

# Optimal Number of Clusters Documentation

## 1. Introduction

Clustering analysis groups customers into similar segments based on key characteristics. Selecting the right number of clusters is crucial for meaningful segmentation. This analysis uses elbow method (Within-Cluster Sum of Squares - WCSS).

## 2. Elbow Method Analysis

The Elbow Method helps identify the optimal number of clusters by plotting WCSS against different cluster numbers. The "elbow point" indicates the best choice.

Python Code:

```
import matplotlib.pyplot as plt

from sklearn.cluster import KMeans

#Finding the optimal number of clusters

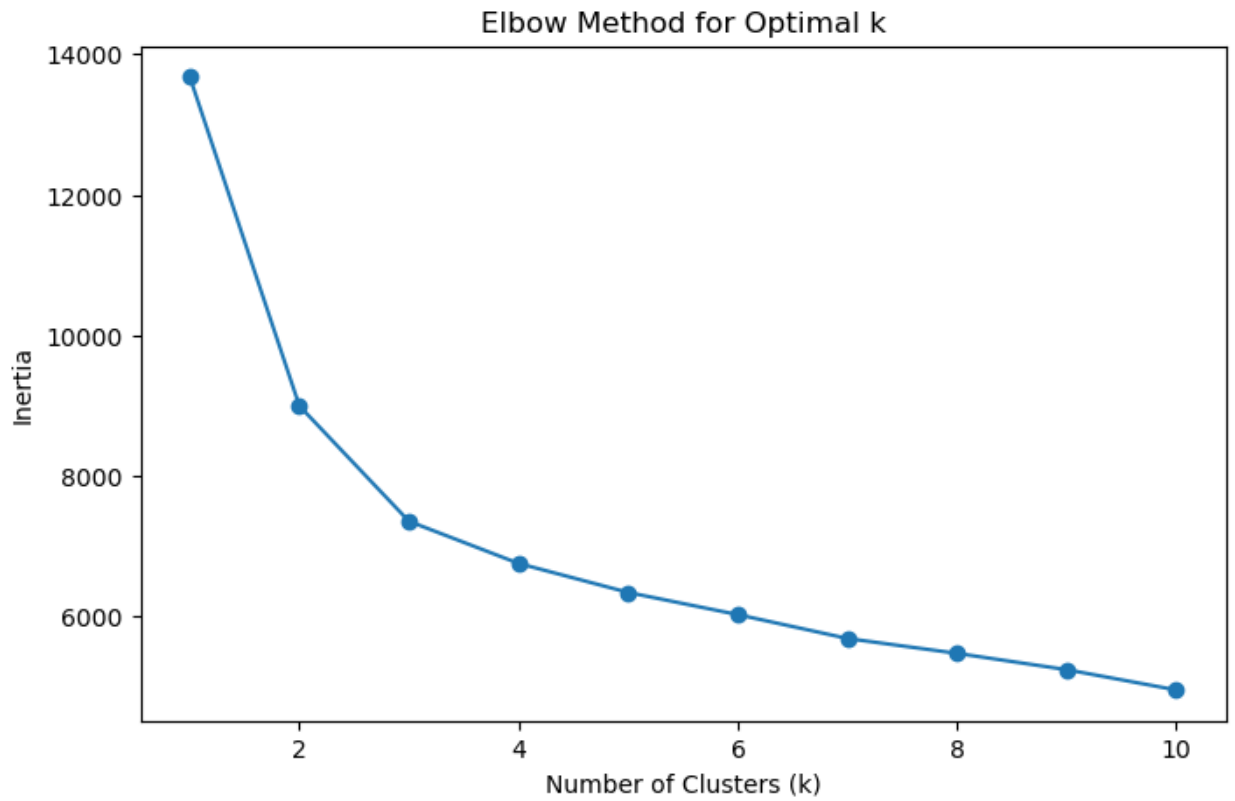
inertia = [] k_values = range(1, 11)

for k in k_values: kmeans = KMeans(n_clusters=k, random_state=42, n_init=10)
kmeans.fit(X_train) inertia.append(kmeans.inertia_)

#Plotting the Elbow Curve

plt.figure(figsize=(8, 5)) plt.plot(k_values, inertia, marker='o', linestyle='-')
plt.xlabel('Number of Clusters (k)') plt.ylabel('Inertia') plt.title('Elbow Method for
Optimal k') plt.show()
```

**Result**



### 3. Conclusion

Based on the Elbow Method, the optimal number of clusters is X. This ensures meaningful customer segmentation, helping improve targeted marketing and customer retention strategies.