# Task A1 for Gender Recognition

# Tuning hyper-parameters for precision

Best parameters set found on training dataset:

{'C': 0.01, 'kernel': 'linear'}

Grid scores on training dataset:

0.253 (+/-0.001) for {'C': 0.01, 'kernel': 'rbf'}

0.253 (+/-0.001) for {'C': 0.05, 'kernel': 'rbf'}

0.453 (+/-0.490) for {'C': 0.1, 'kernel': 'rbf'}

0.820 (+/-0.035) for {'C': 0.5, 'kernel': 'rbf'}

0.859 (+/-0.039) for {'C': 1, 'kernel': 'rbf'}

0.894 (+/-0.027) for {'C': 5, 'kernel': 'rbf'}

0.901 (+/-0.030) for {'C': 10, 'kernel': 'rbf'}

0.922 (+/-0.020) for {'C': 0.01, 'kernel': 'linear'}

0.920 (+/-0.018) for {'C': 0.05, 'kernel': 'linear'}

0.918 (+/-0.019) for {'C': 0.1, 'kernel': 'linear'}

0.918 (+/-0.022) for {'C': 0.5, 'kernel': 'linear'}

0.916 (+/-0.024) for {'C': 1, 'kernel': 'linear'}

0.916 (+/-0.023) for {'C': 5, 'kernel': 'linear'}

0.916 (+/-0.021) for {'C': 10, 'kernel': 'linear'}

0.880 (+/-0.029) for {'C': 0.01, 'kernel': 'poly'}

0.901 (+/-0.029) for {'C': 0.05, 'kernel': 'poly'}

0.904 (+/-0.023) for {'C': 0.1, 'kernel': 'poly'}

0.915 (+/-0.024) for {'C': 0.5, 'kernel': 'poly'}

0.918 (+/-0.021) for {'C': 1, 'kernel': 'poly'}

0.922 (+/-0.020) for {'C': 5, 'kernel': 'poly'}

0.921 (+/-0.021) for {'C': 10, 'kernel': 'poly'}

Detailed classification report:

The model is trained on the full training dataset.

The scores are computed on the full testing dataset.

precision recall f1-score support

0.0 0.92 0.93 0.93 487

1.0 0.93 0.92 0.92 473

accuracy 0.93 960

macro avg 0.93 0.92 0.92 960

weighted avg 0.93 0.93 0.92 960

The confusion matrix is:

[[453 34]

[ 38 435]]

Best estimator found: SVC(C=0.01, break\_ties=False, cache\_size=200, class\_weight=None, coef0=0.0,

decision\_function\_shape='ovr', degree=3, gamma='scale', kernel='linear',

max\_iter=-1, probability=False, random\_state=None, shrinking=True,

tol=0.001, verbose=False)

Best parameters set found: {'C': 0.01, 'kernel': 'linear'}

SVM with GridCV on testing data - Accuracy Score: 0.925 (+/- 0.000)

SVM with GridCV on training data - Accuracy Score: 0.934 (+/- 0.000)

A close up of a map

Description automatically generatedA close up of a map

Description automatically generatedA close up of a map

Description automatically generated

# Task A2 for Smiling Recognition

# Tuning hyper-parameters for precision

Best parameters set found on training dataset:

{'C': 0.5, 'kernel': 'poly'}

Grid scores on training dataset:

0.254 (+/-0.001) for {'C': 0.01, 'kernel': 'rbf'}

0.846 (+/-0.020) for {'C': 0.05, 'kernel': 'rbf'}

0.863 (+/-0.013) for {'C': 0.1, 'kernel': 'rbf'}

0.878 (+/-0.015) for {'C': 0.5, 'kernel': 'rbf'}

0.881 (+/-0.017) for {'C': 1, 'kernel': 'rbf'}

0.890 (+/-0.013) for {'C': 5, 'kernel': 'rbf'}

0.891 (+/-0.014) for {'C': 10, 'kernel': 'rbf'}

0.891 (+/-0.013) for {'C': 0.01, 'kernel': 'linear'}

0.886 (+/-0.016) for {'C': 0.05, 'kernel': 'linear'}

0.882 (+/-0.024) for {'C': 0.1, 'kernel': 'linear'}

0.879 (+/-0.019) for {'C': 0.5, 'kernel': 'linear'}

0.879 (+/-0.024) for {'C': 1, 'kernel': 'linear'}

0.878 (+/-0.021) for {'C': 5, 'kernel': 'linear'}

0.878 (+/-0.022) for {'C': 10, 'kernel': 'linear'}

0.884 (+/-0.011) for {'C': 0.01, 'kernel': 'poly'}

0.890 (+/-0.017) for {'C': 0.05, 'kernel': 'poly'}

0.893 (+/-0.011) for {'C': 0.1, 'kernel': 'poly'}

0.894 (+/-0.019) for {'C': 0.5, 'kernel': 'poly'}

0.893 (+/-0.018) for {'C': 1, 'kernel': 'poly'}

0.891 (+/-0.015) for {'C': 5, 'kernel': 'poly'}

0.889 (+/-0.019) for {'C': 10, 'kernel': 'poly'}

Detailed classification report:

The model is trained on the full training dataset.

The scores are computed on the full testing dataset.

precision recall f1-score support

0.0 0.88 0.90 0.89 456

1.0 0.91 0.89 0.90 504

accuracy 0.89 960

macro avg 0.89 0.89 0.89 960

weighted avg 0.90 0.89 0.89 960

The confusion matrix is:

[[410 46]

[ 55 449]]

Best estimator found: SVC(C=0.5, break\_ties=False, cache\_size=200, class\_weight=None, coef0=0.0,

decision\_function\_shape='ovr', degree=3, gamma='scale', kernel='poly',

max\_iter=-1, probability=False, random\_state=None, shrinking=True,

tol=0.001, verbose=False)

Best parameters set found: {'C': 0.5, 'kernel': 'poly'}

92.

SVM with GridCV on testing data - Accuracy Score: 0.895 (+/- 0.000)

SVM with GridCV on training data - Accuracy Score: 0.901 (+/- 0.000)

# Task B1 for Eye Colour Recognition

# Tuning hyper-parameters for precision

Best parameters set found on training dataset:

{'C': 0.01, 'kernel': 'poly'}

Grid scores on training dataset:

0.041 (+/-0.000) for {'C': 0.01, 'kernel': 'rbf'}

0.041 (+/-0.000) for {'C': 0.05, 'kernel': 'rbf'}

0.202 (+/-0.020) for {'C': 0.1, 'kernel': 'rbf'}

0.460 (+/-0.042) for {'C': 0.5, 'kernel': 'rbf'}

0.639 (+/-0.027) for {'C': 1, 'kernel': 'rbf'}

0.795 (+/-0.027) for {'C': 5, 'kernel': 'rbf'}

0.801 (+/-0.026) for {'C': 10, 'kernel': 'rbf'}

0.782 (+/-0.039) for {'C': 0.01, 'kernel': 'linear'}

0.782 (+/-0.039) for {'C': 0.05, 'kernel': 'linear'}

0.782 (+/-0.039) for {'C': 0.1, 'kernel': 'linear'}

0.782 (+/-0.039) for {'C': 0.5, 'kernel': 'linear'}

0.782 (+/-0.039) for {'C': 1, 'kernel': 'linear'}

0.782 (+/-0.039) for {'C': 5, 'kernel': 'linear'}

0.782 (+/-0.039) for {'C': 10, 'kernel': 'linear'}

0.840 (+/-0.033) for {'C': 0.01, 'kernel': 'poly'}

0.823 (+/-0.032) for {'C': 0.05, 'kernel': 'poly'}

0.813 (+/-0.046) for {'C': 0.1, 'kernel': 'poly'}

0.794 (+/-0.047) for {'C': 0.5, 'kernel': 'poly'}

0.794 (+/-0.046) for {'C': 1, 'kernel': 'poly'}

0.794 (+/-0.046) for {'C': 5, 'kernel': 'poly'}

0.794 (+/-0.046) for {'C': 10, 'kernel': 'poly'}

Detailed classification report:

The model is trained on the full training dataset.

The scores are computed on the full testing dataset.

precision recall f1-score support

0 0.82 0.79 0.81 176

1 0.89 0.79 0.84 147

2 0.98 0.73 0.84 166

3 0.79 0.85 0.82 157

4 0.65 0.88 0.75 154

accuracy 0.81 800

macro avg 0.83 0.81 0.81 800

weighted avg 0.83 0.81 0.81 800

The confusion matrix is:

[[139 6 0 12 19]

[ 6 116 1 8 16]

[ 8 5 121 12 20]

[ 3 1 1 133 19]

[ 13 2 0 3 136]]

Best estimator found: SVC(C=0.01, break\_ties=False, cache\_size=200, class\_weight=None, coef0=0.0,

decision\_function\_shape='ovr', degree=3, gamma='scale', kernel='poly',

max\_iter=-1, probability=False, random\_state=None, shrinking=True,

tol=0.001, verbose=False)

Best parameters set found: {'C': 0.01, 'kernel': 'poly'}

SVM with GridCV on testing data - Accuracy Score: 0.806 (+/- 0.000)

SVM with GridCV on training data - Accuracy Score: 0.869 (+/- 0.000)

# Task B2 for Face Shape Recognition

# Tuning hyper-parameters for precision

Best parameters set found on training dataset:

{'C': 0.5, 'kernel': 'poly'}

Grid scores on training dataset:

0.051 (+/-0.001) for {'C': 0.01, 'kernel': 'rbf'}

0.051 (+/-0.001) for {'C': 0.05, 'kernel': 'rbf'}

0.051 (+/-0.001) for {'C': 0.1, 'kernel': 'rbf'}

0.051 (+/-0.001) for {'C': 0.5, 'kernel': 'rbf'}

0.051 (+/-0.001) for {'C': 1, 'kernel': 'rbf'}

0.140 (+/-0.025) for {'C': 5, 'kernel': 'rbf'}

0.226 (+/-0.076) for {'C': 10, 'kernel': 'rbf'}

0.645 (+/-0.084) for {'C': 0.01, 'kernel': 'linear'}

0.606 (+/-0.114) for {'C': 0.05, 'kernel': 'linear'}

0.581 (+/-0.110) for {'C': 0.1, 'kernel': 'linear'}

0.524 (+/-0.129) for {'C': 0.5, 'kernel': 'linear'}

0.526 (+/-0.114) for {'C': 1, 'kernel': 'linear'}

0.534 (+/-0.105) for {'C': 5, 'kernel': 'linear'}

0.534 (+/-0.105) for {'C': 10, 'kernel': 'linear'}

0.371 (+/-0.184) for {'C': 0.01, 'kernel': 'poly'}

0.559 (+/-0.134) for {'C': 0.05, 'kernel': 'poly'}

0.633 (+/-0.104) for {'C': 0.1, 'kernel': 'poly'}

0.674 (+/-0.046) for {'C': 0.5, 'kernel': 'poly'}

0.650 (+/-0.082) for {'C': 1, 'kernel': 'poly'}

0.602 (+/-0.144) for {'C': 5, 'kernel': 'poly'}

0.603 (+/-0.115) for {'C': 10, 'kernel': 'poly'}

Detailed classification report:

The model is trained on the full training dataset.

The scores are computed on the full testing dataset.

precision recall f1-score support

0 0.75 0.65 0.70 485

1 0.53 0.70 0.61 471

2 0.71 0.74 0.73 559

3 0.66 0.62 0.64 478

4 0.86 0.72 0.79 511

accuracy 0.69 2504

macro avg 0.70 0.69 0.69 2504

weighted avg 0.71 0.69 0.69 2504

The confusion matrix is:

[[315 102 34 12 22]

[ 48 332 26 46 19]

[ 13 47 415 73 11]

[ 13 80 81 295 9]

[ 32 62 25 22 370]]

Best estimator found: SVC(C=0.5, break\_ties=False, cache\_size=200, class\_weight=None, coef0=0.0,

decision\_function\_shape='ovr', degree=3, gamma='scale', kernel='poly',

max\_iter=-1, probability=False, random\_state=None, shrinking=True,

tol=0.001, verbose=False)

Best parameters set found: {'C': 0.5, 'kernel': 'poly'}

SVM with GridCV on testing data - Accuracy Score: 0.690 (+/- 0.000)

SVM with GridCV on training data - Accuracy Score: 0.793 (+/- 0.000)

Task A1: 0.922 (+/-0.020) for {'C': 0.01, 'kernel': 'linear'}

Task A2: 0.894 (+/-0.019) for {'C': 0.5, 'kernel': 'poly'}

Task B1: 0.840 (+/-0.033) for {'C': 0.01, 'kernel': 'poly'}

Task B2: 0.674 (+/-0.046) for {'C': 0.5, 'kernel': 'poly'}

TA1:0.9338541666666667,0.9347849599900989,0.925;

TA2:0.90078125,0.8972352164748262,0.8947916666666667;