

Clustering Results Report

Key Highlights:

- **Number of Clusters Formed:** 5
- **Davies-Bouldin Index (DB Index):** 0.7040 (lower is better, indicating well-separated clusters)

Clustering Methodology

- **Algorithm Used:** K-Means Clustering.
- **Feature Scaling:** Features were scaled before clustering to ensure uniformity and equal importance of variables.
- **Evaluation Metric:** Davies-Bouldin Index was used to evaluate the clustering performance and identify the optimal number of clusters.

Results and Analysis

1. Number of Clusters:

Based on the evaluation of DB Index across various cluster configurations, the optimal number of clusters was determined to be **5**.

2. DB Index Value:

- The DB Index for the selected configuration was **0.7040**.
- This value indicates that the clusters are well-separated and compact, suggesting a meaningful segmentation.

3. Visualization of Clusters:

The clustering graph demonstrates the distribution of customer segments:

- **Axes:** PCA1 and PCA2 (Principal Component Analysis used for dimensionality reduction).

- **Color Coding:** Each color represents a distinct cluster (0 to 4).
 - **Observations:**
 - The clusters are distinctly separated, showing good differentiation between customer groups.
 - The density and spread of points within each cluster suggest that customers within a cluster share similar attributes.
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Insights

1. **Customer Segments:**
 - The segmentation reveals 5 unique customer groups with varying characteristics.
 - These groups can be used for personalized marketing and tailored customer strategies.
 2. **Cluster Cohesion and Separation:**
 - A DB Index of 0.7040 indicates a good balance of compactness and separation.
 - This ensures that customers in the same cluster are highly similar, while those in different clusters are significantly distinct.
 3. **Practical Applications:**
 - Targeted Promotions: Develop campaigns specific to each cluster.
 - Product Recommendations: Personalize product suggestions for customers based on their cluster.
 - Inventory Management: Align stock levels with the preferences of dominant clusters.
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Recommendations

- **Business Applications:**
 - Implement cluster-specific marketing strategies.
 - Focus on high-value clusters for loyalty programs and exclusive offers.
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Conclusion

The clustering analysis successfully segmented the customers into 5 distinct groups with a strong DB Index value of 0.7040. These insights provide a solid foundation for data-driven decision-making and business growth strategies.