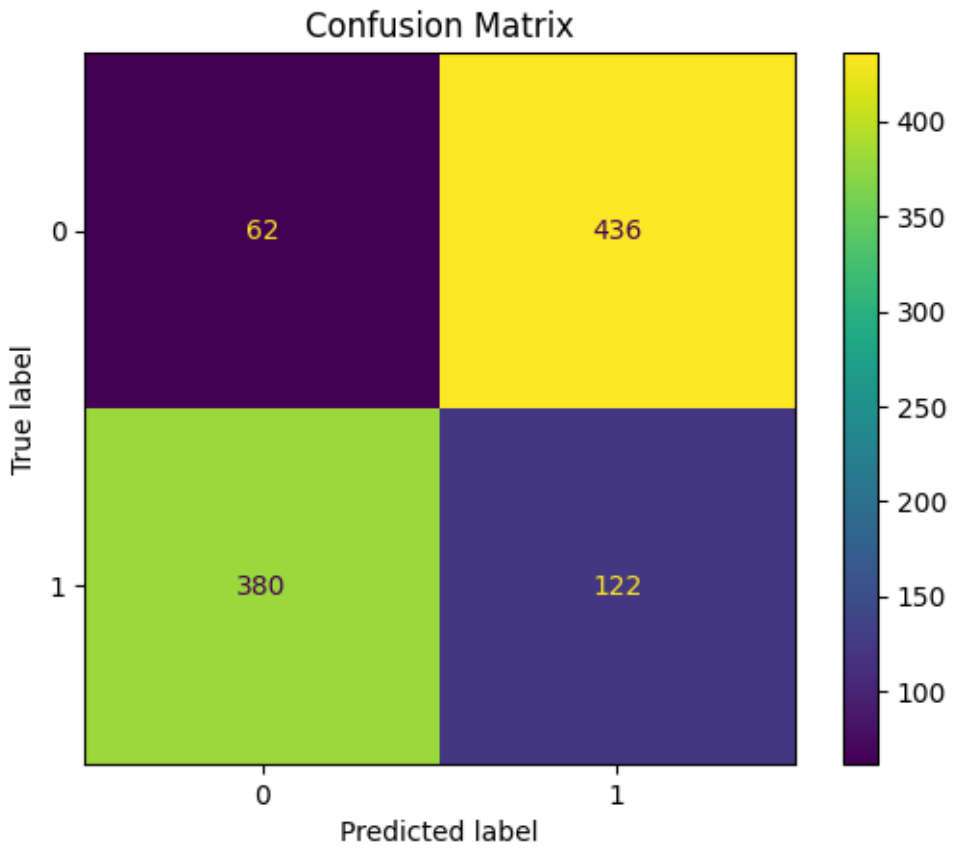
1.4 Pre - Backpropagation Prediction

1.4.1 Confusion Matrix

[ ]:
```
ConfusionMatrixDisplay.from_predictions(y_test, y_pred)
plt.title("Confusion Matrix")
plt.show()
```

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1.4.2 Classification Report

[ ]:
```
print(classification_report(y_test, y_pred))
```

```
              precision    recall  f1-score   support

           0       0.14      0.12      0.13       498
           1       0.22      0.24      0.23       502

    accuracy                           0.18      1000
   macro avg       0.18      0.18      0.18      1000
weighted avg       0.18      0.18      0.18      1000
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1.5 Post - Backpropagation Prediction

[ ]:
```
nn.fit(X_train, y_train, epochs=10000, verbose=True)
nn.show_weights()
y_pred_back = nn.predict(X_test)
```

```
Epoch    1 | loss=0.4069 | acc=0.8560
Epoch 1000 | loss=0.1839 | acc=0.9280
Epoch 2000 | loss=0.1814 | acc=0.9280
Epoch 3000 | loss=0.1814 | acc=0.9320
Epoch 4000 | loss=0.1806 | acc=0.9320
Epoch 5000 | loss=0.1806 | acc=0.9300
Epoch 6000 | loss=0.1814 | acc=0.9300
Epoch 7000 | loss=0.1803 | acc=0.9330
Epoch 8000 | loss=0.1805 | acc=0.9320
Epoch 9000 | loss=0.1835 | acc=0.9340
Epoch 10000 | loss=0.1806 | acc=0.9290

Pesos capa 0 (4 → 8):
[[-0.05513851 -1.66367447  7.23653237  0.63653126 -7.13217986 -0.81423599
  -7.69079986 -2.42032054]
 [-0.64897886  0.13733794  0.48933677 -0.36874628  1.29591763  0.85861633
   2.07985351 -0.0097424 ]
 [ 1.84087407 -0.69774391 -6.08782039  1.54944562  2.77920841 -0.86148131
   3.6451937   1.07865751]
 [-1.06046693  0.16293987  2.42680161 -0.69224522 -0.13467245  0.52596661
   0.95335408 -0.38245337]]

Pesos capa 1 (8 → 2):
[[-1.17200775  0.70319049]
 [-0.69972085  1.31665444]
 [ 0.78447893 -1.12180561]
 [-1.39431251  1.33283366]
 [ 2.11061879 -1.65580472]
 [-0.99835617  0.84514438]
 [-1.02433186  1.14290462]
 [-2.26090967  2.64805923]]
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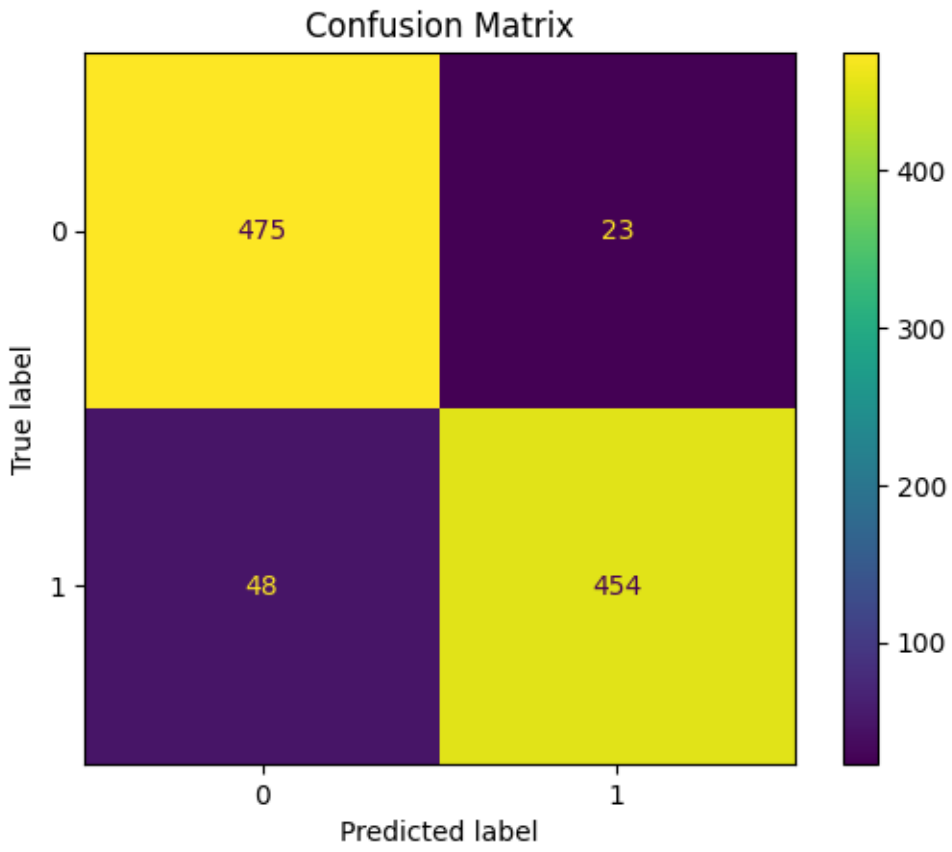
1.5.1 Confusion Matrix

[ ]:
```
ConfusionMatrixDisplay.from_predictions(y_test, y_pred_back)
plt.title("Confusion Matrix")
plt.show()
```

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```

1.5.2 Classification Report

[ ]:
```
print(classification_report(y_test, y_pred_back))
```

```
              precision    recall  f1-score   support

           0       0.91      0.95      0.93       498
           1       0.95      0.90      0.93       502

    accuracy                           0.93      1000
   macro avg       0.93      0.93      0.93      1000
weighted avg       0.93      0.93      0.93      1000
```

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