Customer Segmentation Report

➢ Introduction

Customer segmentation is a crucial technique in business analytics that enables companies to understand their diverse customer base. By grouping customers based on shared characteristics, businesses can develop personalized marketing strategies, optimize pricing models, and improve customer service. One of the most effective techniques for segmentation is clustering, a machine learning approach that identifies natural groupings in data. Clustering helps businesses allocate resources efficiently and enhance customer experience by tailoring offerings to specific segments.

➢ Clustering Approach

We use **K-Means clustering**, a widely used unsupervised learning algorithm that partitions data into K clusters based on similarity. The algorithm minimizes intra-cluster variance while maximizing inter-cluster differences.

- **Choosing the Optimal Number of Clusters**
  - The **Elbow Method** helps determine the optimal number of clusters by plotting the Within-Cluster Sum of Squares (WCSS) against the number of clusters. The 'elbow point,' where adding more clusters results in diminishing returns, is selected as the optimal K.
  - The optimal number of clusters for our model is 4.
- **Cluster Evaluation: Davies-Bouldin Index (DB Index)**
  - To evaluate the clustering effectiveness, we use the **Davies-Bouldin Index**, where a lower value indicates better clustering. The DB Index considers intra-cluster cohesion and inter-cluster separation, making it a reliable measure of clustering quality.
  - The DB Index for our model is 1.26 which indicates that the clusters are fairly

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➢ Cluster Visualization

To understand the clustering distribution, **Principal Component Analysis (PCA)** is used for dimensionality reduction. The clusters are plotted in a 2D space, visually demonstrating the distinctions among customer groups. This visualization confirms that the clustering effectively differentiates between customer behaviors.

➢ Results:-

Number of clusters= 4

DB index=1.26

After applying K-Means clustering and determining the optimal number of clusters using the Elbow Method, we obtain the following segmentation:

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Cluster	Characteristics	Business Implication
Cluster 0	Low-spending, few transactions	Offer promotions and discounts to boost engagement.
Cluster 1	High-spending, frequent buyers	Provide premium services, exclusive offers, or membership programs.
Cluster 2	Medium spend, steady transactions	Encourage participation in loyalty programs to enhance retention.
Cluster 3	Inactive customers	Implement reactivation campaigns via personalized outreach.