CS663 - Assignment 4 - Question 4

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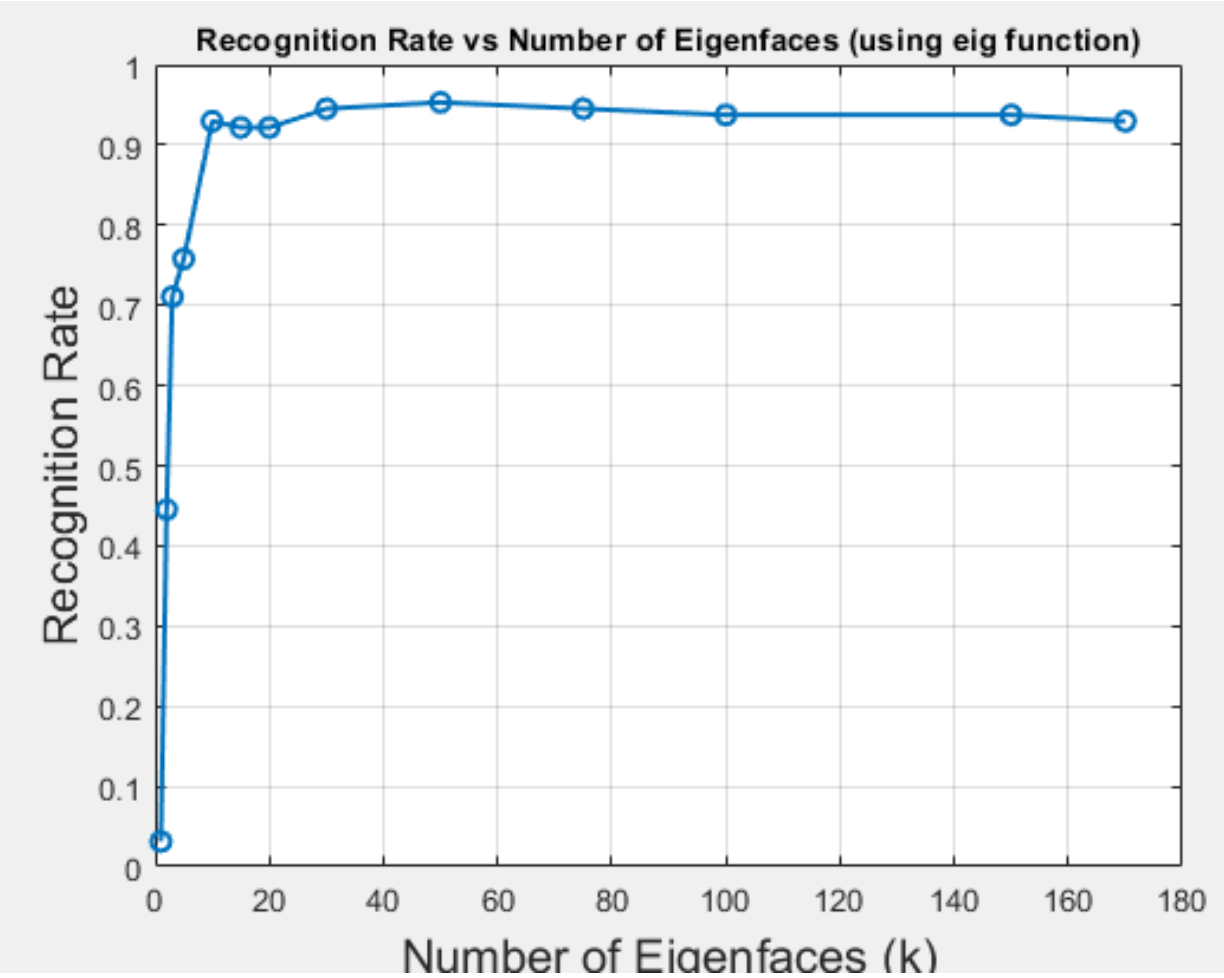
1 Face Recognition of ORL Database

1.1 Using EIG function of MATLAB

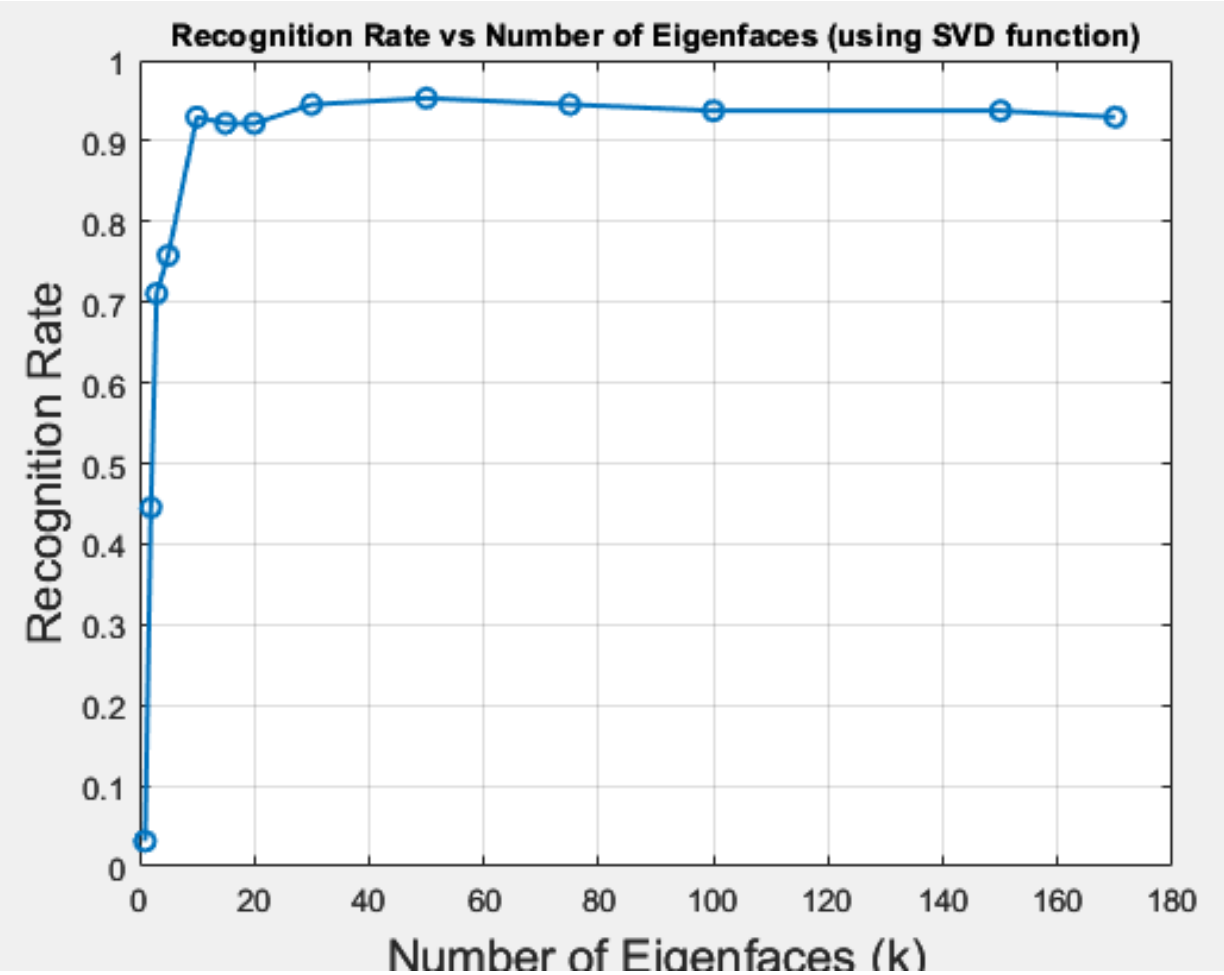
We get the plot for recognition rate vs k as given below



Using EIG function of MATLAB

1.2 Using SVD function of MATLAB

We get the plot for recognition rate vs k as given below



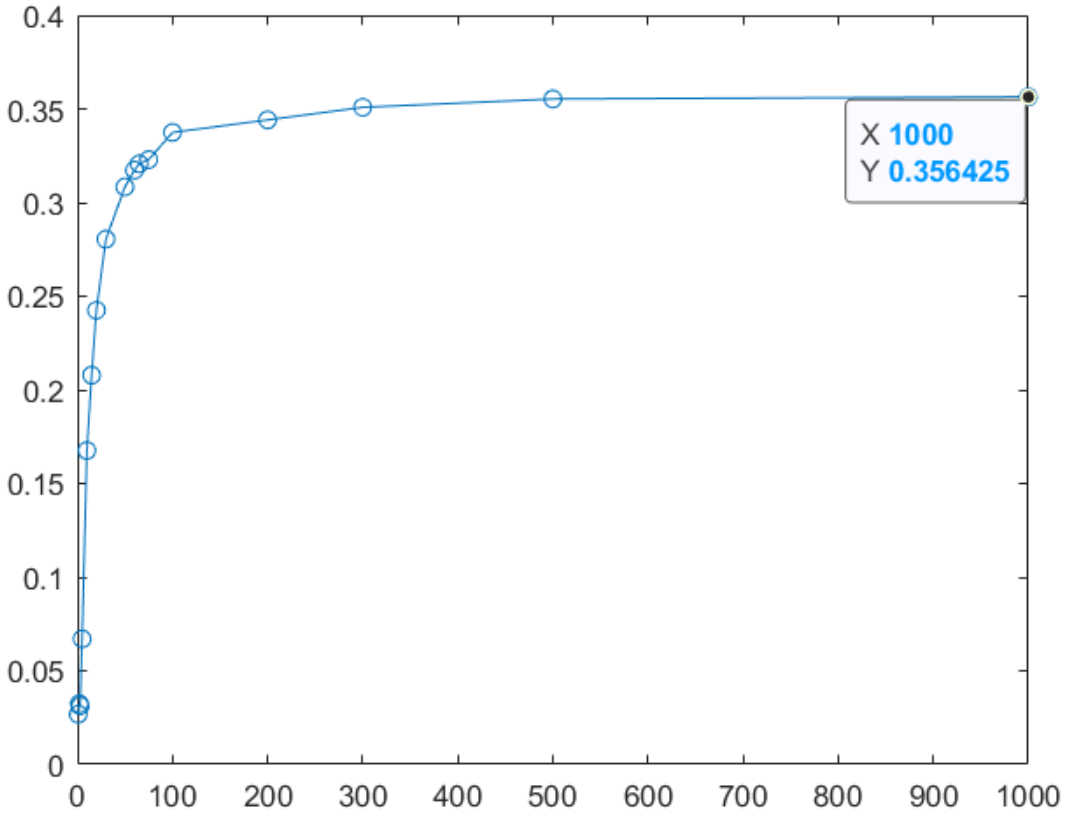
Using SVD function of MATLAB

It is evident that both approaches produce the same plot for recognition rate versus k. From the plot, we can also observe that the maximum recognition rate occurs at k = 50, with a recognition rate of 0.95 at this point.

2 Face Recognition of Yale Database

2.1 A

Plot for the squared difference between all the eigencoefficients calculted using the eig function of MATLAB vs k.

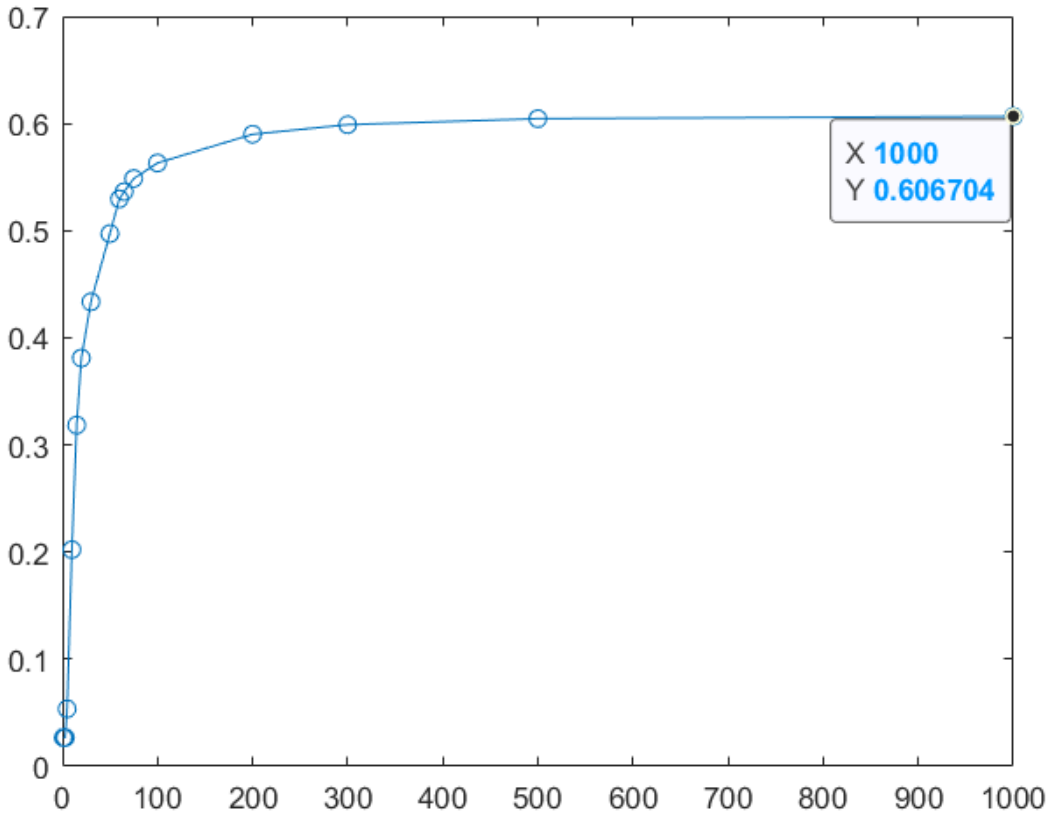


Using all the eigencoefficients

Therefore, we observe that the maximum recognition rate is achieved when k equals 1000, with a recognition rate of 0.356.

2.2 B

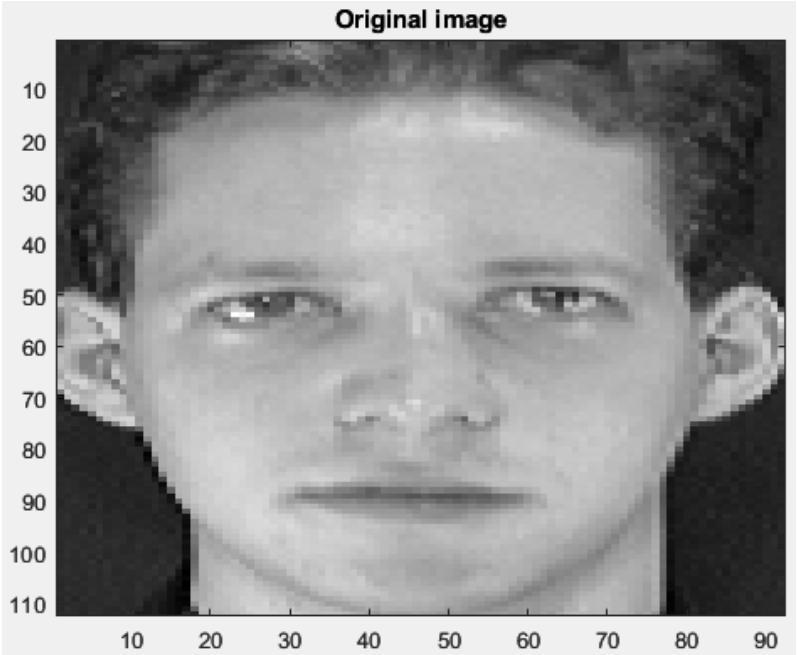
Plot for the squared difference between all the eigencoefficients calculted using the eig function of MATLAB vs k.



using all except the three eigencoefficients corresponding to the largest eigenvalues

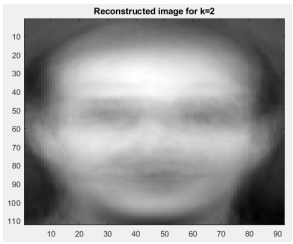
For this case we observe that the maximum recognition rate of 0.606 for K = 1000 Thus, it is evident that the results obtained after rejecting the three largest eigenvalues are superior to those achieved when using all the eigencoefficients.

3 Reconstructions

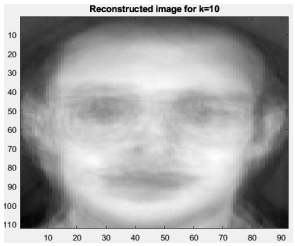


Original Image

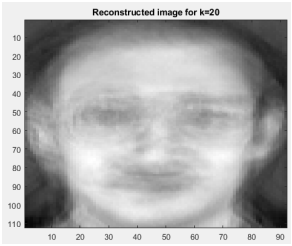
Reconstructed Images for different K values:



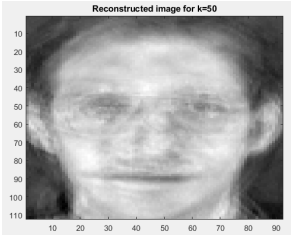
K = 2



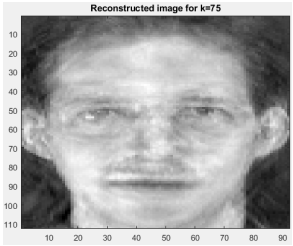
K = 10



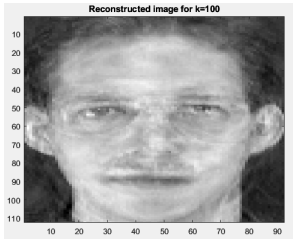
K = 20



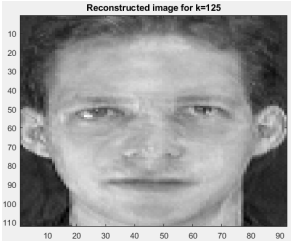
K = 50



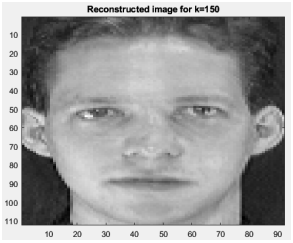
K = 75



K = 100



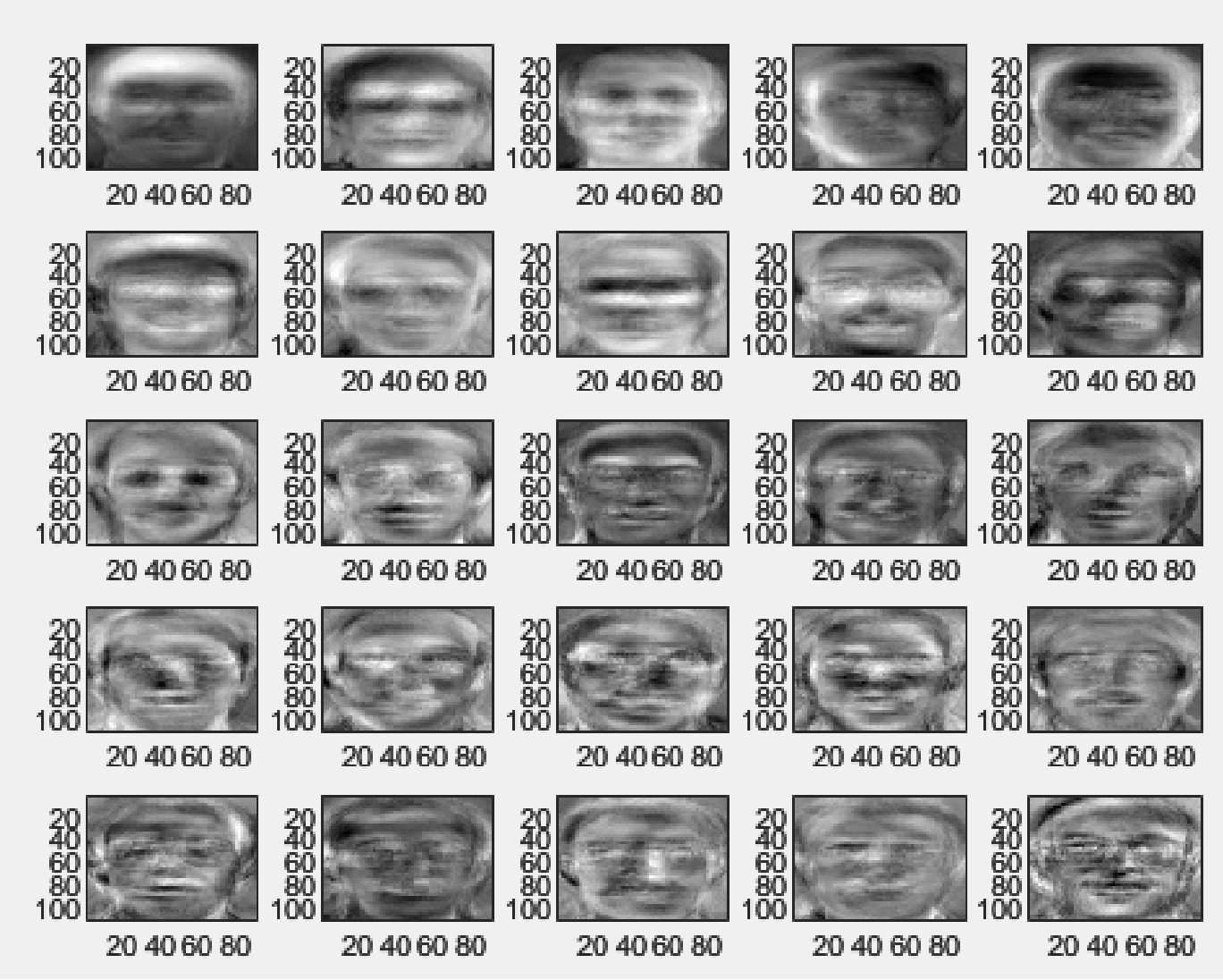
K = 125



K = 150

Starting from $k = 75$ onwards, we were able to successfully identify the reconstructed image in relation to the original image.

25 eigenvectors (eigenfaces) corresponding to the 25 largest eigenvalues:



Original Image

The figure on the top left corresponds to the largest eigenvalue, with the subsequent eigenfaces representing the next highest eigenvalues arranged from left to right. The image at the bottom right represents the eigenface for the 25th largest eigenvalue.