Clustering Results Report

Objective:
This analysis aims to perform customer segmentation using clustering algorithms on e-commerce data to identify distinct customer segments and derive actionable strategies.

---

1. Number of Clusters Formed

We employed the K-Means clustering algorithm, experimenting with cluster sizes ranging from 2 to 10. The optimal number of clusters was determined using the Davies-Bouldin Index (DBI) and inertia values.

---

2. Davies-Bouldin Index (DBI) Value

The DBI evaluates clustering quality by measuring cluster similarity, with lower values indicating better separation.

- **Graph 1:** Davies-Bouldin Index for Different Cluster Sizes
- The lowest DBI value was observed at **X clusters** (replace "X" with the optimal number of clusters identified). This indicates that **X clusters** provide the most well-separated and distinct customer segments.

---

3. Other Clustering Metrics

- **Inertia:**
  Inertia measures the within-cluster sum of squares, reflecting the compactness of the clusters. Lower inertia values indicate better clustering performance.
  - **Graph 2:** Inertia for Different Cluster Sizes
  - As shown in the graph, inertia decreases as the number of clusters increases, suggesting improved within-cluster cohesion. However, the optimal number of clusters is a balance between compactness (inertia) and separation (DBI).

---

4. Insights and Actionable Strategies

Based on the clustering results, the following distinct customer segments were identified:

1. **High-Spending, Frequent Customers:**
   - These customers make regular purchases and contribute significantly to revenue.
   - **Actionable Strategy:** Focus on personalized loyalty programs, exclusive offers, and early access to sales events to retain these high-value customers.
2. **Occasional Shoppers with Lower Spending:**

- Customers in this segment shop infrequently and tend to spend less per transaction.
- **Actionable Strategy:** Implement targeted promotions, seasonal discounts, and reminders to encourage repeat purchases and boost engagement.

3. **Infrequent Shoppers with Varied Preferences:**
   - These customers shop sporadically and exhibit diverse preferences.
   - **Actionable Strategy:** Use data-driven recommendations and tailored marketing campaigns to align with their preferences, improving conversion rates.