(I) Explain clustering algorithms and their use cases.

→ Clustering Algorithms are a type of Machine Learning Unsupervised technique used to group data points into clusters such that objects within same cluster are more similar to each other than to those in another cluster.

→ There are no predefined labels. The algorithm discovers structure directly from the data.

→ Types of clustering Algorithams,

⇒ (i) K-means clustering.

→ It divides data into fixed num of clusters K. It works by placing K centroids and repeatedly assining data points to the nearest Centroid then updating the centroids.

→ It is sensitive to outliers.

→ Use cases are in a customer segementation Image Comparision and Market Analysis.

⇒ (ii) Hierarichal clustering.

→ It builds a tree like structure of clusters Called a dendrogram.

→ cluster can formed by either merging smaller cluster or splitting larger one.

→ Characteristics.

→ No need to predefine number of clusters, produce interpretable hierarchy.

→ It's Computationally expensive for larger datasets.

→ Use cases are Gene expression Analysis Document classification and Taxonomy creation.

⇒ (iii) DBSCAN.

→ It's stands with Density-based Spatial clustering of Applications with noise.

→ It's group points based on data density. clusters are formed where data points closely pack together. and sparse region treated as noise.

→ Characteristics.

→ Automatically finds number of clusters. It Handles a noise and outliers well. It Struggle with varying densities.

→ Use cases are Fraud detection, geographic data analysis and anomaly detection.