

CLUSTERING RESULTS REPORT

1. Number of Clusters Formed

The optimal number of clusters formed is **5**, as determined by the Davies-Bouldin (DB) Index. This number represents the best balance between creating distinct groups and ensuring that the segments are meaningful and actionable for customer segmentation.

2. Davies-Bouldin Index Value

The DB Index value for the clustering solution is **0.8836**. A lower DB Index indicates better clustering quality, meaning the clusters are compact and well-separated. This result demonstrates that the chosen clustering method successfully grouped customers based on their transactional and profile data.

3. Methodology

The clustering process followed these steps:

- **Data Integration:** Customer profile data from the *Customers* dataset was merged with aggregated transactional data from the *Transactions* dataset, ensuring a rich and comprehensive dataset for the analysis.
- **Feature Selection:** Key features, such as total transactions, total quantity purchased, total spending, and average transaction value, were selected. These features best capture customer behavior and transactional patterns.
- **Data Preprocessing:** Standardization was performed to ensure that all features contributed equally to the clustering algorithm, eliminating any biases from differing scales.
- **Clustering Algorithm:** The K-Means clustering algorithm was employed, with the optimal number of clusters identified by evaluating the Davies-Bouldin Index across a range of cluster numbers (2 to 10).

4. Key Observations

The analysis revealed **5 distinct customer segments**, each demonstrating unique behaviors. These differences are crucial for targeting specific customer needs and devising marketing strategies that cater to each segment's preferences.

The segments show considerable variation in transaction frequency, overall spending, and purchasing patterns, enabling tailored strategies for different groups.

5. Applications

The insights from the clustering analysis can be applied to:

- **Targeted Marketing Campaigns:** Craft marketing messages that are more aligned with the behaviors and preferences of each customer segment.
- **Customer Retention:** Identify the most valuable customers and implement retention strategies to maintain their loyalty.

- **Product Recommendations:** Provide personalized product suggestions based on the specific interests and behaviors of each customer segment.
- **Operational Efficiency:** Optimize resource allocation by focusing on the most impactful customer groups, improving overall operational performance.

6. Visualization and Insights

The cluster visualization clearly illustrates how customers are grouped based on key metrics like total spending and transaction frequency. These visual representations offer valuable insights, helping to highlight the differences and similarities across the customer segments, making it easier to strategize and plan interventions for each group.