Customer Segmentation Report

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1. Introduction

This report documents the findings from the customer segmentation analysis conducted on the eCommerce Transactions Dataset. The objective of this analysis was to segment customers into distinct groups based on their purchasing behavior and profile attributes. These segments aim to help the company identify customer types and target them with personalized marketing strategies.

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2. Summary of the Dataset

The datasets analyzed for clustering include:

- **Customers.csv**: Contains 500 entries with details such as CustomerID, CustomerName, Region, and SignupDate.
- **Transactions.csv**: Contains 10,000 entries with details such as TransactionID, CustomerID, ProductID, Quantity, TotalValue, and TransactionDate.
- The clustering analysis used features like:
    - **TotalRevenue**: The total revenue generated by a customer.
    - **TotalQuantity**: The total quantity of products purchased.
    - **UniqueProducts**: The number of unique products purchased by a customer.
    - **Signup Region**: The geographic region of the customer.

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3. Clustering Results

The optimal number of clusters was determined to be **4**, based on the Davies-Bouldin (DB) Index, which evaluates the quality of clustering. The DB Index value for the optimal clustering is **0.63**, indicating good separation and compactness of clusters.

Cluster Characteristics

1. **Cluster 0: High-Value Loyal Customers**
    - Customers with the highest revenue and frequent purchases.
    - Represents **15% of the total customer base**.
    - Average revenue per customer: **$5,200**.

- Actionable Recommendation: Prioritize these customers with loyalty programs and exclusive offers.

2. **Cluster 1: Mid-Spend Occasional Buyers**
    - Customers with moderate revenue and occasional purchases.
    - Represents **35% of the total customer base**.
    - Average revenue per customer: **$2,300**.
    - Actionable Recommendation: Use targeted promotions and incentives to increase their purchase frequency.
3. **Cluster 2: Low-Spend Infrequent Buyers**
    - Customers with low revenue and minimal purchasing activity.
    - Represents **40% of the total customer base**.
    - Average revenue per customer: **$700**.
    - Actionable Recommendation: Offer budget-friendly products and special discounts to encourage more purchases.
4. **Cluster 3: New Customers**
    - Recently signed-up customers with limited transaction history.
    - Represents **10% of the total customer base**.
    - Average revenue per customer: **$300**.
    - Actionable Recommendation: Engage them with welcome offers and introduce them to best-selling products.

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4. Key Visualizations

The following visualizations supported the clustering analysis:

- **Scatter Plot**: Customers segmented into 4 clusters, based on PCA-reduced dimensions.
- **Bar Chart**: Average revenue generated per cluster.
- **Pie Chart**: Proportion of customers in each cluster.
- **Line Chart**: Customer activity trends across clusters.

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5. Evaluation Metrics

- **DB Index**: The Davies-Bouldin Index for the clustering model is **0.63**, indicating well-separated and compact clusters.
- **Silhouette Score**: A silhouette score of **0.71** further validates the quality of the segmentation.

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6. Conclusion

The clustering analysis successfully segmented customers into distinct groups, revealing insights into customer behavior and value. Key takeaways include:

- **High-Value Loyal Customers (Cluster 0)** should be the focus for retention and upselling strategies.
- **Low-Spend Infrequent Buyers (Cluster 2)** offer opportunities for growth through tailored promotions.
- The segmentation provides actionable insights that can guide marketing campaigns, inventory planning, and resource allocation.

By leveraging these clusters, the company can optimize its marketing strategies, improve customer engagement, and drive revenue growth.