

## Project Overview:

The clustering project explores different unsupervised learning techniques to group data points into clusters. The main goal is to understand how various clustering algorithms work and to apply them to a given dataset to uncover patterns and structures.

## Process:

### 1. Data Preprocessing:

- The dataset is loaded and inspected for any inconsistencies.
- Features are scaled to standardize the data.

### 2. Clustering Methods:

- **K-Means Clustering:** This algorithm partitions the data into a pre-defined number of clusters (K). The Elbow Method is used to determine the optimal number of clusters.
- **Agglomerative Hierarchical Clustering:** This method creates a hierarchy of clusters and uses a dendrogram to visualize the merging of clusters at different levels.
- **DBSCAN:** This density-based algorithm clusters points that are closely packed and marks points that are in low-density regions as outliers.

### 3. Visualization:

- Each clustering method's results are visualized using scatter plots and dendrograms to understand how data points are grouped.

### 4. Evaluation:

- The performance and effectiveness of each clustering algorithm are compared based on their ability to group data points meaningfully.

## Output

The output includes visual representations of clusters formed by each algorithm and a comparative analysis of their performance. The project demonstrates how clustering can be applied to identify underlying patterns in data and provides insights into choosing the appropriate clustering technique based on the data's characteristics.