

### **Task 3: Customer Segmentation / Clustering**

- **Objective:** The goal of this analysis was to perform customer segmentation using clustering techniques based on customer profile information and transaction data. The aim was to identify meaningful clusters of customers to aid business decisions and evaluate the quality of these clusters using the Davies-Bouldin (DB) Index.
- **Optimal Number of Clusters:** Based on the DB Index, the optimal number of clusters was 9, as it yielded the lowest DB Index value ( $\sim 1.1$ ).
- **Davies-Bouldin Index:** The DB Index values across different clusters were plotted, with values ranging between 1.10 and 1.50. The graph indicates that 9 clusters provide a balance between intra-cluster compactness and inter-cluster separation.
- **Cluster Visualization:** The PCA plot highlights clear separations between clusters, with centroids marked for each cluster. This visualization demonstrates the relative position of clusters in the reduced-dimensional space.
- **Conclusion:** The customer segmentation successfully grouped customers into 5 clusters based on their profiles and transaction behaviours. These clusters can be further analysed for targeted marketing strategies, product recommendations, or resource allocation. The Davies-Bouldin Index of 1.10 validates the quality of the clustering.