**Unsupervised Learning:**

**Customer Segmentation**

**Business Use Case:**

By understanding customer behaviour, banks can target their marketing strategies more effectively, enhancing customer satisfaction and increasing revenue.

**Approach:**

● Algorithm:

K-Means Clustering

● Steps:

1. Data Preprocessing: Standardizing the data and selecting relevant features.

2. Clustering: Applying clustering algorithms to group customers based on similar transaction patterns.

3. Evaluation: Analysing the clusters using visualization techniques and interpreting the results

**Data Understanding:**

* Data Source: This dataset contains simulated financial transaction records for a fictional financial institution
* **Key Data Dictionary:**

1. Transaction ID: A unique identifier for each transaction (integer).
2. Date: A randomly generated date within the range of the last 5 years (date).
3. Customer ID: A randomly generated customer identifier ranging from 1 to 1000 (integer).
4. Amount: A randomly generated transaction amount between 1 and 10,000 with two decimal places (decimal).
5. Type: A randomly selected transaction type from a predefined list (credit, debit, or transfer) (string).
6. Description: A randomly generated sentence containing six words as the transaction description (string).

**Data Preparation:**

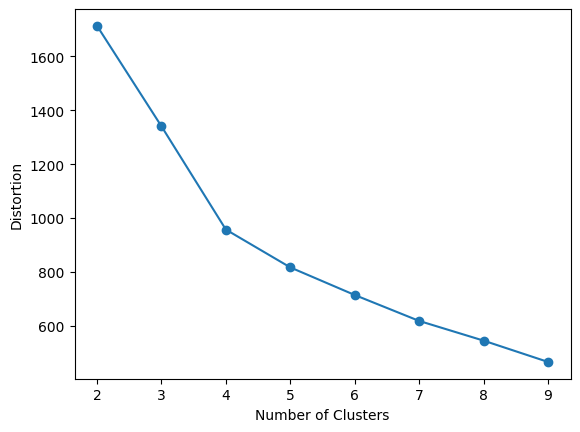
Packages: NumPy, Pandas, Matplotlib, Seaborn, Sklearn.

**Data Cleansing:**

There are no null values.

**Visualization:**

**Elbow Method**



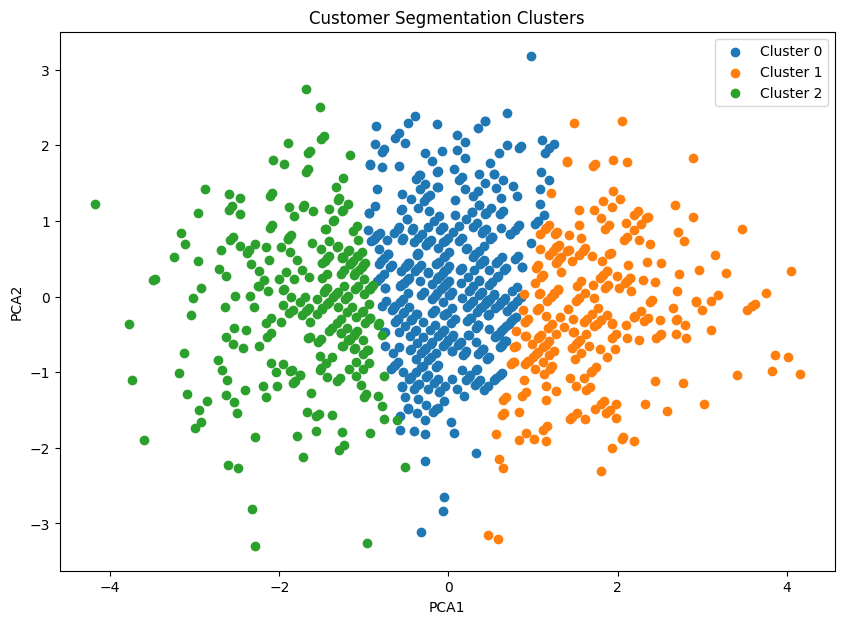
**Silhouette Score**

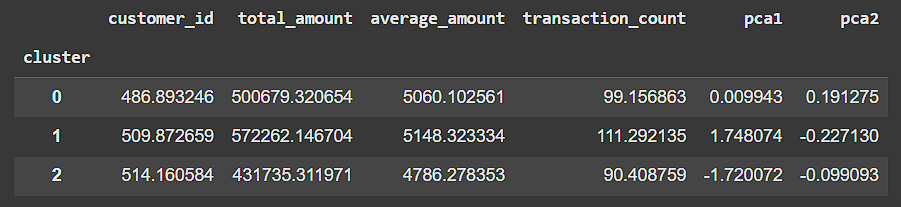
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**Davies-Bouldin Index**



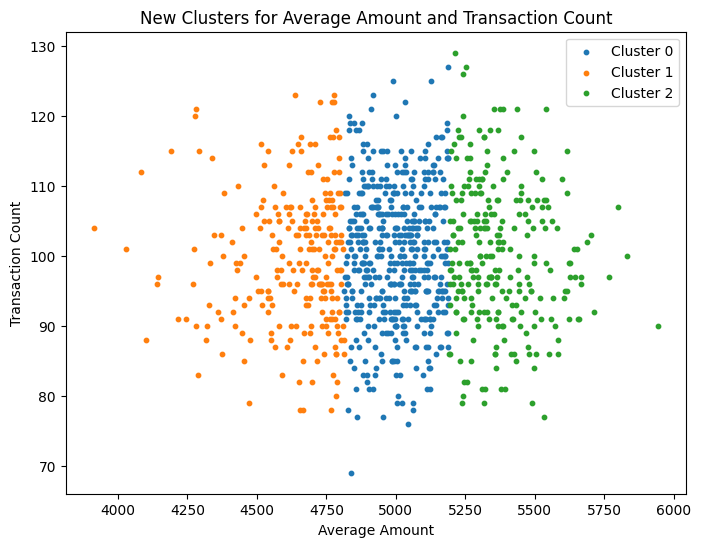
**Principal component analysis (PCA)**

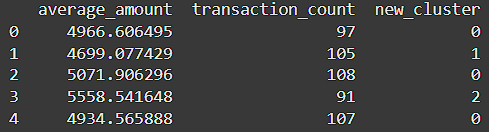


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**Model:**

**K-Means Clustering**



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**Interpreting the Clusters:**

**• Cluster 0 (Blue):**

**Customers in this cluster likely have a moderate transaction count and average spending amount.**

**Action: Offer standard banking services or loyalty programs to maintain engagement.**

**• Cluster 1 (Orange):**

**Customers have lower average amounts but similar transaction counts.**

**Action: Introduce small-scale investment options, savings plans, or basic rewards programs.**

**• Cluster 2 (Green):**

**Customers exhibit high average amounts and moderate transaction activity.**

**Action: Focus on premium products such as credit cards with high rewards, personalized financial planning, or investment options.**

**Recommendations for Targeted Marketing:**

* **High-value customers (Cluster 2)**: Tailor exclusive offers, such as wealth management or concierge services.
* **Moderate spenders (Cluster 0)**: Promote cashback offers or discounts to encourage additional spending.
* **Budget-conscious customers (Cluster 1)**: Suggest low-cost financial services or educational content to increase banking engagement.