

Results

Enhancement results:



1. Original Fingerprint



2. Fingerprint ridge skeleton



3. Extracted skeleton on original fingerprint.

Classification Results

Training with Daubauchie wavelet

```
IPython: Fingerprint_wavelet/src
50% -0.011886 25.547129 -0.000021
75% 0.080583 30.837735 0.064400
max 1.826615 50.292845 0.581116

Image L2CA L2CD L2 CH L2 CV Energy Original std Original mean \
0 0 3056 2691 2227 5676 1120
1 1 4353 739 693 6619 1202
2 2 1852 5964 5731 1867 1949
3 3 5334 216 211 6445 2666
4 4 2640 5655 5321 629 3515

cA5 std cA5 mean cD5 std cD5 mean cD4 mean cD4 std cD3 mean cD3 std \
0 5050 1121 6299 4989 4261 6485 6270 5494
1 6543 1202 3016 1682 480 839 551 4579
2 965 1925 4824 1320 4815 5868 5551 1473
3 6496 2666 2716 4919 602 4778 534 3529
4 714 3457 5210 5417 5572 1710 1118 4919

cD2 mean cD2 std cD1 mean cD1 std Class
0 6134 4197 977 5006 1
1 2277 4339 470 3828 0
2 4875 2804 5775 6309 1
3 746 4003 187 3690 0
4 1622 615 5600 5104 1

trained Gradient Boosting Classifier in 21.17 s
trained Neural Net in 5.26 s
trained Logistic Regression in 0.28 s
trained Decision Tree in 0.45 s
trained Naive Bayes in 0.00 s
trained Linear SVM in 4.24 s
trained Nearest Neighbors in 0.01 s
trained Random Forest in 39.02 s

classifier train_score test_score train_time
6 Random Forest 1.000000 0.912552 39.018215
0 Gradient Boosting Classifier 0.999405 0.907793 21.169140
4 Neural Net 0.920087 0.901249 5.260915
1 Decision Tree 1.000000 0.874479 0.445993
3 Linear SVM 0.883799 0.856633 4.244885
7 Nearest Neighbors 0.883204 0.785842 0.007169
5 Logistic Regression 0.740631 0.734682 0.281484
2 Naive Bayes 0.666270 0.669839 0.004782

For (100, 0.5, frte) - train, test score: 0.98671 - 0.89768
For (100, 0.5, mse) - train, test score: 0.98671 - 0.89709
```

Training with symlet

```
IPython: Fingerprint_wavelet/src
50% 25.526998 0.000092
75% 30.804496 0.064428
max 50.400807 0.581121

Image L2CA L2CD L2CH L2CV Energy Original std Original mean cA5 std \
0 0 3056 2691 2227 5676 1120 5054
1 1 4353 739 693 6619 1202 6543
2 2 1852 5964 5731 1867 1949 972
3 3 5334 216 211 6445 2666 6496
4 4 2640 5655 5321 629 3515 715

cA5 mean cD5 std cD5 mean cD4 mean cD4 std cD3 mean cD3 std \
0 1122 6290 1838 4108 5995 6302 2335
1 1204 2990 4864 521 5314 538 2916
2 1884 4673 5104 4857 3425 5547 2481
3 2665 2809 1272 538 1211 563 3095
4 3455 5214 1134 5565 4093 1123 3405

cD2 mean cD2 std cD1 mean cD1 std Class
0 6139 3601 991 5178 1
1 2271 3979 449 3948 0
2 4892 4642 5783 6503 1
3 739 4135 184 3806 0
4 1605 1643 5591 5281 1
trained Gradient Boosting Classifier in 19.21 s
trained Neural Net in 5.66 s
trained Logistic Regression in 0.19 s
trained Decision Tree in 0.38 s
trained Naive Bayes in 0.00 s
trained Linear SVM in 3.34 s
trained Nearest Neighbors in 0.01 s
trained Random Forest in 31.89 s

classifier train_score test_score train_time
0 Gradient Boosting Classifier 0.999603 0.921475 19.207389
6 Random Forest 1.000000 0.917906 31.890434
4 Neural Net 0.906603 0.888757 5.657996
1 Decision Tree 1.000000 0.879833 0.376672
3 Linear SVM 0.884989 0.879239 3.339535
7 Nearest Neighbors 0.877057 0.799524 0.007357
5 Logistic Regression 0.729923 0.751338 0.188288
2 Naive Bayes 0.662899 0.666865 0.003636
For (100, 0.5, frie) - train, test score: 0.98790 - 0.90006
For (100, 0.5, mse) - train, test score: 0.98790 - 0.90006
```

Training with coiflet wavelet

```
IPython: Fingerprint_wavelet/src
1 420 3865 0
2 5781 6370 1
3 192 3725 0
4 5618 5159 1
trained Gradient Boosting Classifier in 21.68 s
trained Neural Net in 5.04 s
trained Logistic Regression in 0.25 s
trained Decision Tree in 0.41 s
trained Naive Bayes in 0.00 s
trained Linear SVM in 3.58 s
trained Nearest Neighbors in 0.01 s
trained Random Forest in 37.87 s

classifier train_score test_score train_time
6 Random Forest 1.000000 0.912500 37.869029
0 Gradient Boosting Classifier 0.999802 0.908333 21.680692
4 Neural Net 0.913889 0.877976 5.038021
1 Decision Tree 1.000000 0.866667 0.406068
3 Linear SVM 0.889286 0.861310 3.576644
7 Nearest Neighbors 0.874206 0.793452 0.008981
5 Logistic Regression 0.739881 0.747024 0.252956
2 Naive Bayes 0.668254 0.662500 0.004302
For (100, 0.5, frie) - train, test score: 0.98829 - 0.89762
For (100, 0.5, mse) - train, test score: 0.98829 - 0.89643
```