EECS 442 F17 Quiz 6 10/26 Jason J. Corso, jjcorso@umich.edu

Name :

UNIQNAME :

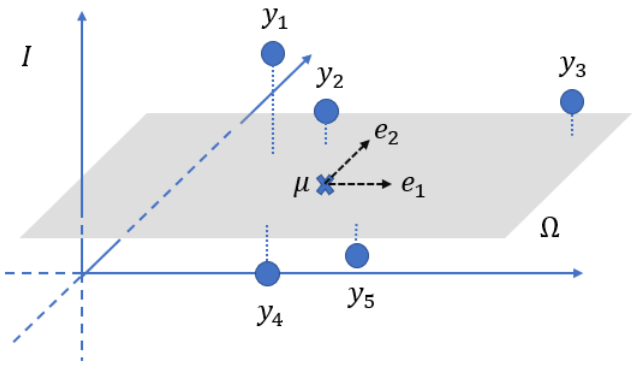
4	4	2	10

Directions – *The quiz is closed book/notes. You have 10 minutes to complete it; use this paper only.*

Problem 1: How to represent "faceness" (4 pts, 2 for each) (Fill in the blanks)

I : image space for all images of certain size.
Ω : subspace for all well-aligned face images, which is called a facespace.

Typically, the dimension of I is about a few million, and that of Ω is about a few hundred. However, we will say that they are 3 and 2 respectively, for this problem. Now, let's look at the below image.

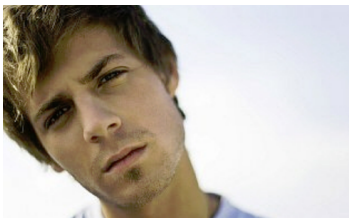


Here, μ is the mean face image, and e_1 and e_2 are eigenfaces, which are obtained from a set of training face images, $\{x_i\}$. We have 5 test images, which are $\{y_j\}$. When we project each y_j onto the Ω, we will have the projected face image, $\hat{y}_j$. If we know that only one of them is not a face image. Then,

Non-face image is (a) _____ because (b) _____ is the largest (Hint: (b) is called a reconstruction error).

Solution:
y_1, $\| y_1 - \hat{y}_1 \|$

Problem 2: Basic assumption in the method of eigenface (4 pts, 2 for each)



The above image is another test image which is not recognized as a face.
Even if the face of the man is in many training images, the above test image is filtered out.
Describe two possible reasons.

(a)

(b)

Solution:
face is not centered in the image, face is tilted, different lighting, different background, ...

Problem 3: Strength of eigenface (2 pts)

Describe any strength of the method of eigenface.

Solution:

> fast, simple and straightforward training process, easy to implement, performs well in a constrained setting, requires no huge memory / no high-dimensional representation, ...