AEEM 5197/6097 "Soft Computing Based AI" or AEEM 7010: Prof. Kelly Cohen - Fall 2019

Take Home Test T#3

This is an Individual Test and comprises 5% of your Final Grade

Due Tuesday, November 19, 2019, 10 AM

Upload on BB a single Pdf document and a single ZIP file containing your codes

Instructions:

PLEASE attach your own code which may be based Kmeans and Fuzzy C-means code I shared with class.

Please download the dataset `Iris2D.mat` from Blackboard which is a matrix 'X' having 150 rows and 2 columns. Task at hand is to cluster iris flowers into classes topologically, providing insight into the types of flowers. The first column represents 'Petal Length' and the second column represents 'Petal Width'.

Use the command in Matlab to upload the data:

```
load Iris2D.mat
```

Use MATLAB's Fuzzy Logic Toolbox's, *fcm* algorithm and the Statistics Toolbox's *kmeans* algorithm as presented in class.

a. Develop a strategy to decide on the "optimal" number of clusters, K, for the above data set. What criteria have you chosen? Discuss your results (**(40 Points)**

b. Use K-means (*kmeans* algorithm) to determine the cluster centers and plot them. **(15 points)**

c. Use fuzzy c-means (*fcm* algorithm) to determine the following: **(20 Points)**

i. The coordinates of the cluster centers
ii. The membership grades for each of the data points
iii. Plot the history of the objective function across the iterations.
iv. Plot the clusters including the cluster centers

d. Please repeat your fcm and kmeans algorithms at least 10 times (for different initial conditions) and note the cluster centers and number of data points in each cluster. Based on these results, discuss your observations on the clustering method (*kmeans* versus *fcm*) **(15 points).**

e. Attach your m-file **(10 points)**