CS663 Assignment 4

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Question 3

A simple method that can be used for reporting whether a given test image belonged to one of the faces in the training set or not, is this:

- Compute the eigen coefficients by projecting the mean-shifted test image (i.e. $\mathbf{z} - \bar{\mathbf{x}}$) onto the (dimensionality reduced) eigen space (i.e. $\mathbf{V}_k$) generated using the training set i.e. $\alpha_k = \mathbf{V}_k \cdot (\mathbf{z} - \bar{\mathbf{x}})$
- Find out the minimum value of the Euclidean norm of the difference of α_k and the eigen coefficients of all training images i.e. $d = \min_i ||\alpha_k - \alpha_{ik}||$
- For some threshold ϵ, the test image will be assigned the same label as that of $\arg\min_i ||\alpha_k - \alpha_{ik}||$ only if $d < \epsilon$. Otherwise, the test image will be reported to not belong to any face of the training set.
- A suitable value of ϵ, separate for each label i can be obtained via the following:

  $$\epsilon_i = \max ||\alpha_{lk} - \alpha_{mk}||, \quad l \neq m$$

  (here α_{jk}'s are the eigen coefficients of training images with label i; that is, ϵ_i is the maximum distance between the eigen coefficients of any two training images having the same label)

Using the proposed solution, results (false positives and false negatives) obtained on the ORL dataset are as shown in the **html/** folder.