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Assignment 4

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Question : 2 solution

In the context of the problem, we selected a value of k=75 based on the excellent recognition rate achieved in the first question. To identify instances where there is no matching identity, we employed a thresholding technique. For each face image, we calculated the minimum squared difference between its eigencoefficients and those of any training image. If this difference exceeded a certain threshold, the image was considered to have no matching identity.

Determining the appropriate threshold value was pivotal. Initially, we computed the mean error as 368.16 and the standard deviation as 109. Armed with this information, we experimented with threshold values ranging from 75 to 400.

Our objective was to identify the threshold that yielded the best results. Essentially, we conducted a cross-validation process to pinpoint the optimal threshold.

To evaluate these thresholds, we considered metrics such as accuracy, F1-score, specificity, and recall, ensuring a comprehensive assessment of the model's performance. Note that We have considered "Positives" referred to situations where a matching identity for a face is detected, while "Negatives" pertain to instances where no matching identity for a face is identified.

We got 128 true positives, 30 false positives and 2 true negatives and got the following results after running thorough experiments from 75-400 threshold values. We can see that we get a threshold value of 172.22. At this threshold, the F1-score is 0.8951 and the accuracy is 0.8125. Also the recognition rate is specified 0.7562. This is the recognition rate when a given face considered to have a matching identity. This is the same as we got when we tried to maximize the accuracy.

Accuracy	**: 0.81**
F1 Score	**: 0.89**
Recall	**: 1.00**
Best Threshold	**: 172.22**
True positives	**: 128**
False Positives	**: 30**
False Negatives	**: 0**
Trune Negatives	**: 2**
Recognition rate	**: 0.756**

We also observed that at threshold value of 70, we achieve maximum specificity. At this threshold, the specificity is 1 and the accuracy is 0.70. Also the F1-score is 0.769. The recognition rate in this case comes out to be 0.5.

Accuracy	**: 0.70**
F1 Score	**: 0.77**
Specificity	**: 1.00**
Best Threshold	**: 70.00**
True positives	**: 80**
False Positives	**: 0**
False Negatives	**: 48**
Trune Negatives	**: 32**
Recognition rate	**: 0.50**

Based on the need of best metrics that is needed we can check for which threshold values we meet the requirements and choose accordingly