**Abstract**

**Customer Segmentation using Unsupervised Learning**

In today’s competitive business environment, understanding customer behavior is crucial for effective marketing strategies. This project leverages **unsupervised learning techniques**, particularly **K-Means Clustering**, to segment customers based on their **age**, **annual income**, and **spending score**. The dataset used is the **Mall Customer Segmentation Dataset** sourced from Kaggle.

The project involves data preprocessing, feature scaling, determination of optimal clusters using the **Elbow Method**, and application of the K-Means algorithm. Each cluster represents a distinct customer group with similar behavioral traits. Further analysis through **cluster profiling**, **visualizations**, and **principal component analysis (PCA)** provides deeper insights into customer types.

The outcome of this segmentation can help businesses **personalize marketing**, **allocate resources efficiently**, and **improve customer satisfaction**. This study demonstrates the practical impact of unsupervised learning in real-world retail analytics.