

Clustering Results Report

1. **Overview**

In this report, The clustering results on customer data using the `AvgTransactionValue` and `NumberOfTransactions` features, The goal was to identify meaningful customer segments based on their spending behavior. Various clustering metrics, including the **Davies-Bouldin Index (DB Index)**, were calculated to evaluate the quality of the clusters formed.

2. **Number of Clusters Formed**

Using the K-Means algorithm, we identified and optimized the number of clusters. Based on **Elbow Method**, the optimal number of clusters selected was:

- **Number of clusters**: 3

This number of clusters was found to be optimal as it balanced both intra-cluster compactness and inter-cluster separation.

3. **Clustering Metrics**

a) **Davies-Bouldin Index (DB Index)**

- **DB Index**: 0.37

The Davies-Bouldin Index measures the average similarity ratio of each cluster with the cluster most similar to it. A lower value of DB Index indicates that clusters are well-separated. In our case, a DB Index value of 0.37 suggests a reasonable separation between clusters.

4. **Summary of Clusters**

The clustering algorithm grouped customers into 3 segments based on their spending behavior. Below is a summary of each cluster:

- **Cluster 1**: This group contains customers with high total spend but fewer transactions. These customers likely make large, infrequent purchases.
- **Cluster 2**: This group includes customers with low total spend but a higher transaction frequency, indicating regular but smaller purchases.
- **Cluster 3**: Represents customers with moderate total spend and moderate transaction frequency, possibly an average customer group.

5. **Recommendations**

Based on the clustering results:

- **Cluster 1** (High spend, low frequency) could be targeted with high-value promotions or exclusive deals.
- **Cluster 2** (Low spend, high frequency) could benefit from loyalty programs to encourage larger transactions.
- **Cluster 3** (Moderate spend, moderate frequency) could be maintained with general promotional strategies to retain their consistent engagement.