**Project-2**

We have separated the data with test data containing six elements of each material type and rest being the training data where we will do the machine learning and predict the output on test data and then calculate the error rate

Q1) We have implemented bagging by generating random index with limit of length of training data and size of length of training data, then we have done the classification by softmax which is also our learner and then we calculate the output with the maximum vote given by the number of classifiers.

Also after that we calculate the accuracy by taking the ratio of correctly predicted and total number of test data elements.

Q2) We have implemented AdaBoost with the help of a up classifying where the data is generated through the given weights , which keeps on getting larger when a training item is misclassified and then is passed on to the other data and then on we perform the same iterations for the given number of times.

And then with the value of error we calculate the alpha value where

Error = Summation(weights of misclassified)

Alpha = 0.5\*ln(1-error/error)

Then for the prediction we multiply alpha which is obtained by the particular classifier and then we do the summation of all output and then we do the sign function on that particular summation in order to get the result.

Again we have calculated the error rate by 100-accuracy% , where we calculated accuracy as ratio of correct classified and total number of test data elements

Q3)We have implement K-Clustering as generating a random given number of centroids and then calculating euclidean distance for all the dataset and then allocating it to a cluster and then we again find the centroids by finding the mean of the cluster points and then we again repeat the whole procedure till we get the same centroids

For accuracy we have again calculated the label as the majority of the material cluster has and now we have calculated the particular cluster accuracy with ratio of correctly predicted points in cluster and the number of the total elements present in that particular cluster. Whereas we have calculated weighted accuracy by multiplying the accuracy of the cluster with ratio of elements present in cluster and elements present in whole dataset and then addend all the accuracy in order to find the weighted accuracy.