Exercise3_forTA1

October 11, 2018

1 Affective Computing - Programming Assignment 3

1.0.1 Objective

Your task is to use the feature-level method to combine the facial expression features and audio features. A multi-modal emotion recognition system is constructed to recognize happy versus sadness facial expressions (binary-class problem) by using a classifier training and testing structure.

The original data is based on lab1 and lab2, from ten actors acting happy and sadness behaviors. * Task 1: Subspace-based feature fusion method: In this case, z-score normalization is utilized. Please read "Fusing Gabor and LBP feature sets for kernel-based face recognition" and learn how to use subspace-based feature fusion method for multi-modal system.

- Task 2: Based on Task1, use Canonical Correlation Analysis to calculate the correlation coefficient of facial expression and audio features. Finally, use CCA to build a multi-modal emotion recognition system. The method is described in one conference paper "Feature fusion method based on canonical correlation analysis and handwritten character recognition"
- Optional task: Use feature-level method (Task 2) on 10-fold cross-validation estimate of the emotion recognition system performance

To produce emotion recognition case, Support Vector Machine (SVM) classifiers are trained. 50 videos from 5 participants are used to train the emotion recognition, use spatiotemporal features. The rest of the data (50 videos) is used to evaluate the performances of the trained recognition systems.

1.1 Task 1. Subspace-based method

Please read "Fusing Gabor and LBP feature sets for kernel-based face recognition" and apply their framework for the exercise. We use Support Vector Machine (SVM) with linear kernel for classification.

1.1.1 Setting up the environment

First, we need to import the basic modules for loading the data and data processing

1.1.2 Loading data

We load the facial expression data (training data, training class, testing data, testing class) and audio data (training data, testing data)

1.1.3 Extract the subspace for facial expression feature and audio features.

Extract the subspace for facial expression feature and audio features using principal component analysis through using `sklearn.decomposition.PCA()` function. ReducedDim is the dimensionality of the reduced subspace. Set ReducedDim to 20 and 15 for facial expression feature and audio feature, respectively.

1.1.4 Feature classification

Use the `SVM` function to train Support Vector Machine (SVM) classifiers. Construct an SVM using the 'combined_trainingData' and linear kernel. The 'training_class' group vector contains the class of samples: 1 = happy, 2 = sadness, corresponding to the rows of the training data matrices.

Then, calculate average classification performances for both training and testing data. The correct class labels corresponding with the rows of the training and testing data matrices are in the variables 'training_class' and 'testing_class', respectively.

```
In [18]: #Calculate and Print the training accuracy and testing accuracy.
```

```
1.0
0.98
```

Compute the confusion matrix through __`sklearn.metrics.confusion_matrix()`__function for training data and testing data respectively

```
In [19]:

[[25  0]
 [ 0 25]]
[[25  0]
 [ 1 24]]
```

1.2 Task 2.

Based on Task1, use Canonical Correlation Analysis to calculate the correlation coefficient of facial expression and audio features. Finally, use CCA to build a multi-modal emotion recognition system.

Use (`sklearn.cross_decomposition.CCA()`) function to calculate the correlation coefficient of facial expression and audio features.

```
In [6]:

(50L, 15L)
```

Train SVM classifiers through 'linear' kernel, print the training and testing accuracy and compute the confusion matrix.

```
In [20]: #Calculate and Print the training accuracy and testing accuracy.

         # Compute the confusion matrix through sklearn.metrics.confusion_matrix()function for
```

```
1.0
0.92
[[25  0]
 [ 0 25]]
[[25  0]
 [ 4 21]]
```

1.3 Optional task:

Use feature-level method (Task 2) on 10-fold cross-validation estimate of the emotion recognition system performance

```
In [8]:
```

```
C:\ProgramData\Anaconda2\lib\site-packages\sklearn\utils\validation.py:578: DataConversionWarn
  y = column_or_1d(y, warn=True)


0.9099999999999999
0.12206555615733702
```