**Computer Vison Assignment**

EigenFace using PCA

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- Due: 11:00 PM, 28/May 2021 (No tolerance for the late submission)

- Description: Download the matlab code from "Assginments" menu at Ajou BB. After reading the following questions and make the matlab codes for getting the correct answers. In the end, you should solve the quiz at "Assignments" menu at Ajou BB. You have only one chance to solve it but there is no time limit during solving. ** Read "ReadMe.txt" file first.

(아주 BB내 퀴즈/숙제 난에서 zip파일을 받아서 실험을 해보고 아래 문제와 같은 Quiz를 아주 BB에서 풀 것. 코드 자체는 제출 필요 없음. 단 한 번만 풀 수 있으나 풀이 중 시간 제한은 없음. 기한 내에 풀이를 완료할 것.)

- Cautions: One chance to submit your answers in Ajou BB. No time limitation after starting the quiz. However, you should solve it before Due day. It is not necessary to submit your code and report to Assignment menu at Ajou BB. (Do not send it to TA or Prof. Hwang by email)

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**Question1**) 'k' in the 'trainPCA.m' is the total number of the selected eigenvectors whose corresponding eigenvalues are large. Which 'k' is larger than the other 'k' in the following cases?

| Input images | Output Images from $k_1$ | Output Images from $k_2$ |
|---|---|---|

**Answers**)

(1) $k_1 > k_2$

(2) $k_1 < k_2$

(3) $k_1 = k_2$

(4) Cannot know.

**Question2**) In the assignment matlab code, there are two codes, "trainPCA.m" and "testPCA.m." In "testPCA.m", there are missing parts (Check "Write code here" comments in "testPCA.m"). You should make the correct codes for getting the following results by yourself.

```
>> trainPCA
Training PCA model...
[1] Average Pixel Difference (k=50) is 0.061146
[2] Average Pixel Difference (k=1000) is 0.000954
>> testPCA
[1] Average Pixel Difference (k=50) is 0.061594
[2] Average Pixel Difference (k=1000) is 0.001006
```

After that, write the correct answer with a single sentence for the following question.

(Korean student should write the answer in Korean and foreign student should write English answer.)

- Question: Why the average pixel difference of trainPCA is lower than that of testPCA?

**Answer**) Write a single sentence as a correct answer.

**Question3**) For changing the gender, you complete missing parts of "trainGenderPCA.m." (Check "Write code here" at "trainGenderPDA.m") The correct reconstructed images are as follows (e.g., k=10)

| | | |
|---|---|---|
|  |  |  |
| (1) Input Female Images | (2) Reconstructed Female Images from Male EigenFaces | (3) Reconstructed Female Images from Female EigenFaces |

| | | |
|---|---|---|
|  |  |  |
| (4) Input Male Images | (5) Reconstructed Male Images from Female EigenFaces | (6) Reconstructed Male Images from Male EigenFaces |

- Question: What is the image ("rx") made by the following code?

```
y = U_male(:,1:k)'*(train_image_female - repmat(mu_male, [1 m]));
rx = U_male(:, 1:k)*y + repmat(mu_male, [1 m]);
```

**Answer**)

(1) Input female images

(2) Reconstructed Female Images from Male EigenFaces

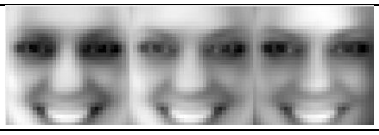
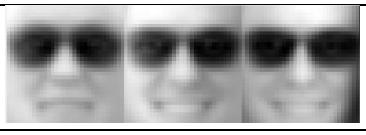
(3) Reconstructed Female Images from Female EigenFaces

(4) Input Male Images

(5) Reconstructed Male Images from Female EigenFaces

(6) Reconstructed Male Images from Male EigenFaces

**Question 4**) When projecting the male faces into the female eigenfaces and reconstructing the images, the sunglasses are disappeared like the following figures. On the other hand, Male eigenfaces result in the correct reconstructions. This phenomenon is not caused by the different gender. Note that the correct answer is not the small 'k' values in this question.

| | | |
|---|---|---|
|  |  |  |
| Input Male Images | Reconstructed Male Images from Female EigenFaces | Reconstructed Male Images from Male EigenFaces |

Answer) Write a single sentence on the main reason for this phenomenon.