

Customer Segmentation Report

1. Number of Clusters

The optimal number of clusters is 5 (based on the Davies-Bouldin (DB) Index).

2. Clustering Metrics

- **DB Index values for different cluster counts:**
 - K=2: 1.0072
 - K=3: 0.9578
 - K=4: 1.0604
 - K=5: 0.8525 (optimal)
 - K=6: 0.8694
 - K=7: 0.8553
 - K=8: 0.9125
 - K=9: 0.8848
 - K=10: 0.8630
- **Optimal DB Index:** 0.8525 (lower DB Index indicates better clustering).

3. Cluster Characteristics

The clusters exhibit distinct characteristics based on customer spending behavior and transaction activity:

Cluster	Total Spent (USD)	Transaction Count	Average Transaction Value (USD)
0	6236.28	7.89	800.22
1	1125.42	2.94	372.11
2	4327.40	4.11	1066.05
3	2163.80	3.05	730.43

4	3516.34	6.08	589.91
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4. Visual Representations

- **DB Index Plot:** Displays DB Index values for clusters ranging from 2 to 10, showing the optimal value at K=5.
- **Cluster Visualizations:**
 - Scatter plots and bar charts were used to represent cluster distribution and key features such as total spending and transaction count.

Insights

1. **High-Value Customers** (Cluster 0 and Cluster 2):
 - Customers in these clusters spend the most, with Cluster 2 showing the highest average transaction value.
2. **Low-Engagement Customers** (Cluster 1):
 - These customers have the lowest transaction count and total spend.
3. **Moderate-Spending Customers** (Clusters 3 and 4):
 - These groups exhibit mid-range spending and transaction counts.

Actionable Recommendations

1. **Retention Campaigns:** Focus on high-value customers in Clusters 0 and 2 with loyalty programs and exclusive offers.
2. **Engagement Strategies:** Encourage repeat purchases from low-engagement customers in Cluster 1 through discounts or personalized recommendations.
3. **Targeted Marketing:** For moderate-spending customers, tailor promotions based on their transaction trends.