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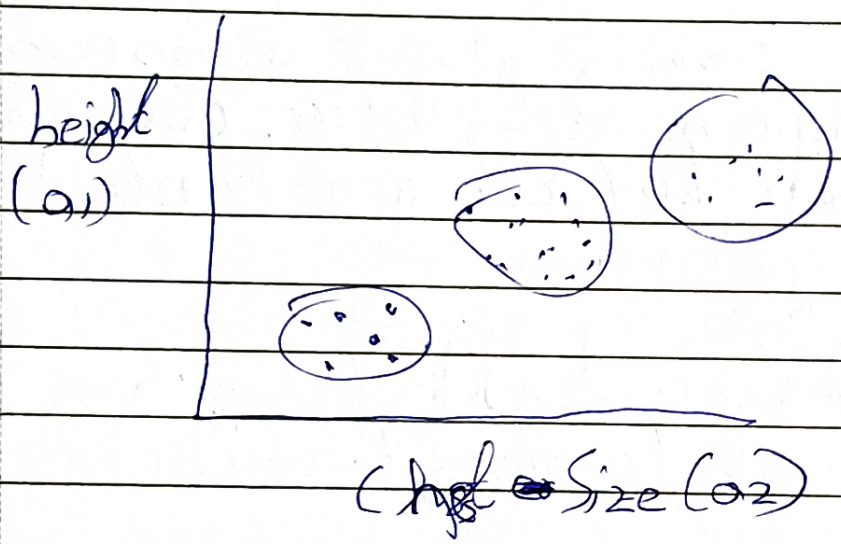
~~Submit Computer Lab Assignment list~~

K-means clustering

↳ greedy algorithm

Input : a dataset

$(x_1, x_2 \cdots x_n) \rightarrow$ where x_i is a vector



Clustering is a process to partition datapoints into multiple groups where each grp contains similar datapoints,

The objective of clustering is to find groups that will maximise inter-cluster distance and minimize intra-cluster distance,

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K = # of cluster

Output : K clusters

Step1: Randomly select K data points from X and assign to K diff clusters & consider that those points are the centroids of the cluster.

Step2: For the remaining points assign each data point to the nearest clusters. (where the Euclidean distance between p and centroid of cluster is considered.

Step3: Update ~~the~~ each centroid by taking avg of data points belonging to each cluster

Step4: Repeat the process of assigning data points to cluster until convergence (when centroids remain unchanged.

Local greedy choice based on 3 dist from centroids choosing a centroid

Suboptimal but to be acceptable too many iterations,

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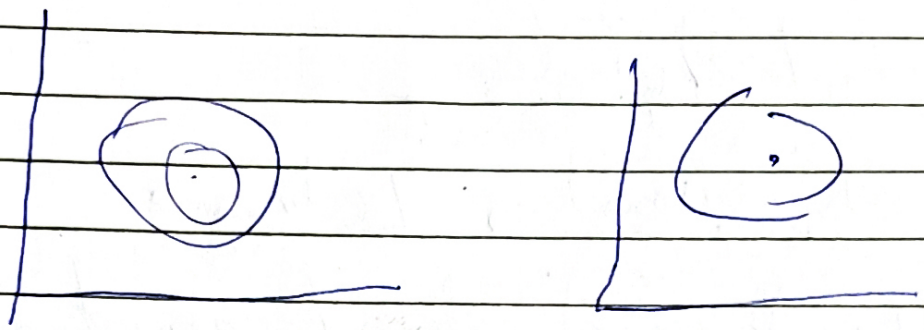
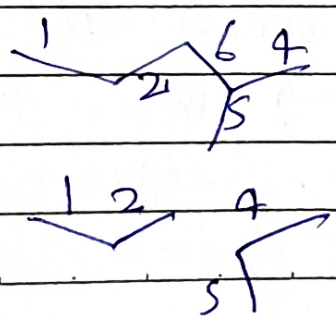
It does not work for arbitary shapes



Same centroid.

MST-based clustering

① Represent data point as weighted graph where each data point is a node of a graph and an edge weight is the Euclidean distance between two data points representing any two nodes
② Construct the MST using prim's algorithm
③ Delete the max weight edge from MST
④ Obtain the subgraphs
⑤ Apply step 3 to each subgraph until recd no of cluster is obtained



May also delete 2nd max weight

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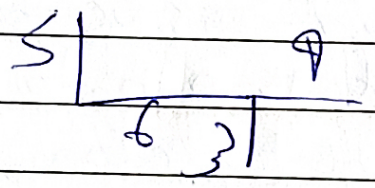
DBSCAN

Density based clustering

Density estimation technique

Density drops sharply on seperation of clusters based on a threshold value.

Another Ratio based edge division



MST-based clustering

1st step $O(n^2) = O(m+n)$

2nd step $O((m+n)\log n)$ → worst case (avr case) $O(n^2 \log n)$

3rd step $O(kn)$ → if directly sort priority queue $O(n \log n)$

best case $O(n \log n)$

$O((m+n)\log n)$