

## Pattern Recognition- Assignment 2

Consider three Gaussian distributions, namely  $N(\mu_1, \Sigma_1)$ ,  $N(\mu_2, \Sigma_2)$ , and  $N(\mu_3, \Sigma_3)$ , where  $\mu_1$ ,  $\mu_2$ , and  $\mu_3$  are the mean vectors and  $\Sigma_1$ ,  $\Sigma_2$ , and  $\Sigma_3$  are the covariance matrix of the distributions. Generate 30 random data points from  $N(\mu_1, \Sigma_1)$ , 25 data points from  $N(\mu_2, \Sigma_2)$ , and 40 data points from  $N(\mu_3, \Sigma_3)$ , and label them as D1, D2, and D3, belongs to class1, class2, and class3 respectively. The resulting dataset, along with their corresponding class labels, forms the Ground Truth dataset [D1, D2, D3]. After generating the data points and assigning class labels, the resulting dataset [D1, D2, D3] is shuffled to create a randomized dataset where the class labels are randomly assigned to the data points.

Using this randomized shuffled Ground Truth dataset, perform the following four clustering algorithms:

1. Gaussian Mixture Model
2. Expectation-Maximization Model
3. Hierarchical Clustering
4. K-Nearest Neighbor (KNN) Algorithm

Compare and analyze the performance of the four algorithms based on their accuracy and efficiency.