# ABC Bank Customer Segmentation: Cluster Analysis Report

## 📂 Background

ABC Bank is running a marketing campaign to promote credit cards to existing customers. The marketing team wants to understand the **natural segments** within the customer base using demographic and financial data. This unsupervised learning exercise uses **K-means clustering** to identify those segments.

## 📊 Dataset Summary

**Data Fields Used for Clustering:** - age - MonthlyIncome - MinBal (Minimum Balance) - MaxBal (Maximum Balance) - Age.with.Bank (Years with Bank)

**Excluded Fields:** - Customer id - City

## ⚖️ Methodology

1. Imported and cleaned the dataset.
2. Scaled numeric variables.
3. Applied **K-means clustering** with k = 3.
4. Validated optimal number of clusters using the **Elbow Method**.
5. Calculated cluster-wise summary statistics.
6. Visualized clusters using PCA.

## 🔢 Elbow Plot: Choosing Number of Clusters

The Within-Cluster Sum of Squares (WSS) plot clearly shows an “elbow” at **k = 3**, indicating the optimal number of clusters.

|  |
| --- |
| Elbow Plot |

Elbow Plot

## 👥 Cluster Summary Statistics

| Cluster | Age | Monthly Income | Min Balance | Max Balance | Years with Bank |
| --- | --- | --- | --- | --- | --- |
| **1** | 37.5 | 42,471 | 15,996 | 30,039 | 3.5 |
| **2** | 55.0 | 82,431 | 39,982 | 54,980 | 6.5 |
| **3** | 27.0 | 12,499 | 3,744 | 12,547 | 1.0 |

## 🔍 Cluster Interpretation

### 🟦 Cluster 1: Mid-income, Mid-age Customers

* Moderate income and balances
* Likely working professionals or small families
* ✅ Target for: **Standard credit card offers**, **loyalty programs**

### 🟨 Cluster 2: High-Value, Mature Customers

* Highest income and balances
* Long-standing relationship with bank
* ✅ Target for: **Premium cards**, **investment services**, **exclusive offers**

### ⬛ Cluster 3: Young, Low-Value Customers

* Low income and very low balances
* Short tenure
* ✅ Target for: **Entry-level cards**, **onboarding**, **credit education**

## 📊 Cluster Visualization

PCA-based visualization of customer segments:

|  |
| --- |
| Cluster Plot |

Cluster Plot

## 🌐 Recommendations

* Focus high-value promotions on **Cluster 2**.
* Use personalized loyalty strategies for **Cluster 1**.
* Build long-term relationships with **Cluster 3** via onboarding programs.

## 📃 Output Files

* Cleaned and labeled dataset: outputs/customer\_clusters.csv
* WSS plot: outputs/elbow\_plot.png
* Cluster plot: outputs/cluster\_plot.png

## 📊 Next Steps

* Deploy segmentation in a marketing dashboard.
* Monitor customer movement across clusters over time.
* Extend clustering using behavioral (transaction) data.

*Report prepared as part of the Cluster Analysis Assignment for ABC Bank.*