Report : Assignment - 3

Input: The input training data is ‘train.mat’ and the test data is ‘test.mat’. ‘train.mat’ and ‘test.mat’ are given in struct format.

Steps to solve the problem:

Step 1: Convert both ‘train.mat’ and ‘test.mat’ struct to matrix. XTrain is training set matrix, YTrain is training label matrix. YTrain is one hot matrix of labels. Suppose for a particular data point i the label is three, so in the matrix YTrain[i][3] = 1. Similarly, XTest and YTest is also created from ‘test.mat’.

Step 2: After converting both the data into matrix, transform the data in a desired format to call pcaHW(XTrain,YTrain,K,XTest,YTest).

Dimensions of different matrices are:

XTrain : [Number of training sample x dimension of the image] = [1000 x 784]
YTrain: [Number of training sample x number of class] = [1000 x 10]
K: Scalar
XTest: [dimension of the image x number of test images] = [784 x 100]
YTest: [1 x class number] = [1x100]

To get our desired dimensions in XTest and YTest, we transposed the original matrices:

```
XTest = XTest';
YTest = YTest';
```

Step 3: To determine the best eigen value, different values are tested. Eigen values from 1 to 200 is tested and best value is considered, for the least error in final result. The least error is 0.05 is achieved at eigen value 187.

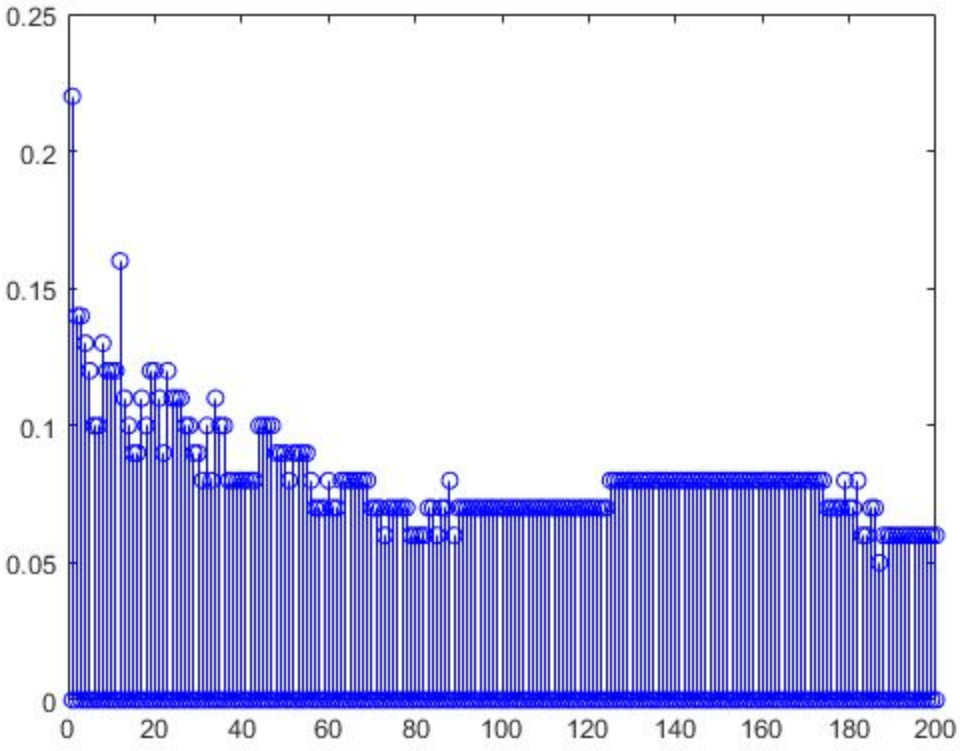

Fig 1. Plotting errors for different eigenvalues from 0 to 200

In Fig 1. errors of different eigenvalues are shown. The eigenvalues are ranging from 0 to 200. The minimum error is achieved for eigenvalue 187 and the error is 0.05.