RFM_Customer_Segmentation

January 30, 2025

[6]:

```
import pandas as pd
from datetime import datetime as dt, timedelta
import numpy as np
import seaborn as sns
import matplotlib.pyplot as plt
import plotly.express as px
import plotly.graph_objects as go
import plotly.colors
```

[9]:

```
df = pd.read_csv('online_retail.csv')
```

[10]:

```
df.head()
```

[10]:

```
  InvoiceNo StockCode                          Description  Quantity  \
0    536365    85123A   WHITE HANGING HEART T-LIGHT HOLDER         6
1    536365     71053                  WHITE METAL LANTERN         6
2    536365    84406B       CREAM CUPID HEARTS COAT HANGER         8
3    536365    84029G  KNITTED UNION FLAG HOT WATER BOTTLE         6
4    536365    84029E       RED WOOLLY HOTTIE WHITE HEART.         6

           InvoiceDate  UnitPrice  CustomerID         Country
0  2010-12-01 08:26:00       2.55     17850.0  United Kingdom
1  2010-12-01 08:26:00       3.39     17850.0  United Kingdom
2  2010-12-01 08:26:00       2.75     17850.0  United Kingdom
3  2010-12-01 08:26:00       3.39     17850.0  United Kingdom
4  2010-12-01 08:26:00       3.39     17850.0  United Kingdom
```

[13]:

```
df.dtypes
```

[13]:

```
InvoiceNo       object
StockCode       object
Description     object
Quantity         int64
InvoiceDate     object
UnitPrice      float64
CustomerID     float64
Country         object
dtype: object
```

[20]:

```
## Finiding each customers RFM Values

# Recency

# Define the reference date as a Timestamp
day = pd.to_datetime('2012-01-01')

# Convert InvoiceDate column to datetime
df['InvoiceDate'] = pd.to_datetime(df['InvoiceDate'])

# Calculate Recency
recency = df.groupby("CustomerID").agg({"InvoiceDate": lambda x: (day - x.
  ↪max()).days})

# Rename the column for clarity
recency.rename(columns={"InvoiceDate": "Recency"}, inplace=True)

print(recency.head(3))
```

```
            Recency
CustomerID
12346.0         347
12347.0          24
12348.0          97
```

[22]:

```
# Frequency

freq=df.drop_duplicates(subset="InvoiceNo").
  ↪groupby(["CustomerID"])[["InvoiceNo"]].count()
freq.head()
```

[22]:

```
            InvoiceNo
CustomerID
12346.0             2
12347.0             7
12348.0             4
12349.0             1
12350.0             1
```

[24]:

```
#  Monetary Value

df["total"]=df["UnitPrice"]*df["Quantity"]
money = df.groupby(["CustomerID"])[["total"]].sum()
money.head()
```

[24]:

```
              total
CustomerID
12346.0        0.00
```

```
12347.0     4310.00
12348.0     1797.24
12349.0     1757.55
12350.0      334.40
```

[29]:

```
RFM = pd.concat([recency,freq,money],axis=1)
recency.columns=["Recency"]
freq.columns=["Frequency"]
money.columns=["Monetary"]
```

[30]:

```
RFM
```

[30]:

```
            Recency  Frequency  Monetary
CustomerID
12346.0         347          2      0.00
12347.0          24          7   4310.00
12348.0          97          4   1797.24
12349.0          40          1   1757.55
12350.0         332          1    334.40
…             …        …       …
18280.0         299          1    180.60
18281.0         202          1     80.82
18282.0          29          3    176.60
18283.0          25         16   2094.88
18287.0          64          3   1837.28

[4372 rows x 3 columns]
```

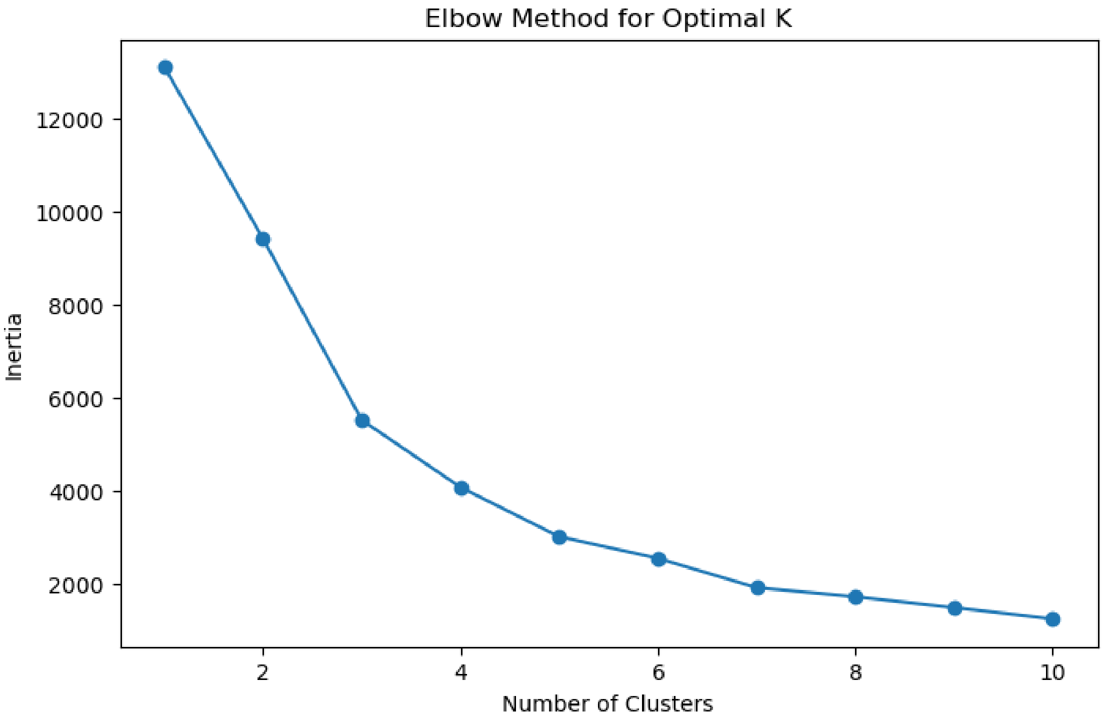
[31]:

```
## Standarize the dataset to form a common scale to help the machine learning␣
 ↪model

from sklearn.preprocessing import StandardScaler

scaler=StandardScaler()
scaled=scaler.fit_transform(RFM)
```

[35]:

```
import numpy as np
import matplotlib.pyplot as plt
from sklearn.cluster import KMeans

# Assuming `scaled` is your scaled dataset
inertia = []
for i in np.arange(1, 11):
    kmeans = KMeans(n_clusters=i, random_state=42)
    kmeans.fit(scaled)
    inertia.append(kmeans.inertia_)
```

```
# Plot the elbow curve
plt.figure(figsize=(8, 5))
plt.plot(range(1, 11), inertia, marker="o")  # Correct marker style
plt.xlabel("Number of Clusters")
plt.ylabel("Inertia")
plt.title("Elbow Method for Optimal K")
plt.show()


# since the elbow is between 2 and 4 I would asssumen number of cluster is 3
```



```
[42]: kmeans = KMeans(n_clusters=3)
      kmeans.fit(scaled)
      RFM["Clusters"]=(kmeans.labels_ +1)

      RFM
```

```
[42]:             Recency  Frequency  Monetary  Clusters
      CustomerID
      12346.0         347          2      0.00         2
      12347.0          24          7   4310.00         1
      12348.0          97          4   1797.24         1
      12349.0          40          1   1757.55         1
```

```
12350.0          332           1    334.40         2
…              …        …       …       …
18280.0          299           1    180.60         2
18281.0          202           1     80.82         2
18282.0           29           3    176.60         1
18283.0           25          16   2094.88         1
18287.0           64           3   1837.28         1

[4372 rows x 4 columns]
```

[45]:

```python
group = RFM.groupby("Clusters")[["Recency", "Frequency", "Monetary"]].mean()
print(group)
```

```
             Recency  Frequency      Monetary
Clusters
1          61.593084   5.548626   1795.309282
2         267.719964   1.852755    460.644066
3          27.346154  83.346154  75966.387308
```

[46]:

```python
def func(row):
    if row["Clusters"] == 1:
        return "Avg Cx"
    elif row["Clusters"] == 3:
        return "Whales Cx"
    else:
        return "Lapsed Cx"
```

[55]:

```python
RFM["Condition"] = RFM.apply(func,axis=1)
RFM
```

[55]:

```
            Recency  Frequency  Monetary  Clusters  Condition
CustomerID
12346.0          347           2      0.00         2  Lapsed Cx
12347.0           24           7   4310.00         1     Avg Cx
12348.0           97           4   1797.24         1     Avg Cx
12349.0           40           1   1757.55         1     Avg Cx
12350.0          332           1    334.40         2  Lapsed Cx
…              …        …       …       …        …
18280.0          299           1    180.60         2  Lapsed Cx
18281.0          202           1     80.82         2  Lapsed Cx
18282.0           29           3    176.60         1     Avg Cx
18283.0           25          16   2094.88         1     Avg Cx
18287.0           64           3   1837.28         1     Avg Cx

[4372 rows x 5 columns]
```

[57]:

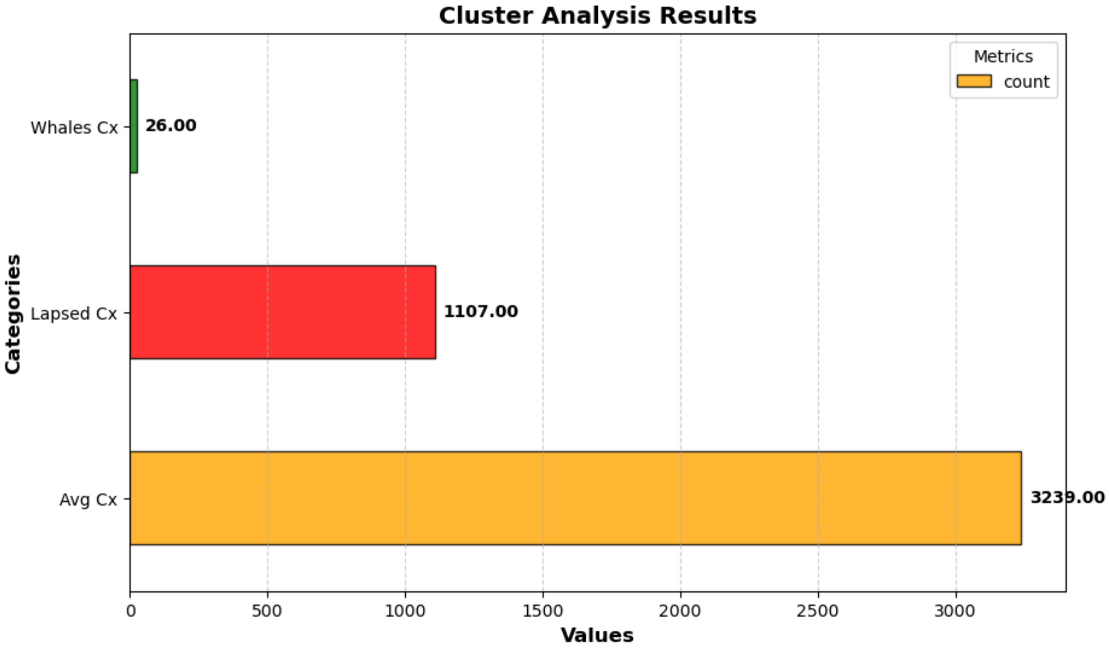
```python
result = RFM["Condition"].value_counts()
result
```

[57]:

```
Condition
Avg Cx        3239
Lapsed Cx     1107
Whales Cx       26
Name: count, dtype: int64
```

[60]:

```python
import matplotlib.pyplot as plt

# Set figure size
plt.figure(figsize=(10, 6))

# Plot horizontal bar chart with custom colors
ax = result.plot(kind='barh', color=["orange", "red", "green"],␣
 ↪edgecolor='black', alpha=0.8)

# Add labels to each bar
for bars in ax.containers:
    ax.bar_label(bars, fmt="%.2f", padding=5, fontsize=10, fontweight='bold')

# Add grid lines for better readability
plt.grid(axis='x', linestyle='--', alpha=0.6)

# Set labels and title
plt.xlabel("Values", fontsize=12, fontweight='bold')
plt.ylabel("Categories", fontsize=12, fontweight='bold')
plt.title("Cluster Analysis Results", fontsize=14, fontweight='bold')

# Add a legend (if multiple columns exist in `result`)
plt.legend(title="Metrics", fontsize=10)

# Display the plot
plt.show()
```


Cluster Analysis Results
Metrics
count
Whales Cx
26.00
Lapsed Cx
1107.00
Avg Cx
3239.00
Categories
0
500
1000
1500
2000
2500
3000
Values

[ ]: