Learning stage :

after pretreatments

Concatenating the columns of the matrices image in vectors

Calculation of the average image

Calculation of centered images

Projection of images

End of learning

Calculation of the within-classes scatter

Calculation of the between-classes scatter

The Fisherfaces algorithm we are going to implement basically goes like this:

* Construct the Imagematrix X with each column representing an image. Each image is a assigned to a class in the corresponding class vector C.
* Project X into the (N-c)-dimensional subspace as P with the rotation matrix WPca identified by a Principal Component Analysis, where
  + N is the number of samples in X
  + c is unique number of classes (length(unique(C)))
* Calculate the between-classes scatter of the projection P as Sb = \sum\_{i=1}^{c} N\_i\*(mean\_i - mean)\*(mean\_i - mean)^T, where
  + mean is the total mean of P
  + mean\_i is the mean of class i in P
  + N\_i is the number of samples for class i
* Calculate the within-classes scatter of P as Sw = \sum\_{i=1}^{c} \sum\_{x\_k \in X\_i} (x\_k - mean\_i) \* (x\_k - mean\_i)^T, where
  + X\_i are the samples of class i
  + x\_k is a sample of X\_i
  + mean\_i is the mean of class i in P
* Apply a standard Linear Discriminant Analysis and maximize the ratio of the determinant of between-class scatter and within-class scatter. The solution is given by the set of generalized eigenvectors Wfld of Sb and Sw corresponding to their eigenvalue. The rank of Sb is atmost (c-1), so there are only (c-1) non-zero eigenvalues, cut off the rest.
* Finally obtain the Fisherfaces by W = WPca \* Wfld.