

Demo Face Recognition

1, Eigen Faces

Eigen Face Image



Eigen Face Image



Eigen Face 1

Eigen Face 2

Eigen Face Image



Eigen Face 3

As shown in the Eigen Faces figures, we can get three different Eigen Faces from the 4 enrolled persons.

Each person only contributes one average image.

We first calculate the eigenvectors of the matrix $A'A$. Then we got 4 eigenvalues. But the first eigenvalue is zero. So we only get 3 eigenvectors and use that as $P2$.

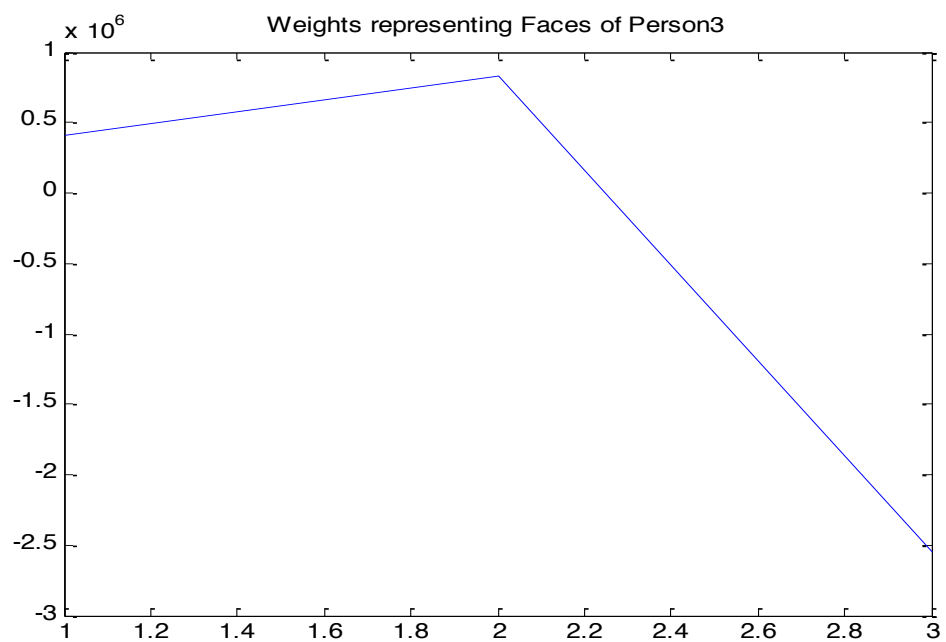
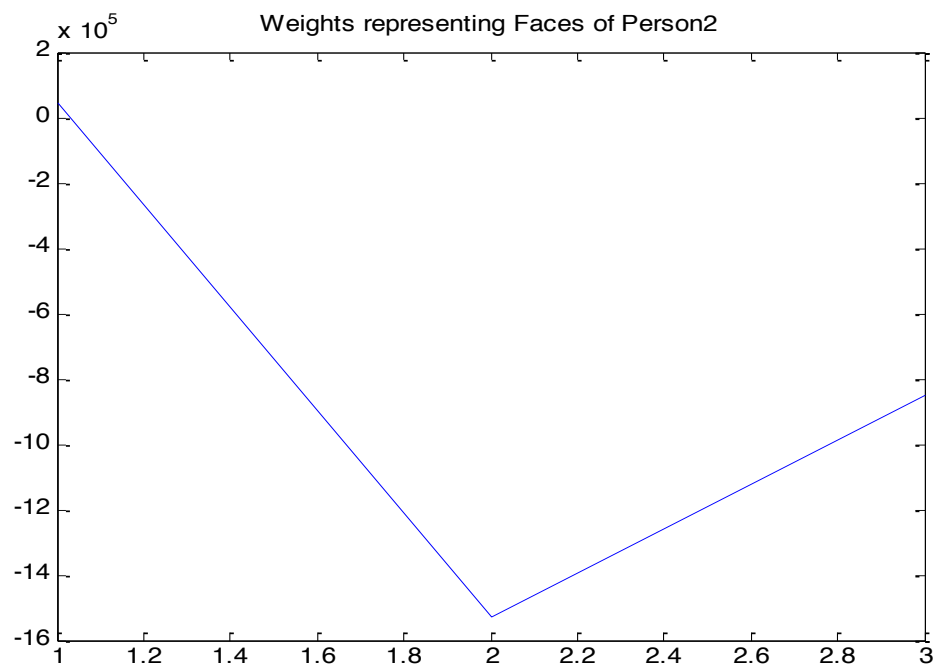
Thus we can get the “Eigenfaces “ by calculating $A*P2$. One thing we need to pay attention is that all the Eigen faces got in this way is still in vector form.

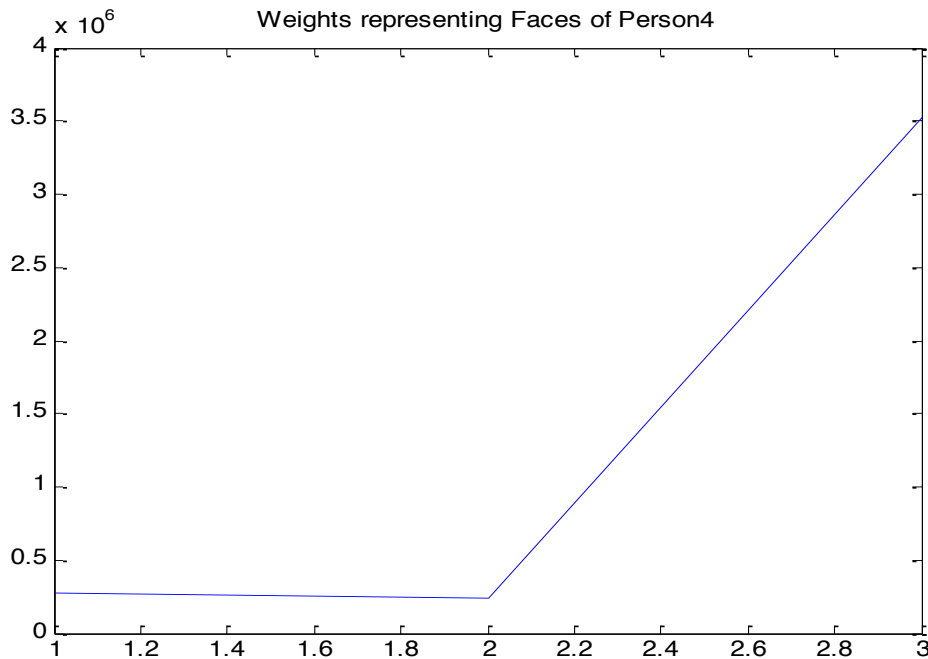
We need to reshape them before we show them out.

These three Eigen faces will be used in presenting the different persons' faces.

2, Weights to present different persons (every two images of the same person have the same weights)







This step is trying to get the different weights of different enrolled faces. We have 8 enrolled faces together.

But followed by the instruction you have learned in lecture. Every person in enrollment only has one image's contribution. After calculating the average images of four persons, we can calculate four different weights for these four persons. So every image of the same person has the same weights. We can get four different weights combinations.

wt_a =

1.0e+006 *

-0.7352 0.0461 0.4091 0.2800

0.4576 -1.5299 0.8269 0.2453

-0.1283 -0.8515 -2.5523 3.5321

Each column of the wta matrix is the different weight of a certain person.

To generate a smooth plot with many weight values. The sample needs to be big. Sample space with 4 person is small.

3, Results

Right Result Image



PCA Recognised Image



True Result 1 Recognized face 1

Right Result Image



PCA Recognised Image



True Result 2 Recognized Result 2

Right Result Image



PCA Recognised Image



True Result 3 Recognized result 3

Right Result Image



PCA Recognised Image



True Result 3 Recognized result 3

Right Result Image



PCA Recognised Image

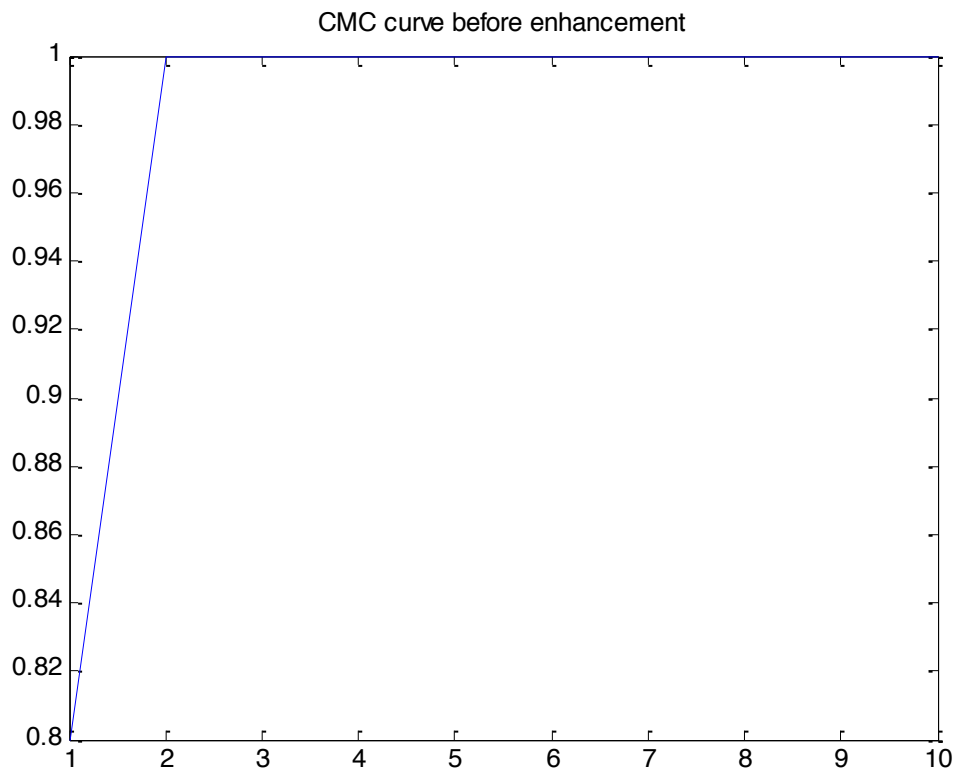


True Result 4 Recognized result 4

All the testing results are listed above. We can see we got correct recognitions except the second test image. We found the minimum weights difference for the second image is the the forth weights in W_{ta} . That means we will have person 4 similar with person 1 by applying PCA algorithm.

The accuracy of PCA algorithm is good. Because we got 4 first rank matching in this database. **The first rank matching reached 80%.**

Second rank matching reached 100%.

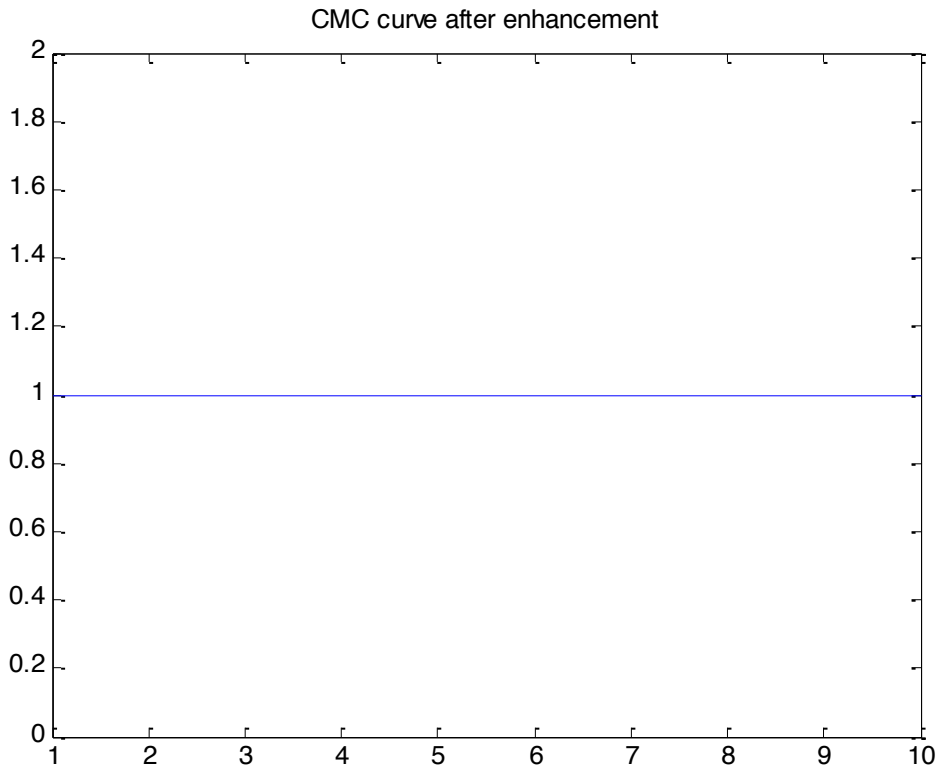


4, Results after applying enhancement to the testing images.

Then we got the new result like this:

True result index: 1 1 2 3 4

Matching person index2: 1 1 2 3 4



So after histogram equalization to the testing images, we got 100% first rank matching accuracy.

5, some note

If the testing image is very different from the average images stored in training process, we may get wrong result. Because PCA always try to find some images have same characteristics. So it is easy to find a wrong matching just because the two images have same PCA features. And in PCA detection, we need pay extra attention for the quality of new coming testing images.