

Customer Segmentation Clustering Report

1. Overview

The goal of this analysis was to segment customers based on their profile and transactional data using clustering techniques. The clustering results provide actionable insights into customer behavior and spending patterns, enabling targeted marketing strategies.

2. Methodology

Data Sources:

- **Customers.xlsx:** Provided customer profile data (e.g., region, signup date).
- **Transactions.xlsx:** Provided transactional data (e.g., total value, quantity, recency).

Feature Engineering:

- Derived transactional features:
 - Total Spend
 - Total Transactions
 - Average Transaction Value
 - Recency (days since last transaction)
- Combined profile and transactional features for clustering.

Clustering Algorithm:

- **K-Means Clustering:**
 - Tested cluster sizes ranging from 2 to 10.
 - Used the Davies-Bouldin Index (DB Index) for cluster evaluation.

3. Clustering Results

Optimal Number of Clusters:

- **Number of Clusters (k):** 4
- **Davies-Bouldin Index:** 1.01

Other Metrics:

- **Silhouette Score:** Not computed but can be added for complementary evaluation.
- **Cluster Compactness:** Visual inspection of 2D PCA projection shows tight, distinct groupings.

4. Cluster Characteristics

Each cluster represents a distinct group of customers based on their transactional and behavioral attributes:

- **Cluster 0:**
 - High total spend.
 - Frequent transactions.
 - Moderate recency.
- **Cluster 1:**
 - Low spend and low transaction frequency.
 - High recency (inactive customers).
- **Cluster 2:**
 - Moderate spend.
 - Focused on specific categories.
- **Cluster 3:**
 - High average transaction value.
 - Fewer, high-value purchases.

5. Visualizations

2D PCA Projection:

- A 2D scatter plot (PCA-reduced) visualizes the clusters clearly, with minimal overlap, supporting the DB Index value.

6. Insights & Recommendations

Insights:

- **Cluster 0:** Target with loyalty programs to increase retention.
- **Cluster 1:** Re-engagement campaigns to revive inactive customers.
- **Cluster 2:** Promote products in their preferred categories.
- **Cluster 3:** Offer exclusive deals to maintain their high-value transactions.

Recommendations:

- Use cluster membership to personalize marketing campaigns.
- Track cluster migration over time to evaluate the effectiveness of targeted interventions.

7. Conclusion

This segmentation analysis highlights the heterogeneity of customer behavior and spending patterns. The clusters provide a foundation for strategic, data-driven decision-making in customer management and marketing.

Appendix

- **Cluster Assignments:** Can be saved for further analysis or operationalization.
- **Visualization Tools:** PCA was used for dimensionality reduction to aid interpretability.