FOML.ipynb

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sample_data

BankNote_Authentication.csv

Disk 68.34 GB available

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```python
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

# Load the uploaded CSV file
bnotes = pd.read_csv('BankNote_Authentication.csv')
print("First 10 rows of dataset:")
print(bnotes.head(10))

# Separate features and target
x = bnotes.drop('class', axis=1)
y = bnotes['class']

print("\nFeature sample:")
print(x.head(2))
print("\nTarget sample:")
print(y.head(2))

# Function to train and evaluate MLP with a given activation and test size
def evaluate_mlp(activation_fn, test_size):
    print(f"\n\n--- Activation: {activation_fn}, Test size: {test_size} ---")
    x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=test_size, random_state=42)
    mlp = MLPClassifier(max_iter=500, activation=activation_fn, 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))

# Test size = 0.2
for activation in ['relu', 'logistic', 'tanh', 'identity']:
    evaluate_mlp(activation, test_size=0.2)

# Test size = 0.3
for activation in ['relu', 'logistic', 'tanh', 'identity']:
    evaluate_mlp(activation, test_size=0.3)
```

Variables Terminal

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First 10 rows of dataset:

	variance	skewness	curtosis	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

Feature sample:

	variance	skewness	curtosis	entropy
0	3.6216	8.6661	-2.8073	-0.44699
1	4.5459	8.1674	-2.4586	-1.46210

Target sample:

```
0    0
1    0
Name: class, dtype: int64
```

--- Activation: relu, Test size: 0.2 ---

Confusion Matrix:

```
[[148   0]
 [  0 127]]
```

Classification Report:

	precision	recall	f1-score	support
0	1.00	1.00	1.00	148
1	1.00	1.00	1.00	127
accuracy			1.00	275
macro avg	1.00	1.00	1.00	275
weighted avg	1.00	1.00	1.00	275

--- Activation: logistic, Test size: 0.2 ---

Confusion Matrix:

```
[[148   0]
 [  1 126]]
```

Classification Report:

	precision	recall	f1-score	support
0	0.99	1.00	1.00	148
1	1.00	0.99	1.00	127
accuracy			1.00	275
macro avg	1.00	1.00	1.00	275
weighted avg	1.00	1.00	1.00	275

--- Activation: tanh, Test size: 0.2 ---

Confusion Matrix:

```
[[148   0]
 [  0 127]]
```

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

           0       1.00      1.00      1.00       148
           1       1.00      1.00      1.00       127

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


--- Activation: identity, Test size: 0.2 ---

Confusion Matrix:
[[146   2]
 [  2 125]]

Classification Report:
              precision    recall  f1-score   support

           0       0.99      0.99      0.99       148
           1       0.98      0.98      0.98       127

    accuracy                           0.99       275
   macro avg       0.99      0.99      0.99       275
weighted avg       0.99      0.99      0.99       275


--- Activation: relu, Test size: 0.3 ---

Confusion Matrix:
[[229   0]
 [  0 183]]

Classification Report:
              precision    recall  f1-score   support

           0       1.00      1.00      1.00       229
           1       1.00      1.00      1.00       183

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


--- Activation: logistic, Test size: 0.3 ---

Confusion Matrix:
[[229   0]
 [  1 182]]

Classification Report:
              precision    recall  f1-score   support

           0       1.00      1.00      1.00       229
           1       1.00      0.99      1.00       183

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

```
 [  0 183]]

Classification Report:
              precision    recall  f1-score   support

           0       1.00      1.00      1.00       229
           1       1.00      1.00      1.00       183

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


--- Activation: logistic, Test size: 0.3 ---

Confusion Matrix:
[[229   0]
 [  1 182]]

Classification Report:
              precision    recall  f1-score   support

           0       1.00      1.00      1.00       229
           1       1.00      0.99      1.00       183

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


--- Activation: tanh, Test size: 0.3 ---

Confusion Matrix:
[[229   0]
 [  0 183]]

Classification Report:
              precision    recall  f1-score   support

           0       1.00      1.00      1.00       229
           1       1.00      1.00      1.00       183

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


--- Activation: identity, Test size: 0.3 ---

Confusion Matrix:
[[226   3]
 [  2 181]]

Classification Report:
              precision    recall  f1-score   support

           0       0.99      0.99      0.99       229
           1       0.98      0.99      0.99       183

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