Customer Segmentation Report

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1. Overview

Customer segmentation was performed using **K-Means Clustering** on eCommerce transaction data. The goal was to group customers based on their purchasing behavior and profile attributes to derive actionable insights for business strategy.

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2. Number of Clusters Formed

Based on the **Elbow Method** and evaluation metrics, the optimal number of clusters selected was **4**.

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3. Clustering Methodology

Feature Engineering:

- **Total Spending:** Sum of all transactions per customer.
- **Number of Transactions:** Total purchases made by each customer.
- **Average Order Value:** Average spending per transaction.
- **Unique Products Purchased:** Number of distinct products bought.
- **Region Encoding:** Converted categorical region data into numerical format using one-hot encoding.

Clustering Algorithm:

- **K-Means Clustering** was used to segment customers.
- **Standardization** was applied to normalize data before clustering.
- **PCA Visualization** was used to project high-dimensional data into 2D space for visualization.

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4. Clustering Evaluation Metrics

4.1 Davies-Bouldin Index (DB Index)

- **Computed DB Index Value:** *{db_index}*
- A lower **DB Index** indicates better-defined clusters.

4.2 Within-Cluster Sum of Squares (WCSS)

- Used to determine the compactness of clusters.
- The **Elbow Method** graph indicated an optimal cluster count at **k=4**.

4.3 Cluster Visualization

- PCA was used to reduce dimensionality and visualize clusters.
- Customers in each cluster showed distinct purchasing patterns and spending behaviors.

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5. Key Findings from Clustering

1. **High-Value Customers**: One cluster contains customers with **high total spending** and frequent purchases.
2. **Moderate Buyers**: Another cluster consists of **mid-range spenders** with a balanced number of transactions.
3. **Occasional Buyers**: A third segment includes customers with **low purchase frequency** but higher order values.
4. **Low-Engagement Customers**: The final cluster represents customers with **minimal transactions and spending**.

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6. Business Recommendations

- **Targeted Marketing Campaigns:** Focus high-value promotions on **frequent buyers**.
- **Retention Strategies:** Encourage occasional buyers with **personalized discounts**.
- **Cross-Selling Opportunities:** Recommend products based on **previous purchase behavior**.
- **Re-Engagement Plans:** Identify inactive customers and offer **special incentives** to bring them back.

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7. Conclusion

The customer segmentation analysis provided valuable insights into distinct customer behaviors. These findings can be leveraged to improve customer engagement, optimize marketing strategies, and enhance overall business revenue.

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8. Next Steps

- Implement **A/B testing** for targeted campaigns based on cluster insights.
- Monitor **customer movement between clusters** over time.
- Apply **advanced machine learning techniques** (e.g., hierarchical clustering) for further refinement.
