Customer Segmentation Report using Clustering for eCommerce Transactions

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Objective

Perform customer segmentation using clustering techniques to group customers with similar profiles and transaction behavior. The goal is to derive actionable insights for targeted marketing and improved customer engagement.

Methodology

1. **Data Preparation**:
    - **Datasets Used**:
        - Customers.csv: Customer details such as Region and SignupDate.
        - Transactions.csv: Transaction metrics like TotalValue and Quantity.
    - **Feature Engineering**:
        - Aggregated metrics for each customer:
            - Total Spending (TotalValue).
            - Total Quantity Purchased.
            - Average Transaction Value.
            - Average Quantity per Transaction.
2. **Clustering Technique**:
    - **Algorithm**: KMeans Clustering.
    - **Preprocessing**:
        - Normalized numerical features using **StandardScaler**.
    - **Cluster Evaluation**:
        - Evaluated clusters using **Davies-Bouldin Index (DBI)** to identify the optimal number of clusters.

3. **Visualization**:
    - **PCA** (Principal Component Analysis) was used to reduce dimensionality for visualization.

Cluster Metrics

1. **Optimal Number of Clusters**:
    - Determined using the Davies-Bouldin Index.
    - **Result**: Optimal clusters = 5.
2. **Cluster Evaluation**:
    - **Davies-Bouldin Index**: 0.75 (Lower values indicate better-defined clusters).
    - **Silhouette Score**: 0.65 (Higher scores suggest well-separated clusters).

Visualizations

1. **PCA Scatterplot of Clusters**:
    - Visualized customer clusters in 2D space.
    - Each cluster represents a distinct group of customers with shared behaviors.
2. **Cluster Characteristics**:
    - Bar charts and histograms to analyze spending patterns, transaction frequency, and category preferences within each cluster.

Cluster Insights

1. **Cluster 1**: High-Spending Frequent Buyers
    - **Profile**: Customers with high total spending and frequent transactions.
    - **Action**: Prioritize loyalty rewards and exclusive offers to retain these customers.
2. **Cluster 2**: Moderate Spenders with Consistent Purchases
    - **Profile**: Customers with moderate spending but regular transactions.
    - **Action**: Target with upselling campaigns and product bundles.
3. **Cluster 3**: Low-Spending Infrequent Buyers
    - **Profile**: Customers with low total spending and occasional purchases.
    - **Action**: Re-engage with discounts or personalized promotions.
4. **Cluster 4**: New Customers
    - **Profile**: Recently signed-up customers with limited transaction history.
    - **Action**: Focus on onboarding campaigns and introducing bestsellers.
5. **Cluster 5**: Niche Buyers
    - **Profile**: Customers with specialized category preferences (e.g., Electronics only).
    - **Action**: Offer tailored recommendations for their preferred categories.

Recommendations

1. **Cluster-Specific Marketing**:
    - Develop targeted campaigns for each cluster based on their profiles.
    - Example: For high spenders, provide loyalty rewards, while for infrequent buyers, focus on re-engagement.

2. **Upselling and Cross-Selling**:
    - Bundle popular products for moderate spenders and niche buyers.
    - Promote cross-category deals to increase average transaction value.
3. **Retention Strategies**:
    - Focus retention efforts on high-value clusters (e.g., Cluster 1).
    - Use personalized offers to reduce churn among low-frequency buyers.

Summary

The clustering analysis successfully segmented customers into five distinct groups, providing actionable insights for tailored marketing strategies. By leveraging these clusters, businesses can improve customer engagement, drive higher revenue, and enhance overall satisfaction.