

Assignment LDA- IRM2016502

Problem:

To perform Face recognition using LDA.

Data:

I have used the 'ORL Database of Faces' from which I've chosen 15 different people each folder having 10 faces of a single person. Out of the 10 faces I chose 5 faces for training and remaining for testing purposes.

Procedure:

- As the first step I've loaded the data into a numpy array. We have a total of 15 classes and 5 images in each class for training, 5 images of each class for Testing.
- First I've found the mean of all train images so as to make the mean zero.

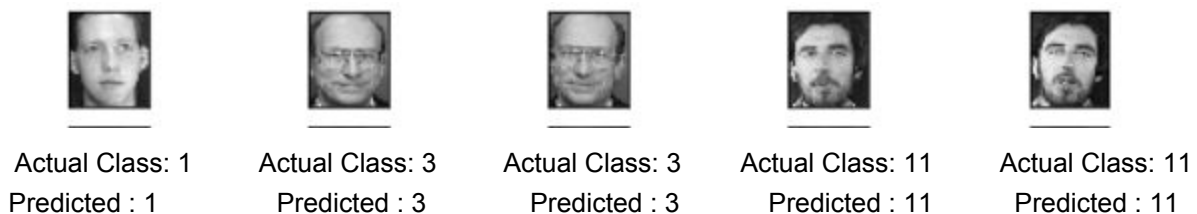
Mean Face



- Then after This mean face is subtracted from all the faces.
- Later I've found the covariance matrix and from which we could get its eigenvalues and eigenvectors.
- Now we need to choose a K to take top K eigenvectors corresponding to first K eigenvalues when they are sorted in descending order.
- Suppose K value is k . Then k eigenvectors are chosen according to their order of eigenvalues.

- Multiplied them with input to get eigen_faces.
- These are again multiplied to input faces to get signatures/ weights of each training image.
- Then found the covariance to calculate inter class difference SB and intra class difference SW.
- We have to reduce SW and maximise SB $J = SW^{-1} * SB$.
- Calculate eigenvalues and eigenvectors for J, take P eigenvectors corresponding to decreasingly sorted eigenvalues.
- We get the fisher faces multiplying them with projected faces
- During testing I've taken an image, normalised it, then multiplied it with eigen_faces to get it's weights.
- Then the image class with minimum weight difference is predicted as the class of test image.

The below is a sample of testing where actual class and predicted class along with the image are shown.



Also I've printed the accuracies using both PCA and LDA.

Accuracy using LDA: 0.84
Accuracy using PCA: 0.8666666666666667