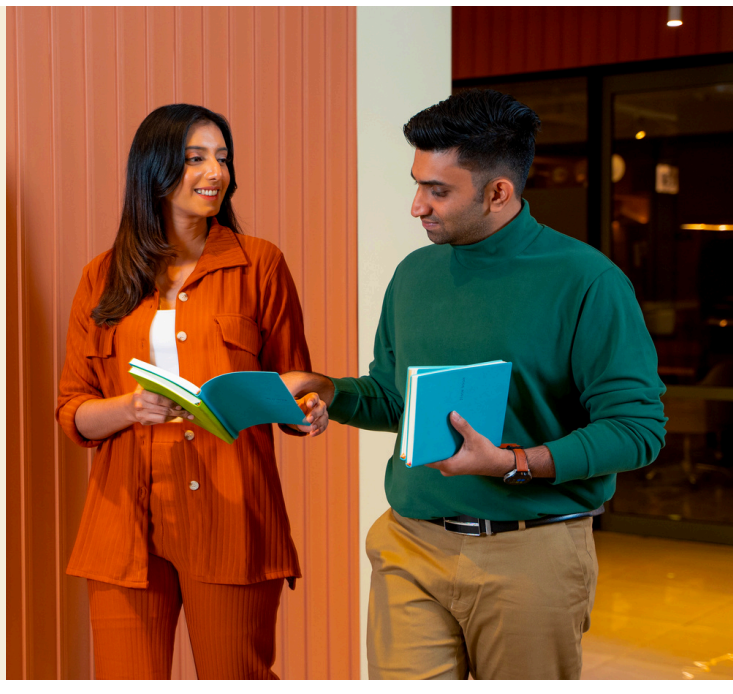
PREPARED BY: HAIDER ALI

CUSTOMER SEGMENTATION ANALYSIS



Introduction

The goal of this analysis is to group customers based on **Age, Annual Income, and Spending Score**. Understanding customer segments enables **personalized offers and targeted marketing campaigns**. This analysis uses the **Mall Customers Dataset** from Kaggle. The methodology, results, and actionable insights are presented below.

Data Overview

The dataset contains **200 customers** with the following features:

- **CustomerID** – Unique identifier
- **Gender** – Male or Female
- **Age** – Customer age in years
- **Annual Income (k$)** – Yearly income
- **Spending Score (1-100)** – Measure of purchasing behavior

For clustering, we focused on **Age, Annual Income, and Spending Score**, which best capture customer similarity for marketing insights.

Data Cleaning

Data cleaning ensures accurate and reliable analysis. The following steps were performed using **Pandas**, a Python library for data manipulation:

1. **Initial Inspection**
   - Viewed the first five rows to understand the structure and values of the dataset.
2. **Statistical Overview**
   - Examined summary statistics such as mean, standard deviation, minimum, and maximum values to identify unusual patterns.
3. **Data Types**
   - Checked the data types for each column and converted them where necessary.
4. **Removal of Irrelevant Columns**
   - Dropped the CustomerID column, as it does not contribute to clustering.
5. **Duplicates**
   - Checked for duplicate rows; none were found.
6. **Encoding Categorical Variables**
   - Converted the Gender column to numerical format: Male = 0, Female = 1, to make it usable for analysis.

These steps ensure that the dataset is **clean, standardized, and ready for clustering**.

Methodology

We applied **KMeans clustering** to group customers into **five segments** based on similarity in Age, Income, and Spending Score.

- The optimal number of clusters was determined using the **Elbow Method**.
- Each cluster represents a group of customers with similar demographic and behavioral patterns.
- Descriptive segment names were assigned for clarity: “Young High-Spenders,” “Average Young,” etc.

Clustering helps businesses identify **distinct customer groups** and target them with tailored marketing strategies.

Cluster Analysis and Insights

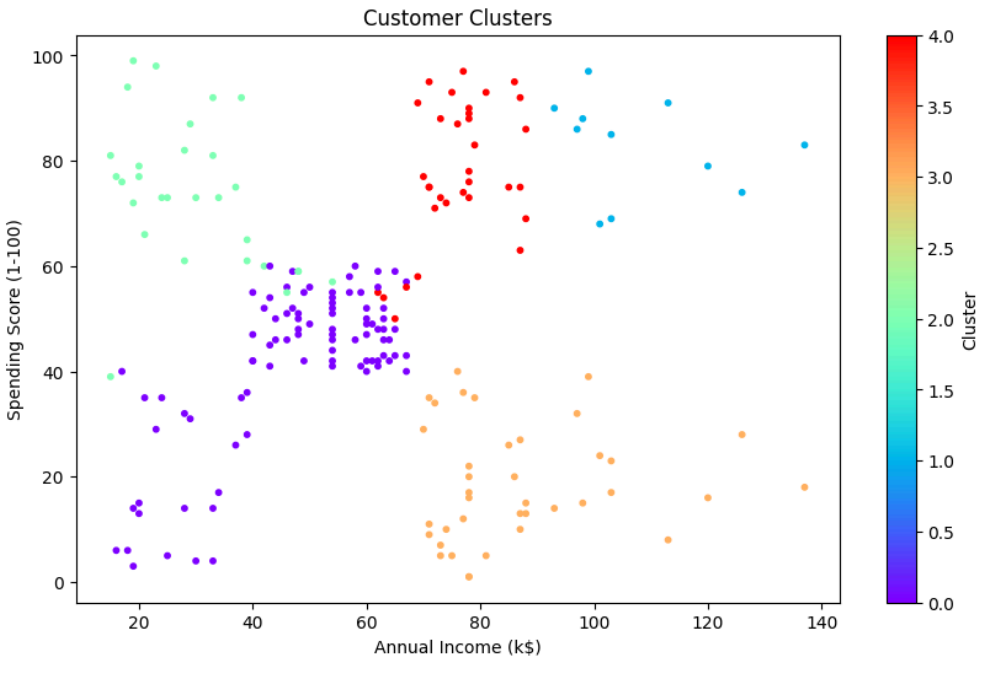
Segment Name	Number of Customers	Avg Age	Avg Annual Income (k$)	Avg Spending Score	Recommendations
Older Moderate-Spenders	89	46.2	47.7	41.8	Focus on engagement campaigns and moderate upselling.
High-Income High-Spenders	11	32.5	108.2	82.7	Target with premium offers and personalized campaigns.
Young Low-Income High-Spenders	29	24.7	29.6	73.7	Offer loyalty programs and promotional deals to increase retention.
High-Income Low-Spenders	38	40.4	87.0	18.6	Encourage engagement with personalized campaigns to boost spending.
Moderate-Income High-Spenders	33	31.8	76.1	77.8	Apply targeted campaigns for upselling and engagement.

Insights:

- The **High-Income High-Spenders** segment is small but highly valuable — prioritize premium offers.
- **Young Low-Income High-Spenders** have high spending relative to income — loyalty programs can retain them.
- **High-Income Low-Spenders** have potential to increase purchases through targeted engagement.
- **Older Moderate-Spenders** are the largest group; moderate campaigns and upselling are effective.
- **Moderate-Income High-Spenders** respond well to standard personalized campaigns.

Visualization

To visually represent the clusters:



> The plot highlights **distinct customer groups**, helping businesses **visualize which segments are high-value, low-spenders, or mixed**, guiding marketing strategy.

Conclusion

This analysis identifies **five actionable customer segments**:

- **Prioritize high-value segments** for upselling and premium offerings.
- **Use loyalty programs and promotions** to engage low-income or moderate spenders.
- **Tailor campaigns** for mixed or moderate segments to maximize engagement.

Leveraging these insights allows businesses to **optimize marketing spend, improve customer engagement, and increase ROI**.