
Fruits DT best parameters:

{'ccp_alpha': 0.014736842105263158, 'criterion': 'entropy'}

Fruits DT time to train: 0.018931150436401367 seconds

Fruits DT time to test: 0.0 seconds

Fruits DT test results:

	precision	recall	f1-score	support
0.0	0.6471	0.7857	0.7097	14
1.0	0.6667	0.6364	0.6512	22
2.0	0.8857	0.9118	0.8986	34
3.0	0.7857	0.6471	0.7097	17
4.0	0.8718	1.0000	0.9315	34
5.0	1.0000	0.9737	0.9867	38
6.0	0.7500	0.6000	0.6667	20
accuracy		0.8380		179
macro avg	0.8010	0.7935	0.7934	179
weighted avg	0.8371	0.8380	0.8345	179

[[11 0 0 2 1 0 0]

[0 14 4 0 0 0 4]

[0 3 31 0 0 0 0]

[4 0 0 11 2 0 0]

[0 0 0 0 34 0 0]

[0 0 0 1 0 37 0]

```
[ 2 4 0 0 2 0 12]]
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Phones DT best parameters:

```
{'ccp_alpha': 0.0, 'criterion': 'entropy'}
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Phones DT time to train: 0.009966611862182617 seconds

Phones DT time to test: 0.0 seconds

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Phones DT test results:

	precision	recall	f1-score	support
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0.0	0.9375	0.9184	0.9278	98
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1.0	0.8469	0.7981	0.8218	104
-----	--------	--------	--------	-----

2.0	0.8125	0.8585	0.8349	106
-----	--------	--------	--------	-----

3.0	0.9149	0.9348	0.9247	92
-----	--------	--------	--------	----

accuracy		0.8750		400
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macro avg	0.8780	0.8774	0.8773	400
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weighted avg	0.8756	0.8750	0.8749	400
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```
[[90 8 0 0]
```

```
[ 6 83 15 0]
```

```
[ 0 7 91 8]
```

```
[ 0 0 6 86]]
```

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```

Fruits boosting best parameters:

```
{'estimator__criterion': 'entropy', 'estimator__max_depth': 9, 'estimator__splitter': 'random',  
'n_estimators': 50}
```

Fruits boosting time to train: 0.22317981719970703 seconds

Fruits boosting time to test: 0.0069768428802490234 seconds

Fruits boosting test results:

	precision	recall	f1-score	support
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0.0	0.9231	0.8571	0.8889	14
-----	--------	--------	--------	----

1.0	0.9412	0.7273	0.8205	22
-----	--------	--------	--------	----

2.0	0.8919	0.9706	0.9296	34
-----	--------	--------	--------	----

3.0	0.8824	0.8824	0.8824	17
-----	--------	--------	--------	----

4.0	0.9429	0.9706	0.9565	34
-----	--------	--------	--------	----

5.0	1.0000	1.0000	1.0000	38
-----	--------	--------	--------	----

6.0	0.8636	0.9500	0.9048	20
-----	--------	--------	--------	----

accuracy		0.9274		179
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macro avg	0.9207	0.9083	0.9118	179
-----------	--------	--------	--------	-----

weighted avg	0.9290	0.9274	0.9258	179
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```
[[12 0 0 2 0 0 0]
```

```
[ 0 16 4 0 0 0 2]
```

```
[ 0 1 33 0 0 0 0]
```

```
[ 1 0 0 15 1 0 0]
```

```
[ 0 0 0 0 33 0 1]
```

```
[ 0 0 0 0 0 38 0]
```

```
[ 0 0 0 0 1 0 19]]
```


Phones boosting best parameters:

```
{'estimator__criterion': 'entropy', 'estimator__max_depth': 6, 'estimator__splitter': 'best', 'n_estimators': 42}
```


Phones boosting time to train: 0.7585134506225586 seconds

Phones boosting time to test: 0.006952047348022461 seconds

Phones boosting test results:

	precision	recall	f1-score	support
0.0	0.9388	0.9388	0.9388	98
1.0	0.8505	0.8750	0.8626	104
2.0	0.8750	0.8585	0.8667	106
3.0	0.9451	0.9348	0.9399	92
accuracy		0.9000		400
macro avg	0.9023	0.9018	0.9020	400
weighted avg	0.9004	0.9000	0.9001	400

[[92 6 0 0]

[6 91 7 0]

[0 10 91 5]

[0 0 6 86]]

Fruits KNN best parameters:

```
{'algorithm': 'ball_tree', 'leaf_size': 1, 'n_neighbors': 3, 'weights': 'distance'}
```

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```

Fruits KNN time to train: 0.003985404968261719 seconds

Fruits KNN time to test: 0.009968757629394531 seconds

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```

Fruits KNN test results:

	precision	recall	f1-score	support
--	-----------	--------	----------	---------

0.0	0.9231	0.8571	0.8889	14
-----	--------	--------	--------	----

1.0	0.8824	0.6818	0.7692	22
-----	--------	--------	--------	----

2.0	0.8684	0.9706	0.9167	34
-----	--------	--------	--------	----

3.0	0.9333	0.8235	0.8750	17
-----	--------	--------	--------	----

4.0	0.8919	0.9706	0.9296	34
-----	--------	--------	--------	----

5.0	1.0000	1.0000	1.0000	38
-----	--------	--------	--------	----

6.0	0.8095	0.8500	0.8293	20
-----	--------	--------	--------	----

accuracy		0.9050		179
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macro avg	0.9012	0.8791	0.8869	179
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weighted avg	0.9064	0.9050	0.9028	179
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```
[[12 0 0 1 1 0 0]
```

```
[ 0 15 5 0 0 0 2]
```

```
[ 0 1 33 0 0 0 0]
```

```
[ 1 0 0 14 1 0 1]
```

```
[ 0 0 0 0 33 0 1]
```

```
[ 0 0 0 0 0 38 0]
```

```
[ 0 1 0 0 2 0 17]]
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Phones KNN best parameters:

```
{'algorithm': 'ball_tree', 'leaf_size': 1, 'n_neighbors': 200, 'weights': 'distance'}
```


Phones KNN time to train: 0.009964942932128906 seconds

Phones KNN time to test: 0.07175993919372559 seconds

Phones KNN test results:

	precision	recall	f1-score	support
0.0	0.6897	0.8163	0.7477	98
1.0	0.4868	0.3558	0.4111	104
2.0	0.5000	0.5566	0.5268	106
3.0	0.7000	0.6848	0.6923	92
accuracy		0.5975		400
macro avg	0.5941	0.6034	0.5945	400
weighted avg	0.5890	0.5975	0.5889	400

[[80 16 2 0]

[36 37 28 3]

[0 23 59 24]

[0 0 29 63]]

Fruits NN best parameters:

```
{'activation': 'tanh', 'hidden_layer_sizes': [25, 25], 'learning_rate': 'adaptive', 'learning_rate_init': 0.01}
```

Fruits NN time to train: 0.25514698028564453 seconds

Fruits NN time to test: 0.001992464065551758 seconds

Fruits NN test results:

	precision	recall	f1-score	support
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0.0	1.0000	0.8571	0.9231	14
-----	--------	--------	--------	----

1.0	0.8571	0.8182	0.8372	22
-----	--------	--------	--------	----

2.0	0.9429	0.9706	0.9565	34
-----	--------	--------	--------	----

3.0	0.8889	0.9412	0.9143	17
-----	--------	--------	--------	----

4.0	0.8947	1.0000	0.9444	34
-----	--------	--------	--------	----

5.0	1.0000	1.0000	1.0000	38
-----	--------	--------	--------	----

6.0	0.8824	0.7500	0.8108	20
-----	--------	--------	--------	----

accuracy		0.9274		179
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macro avg	0.9237	0.9053	0.9123	179
-----------	--------	--------	--------	-----

weighted avg	0.9279	0.9274	0.9259	179
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[[12 0 0 1 1 0 0]

[0 18 2 0 0 0 2]

[0 1 33 0 0 0 0]

[0 0 0 16 1 0 0]

[0 0 0 0 34 0 0]

[0 0 0 0 0 38 0]

[0 2 0 1 2 0 15]]

Phones NN best parameters:

```
{'activation': 'logistic', 'hidden_layer_sizes': [25, 25], 'learning_rate': 'constant', 'learning_rate_init': 0.01}
```

Phones NN time to train: 0.5949392318725586 seconds

Phones NN time to test: 0.001993417739868164 seconds

Phones NN test results:

	precision	recall	f1-score	support
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0.0	1.0000	0.9592	0.9792	98
-----	--------	--------	--------	----

1.0	0.9439	0.9712	0.9573	104
-----	--------	--------	--------	-----

2.0	0.9709	0.9434	0.9569	106
-----	--------	--------	--------	-----

3.0	0.9583	1.0000	0.9787	92
-----	--------	--------	--------	----

accuracy		0.9675		400
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macro avg	0.9683	0.9684	0.9680	400
-----------	--------	--------	--------	-----

weighted avg	0.9681	0.9675	0.9675	400
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```
[[ 94  4  0  0]
```

```
[ 0 101  3  0]
```

```
[ 0  2 100  4]
```

```
[ 0  0  0 92]]
```

Phones SVM best parameters:

```
{'C': 2, 'degree': 2, 'gamma': 2.0, 'kernel': 'linear'}
```

Phones SVM time to train: 0.048836469650268555 seconds

Phones SVM time to test: 0.004982948303222656 seconds

Phones SVM test results:

	precision	recall	f1-score	support
0.0	0.9794	0.9694	0.9744	98
1.0	0.9423	0.9423	0.9423	104
2.0	0.9612	0.9340	0.9474	106
3.0	0.9583	1.0000	0.9787	92
accuracy		0.9600		400
macro avg	0.9603	0.9614	0.9607	400
weighted avg	0.9601	0.9600	0.9599	400

[[95 3 0 0]

[2 98 4 0]

[0 3 99 4]

[0 0 0 92]]

Fruits SVM best parameters:

{'C': 0.2, 'degree': 2, 'gamma': 10.577777777777778, 'kernel': 'poly'}

Fruits SVM time to train: 0.010960817337036133 seconds

Fruits SVM time to test: 0.0009982585906982422 seconds

Fruits SVM test results:

	precision	recall	f1-score	support
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0.0	0.9286	0.9286	0.9286	14
1.0	0.7727	0.7727	0.7727	22
2.0	0.9429	0.9706	0.9565	34
3.0	0.9375	0.8824	0.9091	17
4.0	0.9714	1.0000	0.9855	34
5.0	1.0000	0.9737	0.9867	38
6.0	0.8500	0.8500	0.8500	20

accuracy		0.9274		179
macro avg	0.9147	0.9111	0.9127	179
weighted avg	0.9275	0.9274	0.9272	179

```
[[13 0 0 1 0 0 0]
 [ 0 17 2 0 0 0 3]
 [ 0 1 33 0 0 0 0]
 [ 1 0 0 15 1 0 0]
 [ 0 0 0 0 34 0 0]
 [ 0 1 0 0 0 37 0]
 [ 0 3 0 0 0 0 17]]
```

Process finished with exit code 0