ELEN 4720: Machine Learning for Signals, Information and Data

Homework #3

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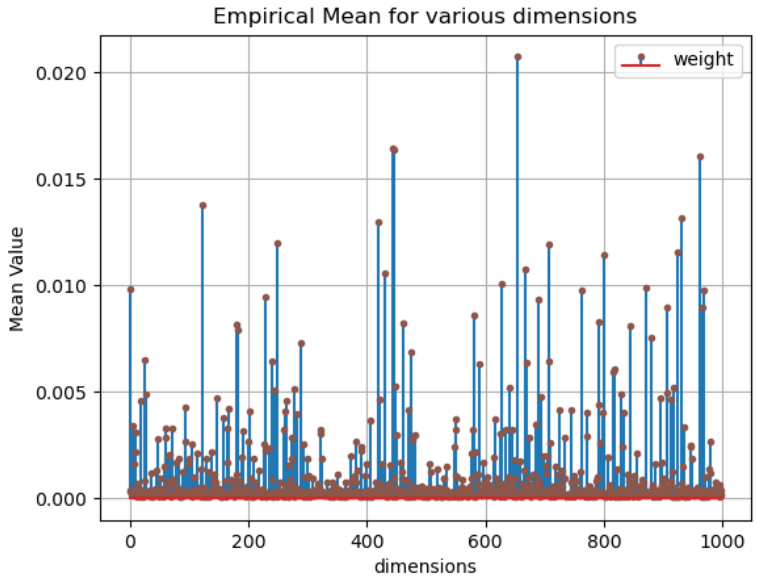
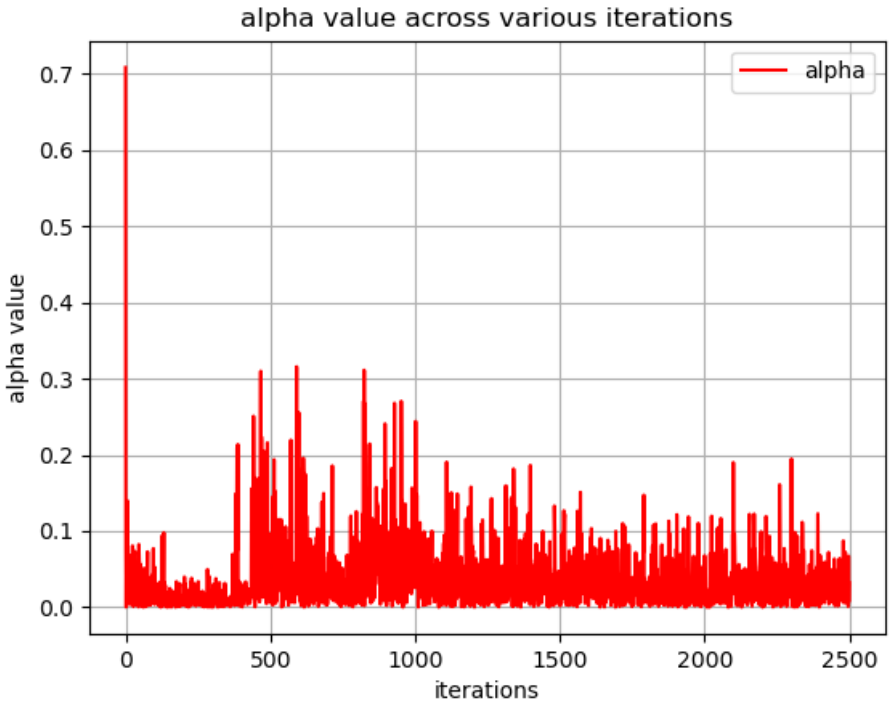
Problem-1 (Boosting Coding)

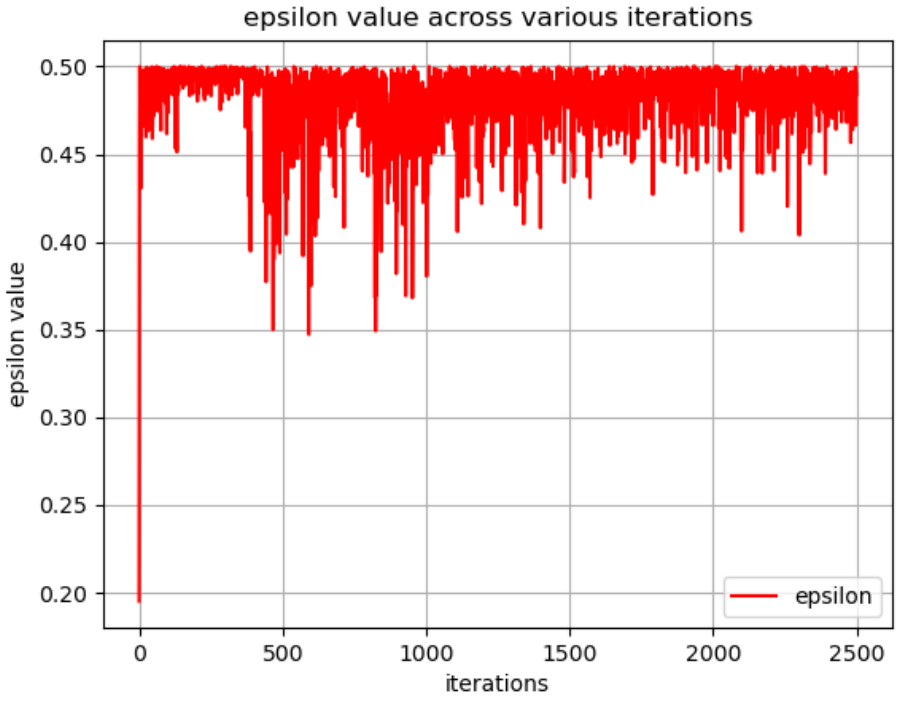
(a) The upper bound and the training error is plotted as shown after 2500 iterations of the AdaBoosting algorithm.

(b) The stem plot for 999 weights is shown below-



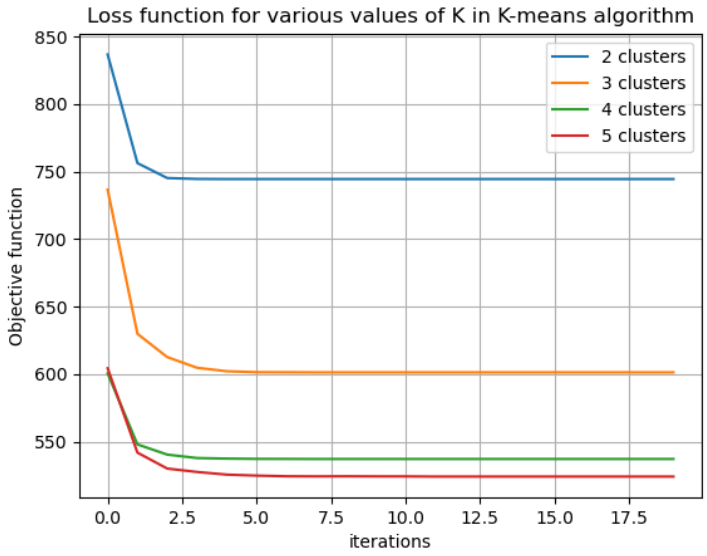
(c) The Plots for alpha and epsilon are shown below respectively-



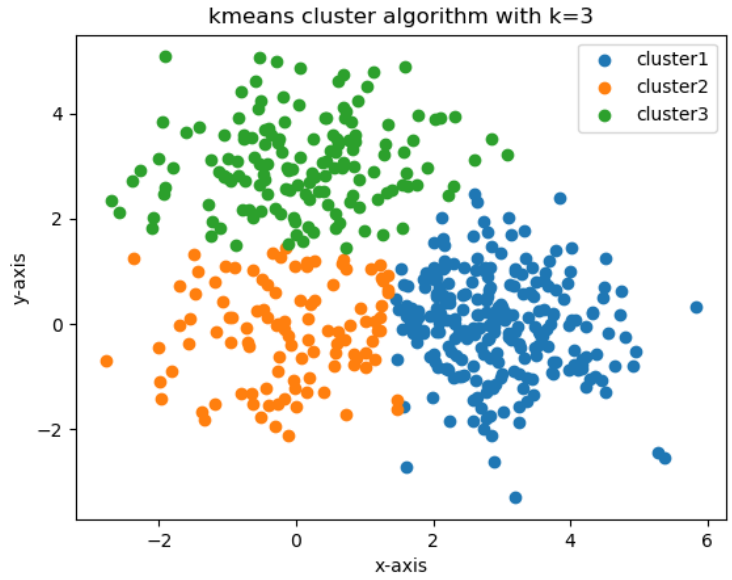


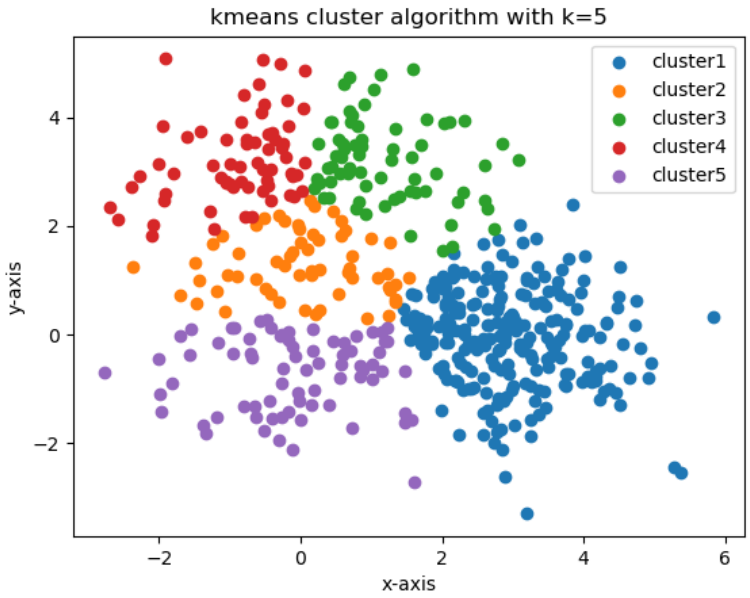
Problem-2-(K-Means)

(a) We have shown how objective function varies for various values of K for 20 iterations-



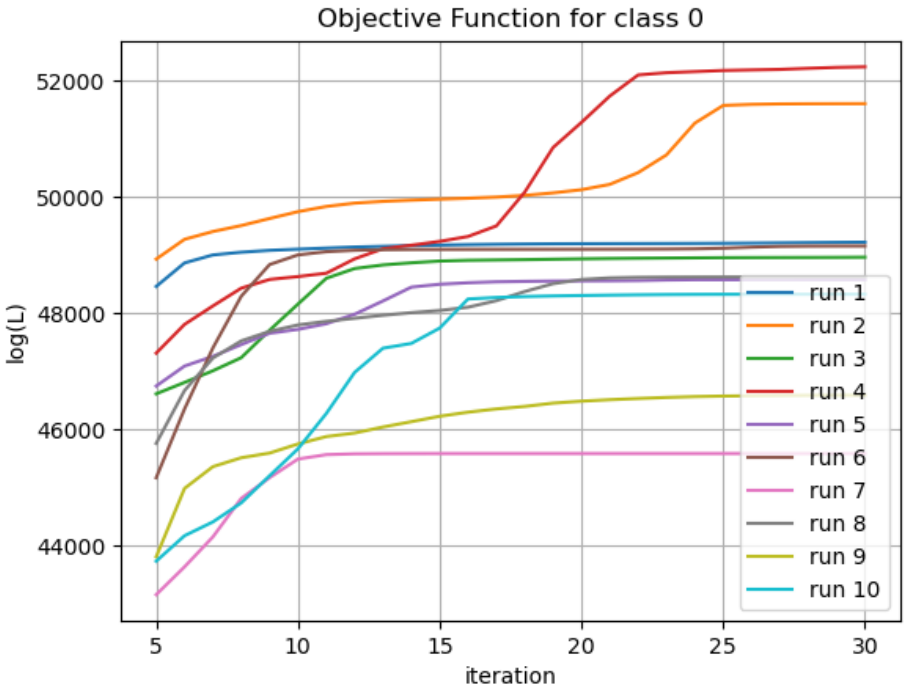
(b) The cluster assignment for K=3 and K=5 is shown respectively in the below figures-

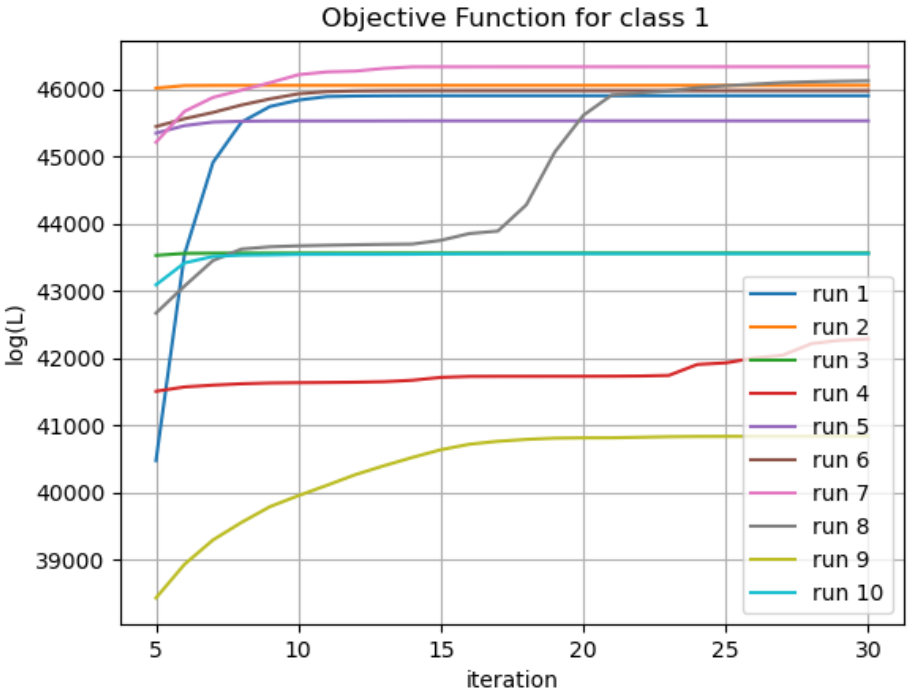




Problem-3(Bayes Classifier Revisited)

(a) The log marginal objective function for class 0 and class 1 are shown below respectively for 10 different runs which are 30 iterations each.


Objective Function for class 0
log(L)
iteration
52000
50000
48000
46000
44000
5
10
15
20
25
30
run 1
run 2
run 3
run 4
run 5
run 6
run 7
run 8
run 9
run 10


Objective Function for class 1
log(L)
iteration
46000
45000
44000
43000
42000
41000
40000
39000
5
10
15
20
25
30
run 1
run 2
run 3
run 4
run 5
run 6
run 7
run 8
run 9
run 10

(b) Confusion matrix and their accuracy for K=1,2,3,4 is shown respectively-

K=1	Predict		
Actual		y_pred=0	y_pred=1
	y=0	180	98
	y=1	6	175
Accuracy=77%			

Table 1-Bayes classifier for K=1

K=2	Predict		
Actual		y_pred=0	y_pred=1
	y=0	195	83
	y=1	9	172
Accuracy=80%			

Table 2-Bayes classifier for K=2

K=3	Predict		
Actual		y_pred=0	y_pred=1
	y=0	202	76
	y=1	8	173
Accuracy=82%			

Table 3-Bayes classifier for K=3

K=4	Predict		
Actual		y_pred=0	y_pred=1
	y=0	234	44
	y=1	13	168
Accuracy=88%			

Table 4-Bayes classifier for K=4