
Total # of points = 100. You can work on the project yourself or you can form a team of two persons to work on the project.

Project description: Design a face recognition system using the Eigenface method you have learned in class. Use the training images in the face dataset provided to produce a set of Eigenfaces and then recognize the faces in the testing set using the Eigenface method. To recognize the face in the input image, compute the Euclidean distances d_i between the Eigenface coefficients of the input image and the Eigenface coefficients of the training images. The input face is then recognized as the face in the training images with the smallest Euclidean distance. (You can skip the computation of \vec{I}_R and d_0 , and ignore thresholds T_0 and T_1 in the lecture slides.)

Python, C++/C, Java or Matlab are the recommended languages to use. If you plan to use a different language, send me an email first. You can use built-in library functions for the *reading*, *writing* and *displaying* of images, to perform *matrix* and *vector* operations, and to compute *eigenvalues* and *eigenvectors* from matrices, but you cannot use library functions to perform other steps that you are required to implement in the project.

Face dataset: The training set contains 8 grayscale face images from 8 different persons, and the testing set contains 5 face images from 4 of the individuals in the training set. Two images in the testing set are from the same person. The images are in *.jpg* format and have dimensions 195 x 231 (width x height) pixels. Each pixel uses 8 bits for grayscale.

What to submit: The following files on NYU Classes by the due date. You can submit the files separately on NYU Classes. No need to put them into a single ZIP file. If you work with a partner, only one of you needs to submit but put down both partners' names on the PDF document.

1. The source code file. Put comments in your source code to make it easier for someone else to read your program. Points will be taken off if you do not have comments.
2. Image files for the mean face m and the 8 Eigenfaces computed from the training images, in *.jpg* or *.bmp* formats.
3. A PDF file that contains
 - a) Instructions on how to run your program. If your program requires compilation, instructions on how to compile your program should also be provided.
 - b) Copy and paste the mean face and Eigenfaces in (2) above onto the PDF document.
 - c) The Eigenface coefficients of the training images $(\vec{\Omega}_i)$.
 - d) The Eigenface coefficients (Ω_I) and recognition result for each test image.
 - e) The recognition accuracy for the test dataset (# correct recognitions / 5.)
 - f) Copy and paste your source code onto the PDF document.

(b) and (f) above are in addition to the source code file and output image files that you have to submit separately in (1) and (2) above.