Online Retail Customer Segmentation

Topics Covered

- Data import
- Data cleaning and wrangling
- EDA
- Preparing data attributes for modeling
- Building ML model
- Conclusion and future work

Goal

- ❑ Perform Cohort Analysis on Online Retail Data
- ❑ Conduct RFM Analysis Based on Online Retail Data
- ❑ Build Customer Segments Using K-Means Clustering Model
- ❑ Introduce the observations and results from this project to the Online Retail marketing department and collaborate in order to apply these insights to marketing strategies.
- ❑ GitHub link to the EDA and ML notebooks and utility functions can be found here.

Online Retail Data

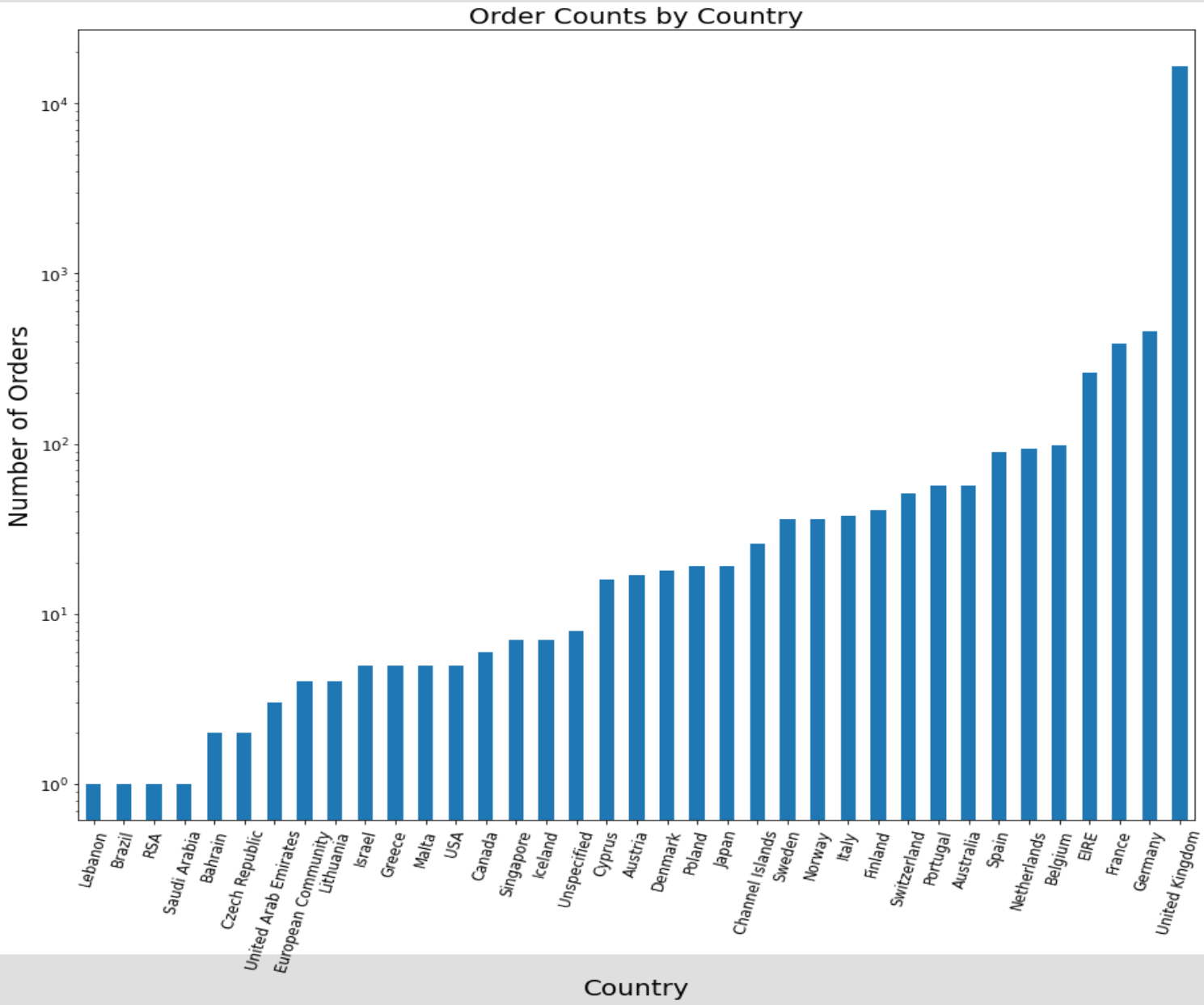
- Downloaded from Kaggel
- Contains all the transactions made from 2010-12-01 to 2011-12-09
- There were originally 541,909 rows and 8 columns in the data
- Each row was associated with one product in an order

Data Field

- **InvoiceNo**: Invoice number. Nominal. A 6-digit integral number uniquely assigned to each transaction. If the InvoiceNo starts with the letter 'C', it indicates a cancellation.
- **StockCode**: Product code. Nominal. A 5-digit integral number uniquely assigned to each distinct product.
- **Description**: Product (item) name. Nominal.
- **Quantity**: The quantities of each product (item) per transaction. Numeric.
- **InvoiceDate**: Invoice date and time. Numeric. The day and time when a transaction was generated.
- **UnitPrice**: Unit price. Numeric.
- **CustomerID**: Customer number. Nominal. A 5-digit integral number uniquely assigned to each customer.
- **Country**: Country name. Nominal. The name of the country where a customer resides.

Data Cleaning

- ✓ *Removed 135,080 rows missing Customer ID*
- ✓ *Removed 8,905 rows with negative Quantity*
- ✓ *Removed 40 rows with UnitPrice 0*
- ✓ *Dropped Description column*



EDA

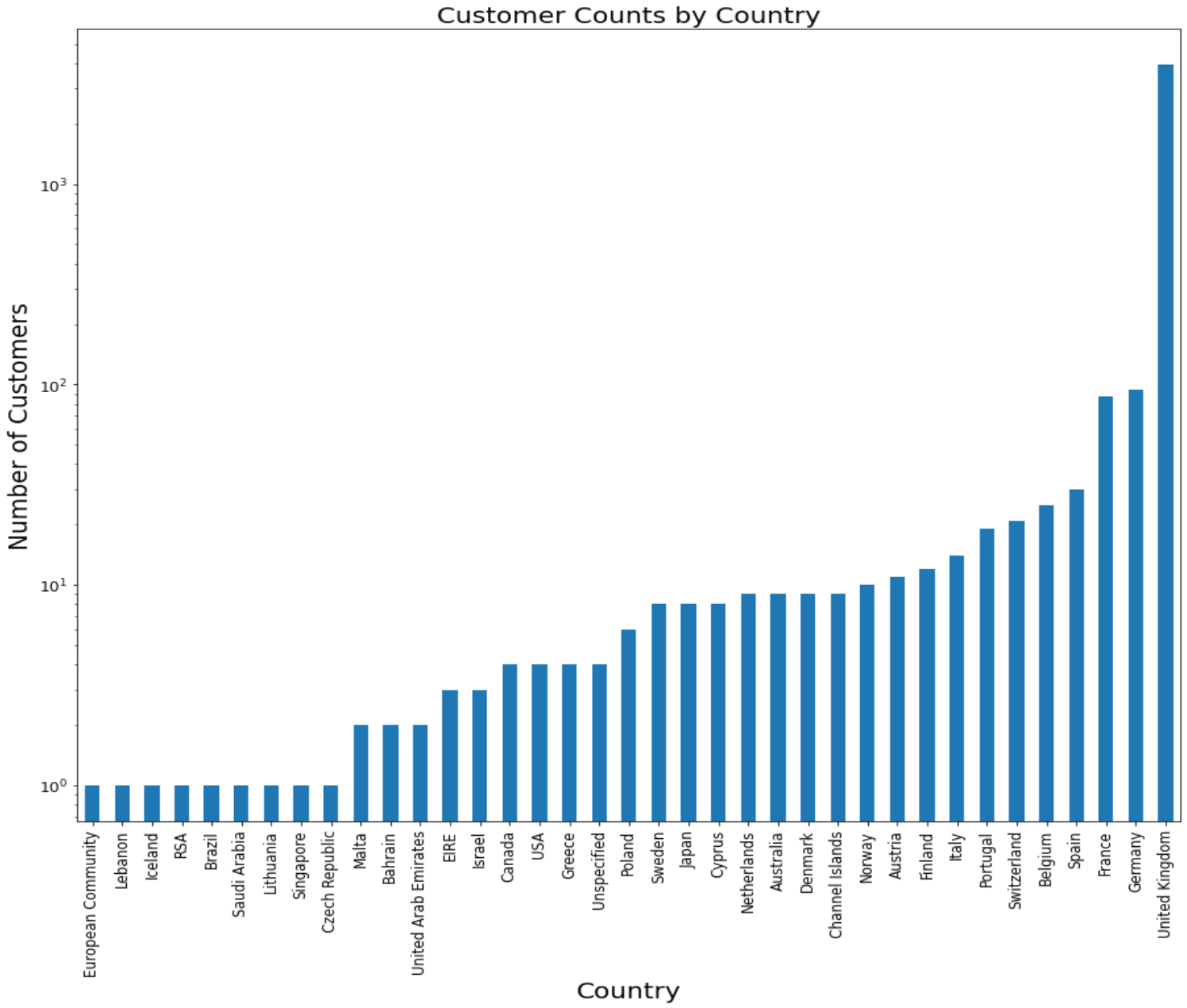
Top five countries with most order counts :

- United kingdom : 16,646
- Germany : 457
- France: 389
- Eire: 260
- Belgium: 98

EDA

Top five countries with most customer counts :

- United kingdom : 3920
- Germany : 94
- France: 87
- Spain: 30
- Belgium: 25



The customers with the top 5 most orders in the UK

Customer ID	12748	17841	13089	14606	15311
Number of Orders	209	124	97	93	91

The UK customers with the top 5 highest total spending amounts

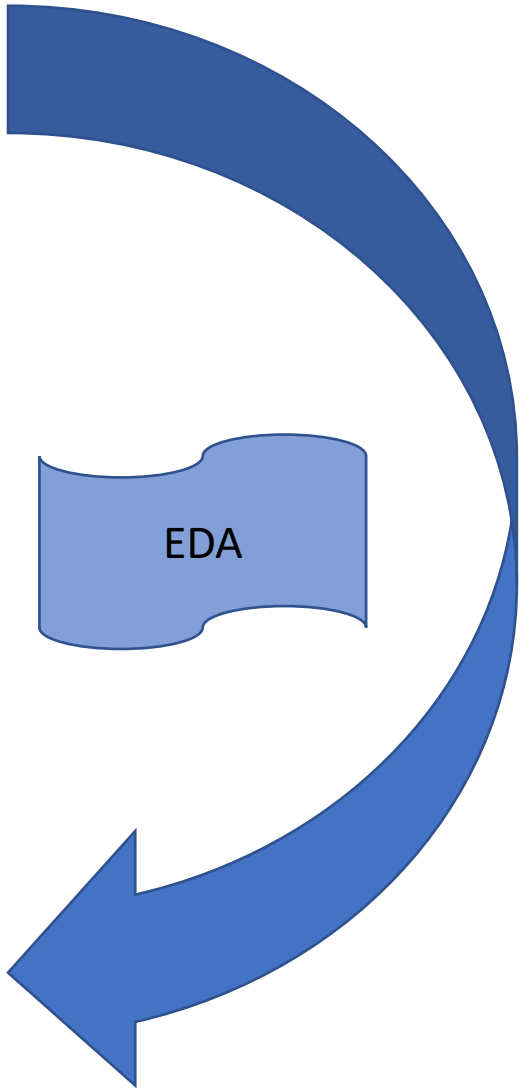
Customer ID	18102	17450	16446	17511	16029
Total Spending Amount	$259,657	$194,550	$168,472	$91,062	$81,024

The top 5 dates with the greatest number of orders in the UK

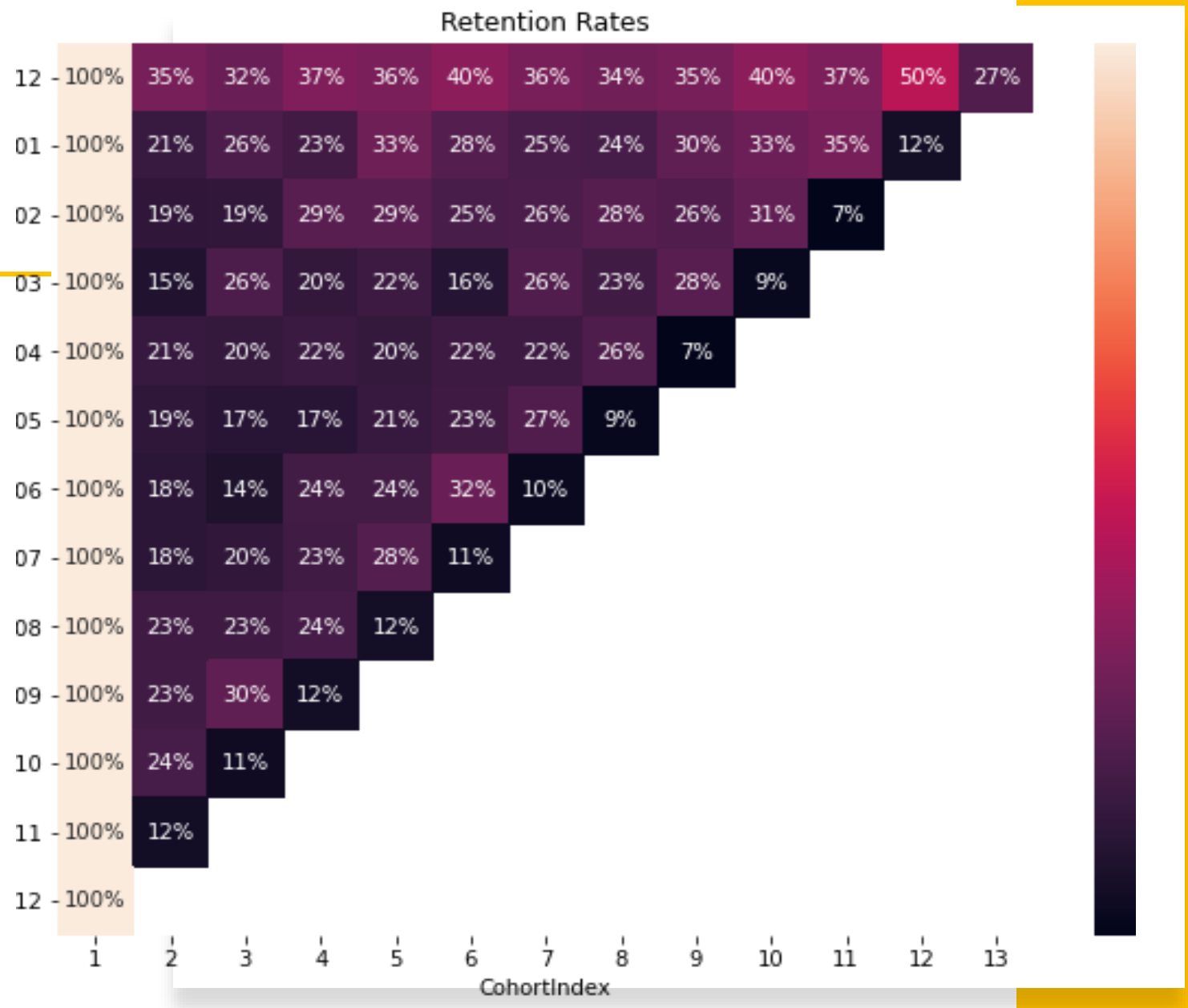
Date	2010-12-02	2011-12-22	2011-11-23	2101-12-01	2011-12-29
Total Number of Orders	135	117	116	115	115

The top 5 days with the greatest transaction amounts in the UK

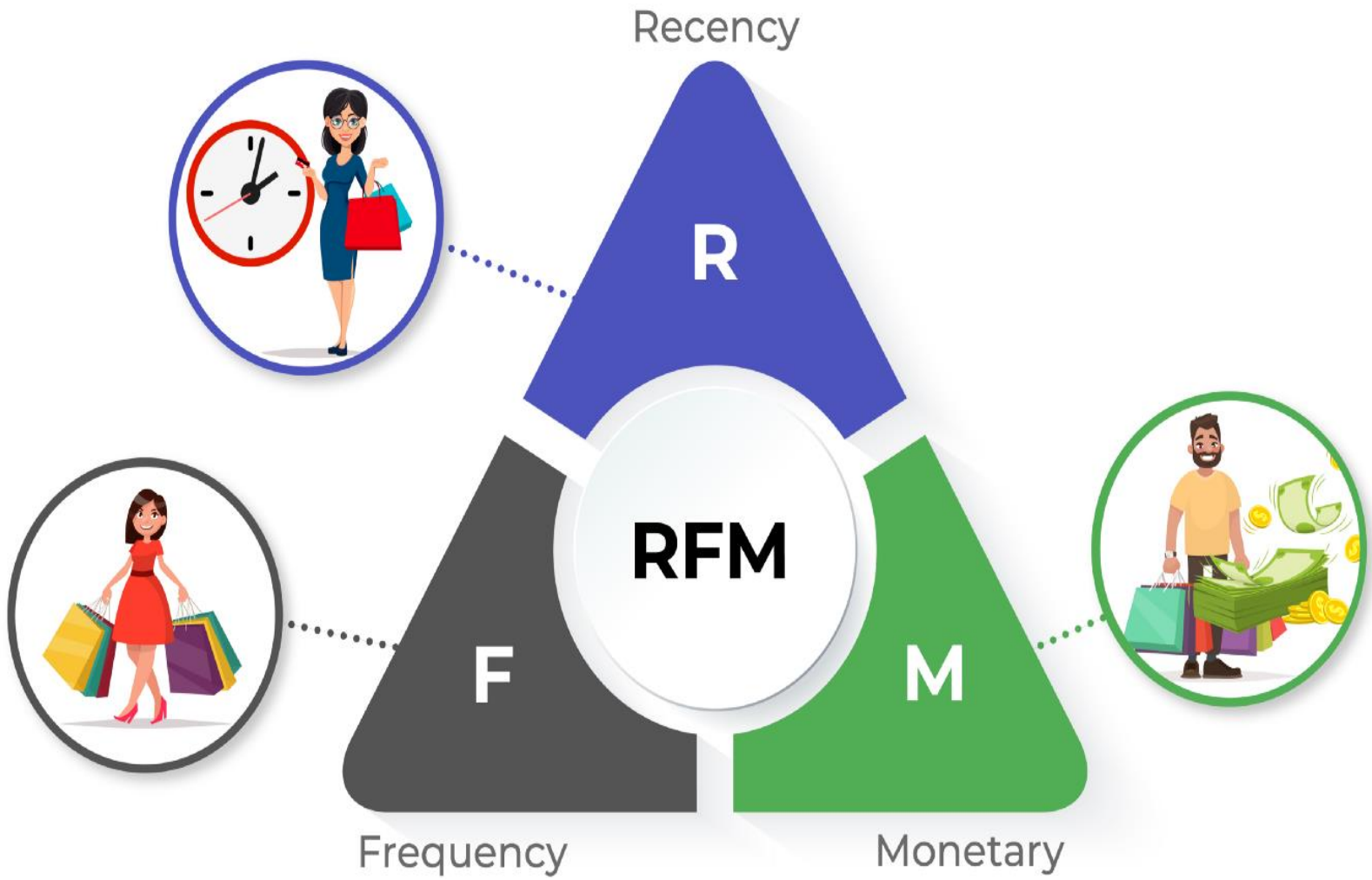
Date	2011-12-09	2011-09-20	2011-01-18	2101-09-15	2011-10-03
Total Amount	$179,562	$100,475	$84,038	$67,891	$61,917



UK Customer Retention Rates



RFM Customer Segmentation



Examples of RFM Segmentation and RFM Scores

CostomerID	Recency	Frequency	Monetary Value	Recency Score	Frequency Score	Monetary Value Score	RFM segment	RFM Score
12346	326	1	$77,183	1	1	4	114	6
12747	3	11	$4,196	4	4	4	444	12
12748	1	211	$34,345	4	4	4	444	12
12749	4	5	$4,090	4	3	4	434	11
12820	4	4	$942	4	3	3	433	10

Based on RFM segmentation, the top 10 largest segments are:

RFM Segment	444	111	112	211	333	344	433	233	212	311
Size	423	396	210	187	187	167	159	139	137	136

The bottom 10 smallest segments are:

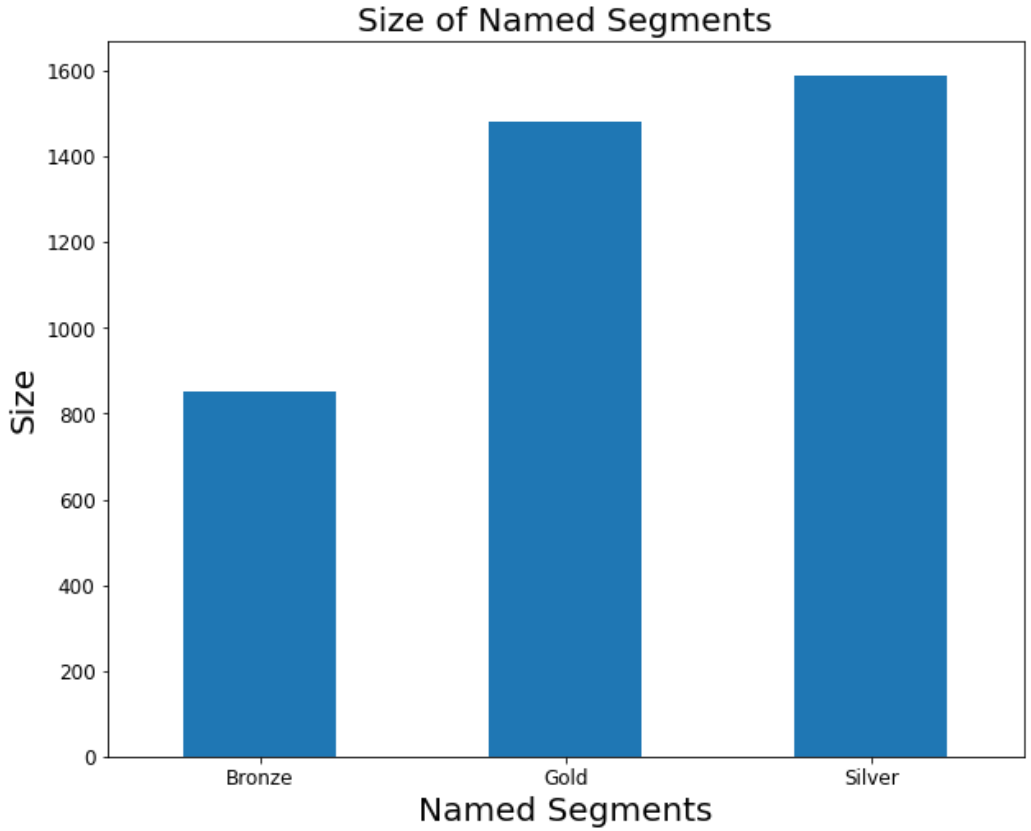
RFM Segment	141	242	414	441	314	142	442	413	143	424
Size	1	1	1	1	2	2	3	3	4	4

Summary Metrics of RFM Segmentation

RFM Score	Count	Recency Mean	Frequency Mean	Monetary Value Mean
3	396	265.5	1.0	158.6
4	454	184.7	1.1	280.7
5	443	110.5	1.3	363.6
6	407	90.3	1.7	704.1
7	374	76.6	2.3	698.8
8	366	58.7	3.0	1126.1
9	409	45.8	4.0	1401.8
10	347	30.0	5.2	2337.6
11	301	21.1	8.0	3476.3
12	423	7.7	15.8	8469.8

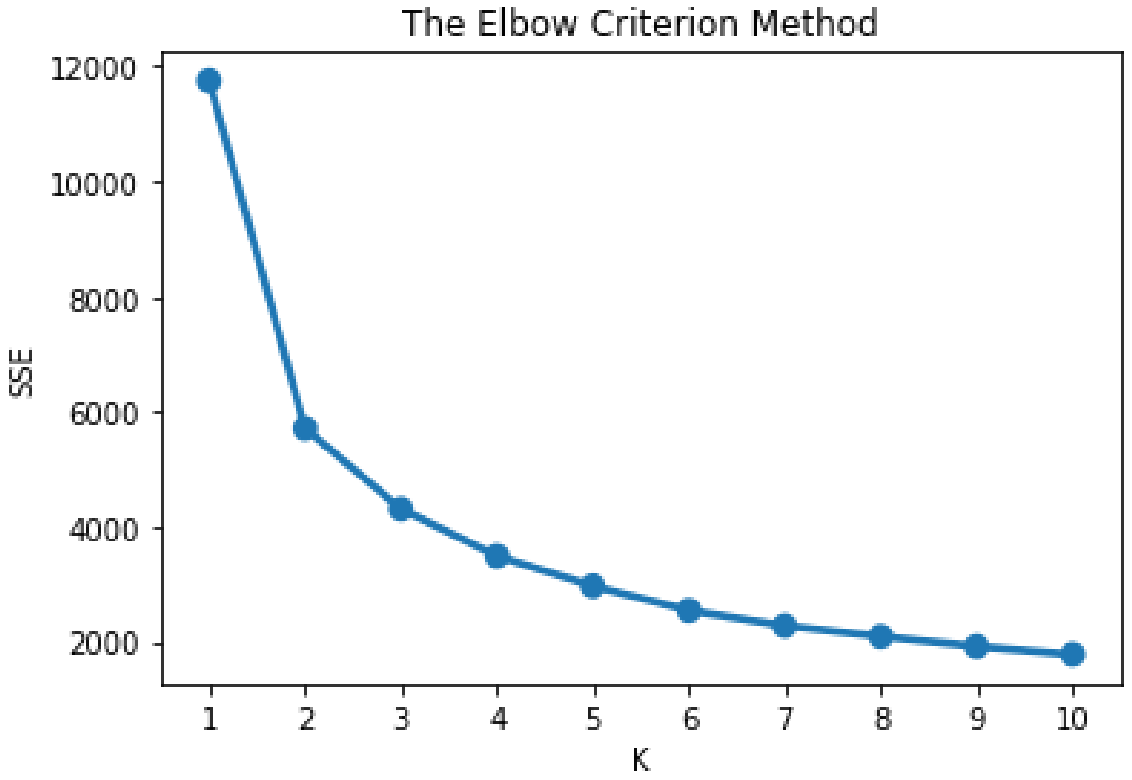
Named Customer Segments

Based on customers' RFM Scores, we also group customers into named segments:
Gold (RFM Score > = 9), Silver (9>= RFM Score >= 5), and Bronze (RFM Score <= 4).



Summary Metrics for Named Segments

Named Segment	Count	Recency Mean	Frequency Mean	Monetary Value Mean
Gold	1480	26.2	8.5	$4,063
Silver	1590	85.4	2.0	$705
Bronze	850	222.4	1.1	$223



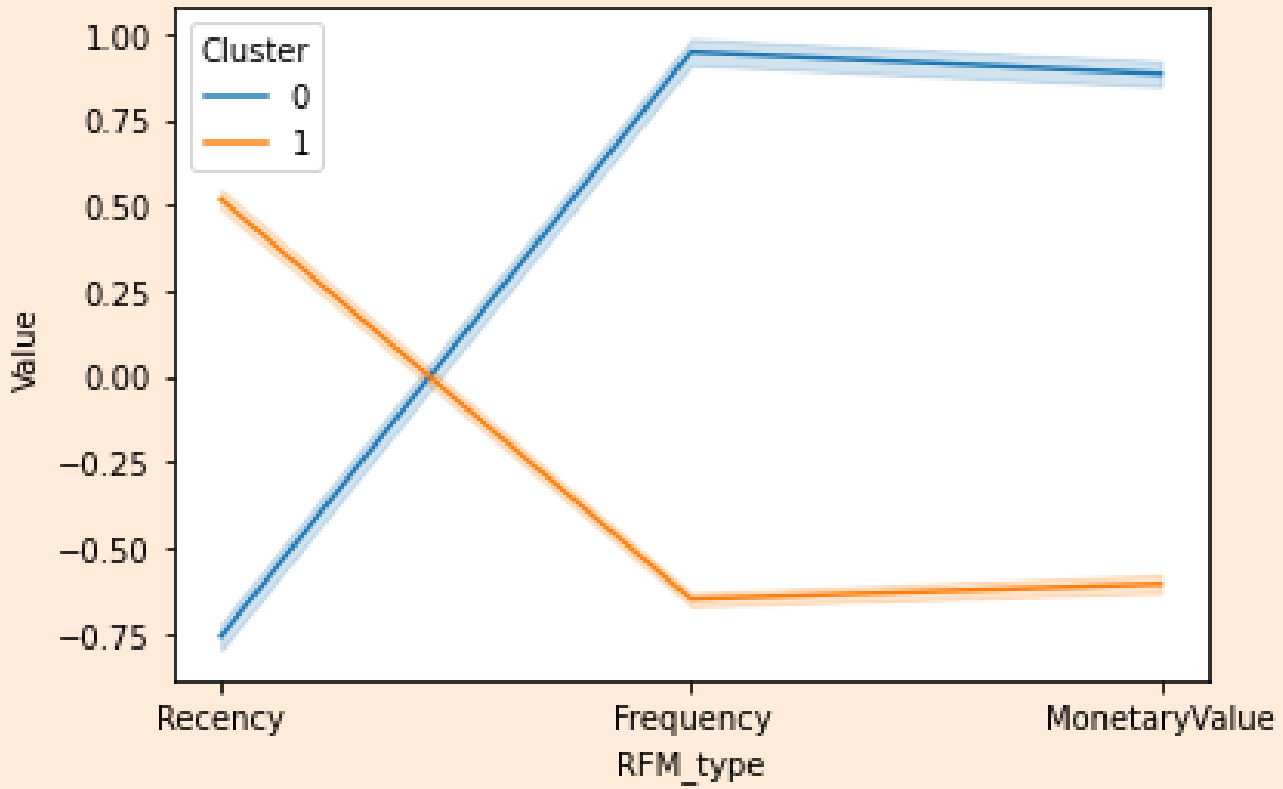
Machine Learning Modeling

- K-Means Clustering Model
- Used the elbow criterion method to choose number of clusters
- The best: K=2

The Summary Metrics of K-Means Clusters

Cluster	Count	Recency Mean	Frequency Mean	Monetary Value Mean
0	1592	28.7	8.1	$3,957
1	2328	136.5	1.6	$440

The Plot of Standardized RFM



The average Recency, Frequency and Monetary Value of customers in cluster 0 are much better than those of customers in cluster 1.

Conclusion

- Target Silver segment
  - Largest group + most potential
  - Ex: offer deals on next purchase before a certain date, bundle discounts
- Maintain Gold segment
  - Best customers + most profitable
  - Ex: implement a point system with exclusive benefits to reward continued customer involvement

Future Work

- Distinguish between recency, frequency, and monetary value in terms of impact on overall RFM score (to better understand customer behavior within each segment)
- Pinpoint the products that have been purchased most frequently and most recently