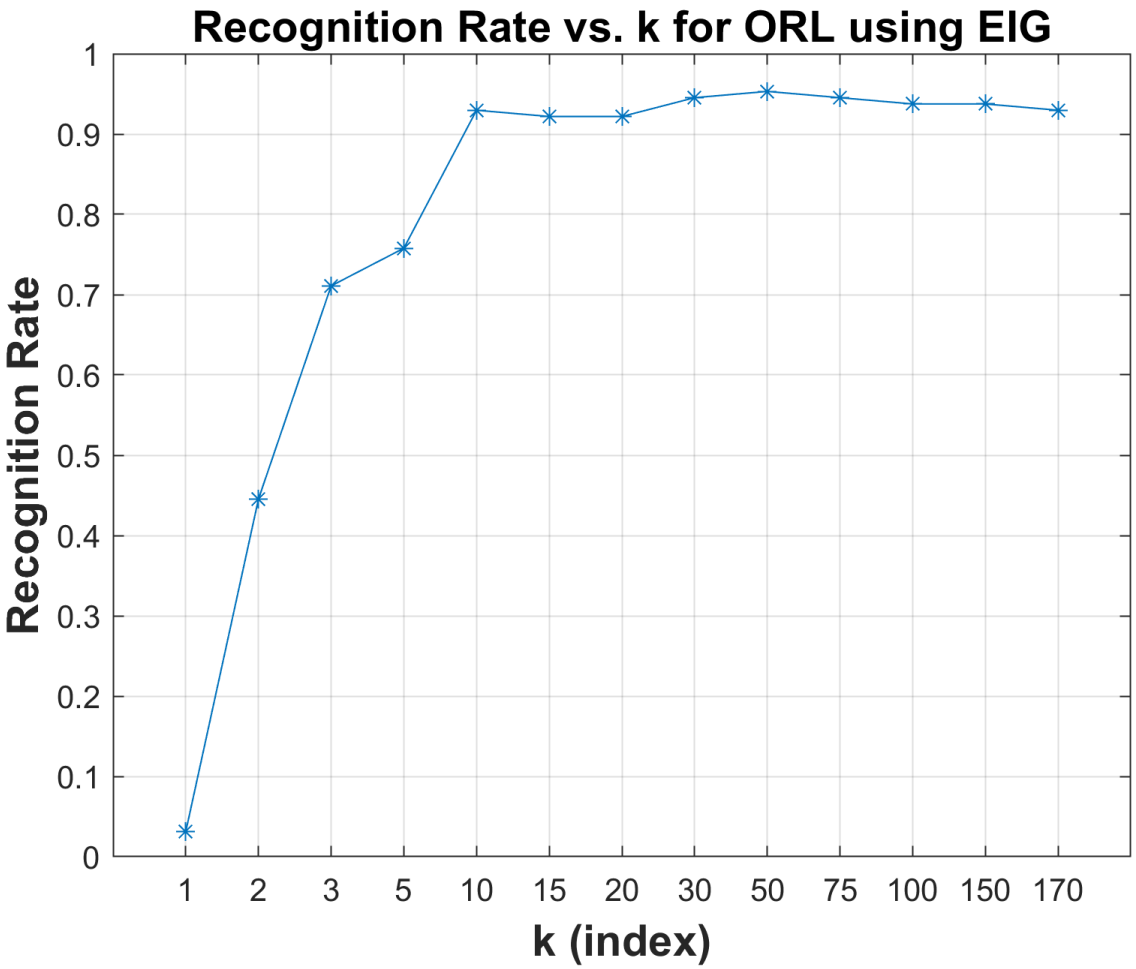
# Question 4

22b0913 22b0949 22b1030
Umesh Gnana Mahesh Gupta

## Contents

# 1 ORL Face Database

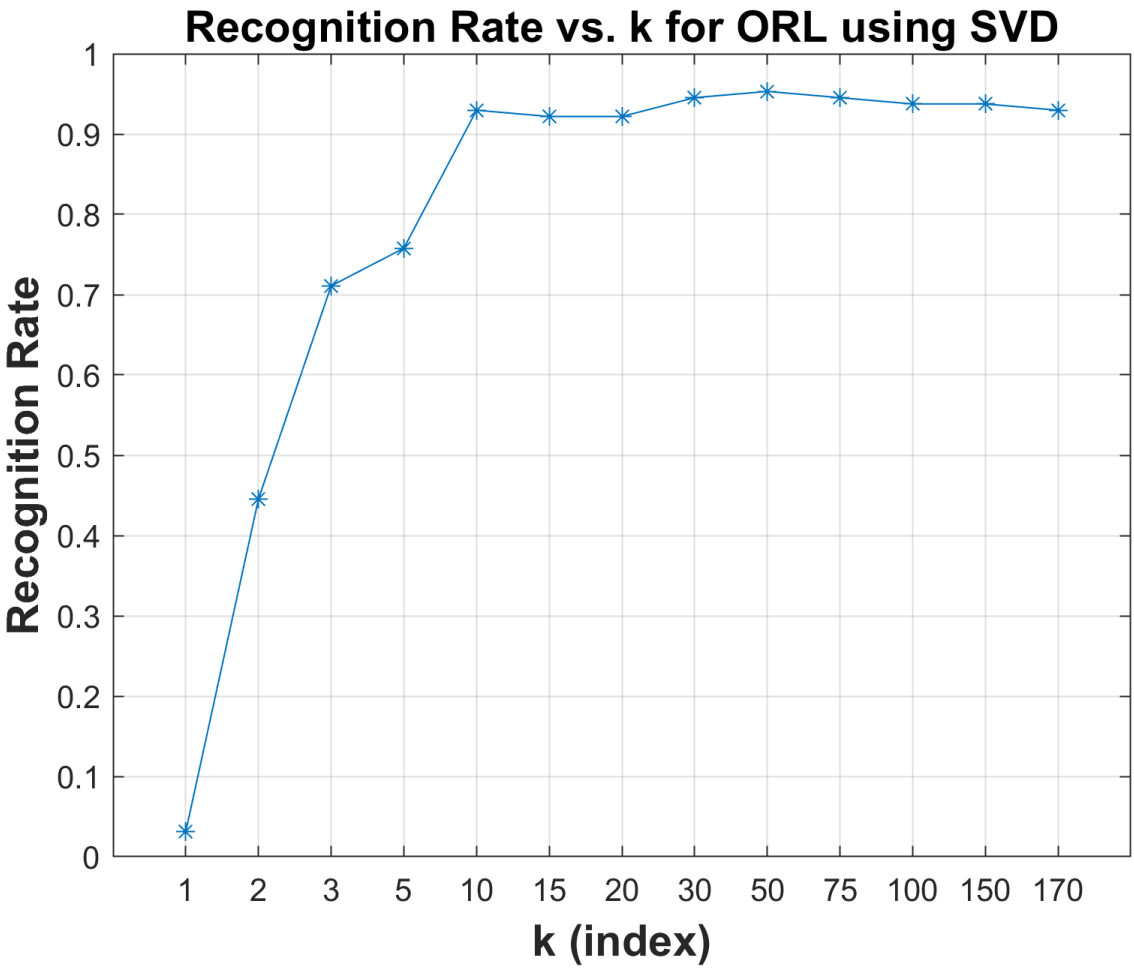
Using `EIG` function of MATLAB we can see `recognition rate` is maximum at $k = 50$ and equal to 0.953125




EIG Function

Now using `svd` function of MATLAB we can see `recognition rate` is maximum at $k = 50$ and equal to 0.953125

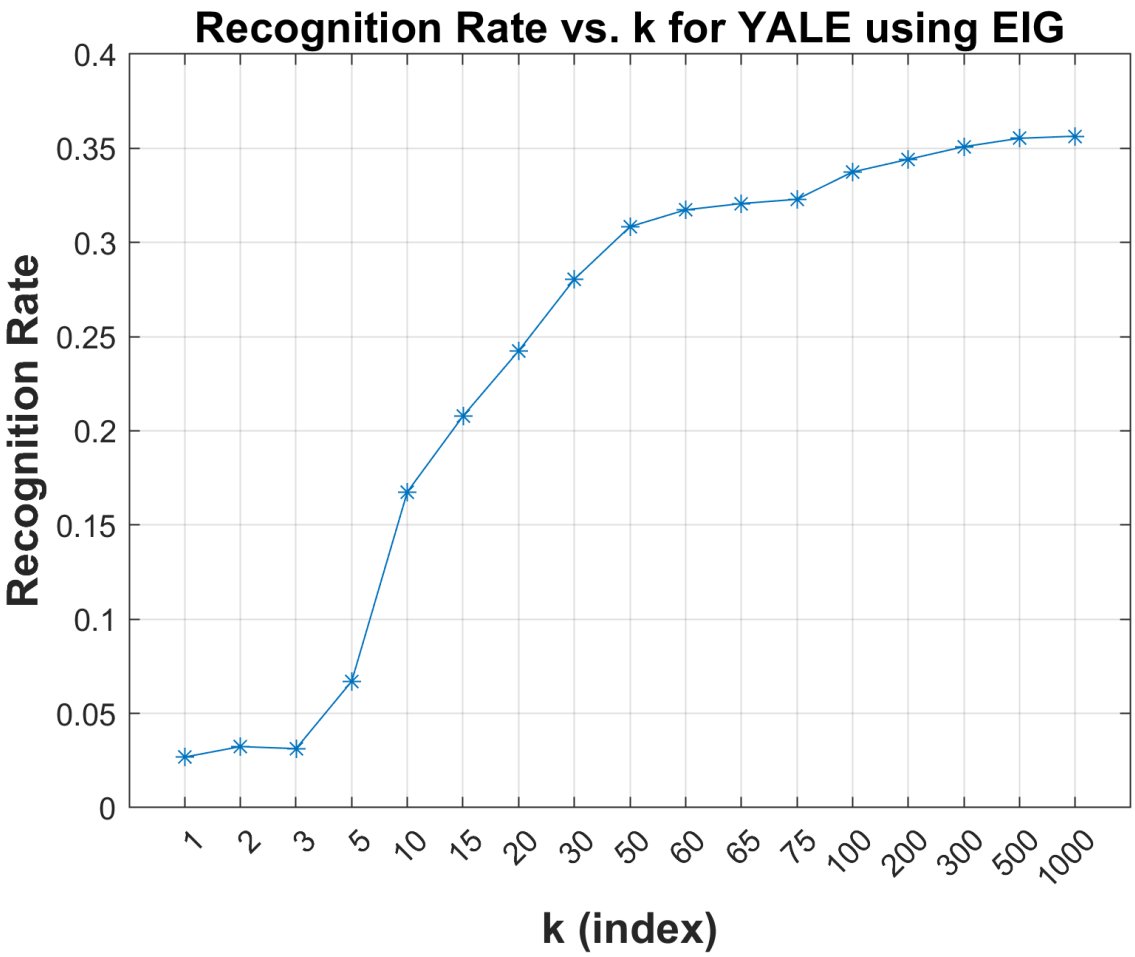
Clearly we can see that both the approaches are giving the same plot for recognition rate vs k.




SVD Function

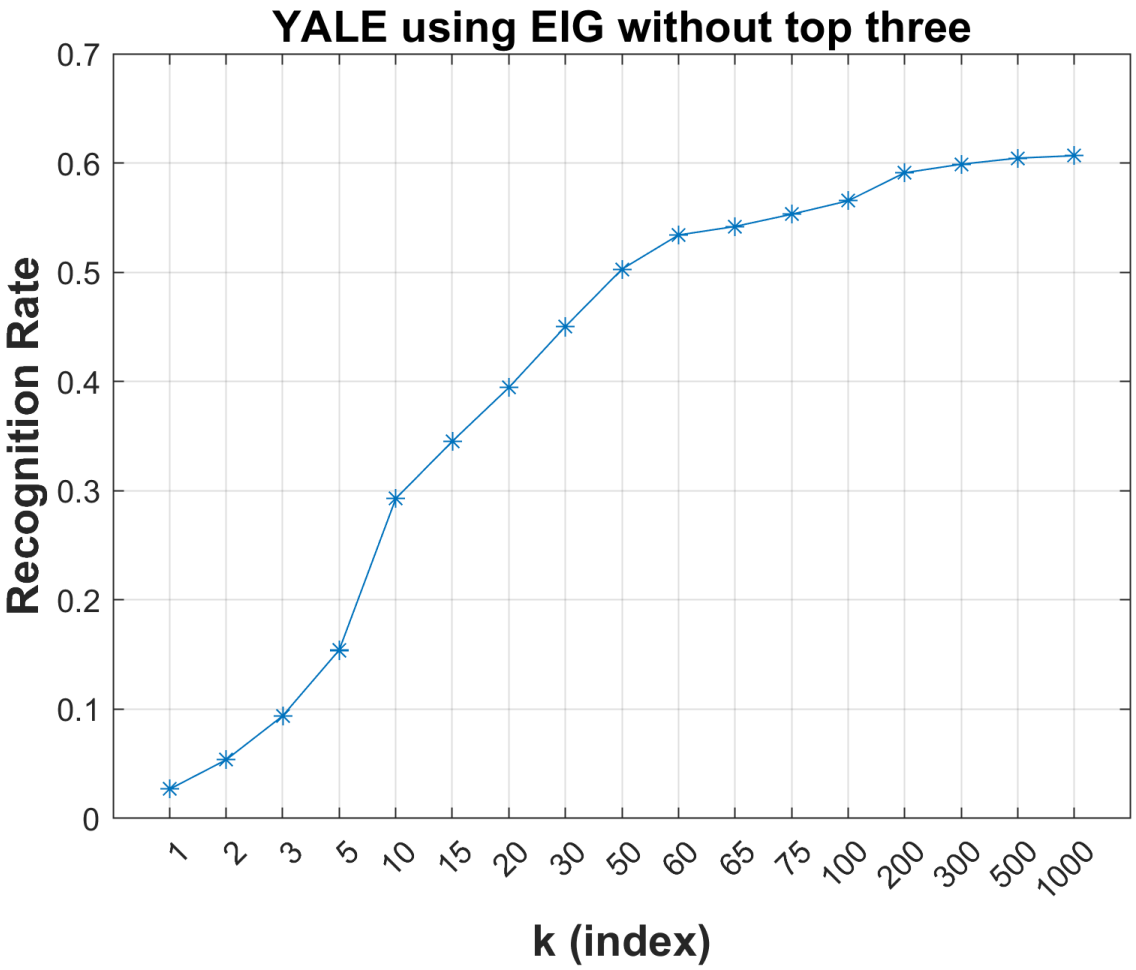
## 2 YALE Face Database

Using `EIG` function of MATLAB we can see `recognition rate` is maximum at $k = 1000$ and equal to 0.356425




EIG Function

We plot the squared difference between all except the three `eigen coefficients` corresponding to the largest eigenvalues vs k.

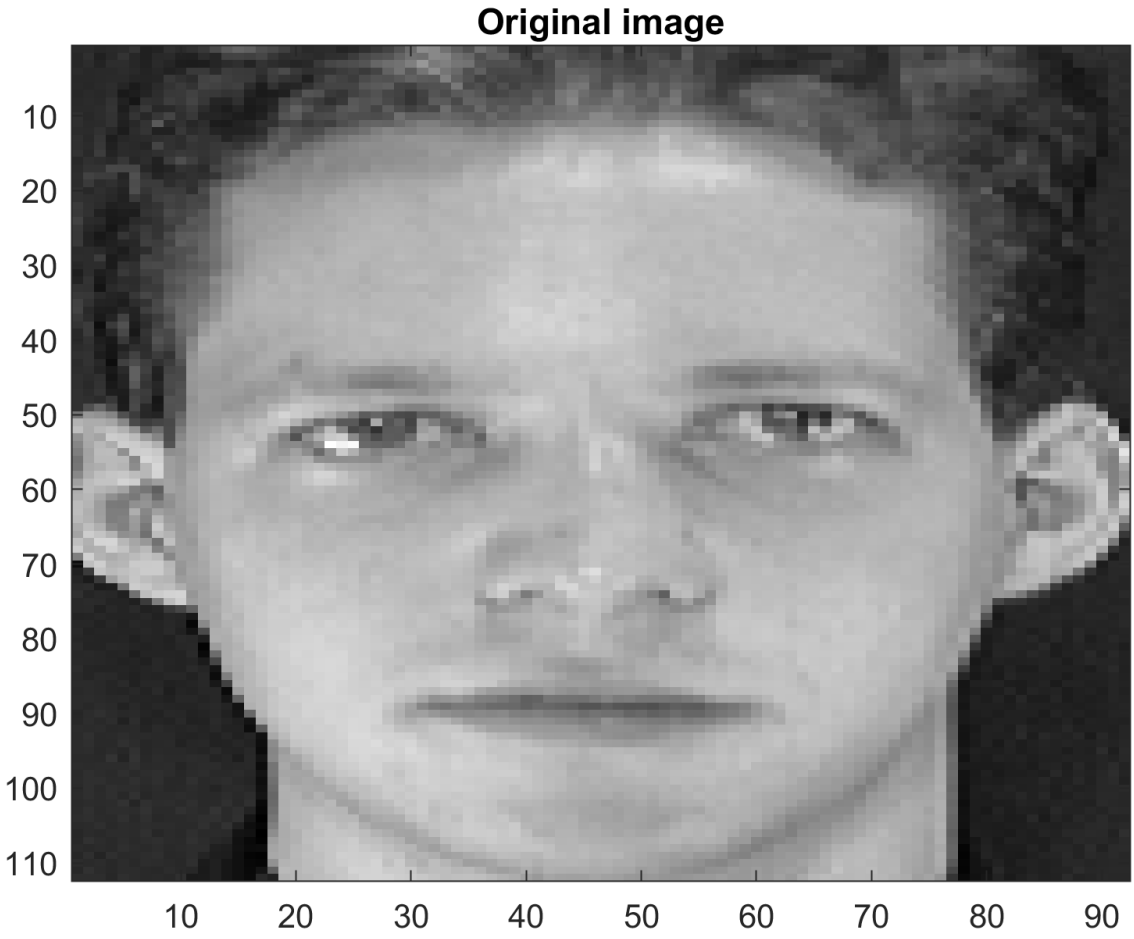



SVD Function

We are achieving maximum value at $k = 1000$ and equal to 0.606704
Here we are removing the top 3 eigen vectors (largest eigenvalues of k) and taking k features.

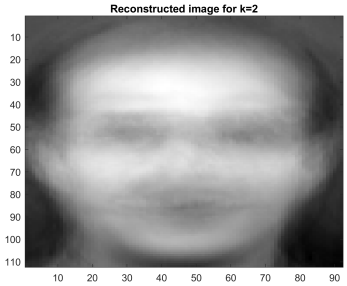
## 3 Reconstruction Of Face

Our target Image:

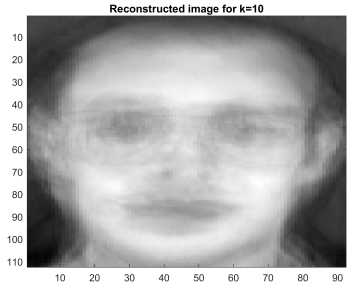



Target Image

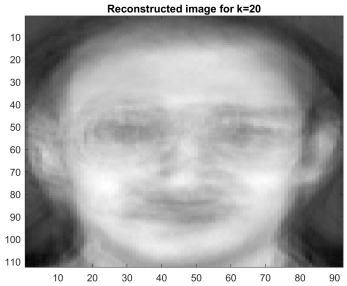
Reconstructed Images:



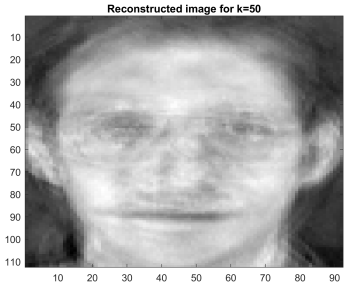

k=2



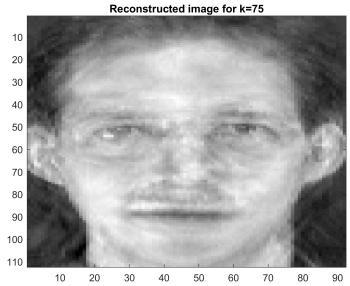

k=10



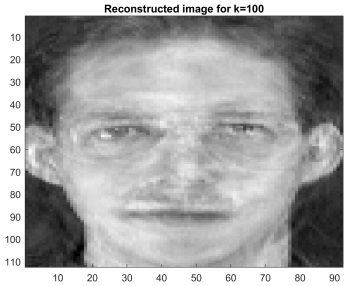

k=20



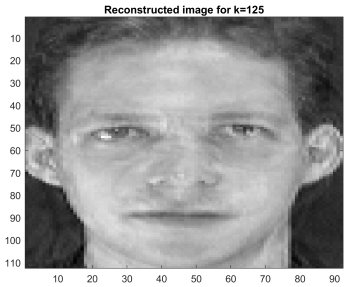

k=50



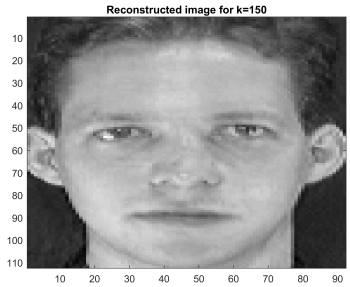

k=75



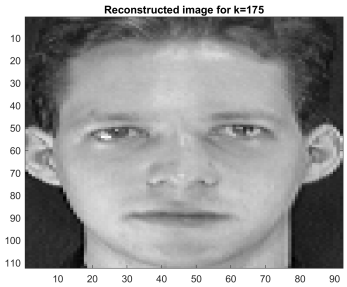

k=100




k=125




k=150




k=175

We can see significant changes from $k = 75$ and best possible image is found at $k = 175$

Plot the 25 eigenvectors (eigenfaces) corresponding to the 25 largest eigenvalues using the subplot or subimage commands in MATLAB.


eigenfaces

- Left Most top figure - Highest eigen value
- Next Highest is the right to it
- 25th highest eigen value is the right most botton one.

# 4 Instructions to run

- `q4ORL.m` file contains the code for finding recognition rate vs k for ORL Dataset using both EIG and SVD, it should be in the same folder which `ORL/` presents
- `q4YALE.m` file contains the code for finding recognition rate vs k for YALE Dataset for both the methods, it should be in the same folder which `CroppedYale/` presents.
- `q4reconstructimage.m` file contains the code for reconstruction of an image from the ORL Database, it should be in the same folder which `ORL/` presents