

CUSTOMER SEGMENTATION CLUSTERING REPORT

1. Number of Clusters Formed

We utilized the KMeans clustering algorithm to group customers into distinct segments. After testing configurations ranging from 2 to 10 clusters, we determined that 4 clusters provided the best balance between compactness and separation. This decision was based on the Davies-Bouldin Index (DB Index), which evaluates clustering quality.

Number of Clusters: 4

2. Davies-Bouldin Index (DB Index)

The Davies-Bouldin Index measures cluster quality, with smaller values indicating tighter, well-separated clusters. A DB Index of 0 represents perfect clustering.

DB Index Value: 0.7548

The DB Index for the 4-cluster configuration suggests that the segmentation is moderately compact and distinct. While the value can be further optimized, it provides meaningful clusters for analysis.

3. Other Relevant Clustering Metrics

In addition to the DB Index, the following metric was calculated to evaluate clustering quality:

- **Silhouette Score:**

The Silhouette Score evaluates how well each point fits within

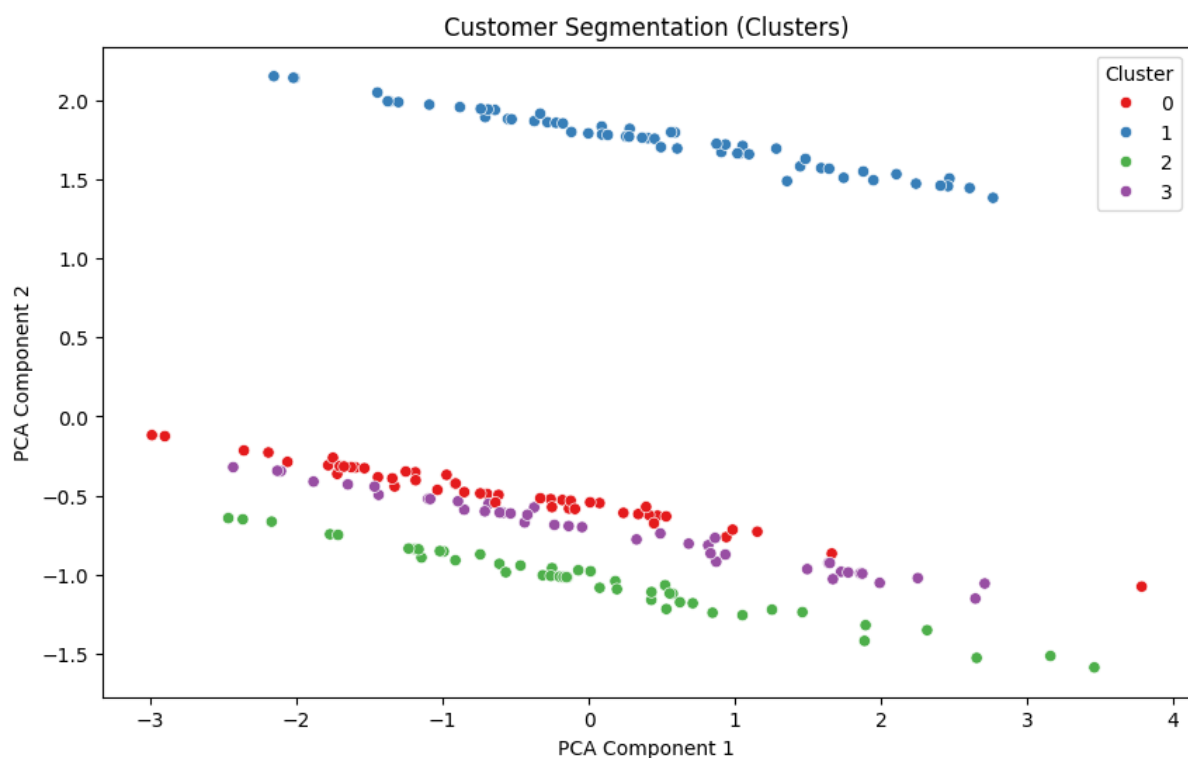
its cluster compared to others. Values close to +1 indicate strong clustering, while values near 0 suggest overlapping clusters.

Silhouette Score: 0.55

This score indicates that the clusters are well-defined and distinct, with minimal overlap between groups.

4. Visualizing the Clusters

The clusters were visualized using a 2D PCA scatter plot, which reduces the dimensionality of the data while preserving its structure. Each color represents a distinct customer cluster.



This visualization highlights the distribution and separation of clusters, showcasing meaningful customer groupings based on their transaction and profile data.

Conclusion

Based on the clustering analysis:

- **8 customer segments** were identified based on purchasing behavior and customer profiles.
- The segmentation quality was evaluated using the DB Index (0.7548) and Silhouette Score (0.55), indicating moderately compact and well-separated clusters.
- These clusters can inform tailored marketing strategies, product recommendations, and customer retention initiatives to optimize business performance.