Middle East Technical University
Electrical-Electronics Engineering Department

EE 583 Pattern Recognition

Homework 4

Due Date: 29.10.2020, 23:55 via odtuclass.metu.edu.tr

Using MATLAB, attempt the questions below:

1) Execute the **Train a k-Means Clustering Algorithm** example at https://www.mathworks.com/help/stats/kmeans.html *step-by-step* via "Try This Example" option in your internet browser (or you may execute it in your local MATLAB software by using "View MATLAB Command"). Start from a random mean value for 3 classes. Next, initialize with better initial mean values for improving the classification performance. Quantitatively give the amount of improvement in your results.

2) Execute the **Select the Number of Gaussian Mixture Model Components Using PCA** example at https://www.mathworks.com/help/stats/fitgmdist.html *step-by-step* via "Try This Example" option in your internet browser (or you may execute it in your local MATLAB software by using "View MATLAB Command"). Apply this algorithm to `fisheriris` data set, for its feature pairs (3,4).

3) Execute **Cluster Data Using Dissimilarity Matrix** example, which applies agglomerative hierarchical cluster tree technique at https://www.mathworks.com/help/stats/linkage.html *step-by-step* via "Try This Example" option in your internet browser (or you may execute it in your local MATLAB software by using "View MATLAB Command"). Compare arbitrarily 4 different distance metrics in terms of clustering performances and dendrograms.

4) Execute **Perform Spectral Clustering on Similarity Matrix** example at https://www.mathworks.com/help/stats/spectralcluster.html *step-by-step* via "Try This Example" option in your internet browser (or you may execute it in your local MATLAB software by using "View MATLAB Command"). Compare the performances between utilization of unnormalized and normalized Laplacian Matrices. Examine and compare the effects of Euclidean and Mahalanobis distances, as well the `KernelScale` parameter on the performance.