Introduction:

This project focuses on **customer segmentation** for Sterling E-commerce, aiming to group customers into distinct segments based on behavior, demographics, and transaction history. These insights will support personalized marketing strategies and improve customer engagement.

Background:

Customer segmentation is essential for understanding and addressing diverse customer preferences. Sterling E-commerce handles vast customer data, and analyzing this information allows the company to cater to specific needs, enhance the customer experience, and optimize sales strategies.

Data Collection and Processing:

The dataset includes customer attributes such as demographics, purchasing behavior, and geographic location. Key preprocessing steps involved handling missing values through forward filling and encoding categorical variables using label encoding to make the data compatible with machine learning algorithms.

Exploratory Data Analysis (EDA):

Key insights from the EDA included:

- Distribution of customer categories (e.g., "Health & Sports," "Men's Fashion")
- Frequency of orders across various cities and counties
- Visualization of order volume over time, highlighting peak sales periods.

Visuals such as bar charts and histograms were generated to show customer distribution across categories and order frequency.

Methodology:

Several machine learning techniques were employed to perform customer segmentation, primarily using **K-Means clustering**. This method grouped customers based on features like purchase behavior, location, and order totals. To determine the optimal number of clusters, the **Elbow Method** was used, supplemented by the **silhouette score**.

Results:

The analysis identified three primary customer segments:

1. High-spending loyal customers.
2. Moderate spenders with occasional purchases.
3. Low-frequency, low-spending customers.

Each group exhibited distinct buying patterns and preferences, providing a clear basis for targeted marketing strategies.

Recommendations:

1. **Loyalty Programs**: Offer rewards to high-spending customers to maintain loyalty.
2. **Targeted Promotions**: Tailor promotions for moderate spenders to encourage repeat purchases.
3. **Acquisition Strategies**: Focus on attracting low-spending customers through personalized campaigns.

Future Work:

Further research could involve incorporating real-time customer behavior, expanding the dataset to include additional attributes like social media interactions, and applying advanced techniques like **deep learning** to enhance segmentation precision.