internship studio

Welcome to

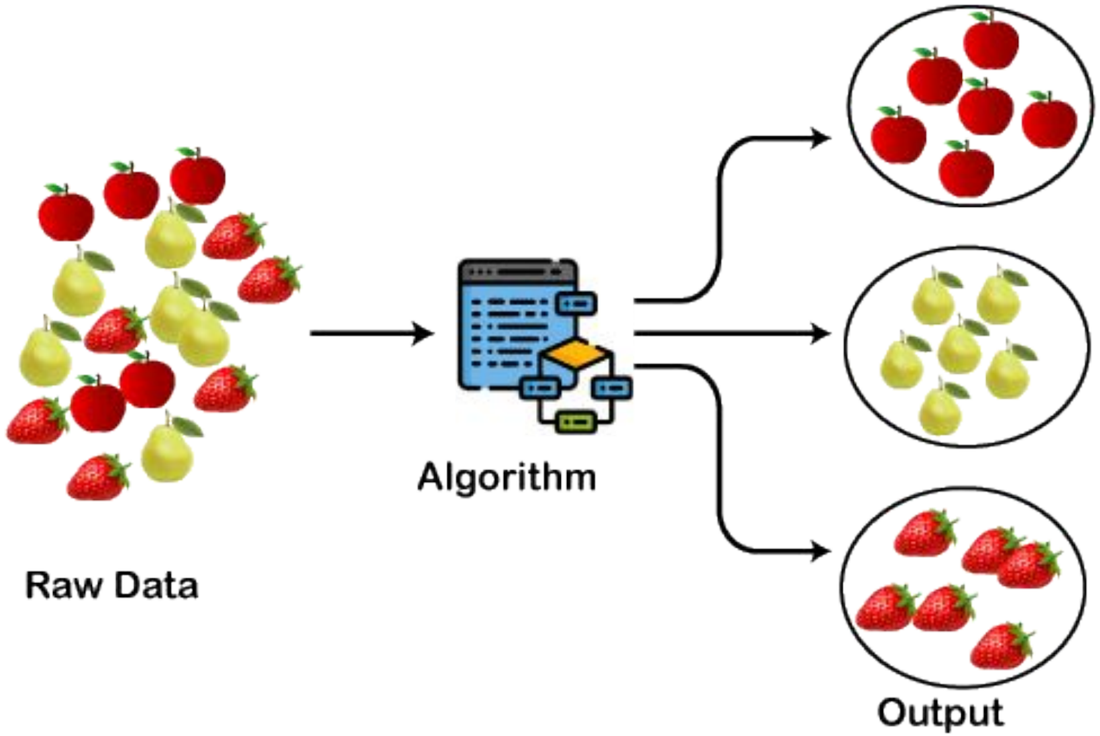
INTERNSHIP STUDIO

Module 04 | Lesson 05

K means clustering

Clustering

Clustering is used to identify groups of similar objects in datasets with two or more variable quantities.
Or Clustering is the task of dividing the population or data points into a number of groups such that data points in the same groups are more similar to other data points in the same group and dissimilar to the data points in other groups. It is basically a collection of objects on the basis of similarity and dissimilarity between them.



K- Means

k-means clustering is a method of cluster analysis which aims to partition n observations into k clusters in which each observation belongs to the cluster with the nearest mean.

- Notations:
  - Patterns:
  - Cluster Centers:
  - Euclidean distance: $||x_i - c_j||^2$

MacQueen, J. B. (1967). "Some Methods for classification and Analysis of Multivariate Observations", Proceedings of 5th Berkeley Symposium on Mathematical Statistics and Probability. University of California Press. pp. 281–297.

Partition

Based on minimum within cluster measurement.

Let there are A1,A2,A3,…. Ac Clusters/partition

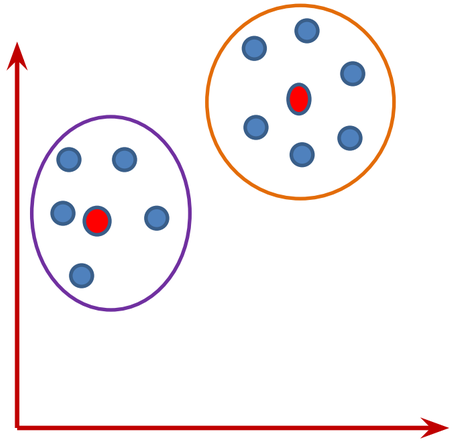
Then they should satisfies these constraints

- $A_i \cap A_j = \emptyset$ $\forall i \neq j$
- $\bigcup_1^c A_i = S$ $s=(x1,x2,x3,\ldots xn\}$
- $A_i \neq \emptyset$

K- Means Algorithm

There are 4 steps in the algorithm.

- Step1- Randomly select *k* centers from the given data.
- Step2- Assign each object to the cluster with the nearest center point. Compute the centers of the clusters of the current partition (i.e., *mean point*, of the cluster).
- Step3- Go back to Step 2, stop when no more new assignment.



New Centers will be calculated by

Center1=(x1+x2+x3+x4+x5)/5
Center2=(x6+x7+x8+x9+x10+x11)/6

K- Means Algorithm

We have given S={ x1,x2,x3,……., Xn) $\in R^m$

Step1: Choose c points y11,y12,y13,… y1c $\in R^m$

Step2: A_{2i} = { x$\in$S: d($\underline{x}$, y_{1i}) <= d($\underline{x}$, y_{1j}) ∀ j≠i }

Step3: y_{2i}= Mean(A_{2i}), i=1,2,3,… c

Step4: if $||y_{1i} - y_{2i}||$<=ε

then

STOP with the output A_{2i}

else

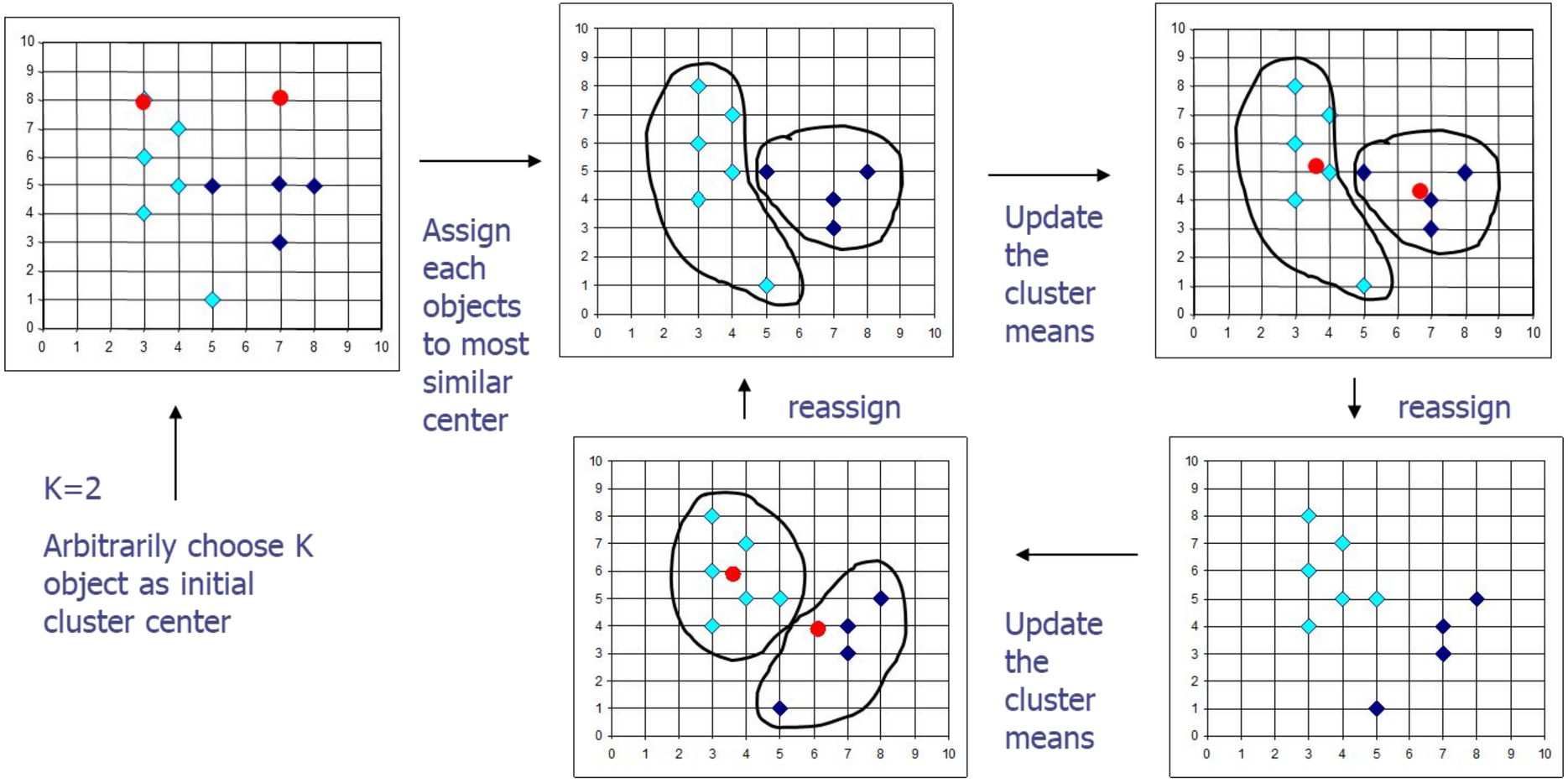
$A_{1i} = A_{2i}$

$A_{2i} = \emptyset$

$y_{1i}=y_{2i}$

GO TO Step2

Example-1


K=2
Arbitrarily choose K object as initial cluster center
Assign each objects to most similar center
reassign
Update the cluster means
reassign
Update the cluster means

Remarks

- ✔ Algorithm usually converges
- ✔ Two different sets of initial seed point may sometimes give rise to two different final clustering.
- ✔ The algorithm tries to implement the Minimum Within Cluster Distance Criteria.
- ✔ We can start with the initial partition of the dataset (instead of the seed point)