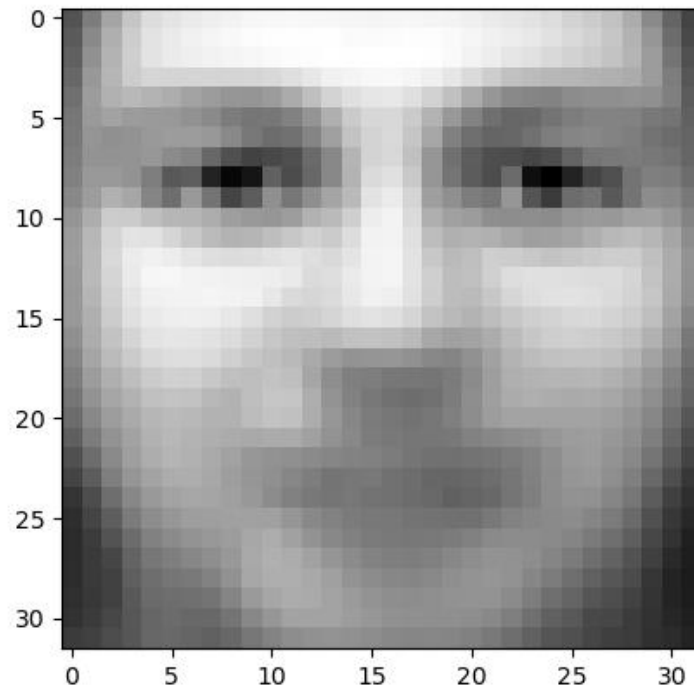
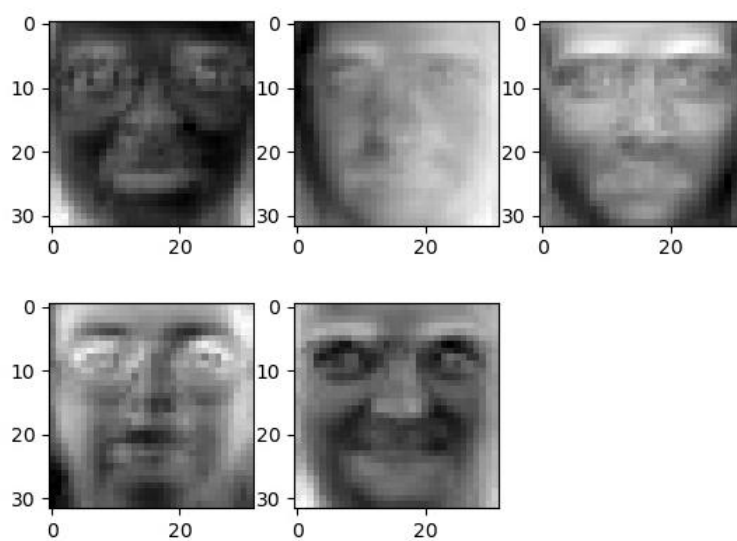


**Q1: The picture of the mean face and top 5 eigenfaces computed by PCA.**

(1) the picture of the mean face is:

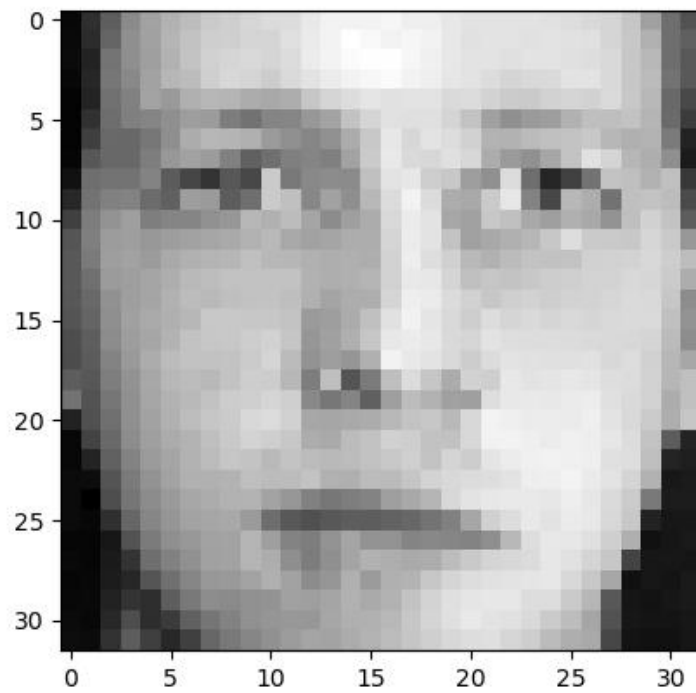


(2) top 5 eigenfaces are:

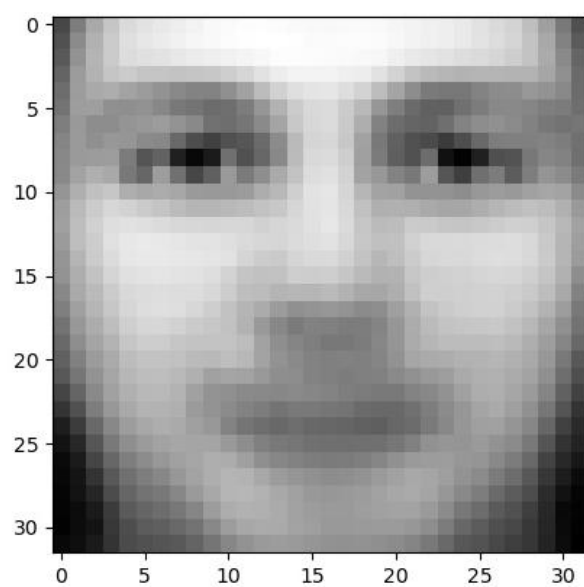


**Q2: Pick a face image in the test set, then project and reconstruct this face using different values of  $K$ . Show the results for 4 different  $K$ 's and comment on the result.**

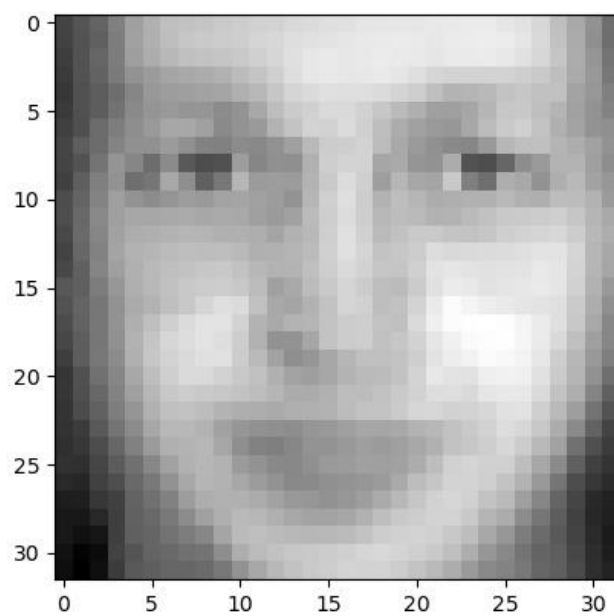
(1) pick the first face image in the test set



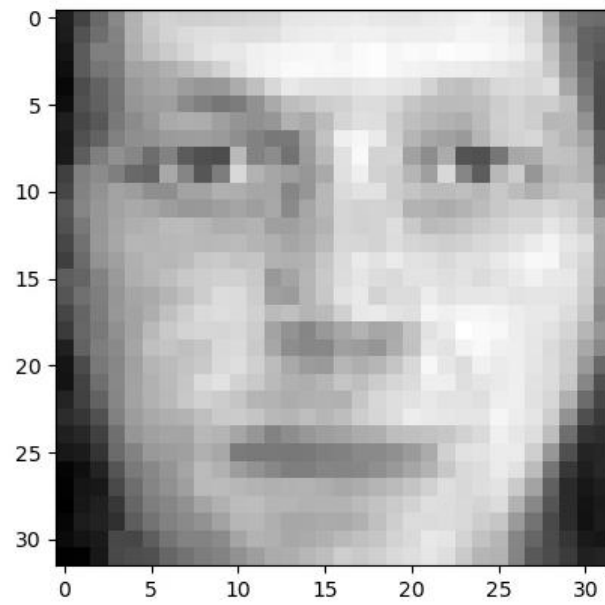
(2)  $K=1$



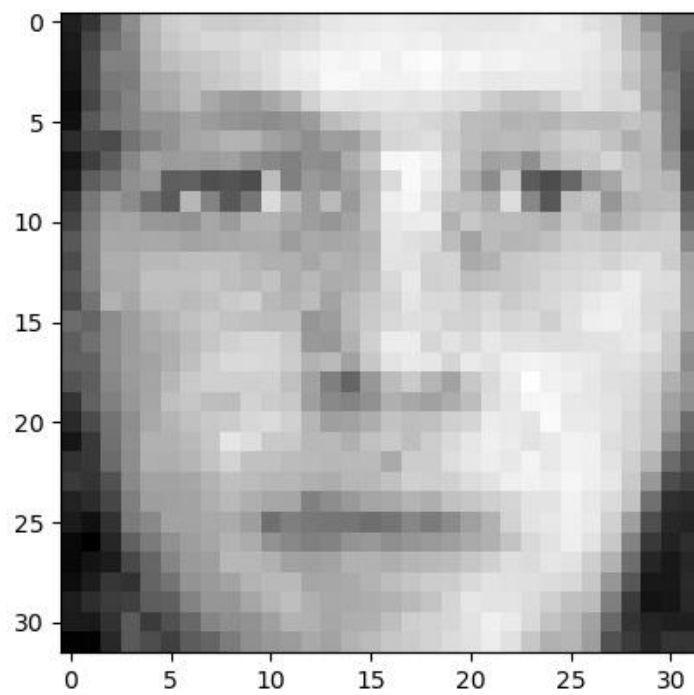
(3)  $K=5$



(4)  $K=20$

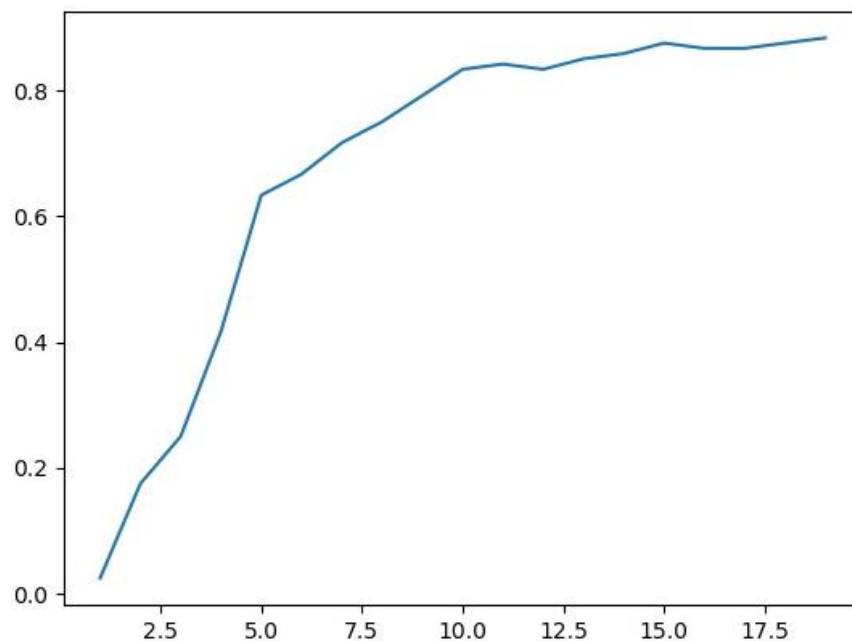


(5)  $K=100$



Comparing pictures of different  $k$  with the original picture, we could find out that the image of reconstructed face becomes more and more similar to the original image with the increase of  $k$  value.

**Q3: A plot of the nearest-neighbour (1NN) classification rate (on the test data) as a function of K. You can choose any sampling of values K from 1 to 1024, as long as it captures the trend of how classification performance changes as a function of K (i.e., we expect performance to be poor for extremely low K, but then to rise very rapidly and level off at some point).**

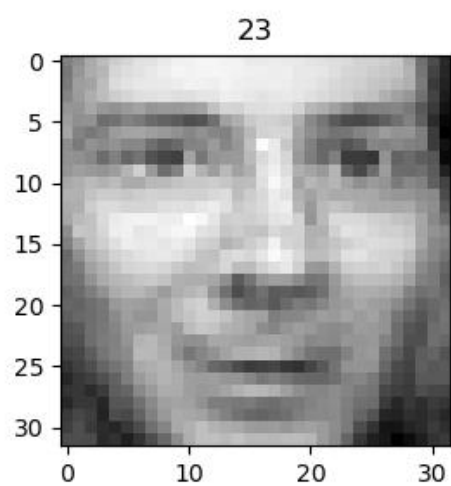
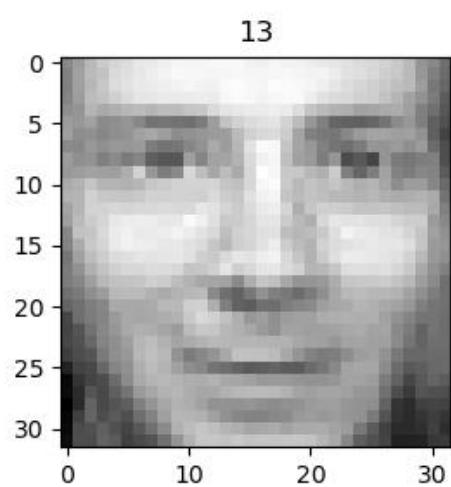


From the picture listed above, we could find out that the accuracy of prediction increases rapidly when the value of k almost between 1 to 10, and then the rate of increase in accuracy slow down quickly.

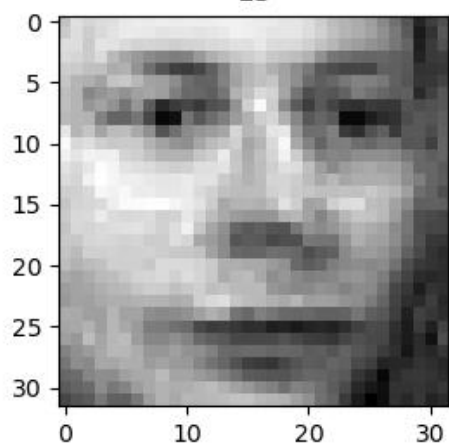
**Q4: Pictures of incorrectly classified faces and their nearest neighbours from the training set for K=100.**

The left picture represents the classified picture.

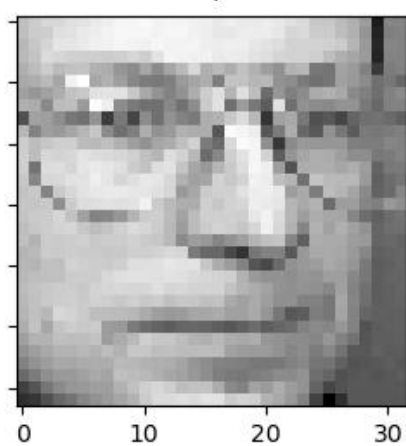
The right picture represent the nearest neighbours of left one.



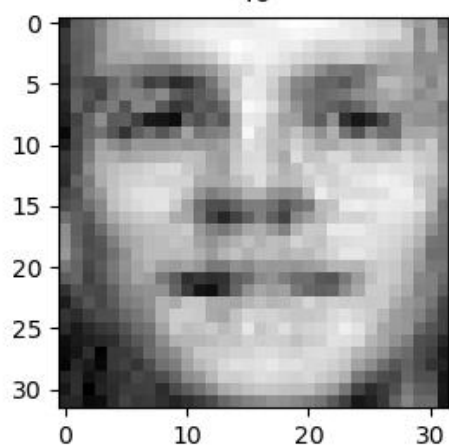
13



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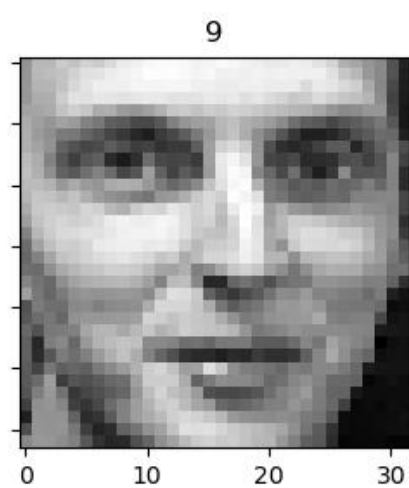
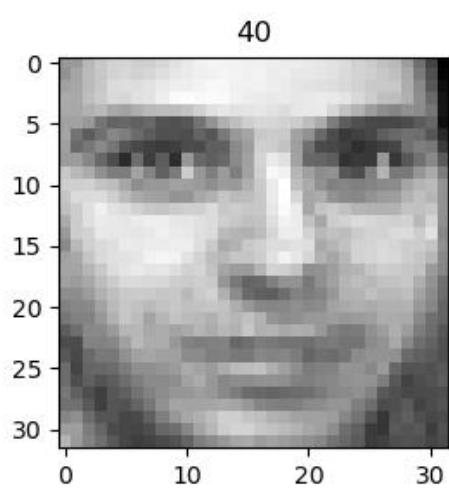
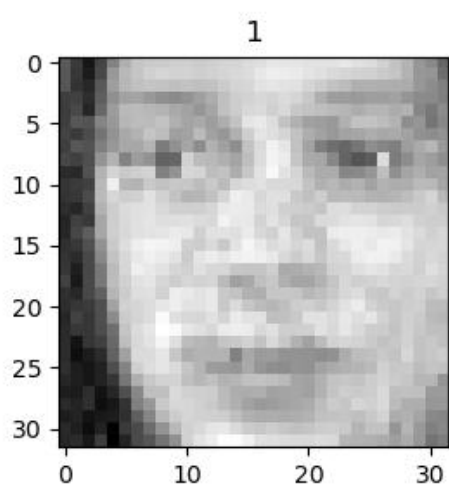


40

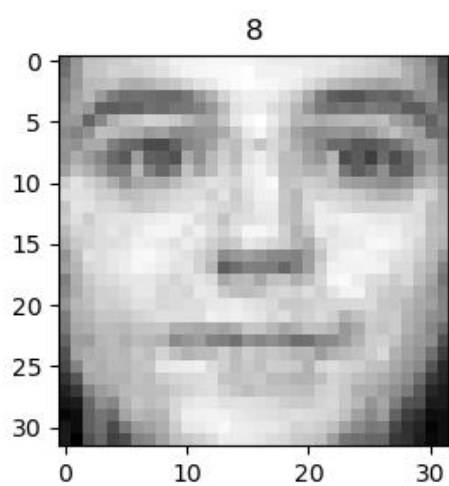
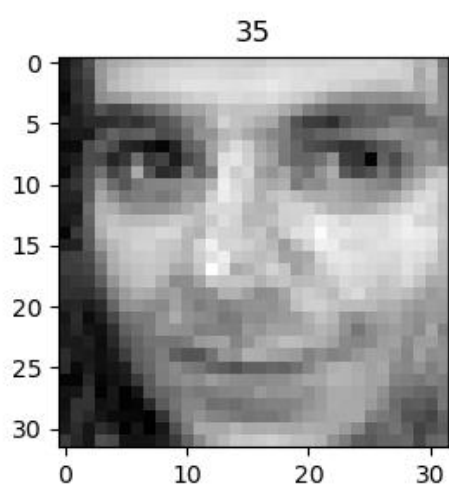


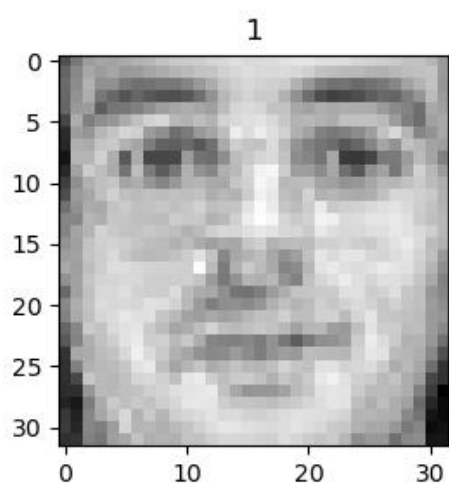
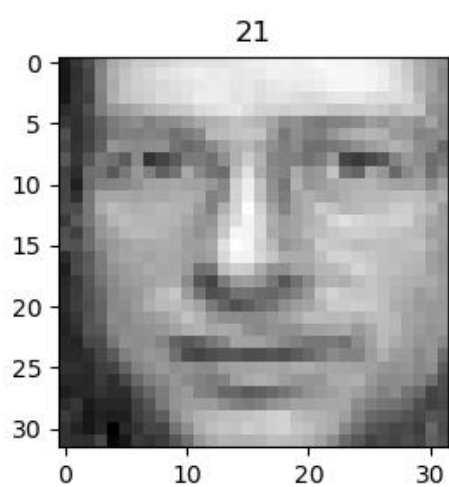
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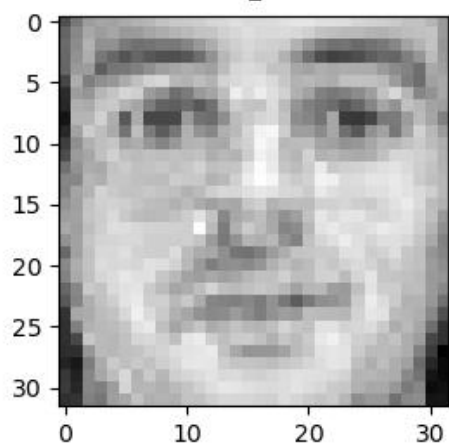




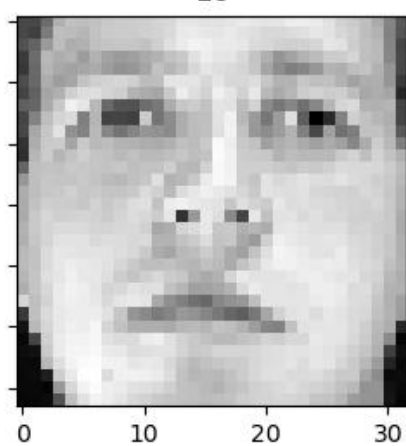




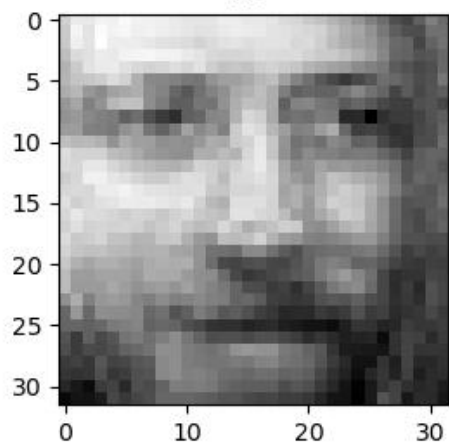
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