HW2 PCA Report

系級：電機四
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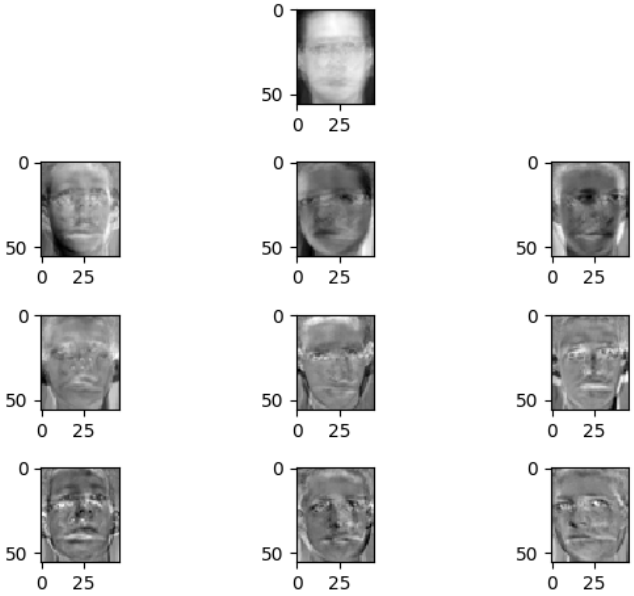
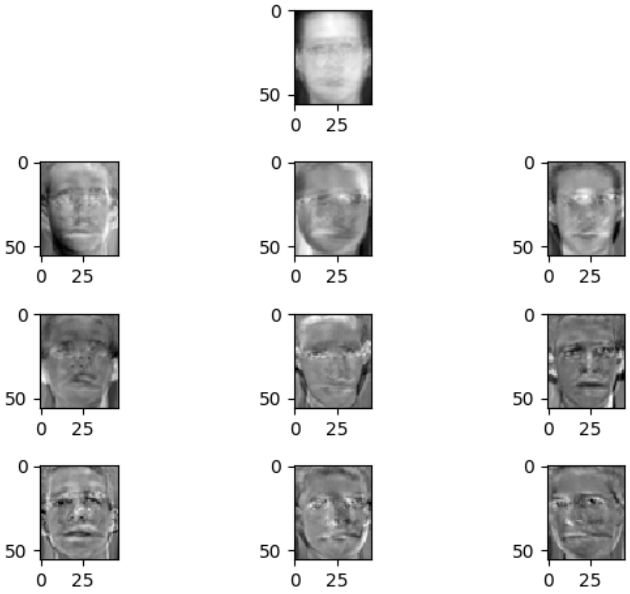
Environment: Linux 4.9.11-1-ARCH
Language: Python 3.6.0

(a)

1. Eigenanalysis on the 2576 * 2576 covariance matrix
   - Time = 0.9894499778747559 sec
   - Plot of the mean image with all the eigenfaces:

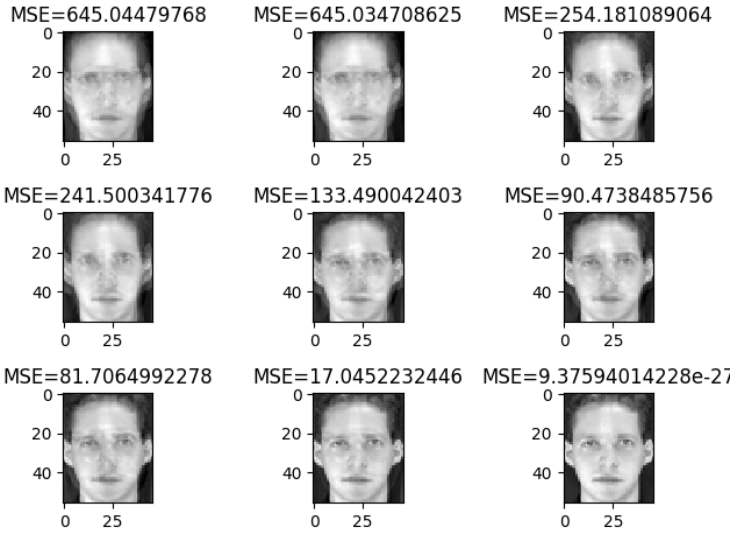


2. Gram matrix trick
   - Time = 0.7061800956726074 sec
   - Plot of the mean image with all the eigenfaces:



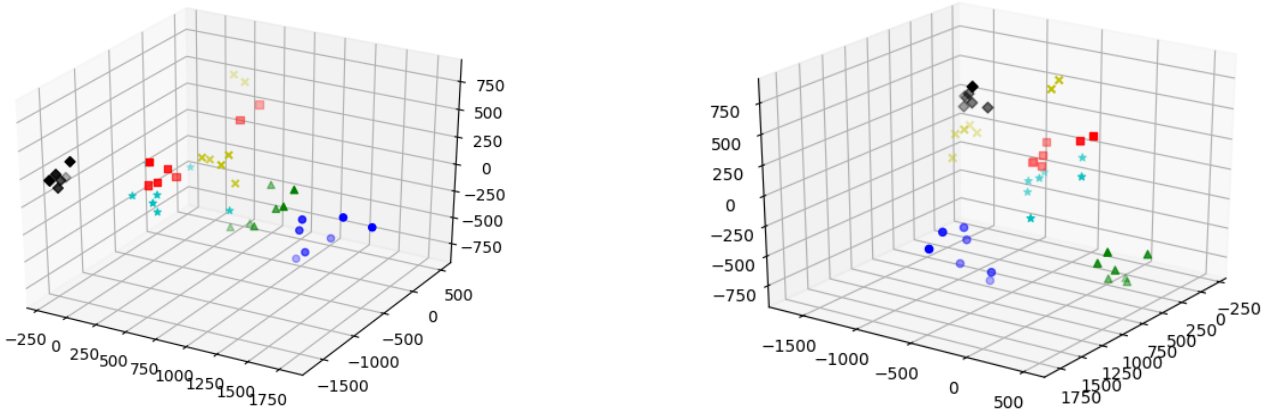
- Interpretation:
  The gram matrix trick is more efficient than the original method since the gram matrix is of size 10 * 10, while the covariance matrix is of size 2576 * 2576 in this case. The eigenvectors obtained by the gram matrix trick are slightly different from those obtained by the original method. According to my result, the first and the fifth eigenvectors obtained by both methods are the same, while others have the same values but different by a negative sign.

3. Reconstructed images using the first n eigenfaces



(b)

1. Plot of all testing images of the first 6 classes using the first 3 coefficients:



2. Identification rates:

	Rank-1	Rank-2	Rank-3
Mode=1	0.86428571	0.90714286	0.93214286
Mode=2	0.85714286	0.91428571	0.94642857
Mode=3	0.85	0.91071429	0.93214286