

Training Day-59 Report:

K means Clustering – Introduction:-

• **K-Mean Clustering** is an Unsupervised Machine Learning algorithm, which groups the unlabeled dataset into different clusters. The article aims to explore the fundamentals and working of k mean clustering along with the implementation.

What is K-means Clustering?

Unsupervised Machine Learning is the process of teaching a computer to use unlabeled, unclassified data and enabling the algorithm to operate on that data without supervision. Without any previous data training, the machine's job in this case is to organize unsorted data according to parallels, patterns, and variations.

K means clustering, assigns data points to one of the K clusters depending on their distance from the center of the clusters. It starts by randomly assigning the clusters centroid in the space. Then each data point is assigned to one of the cluster based on its distance from centroid of the cluster. After assigning each point to one of the cluster, new cluster centroids are assigned. This process runs iteratively until it finds good cluster. In the analysis we assume that number of cluster is given in advanced and we have to put points in one of the group.

How k-means clustering works?

We are given a data set of items, with certain features, and values for these features (like a vector). The task is to categorize those items into groups. To achieve this, we will use the K-means algorithm, an unsupervised learning algorithm. 'K' in the name of the algorithm represents the number of groups/clusters we want to classify our items into. (It will help if you think of items as points in an n-dimensional space). The algorithm will categorize the items into k groups or clusters of similarity. To calculate that similarity, we will use the Euclidean distance as a measurement.

The algorithm works as follows:

1. First, we randomly initialize k points, called means or cluster centroids.
2. We categorize each item to its closest mean, and we update the mean's coordinates, which are the averages of the items categorized in that cluster so far.
3. We repeat the process for a given number of iterations and at the end, we have our clusters.

The “points” mentioned above are called means because they are the mean values of the items categorized in them. To initialize these means, we have a lot of options. An intuitive method is to initialize the means at random items in the data set. Another method is to initialize the means at random values between the boundaries of the data set (if for a feature x , the items have values in $[0,3]$, we will initialize the means with values for x at $[0,3]$).

The above algorithm in pseudocode is as follows:

Initialize k means with random values

--> For a given number of iterations:

--> Iterate through items:

--> Find the mean closest to the item by calculating the euclidean distance of the item with each of the means

--> Assign item to mean

--> Update mean by shifting it to the average of the items in that cluster