









```

# K-Means Clustering for Customer Segmentation

import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from sklearn.cluster import KMeans
from sklearn.preprocessing import StandardScaler

# Sample data (replace with your actual dataset)
data = {
    'CustomerID': range(1, 21),
    'Annual Income (k$)': [15, 16, 17, 18, 19, 20, 35, 36, 37, 38, 70, 71, 72, 73, 74, 90, 91, 92, 93, 94],
    'Spending Score (1-100)': [39, 81, 6, 77, 40, 76, 6, 94, 3, 72, 14, 99, 15, 77, 13, 73, 10, 88, 12, 79]
}
df = pd.DataFrame(data)

# Select features and scale
X = df[['Annual Income (k$)', 'Spending Score (1-100)']]
scaler = StandardScaler()
X_scaled = scaler.fit_transform(X)

# Apply KMeans
kmeans = KMeans(n_clusters=3, random_state=42)
df['Cluster'] = kmeans.fit_predict(X_scaled)

# Plotting
plt.figure(figsize=(8, 6))
colors = ['red', 'green', 'blue']
for i in range(3):
    cluster_data = df[df['Cluster'] == i]
    plt.scatter(cluster_data['Annual Income (k$)'], cluster_data['Spending Score (1-100)'],
                c=colors[i], label=f'Cluster {i}', s=100)

plt.scatter(scaler.inverse_transform(kmeans.cluster_centers_)[:, 0],
            scaler.inverse_transform(kmeans.cluster_centers_)[:, 1],
            s=300, c='yellow', marker='*', label='Centroids')

plt.title('Customer Segmentation')
plt.xlabel('Annual Income (k$)')
plt.ylabel('Spending Score (1-100)')
plt.legend()
plt.grid(True)
plt.tight_layout()
plt.show()

```

## E-COMMERCE CONSUMER ANALYSIS

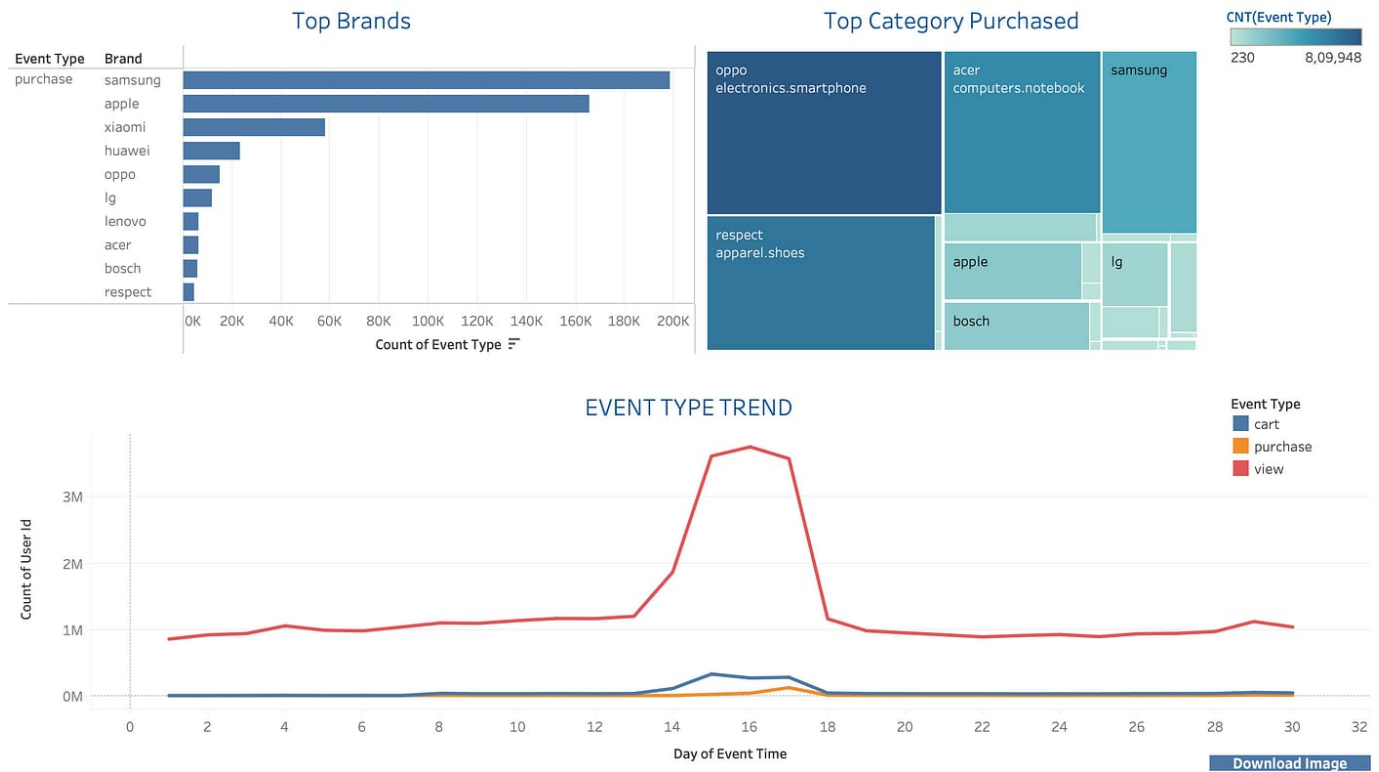


Figure: E-Commerce Consumer Analysis showing top brands, categories, and event trends.