Fruits DT best parameters:

{'ccp_alpha': 0.003157894736842105, 'criterion': 'gini'}

Fruits DT time to train: 0.01793980598449707 seconds

Fruits DT time to test: 0.0 seconds

Fruits DT test results:

	precision	recall	f1-score	support
0.0	0.5294	0.6429	0.5806	14
1.0	0.7143	0.6818	0.6977	22
2.0	0.9167	0.9706	0.9429	34
3.0	0.7143	0.5882	0.6452	17
4.0	0.9143	0.9412	0.9275	34
5.0	0.9744	1.0000	0.9870	38
6.0	0.7059	0.6000	0.6486	20
accuracy			0.8324	179
macro avg	0.7813	0.7750	0.7756	179
weighted avg	0.8305	0.8324	0.8297	179

[[9 1 0 3 0 0 1]
 [0 15 3 0 0 0 4]
 [0 1 33 0 0 0 0]
 [5 1 0 10 1 0 0]
 [1 1 0 0 32 0 0]
 [0 0 0 0 0 38 0]

[2 2 0 1 2 1 12]]

Phones DT best parameters:

{'ccp_alpha': 0.0, 'criterion': 'entropy'}

Phones DT time to train: 0.016942739486694336 seconds

Phones DT time to test: 0.0 seconds

Phones DT test results:

	precision	recall	f1-score	support
0.0	0.9375	0.9184	0.9278	98
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
macro avg	0.8780	0.8774	0.8773	400
weighted avg	0.8756	0.8750	0.8749	400

[[90 8 0 0]

[6 83 15 0]

[0 7 91 8]

[0 0 6 86]]

Fruits boosting best parameters:

{'estimator__criterion': 'gini', 'estimator__max_depth': 4, 'estimator__splitter': 'best', 'n_estimators': 50}

Fruits boosting time to train: 0.7331604957580566 seconds

Fruits boosting time to test: 0.005907297134399414 seconds

Fruits boosting test results:

	precision	recall	f1-score	support
0.0	0.7857	0.7857	0.7857	14
1.0	0.7500	0.6818	0.7143	22
2.0	0.8684	0.9706	0.9167	34
3.0	0.8571	0.7059	0.7742	17
4.0	0.9167	0.9706	0.9429	34
5.0	1.0000	1.0000	1.0000	38
6.0	0.7368	0.7000	0.7179	20
accuracy			0.8715	179
macro avg	0.8450	0.8307	0.8360	179
weighted avg	0.8687	0.8715	0.8685	179

[[11 0 0 2 0 0 1]
 [0 15 5 0 0 0 2]
 [0 1 33 0 0 0 0]
 [3 0 0 12 1 0 1]
 [0 0 0 0 33 0 1]
 [0 0 0 0 0 38 0]
 [0 4 0 0 2 0 14]]

Phones boosting best parameters:

{'estimator__criterion': 'entropy', 'estimator__max_depth': 4, 'estimator__splitter': 'best', 'n_estimators': 42}

Phones boosting time to train: 0.3906097412109375 seconds

Phones boosting time to test: 0.0050106048583984375 seconds

Phones boosting test results:

```
          precision   recall  f1-score   support

     0.0    0.9773   0.8776   0.9247       98
     1.0    0.8276   0.9231   0.8727      104
     2.0    0.7686   0.8774   0.8194      106
     3.0    0.9333   0.7609   0.8383       92


 accuracy                     0.8625      400
 macro avg   0.8767   0.8597   0.8638      400
weighted avg   0.8729   0.8625   0.8634      400
```

[[86 12 0 0]
 [2 96 6 0]
 [0 8 93 5]
 [0 0 22 70]]

Fruits KNN best parameters:

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

Fruits KNN time to train: 0.004984617233276367 seconds

Fruits KNN time to test: 0.01494741439819336 seconds

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
macro avg	0.9012	0.8791	0.8869	179
weighted avg	0.9064	0.9050	0.9028	179

[[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]]

Phones KNN best parameters:

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

Phones KNN time to train: 0.0070002079010009766 seconds

Phones KNN time to test: 0.060790061950683594 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': 'logistic', 'hidden_layer_sizes': [15, 15], 'learning_rate': 'constant', 'learning_rate_init': 0.05}

Fruits NN time to train: 0.19536304473876953 seconds

Fruits NN time to test: 0.0 seconds

Fruits NN test results:

	precision	recall	f1-score	support
0.0	1.0000	0.8571	0.9231	14
1.0	0.8636	0.8636	0.8636	22
2.0	0.9429	0.9706	0.9565	34
3.0	0.8889	0.9412	0.9143	17
4.0	0.8500	1.0000	0.9189	34
5.0	1.0000	1.0000	1.0000	38
6.0	0.9286	0.6500	0.7647	20
accuracy			0.9218	179
macro avg	0.9249	0.8975	0.9059	179
weighted avg	0.9254	0.9218	0.9191	179

[[12 0 0 1 1 0 0]

[0 19 2 0 0 0 1]

[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 4 0 13]]

Phones NN best parameters:

{'activation': 'logistic', 'hidden_layer_sizes': [15, 15], 'learning_rate': 'constant', 'learning_rate_init': 0.02}

Phones NN time to train: 0.3568105697631836 seconds

Phones NN time to test: 0.000995635986328125 seconds

Phones NN test results:

       precision   recall f1-score   support

	precision	recall	f1-score	support
0.0	1.0000	0.9592	0.9792	98
1.0	0.9352	0.9712	0.9528	104
2.0	0.9608	0.9245	0.9423	106
3.0	0.9479	0.9891	0.9681	92

accuracy			0.9600	400
macro avg	0.9610	0.9610	0.9606	400
weighted avg	0.9608	0.9600	0.9600	400

[[94 4 0 0]

 [0 101 3 0]

 [0 3 98 5]

 [0 0 1 91]]

Phones SVM best parameters:

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

Phones SVM time to train: 0.04430842399597168 seconds

Phones SVM time to test: 0.005053520202636719 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: 0.011960268020629883 seconds

Fruits SVM time to test: 0.0009965896606445312 seconds

Fruits SVM test results:

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

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