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EE 550 – HOMEWORK PROJECT 5

Unsupervized Learning – Competitive learning

Introduction:

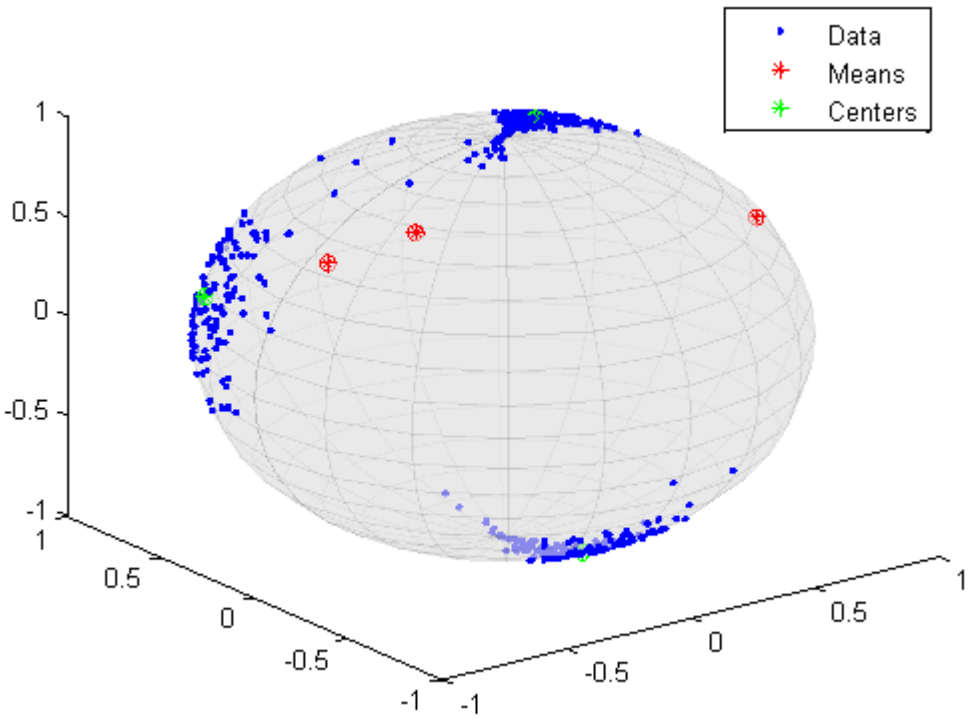
Following report is about using competitive learning algorithm to find cluster means of three seperate clusters on a unit sphere. For generation of the data the means are selected as follows:

Mean1 ; Azimuth = 30 degrees ; Elevation = 15 degrees

Mean2 ; Azimuth = 150 degrees ; Elevation = 75 degrees

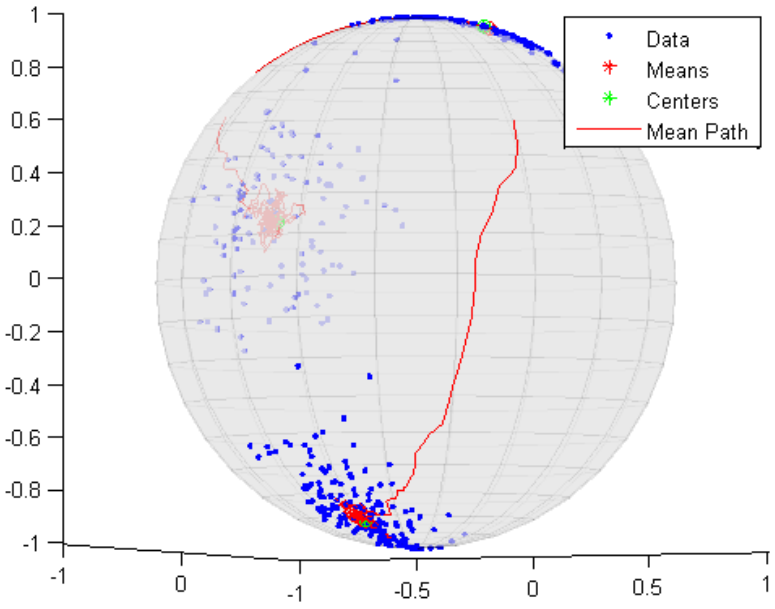
Mean3 ; Azimuth = 270 degrees ; Elevation = 155 degrees

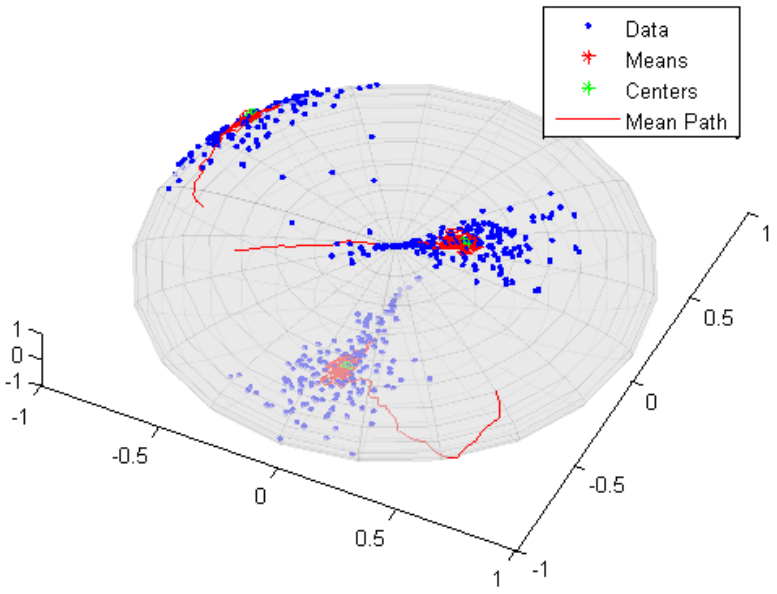
A noise with normal distribution having variance of sqrt(15) is added to the means. Initial positions of means are selected randomly, after generation of data the situation is as follows:

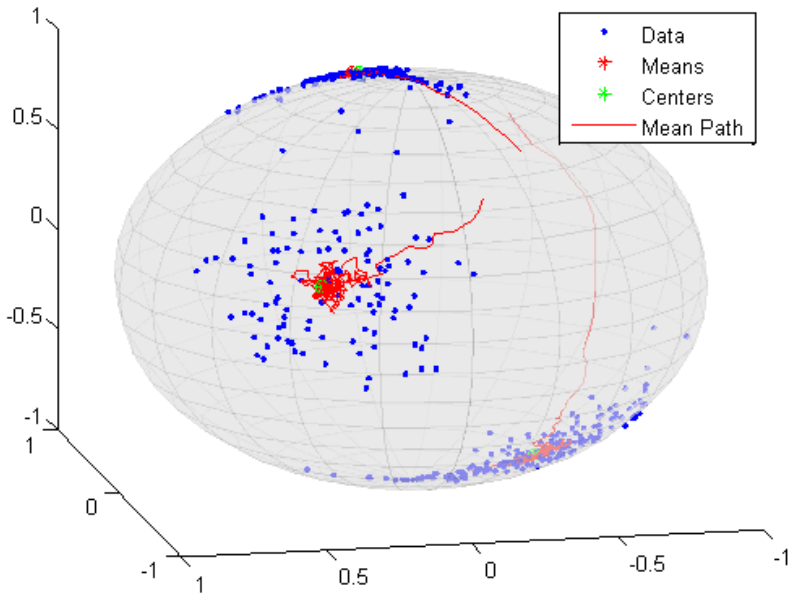


Computation and Results:

After applying competitive learning the means convergence and their pathway become as follows:

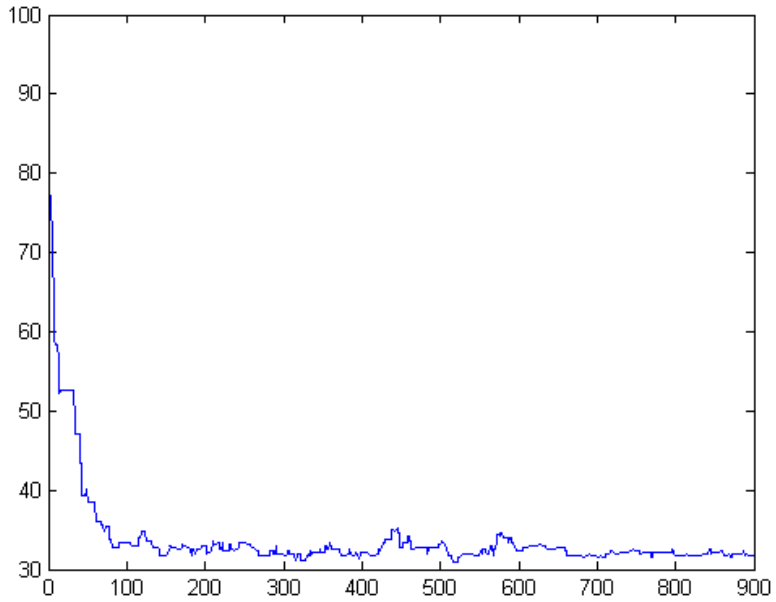




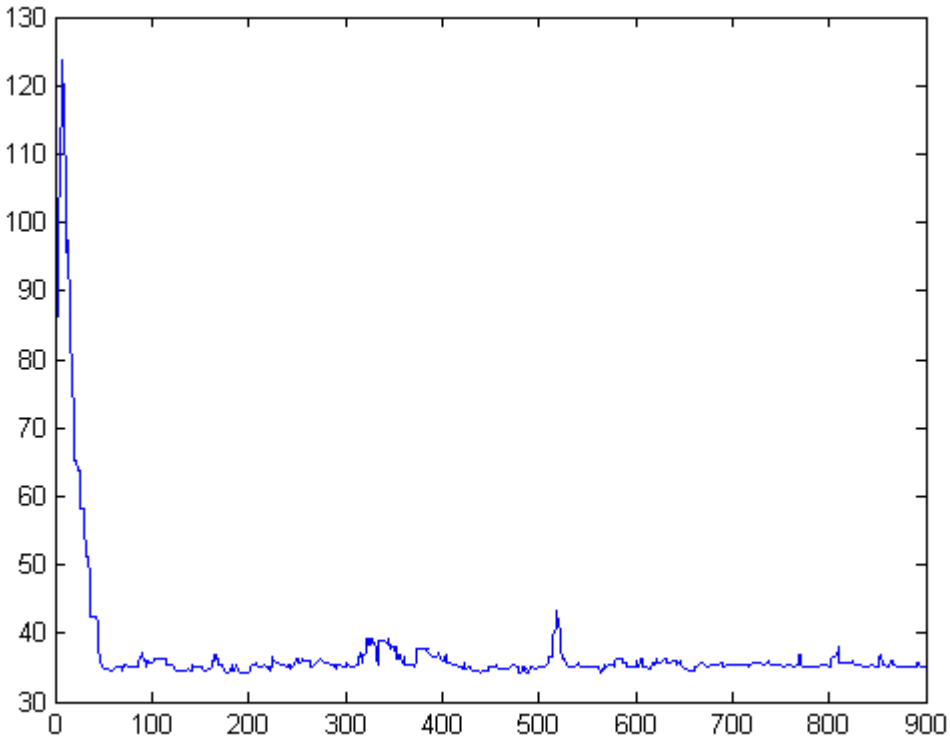


And the error states (defined as summation of norms, of all points belonging to a mean, to the corresponding cluster mean) for all means are as follows:

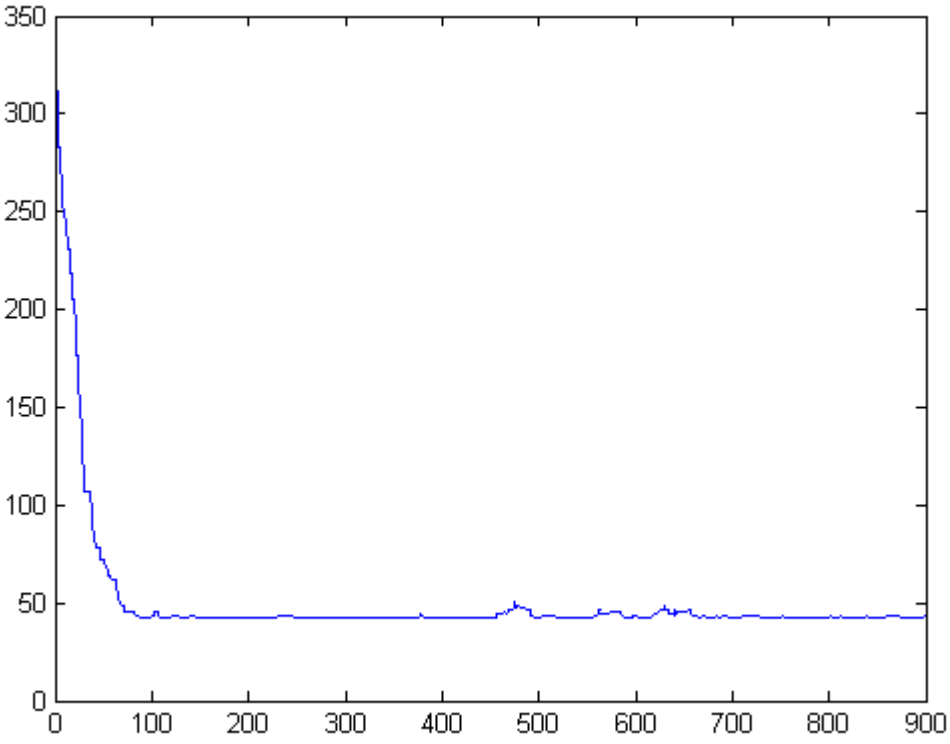
Error of mean 1:



Error of mean 2:



Error of mean 3:



Important Note: The convergence is not guaranteed, according to initial positions of means there may be cases that a mean is near to two clusters in the same time and each cluster try to update this one mean while other means position is steady and far from these two clusters. This is overcomed by changing initial position of means.