Assessment Report

on

"Customer Segmentation in E-commerce"

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BACHELOR OF TECHNOLOGY DEGREE

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in

CSE(AIML)

By

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INTRODUCTION

Customer segmentation is a technique used to divide customers into smaller groups based on similar characteristics or behavior. In this project, we used customer data from an e-commerce platform to understand how different customers behave when shopping online.

We used the RFM model, which looks at:

- **Recency – How recently a customer made a purchase**
- **Frequency – How often they made purchases**
- **Monetary – How much money they spent**

Based on these three factors, we applied a machine learning algorithm called KMeans Clustering to group customers into four different segments. Each segment represents a type of customer, like frequent buyers, high spenders, or inactive users.

This kind of segmentation helps businesses create better marketing strategies, send personalized offers, and improve customer satisfaction.

METHODOLOGY

APPROACH TO SOLVE THIS PROBLEM

1. **Data Collection**
   We start with customer transaction data from an e-commerce platform, which includes details like Invoice No., Date, Customer ID, Quantity, Unit Price, etc.
2. **Data Cleaning**
   We remove missing or incorrect data (like missing customer IDs) and calculate the total amount spent per transaction.
3. **Feature Engineering (RFM Analysis)**
   We calculate three important values for each customer:
   - **Recency**: Days since the last purchase
   - **Frequency**: Total number of purchases
   - **Monetary**: Total money spent
     This helps in understanding customer behavior.
4. **Data Normalization**
   Since the values of Recency, Frequency, and Monetary are on different scales, we scale them using **StandardScaler** so that all features contribute equally during clustering.
5. **Choosing Number of Clusters**
   We use the **Elbow Method** to find the optimal number of customer groups (clusters). It shows us the best value of "k" for **KMeans Clustering**.

6. **KMeans Clustering**

   We apply the **KMeans** algorithm to group customers into clusters based on their RFM values.

7. **Cluster Analysis**

   We analyze each cluster to understand the types of customers—like loyal customers, big spenders, or one-time buyers.

CODE:

```
# Step 1: Upload the dataset
from google.colab import files
uploaded = files.upload()

# Step 2: Import required libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
from sklearn.preprocessing import StandardScaler
from sklearn.cluster import KMeans
import datetime as dt

# Step 3: Load and preview the dataset
filename = list(uploaded.keys())[0]
df = pd.read_csv(filename)

# Step 4: Clean and prepare the data
df = df[pd.notnull(df['CustomerID'])]  # Remove missing CustomerIDs
```

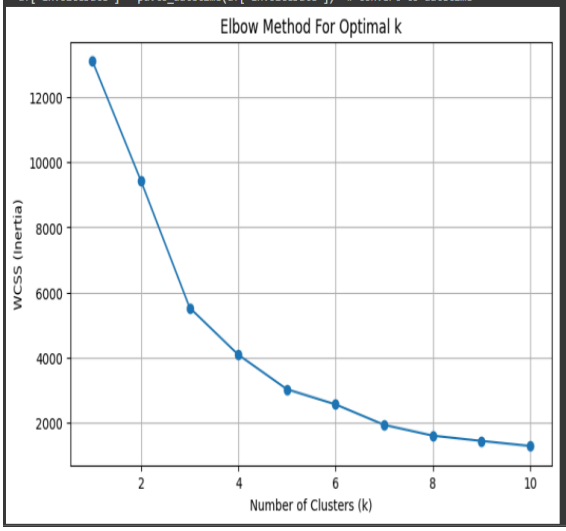
```
df['InvoiceDate'] = pd.to_datetime(df['InvoiceDate'])  # Convert to datetime
df['TotalPrice'] = df['Quantity'] * df['UnitPrice']  # Total amount spent

# Step 5: Create RFM (Recency, Frequency, Monetary) table
reference_date = df['InvoiceDate'].max() + pd.Timedelta(days=1)
rfm = df.groupby('CustomerID').agg({
    'InvoiceDate': lambda x: (reference_date - x.max()).days,  # Recency
    'InvoiceNo': 'nunique',  # Frequency
    'TotalPrice': 'sum'  # Monetary
})
rfm.columns = ['Recency', 'Frequency', 'Monetary']

# Step 6: Normalize the RFM data
scaler = StandardScaler()
rfm_scaled = scaler.fit_transform(rfm)

# Step 7: Find optimal clusters using Elbow Method
wcss = []
for k in range(1, 11):
    kmeans = KMeans(n_clusters=k, random_state=42)
    kmeans.fit(rfm_scaled)
```

```
    wcss.append(kmeans.inertia_)

# Plot Elbow Curve
plt.figure(figsize=(8, 5))
plt.plot(range(1, 11), wcss, marker='o')
plt.xlabel('Number of Clusters (k)')
plt.ylabel('WCSS (Inertia)')
plt.title('Elbow Method For Optimal k')
plt.grid(True)
plt.show()

# Step 8: Apply KMeans Clustering (choose k=4)
kmeans = KMeans(n_clusters=4, random_state=42)
rfm['Cluster'] = kmeans.fit_predict(rfm_scaled)

# Step 9: Analyze Clusters
print("Customers per Cluster:")
print(rfm['Cluster'].value_counts())

print("\nCluster Profiling (Mean RFM values):")
print(rfm.groupby('Cluster').mean())
```

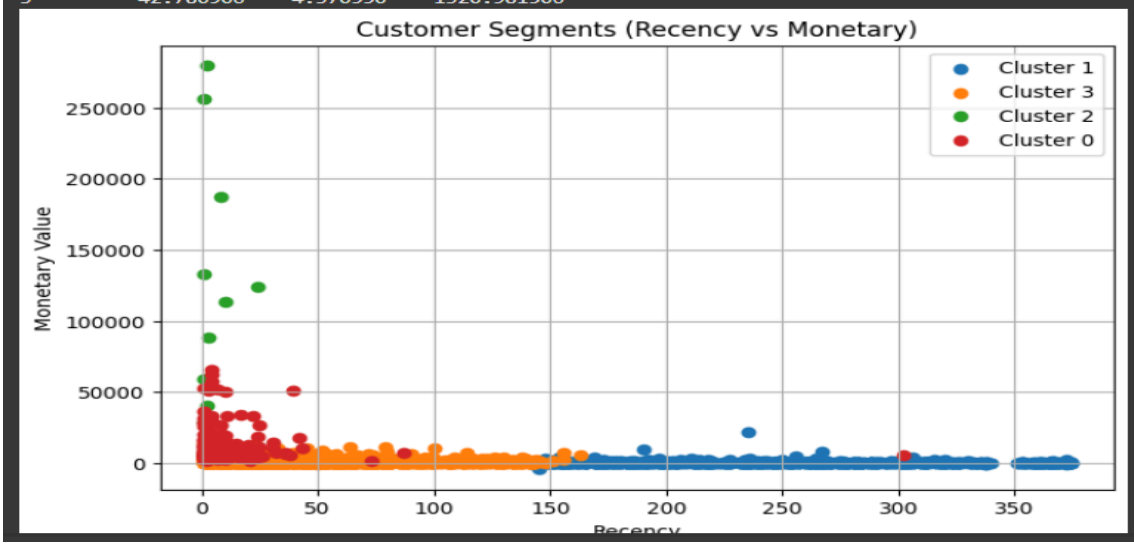
```
# Step 10: Visualize Clusters (Recency vs Monetary)
plt.figure(figsize=(8, 5))
for cluster in rfm['Cluster'].unique():
    subset = rfm[rfm['Cluster'] == cluster]
    plt.scatter(subset['Recency'], subset['Monetary'], label=f'Cluster {cluster}')
plt.xlabel('Recency')
plt.ylabel('Monetary Value')
plt.title('Customer Segments (Recency vs Monetary)')
plt.legend()
plt.grid(True)
plt.show()
```

OUTPUT:

```
Choose Files 9. Custome...mmerce.csv
• 9. Customer Segmentation in E-commerce.csv(text/csv) - 44496850 bytes, last modified: 4/18/2025 - 100% done
Saving 9. Customer Segmentation in E-commerce.csv to 9. Customer Segmentation in E-commerce.csv
<ipython-input-1-095c9a85ae64>:19: UserWarning: Could not infer format, so each element will be parsed individually, falling back to `dateutil`. To ensure parsing is consistent and as-expected, please specify a format.
  df['InvoiceDate'] = pd.to_datetime(df['InvoiceDate'])  # Convert to datetime
```




```
Customers per Cluster:
Cluster
3    3090
1    1077
0     194
2      11
Name: count, dtype: int64

Cluster Profiling (Mean RFM values):
            Recency   Frequency       Monetary
Cluster
0         10.752577   28.510309   12168.264691
1        248.927577    1.805942     455.110716
2          5.090909  109.909091  124312.306364
3         42.780906    4.370550    1320.981506
```



REFERENCE:

GOOGLE

KAGGLE

CHATGPT

Online Retail Dataset from UCI