

Soft computing (Assignment 9)

Question-

Design a face recognition system using Python.

Use of following libraries are allowed:

- NumPy, SciPy for matrix multiplication, finding SVD or Eigenvector etc.
- OpenCV- Python library for inputting/reading images etc.

Using the face dataset:

https://drive.google.com/drive/u/2/folders/1XGdUi0w_FcHcnlQt9mU5y_PNLyFhCW9V

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Training Set- We trained our model in 70 images and tested our model on 30 images.

Co-variance Matrix on training set-

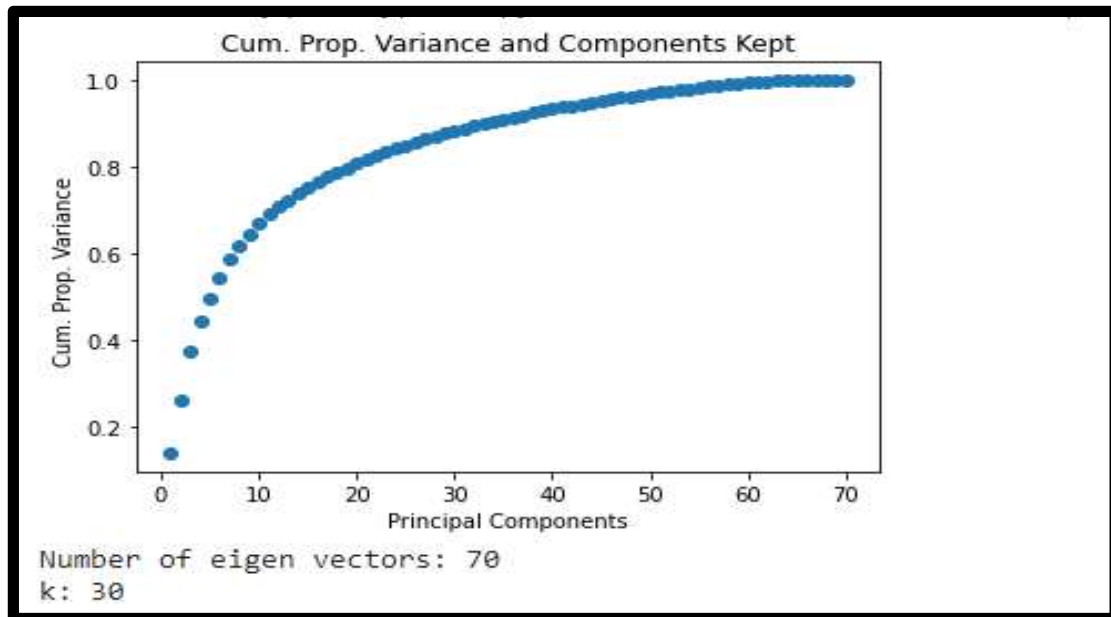
```
Covariance matrix of X:
[[25.46631811  5.80118019  1.90434075 ...  2.21087793 -2.25579805
  -1.02565211]
 [ 5.80118019 21.77838106  4.9797395  ... -0.71448391 -2.69182284
  -3.41189834]
 [ 1.90434075  4.9797395  32.67771093 ... -0.70560838  6.14739285
   1.58343778]
 ...
 [ 2.21087793 -0.71448391 -0.70560838 ... 18.68438002 -0.33086978
   1.82684093]
 [-2.25579805 -2.69182284  6.14739285 ... -0.33086978 16.35681018
   6.26582565]
 [-1.02565211 -3.41189834  1.58343778 ...  1.82684093  6.26582565
  13.45781026]]
```

Cumulative proportion of variance explained vector:

```
[0.14120593+0.00000000e+00j 0.26399378+0.00000000e+00j
 0.37739774+0.00000000e+00j 0.44300913+0.00000000e+00j
 0.49789616+0.00000000e+00j 0.54471101+0.00000000e+00j
 0.58761605+0.00000000e+00j 0.61814444+0.00000000e+00j
 0.64395379+0.00000000e+00j 0.66914584+0.00000000e+00j
 0.69049111+0.00000000e+00j 0.70841314+0.00000000e+00j
 0.72463328+0.00000000e+00j 0.73915034+0.00000000e+00j
 0.75321631+0.00000000e+00j 0.76616263+0.00000000e+00j
 0.77747417+0.00000000e+00j 0.78822178+0.00000000e+00j
 0.79860892+0.00000000e+00j 0.80840037+0.00000000e+00j
 0.81789039+0.00000000e+00j 0.82675758+0.00000000e+00j
 0.83521189+0.00000000e+00j 0.84337308+0.00000000e+00j
 0.85100175+0.00000000e+00j 0.85803953+0.00000000e+00j
 0.8646713 +0.00000000e+00j 0.87106697+0.00000000e+00j
 0.87730654+0.00000000e+00j 0.88342998+0.00000000e+00j
 0.88925598+0.00000000e+00j 0.89491811+0.00000000e+00j
 0.90037657+0.00000000e+00j 0.90572348+0.00000000e+00j
 0.91076183+0.00000000e+00j 0.91572037+0.00000000e+00j
 0.92051294+0.00000000e+00j 0.92518376+0.00000000e+00j
 0.92969453+0.00000000e+00j 0.93407464+0.00000000e+00j
 0.93828466+0.00000000e+00j 0.9422286 +0.00000000e+00j
 0.94609824+0.00000000e+00j 0.94993653+0.00000000e+00j
 0.95357504+0.00000000e+00j 0.957102 +0.00000000e+00j
 0.96057573+0.00000000e+00j 0.96391028+0.00000000e+00j
 0.96709346+0.00000000e+00j 0.97008396+0.00000000e+00j]
```

0.97299699+0.00000000e+00j 0.97588967+0.00000000e+00j
0.9787196 +0.00000000e+00j 0.98144726+0.00000000e+00j
0.98398612+0.00000000e+00j 0.9863849 +0.00000000e+00j
0.98872635+0.00000000e+00j 0.99097736+0.00000000e+00j
0.99315425+0.00000000e+00j 0.99521744+0.00000000e+00j
0.99721517+0.00000000e+00j 0.99881102+0.00000000e+00j

Principal Components-



Testing – We tested our PCA face detection model and got the Accuracy of 80% by predicting 24 images correctly out of 30 .

