**Customer Segmentation Clustering Report**

To segment customers into distinct groups using clustering techniques, leveraging both profile and transaction data. The clusters should help in understanding customer behaviors and improving targeted marketing strategies.

Methodology:

1.Data Integration:

Merged Transactions.csv with Customers.csv using CustomerID to associate transaction information with customer profiles.

Aggregated transaction data to compute:

Total spending (total\_spent).

Average spending per transaction (avg\_spent).

Total transaction count (transaction\_count).

Number of unique products purchased (unique\_products).

2.Feature Engineering:

Added customer profile data (e.g., Region) and encoded the Region feature using LabelEncoder.

Scaled all numerical features using StandardScaler for consistent clustering performance.

3.Clustering:

4.Used K-Means Clustering with 4 clusters, as determined after initial experimentation.

Evaluated clustering quality using Davies-Bouldin Index (DBI), where lower values indicate better-defined clusters.

Visualization:

5.Reduced dimensionality using PCA (Principal Component Analysis) for 2D visualization of clusters.

Visualized clusters with distinct colors to highlight separability.

Key Insights that i observed:

Cluster 0:

High spenders with frequent transactions and a wide variety of products purchased.

Likely loyal or premium customers.

Cluster 1:

Moderate spenders with consistent transaction activity.

Customers with stable purchasing patterns.

Cluster 2:

Low-frequency customers with fewer unique product purchases.

Likely occasional or new customers.

Cluster 3:

Regional influence on spending patterns.

Potential for region-specific marketing strategies.

Visual Representation:

The following PCA plot shows the customer clusters in a 2D space:

Results:

Number of Clusters: 4

Customers were segmented into 4 distinct groups based on their spending behavior and transaction profiles.

Davies-Bouldin Index (DBI): 1.147

Indicates well-defined clusters, with moderate intra-cluster compactness and inter-cluster separability.

Cluster Characteristics:

Each cluster displayed unique characteristics in terms of spending habits, transaction frequency, and product diversity.