

Purdue University, West Lafayette

Spring 2022

ECE 63700 – Digital Image Processing I

Lab-5

Submission Date- 02/25/2022

Submitted by

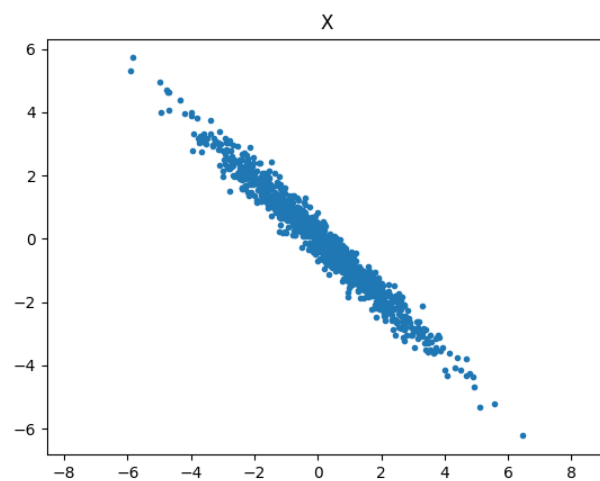
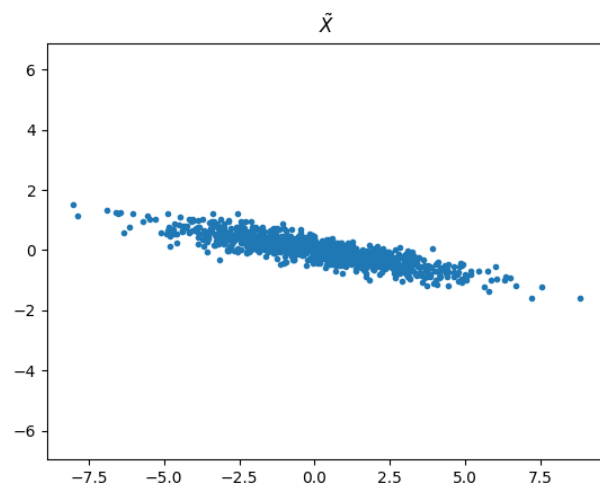
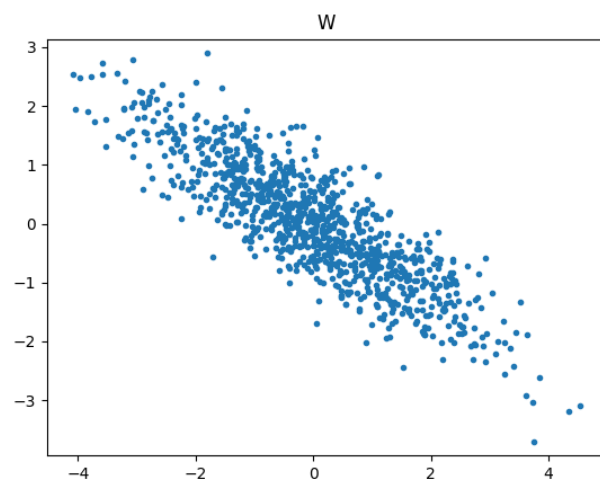
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Section 2.1:



Section 2.2:

1.

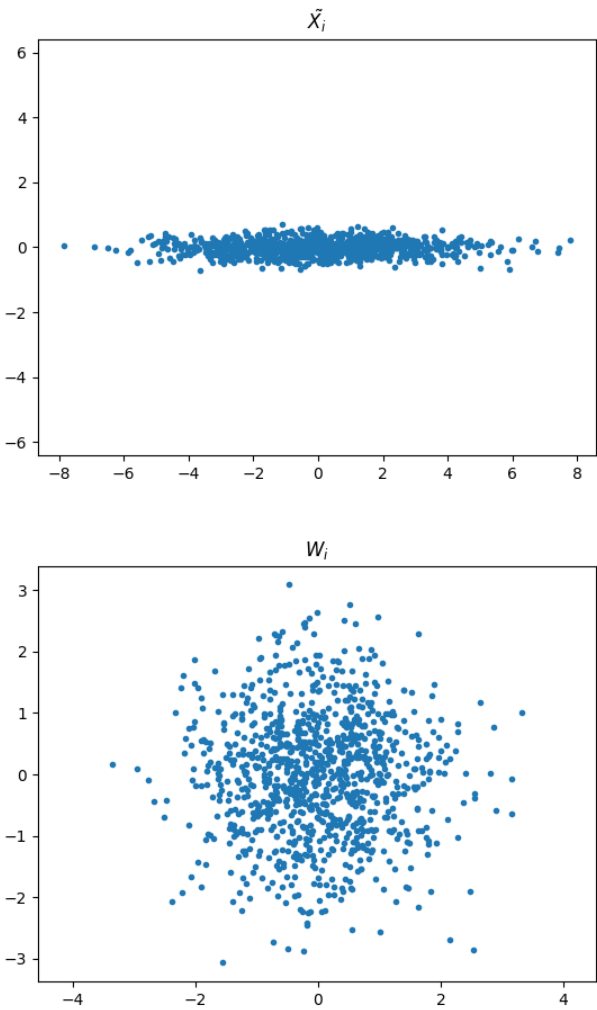
$$R_X = \begin{bmatrix} 2 & -1.2 \\ -1.2 & 1 \end{bmatrix}$$

2.

R_hat =

$$\begin{bmatrix} 3.30371971 & -3.03565699 \\ -3.03565699 & 2.89433079 \end{bmatrix}$$

3.

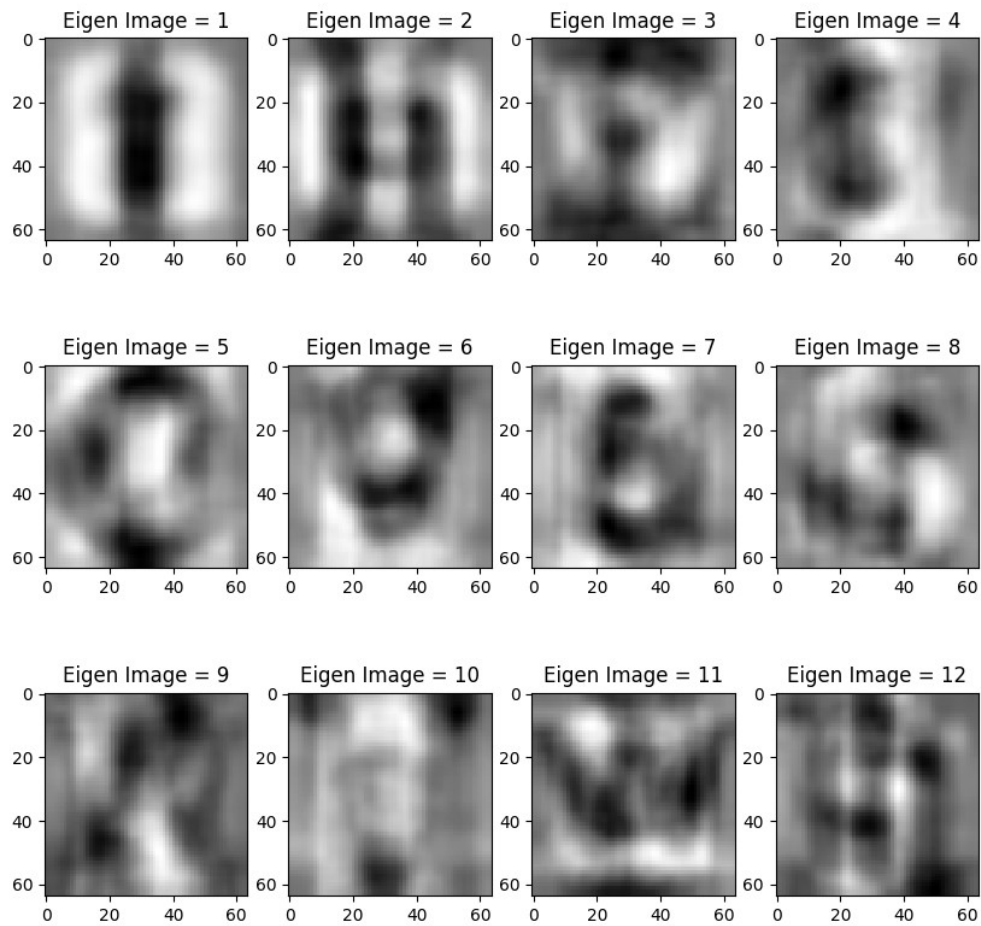


4.R_w

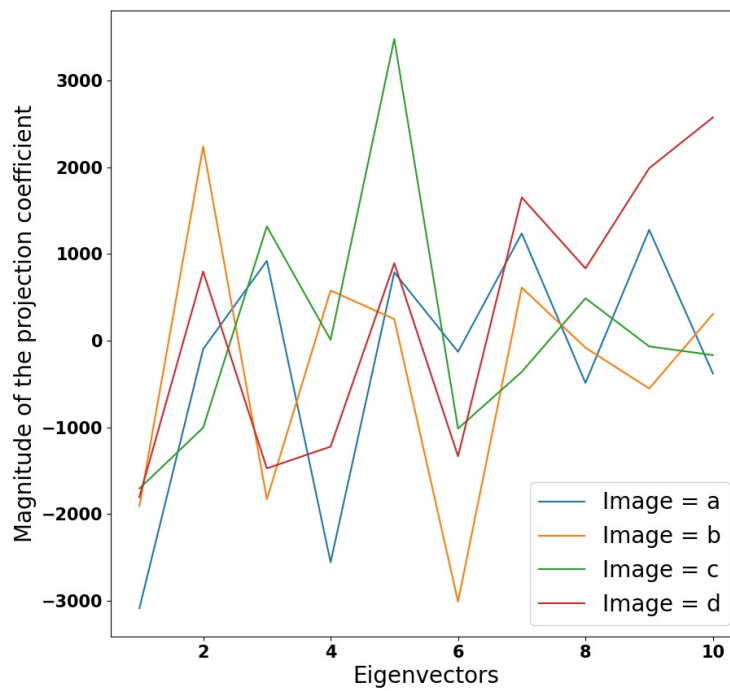
$$\begin{bmatrix} 9.99010276\text{e-}01 & 3.49319118\text{e-}05 \\ 3.49319118\text{e-}05 & 9.99118751\text{e-}01 \end{bmatrix}$$

Section 4:

1. Eigen-images



2. plots of projection coefficients vs. eigenvector number

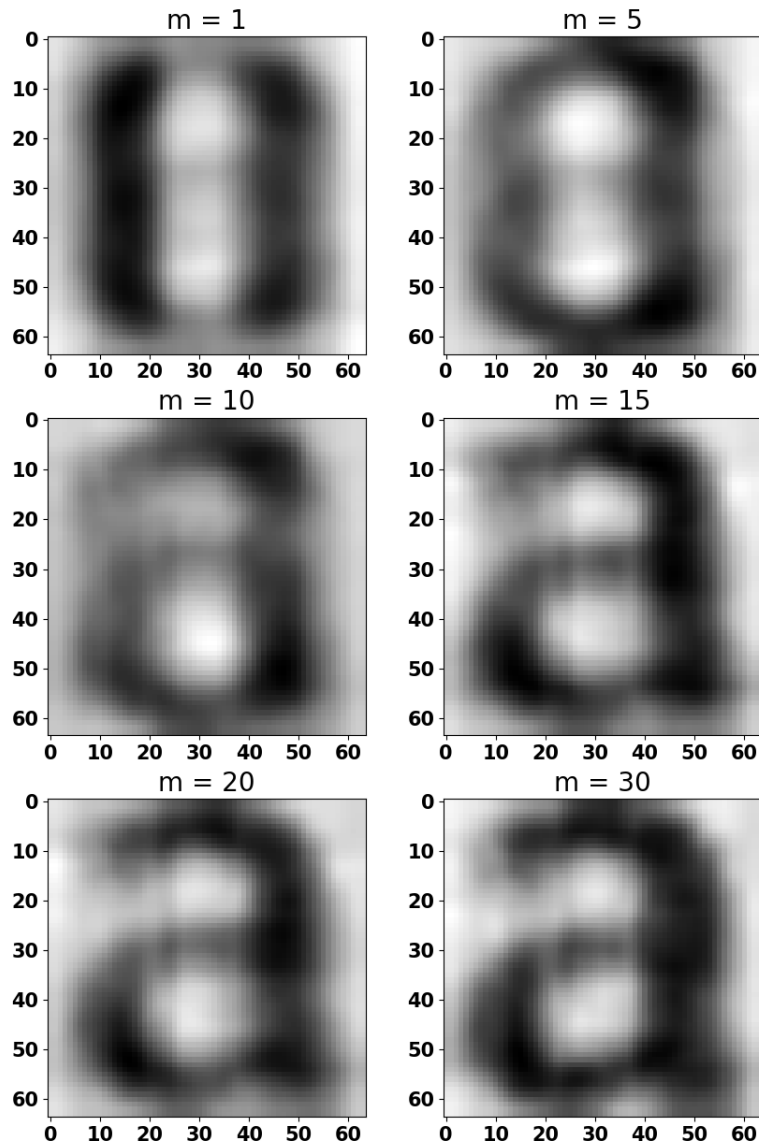


3. original image, and the 6 re-synthesized versions.

Original Image



Reconstructed Image for different number of eigenvectors (m)



Section 5:

Classification result without any modification to the covariance matrix.

| input character | output character |
|-----------------|------------------|
| d | a |
| j | y |
| l | i |
| n | v |
| p | e |
| q | a |
| u | a |
| y | v |

Modification 1:

| input character | output character |
|-----------------|------------------|
| f | t |
| i | l |
| y | v |

Modification 2:

| input character | output character |
|-----------------|------------------|
| g | q |
| y | v |

Modification 3:

| input character | output character |
|-----------------|------------------|
| f | t |
| y | v |

Modification 4:

| input character | output character |
|-----------------|------------------|
| f | t |
| g | q |
| y | v |

Comments: It seems the modification 2 and 3 provides the best classification result providing only two errors.

2. Decreasing the accuracy of the data model actually increases the accuracy of the estimates.

NB: The codes corresponding to this lab can be found in the following github directory

Link: https://github.com/NahianHasan/ECE63700-Digital_Image_Processing/tree/main/Lab_5_Eigen_Decomposition