

## Clustering Results

### Number of Clusters Formed:

After evaluating the clustering results using the Davies-Bouldin Index (DB Index), the optimal number of clusters was determined to be \*X clusters\*. This segmentation divides the customer base into meaningful groups for targeted strategies.

### Davies-Bouldin Index (DB Index):

The DB Index value for the clustering solution is \*Y\*. A lower DB Index indicates well-separated and compact clusters, which suggests that the chosen clustering approach effectively grouped similar customers together.

### Other Clustering Metrics:

1. Silhouette Score: A Silhouette Score of Z further validates the clustering quality by measuring the separation between clusters.
2. Inertia: The sum of squared distances within clusters (inertia) was A, providing additional insight into the compactness of clusters.

### Key Observations:

#### 1. Cluster Characteristics:

- Cluster 1: Customers with high transaction values, frequent purchases, and a preference for Electronics.
- Cluster 2: Customers with moderate transaction values, primarily purchasing Books and Home Decor.
- Cluster 3: Customers from Asia with lower transaction activity.
- Additional clusters exhibit specific combinations of region, transaction frequency, and product categories.

## 2. Business Insights:

- High-value clusters (e.g., Cluster 1) represent potential candidates for loyalty programs or premium services.
- Low-activity clusters indicate areas for targeted marketing campaigns to boost engagement.
- Region-based segmentation can be utilized for region-specific promotions or inventory planning.

### **Visualization:**

1. Davies-Bouldin Index Curve: A line plot showing DB Index values for cluster ranges (2-10), with the optimal cluster count marked.
2. Pairwise Plots: Scatterplots highlighting cluster separations based on key features like transaction value, quantity, and product preferences.
3. Cluster Distribution: Bar charts showing the proportion of customers in each cluster.

### **Recommendations:**

1. Focus marketing resources on high-value clusters to increase retention and revenue.
2. Customize product recommendations for medium-activity clusters to encourage higher spending.
3. Develop strategies to re-engage low-activity customers, particularly in underperforming regions.

The clustering results provide actionable insights that can guide customer relationship management, marketing efforts, and business growth strategies.