Capstone Project

Online Retail Customer Segmentation

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Problem Statement:

In this project, your task is to identify major customer segments on a transnational data set which contains all the transactions occurring between 01/12/2010 and 09/12/2011 for a UK-based and registered non-store online retail.The company mainly sells unique all-occasion gifts. Many customers of the company are wholesalers.

Key Steps:

- Defining the problem statement
- Data Cleaning
- EDA and data visualization
- Data preprocessing
- Feature selection
- Preparing Dataset for model
- Applying model
- Model validation and selection

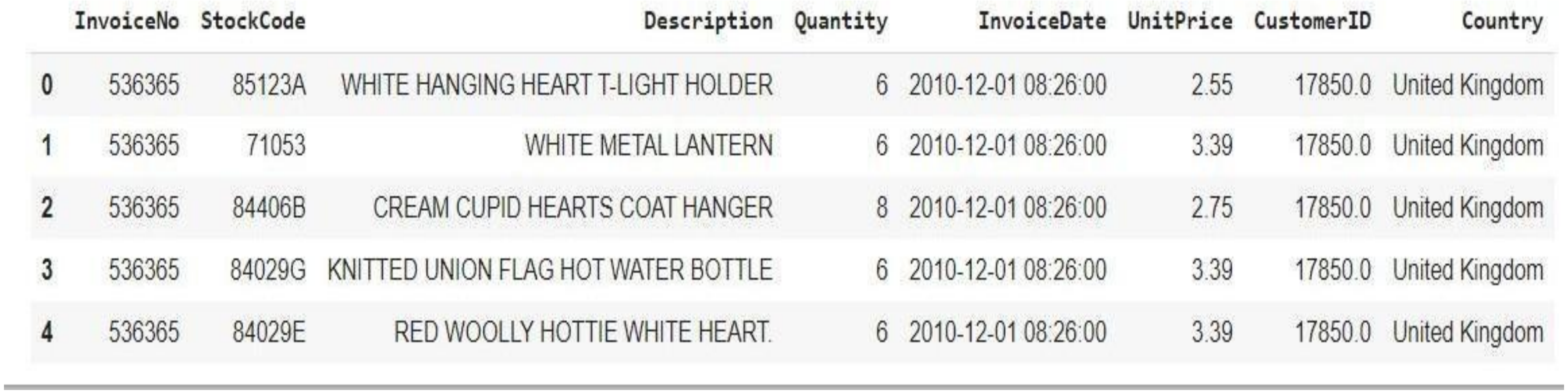
Why is analytics useful for Customer segmentation ?

- To know Recency of customers.
- To know Frequency of customers.
- To know Monetary Value of customers.

Dataset :

Rows : 541909

Columns : 8



	InvoiceNo	StockCode	Description	Quantity	InvoiceDate	UnitPrice	CustomerID	Country
0	536365	85123A	WHITE HANGING HEART T-LIGHT HOLDER	6	2010-12-01 08:26:00	2.55	17850.0	United Kingdom
1	536365	71053	WHITE METAL LANTERN	6	2010-12-01 08:26:00	3.39	17850.0	United Kingdom
2	536365	84406B	CREAM CUPID HEARTS COAT HANGER	8	2010-12-01 08:26:00	2.75	17850.0	United Kingdom
3	536365	84029G	KNITTED UNION FLAG HOT WATER BOTTLE	6	2010-12-01 08:26:00	3.39	17850.0	United Kingdom
4	536365	84029E	RED WOOLLY HOTTIE WHITE HEART.	6	2010-12-01 08:26:00	3.39	17850.0	United Kingdom

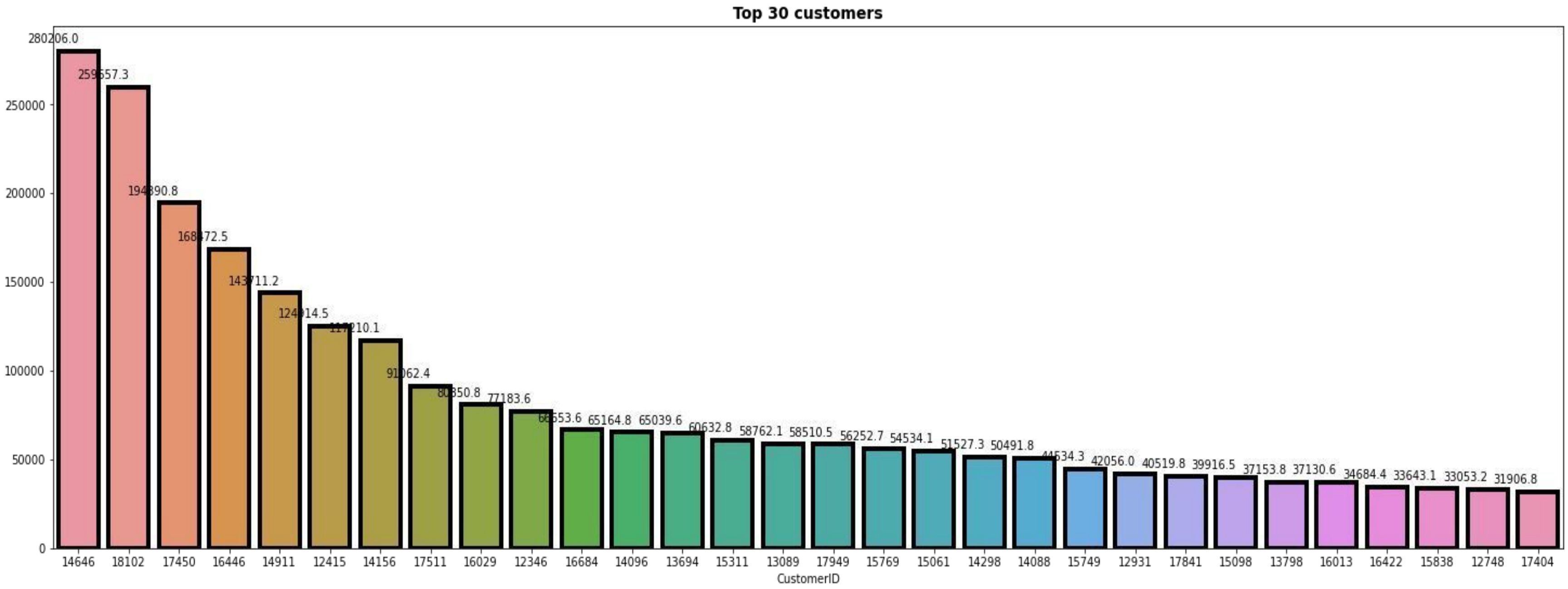
Variable Names:

- InvoiceNo: Invoice number. Nominal, a 6-digit integral number uniquely assigned to each transaction. If this code starts with letter 'c', it indicates a cancellation.
- StockCode: Product (item) 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 each transaction was generated.
- UnitPrice: Unit price. Numeric, Product price per unit in sterling.
- CustomerID: Customer number. Nominal, a 5-digit integral number uniquely assigned to each customer.
- Country: Country name. Nominal, the name of the country where each customer resides.

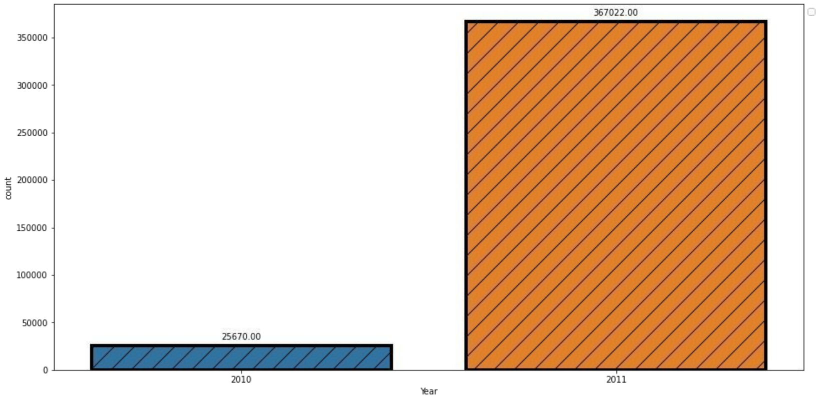
Exploratory Data Analysis:

EDA is used to analyze what the data can tell us before the modeling or by applying any set of instructions/code.

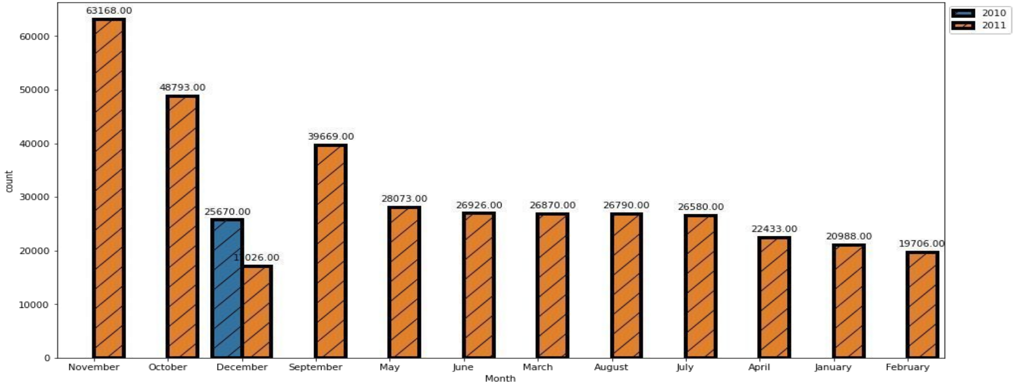
Top 30 customers:



Periodical purchasing stats:

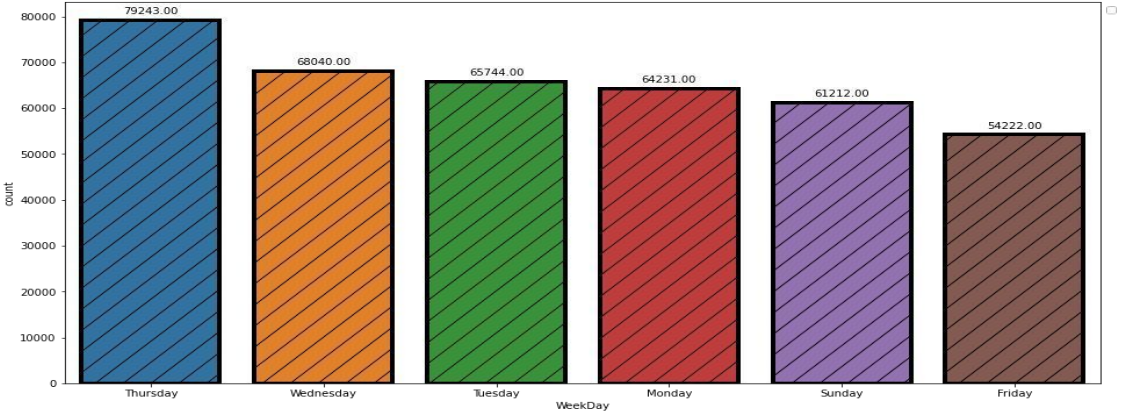


- Here we can see huge spike in 2011 this is because we only have december months data from 2010.

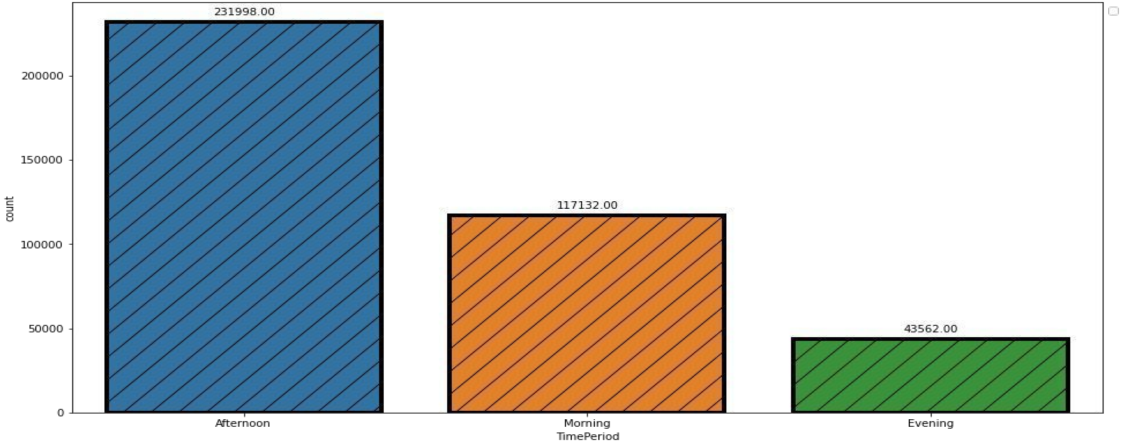


- we can see there is huge sale in the month of october and november.

Periodical purchasing stats:

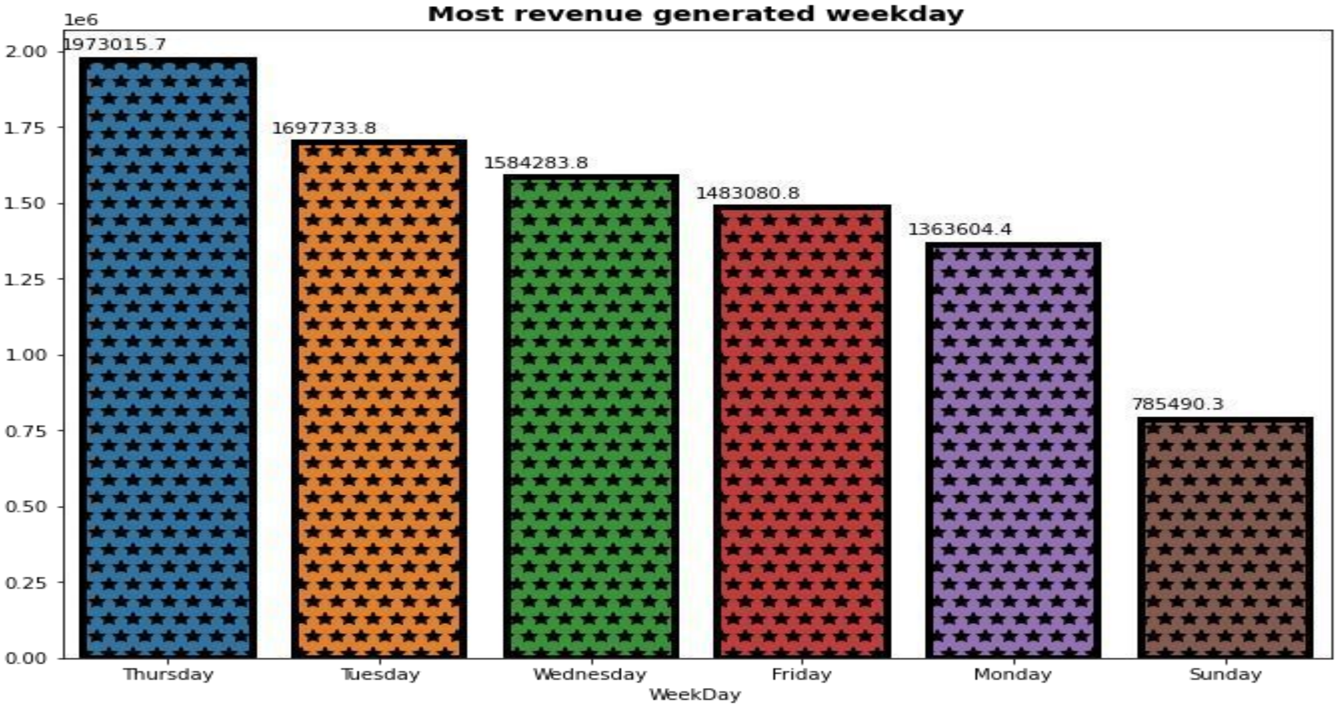


we can see on wednesday and thursday there is more sale



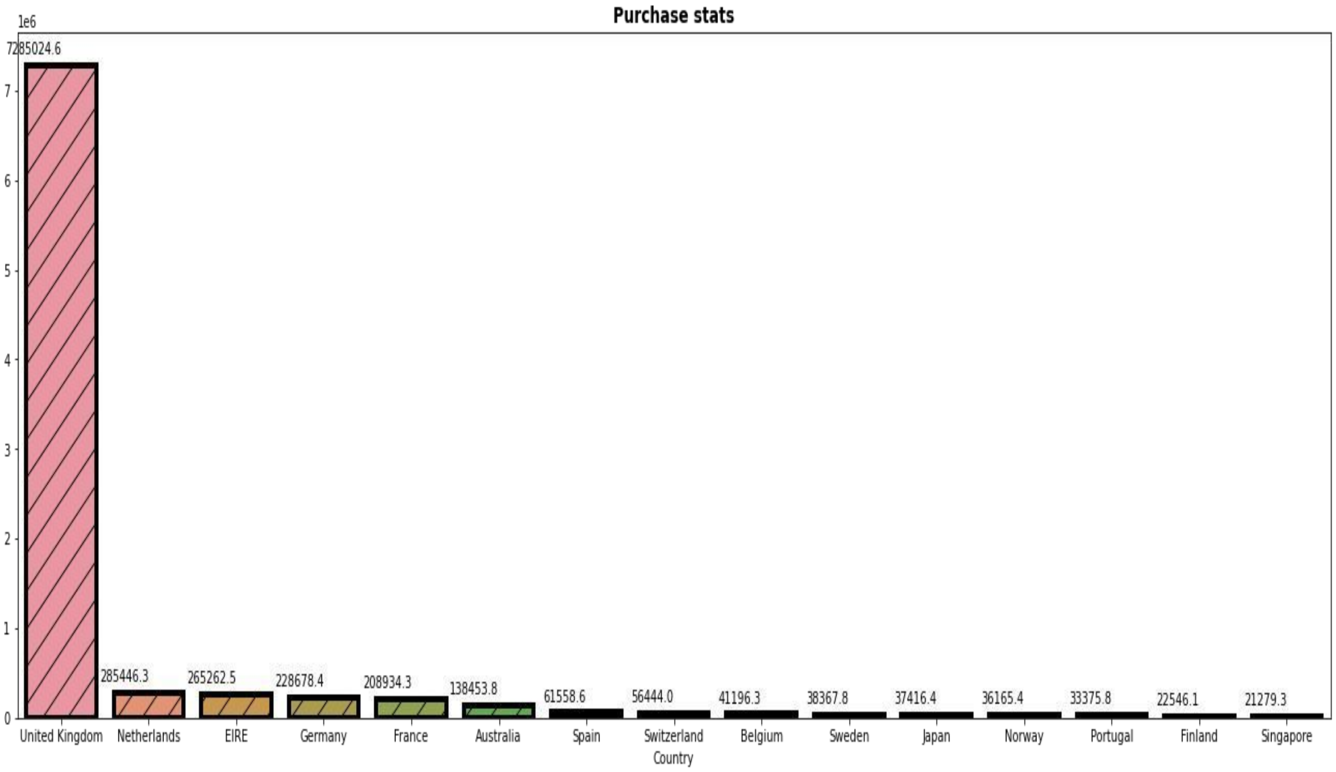
- we can see people are buying on afternoon time period more.

Most revenue generated weekday:



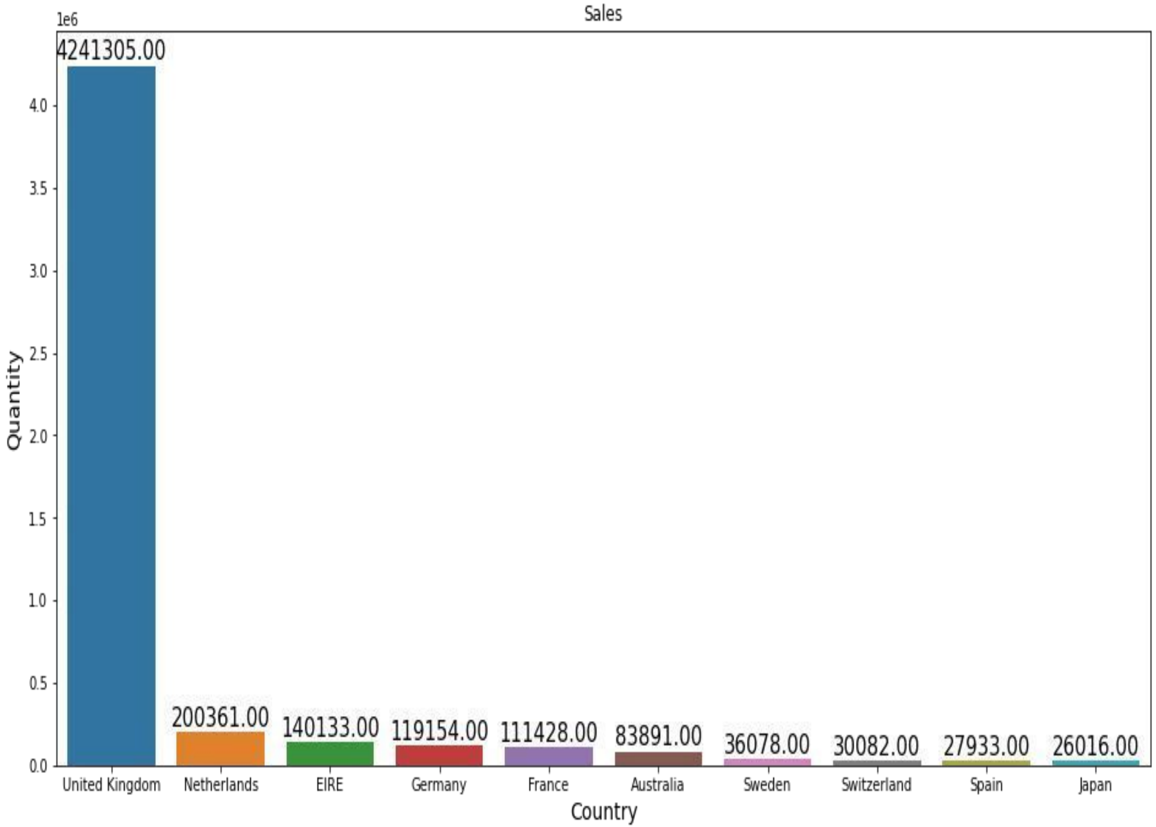
- On Thursday Company is generating the highest Revenue
- On Sunday company is generating less revenue

High quantity and high purchasing countries stats:



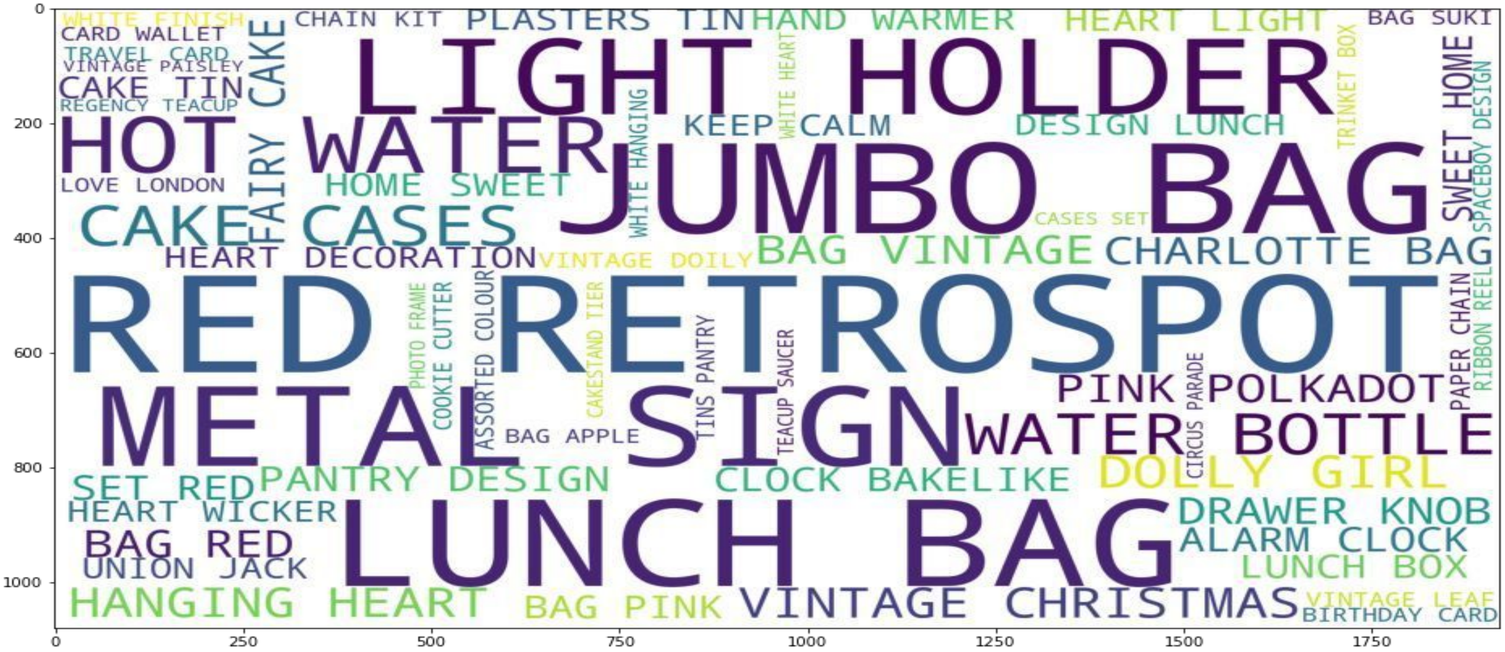
- Here we can see united kingdom is the country which purchase more items as compared to other country.
- Singapore is a least purchasing country.

High quantity and high purchasing countries stats:



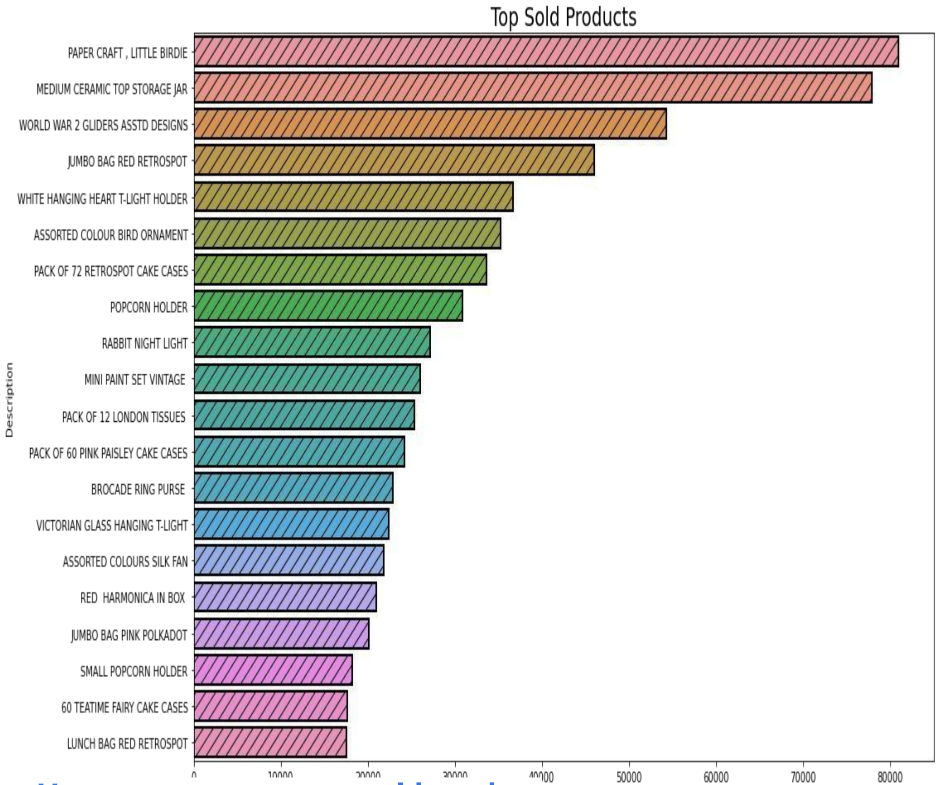
we can see UK is the country which purchase in high quantity. and japan is a lease purchasing country.

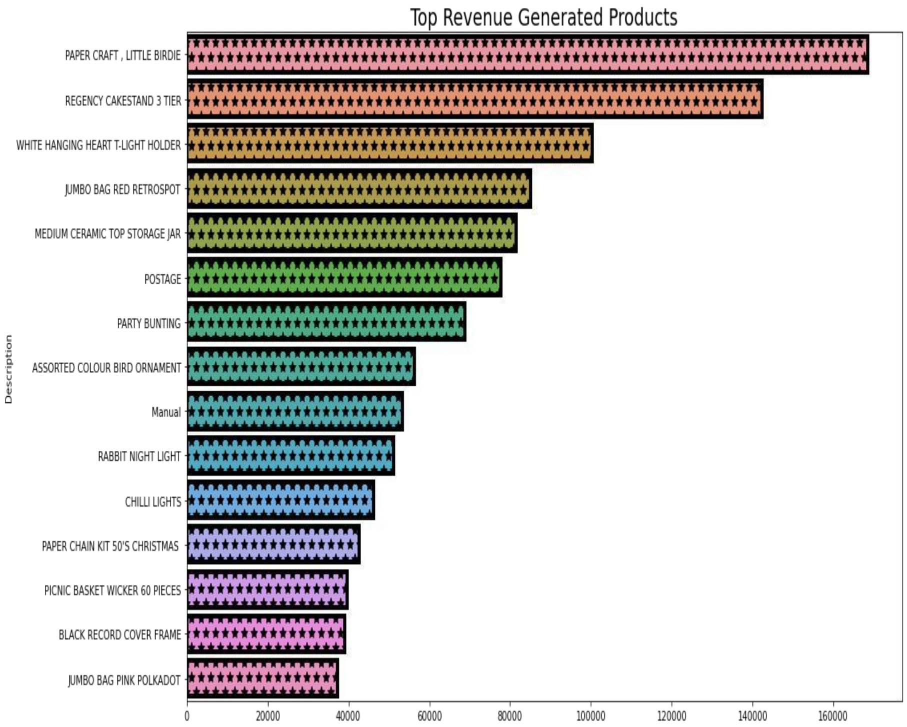
Product Sales Categorization:



- Above we can see the product sale categories.

Top sold and revenue generated product:

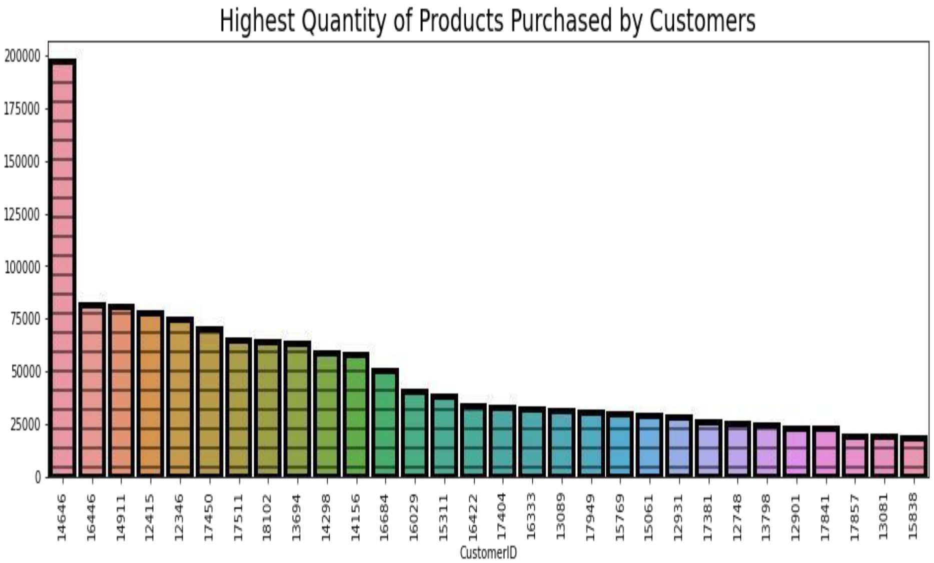


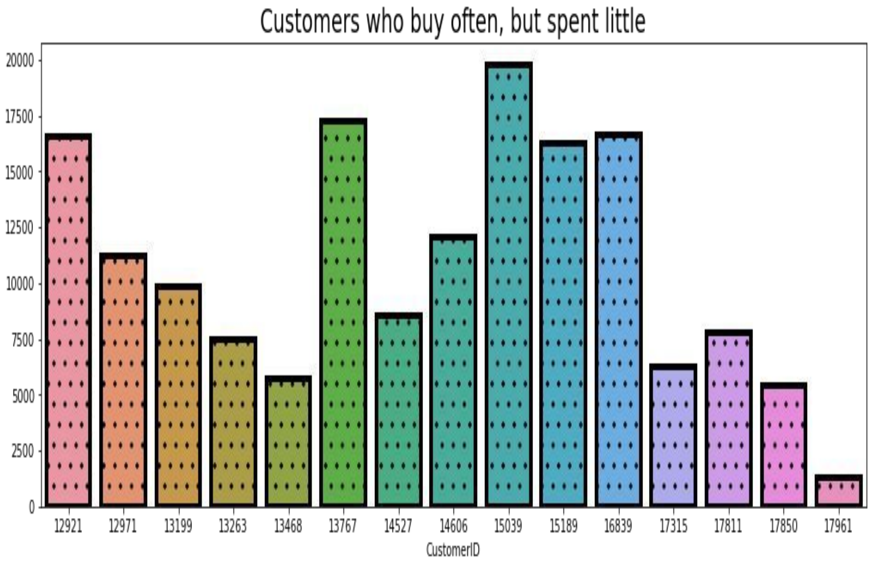


Here we can see most sold product product is Paper craft, little birdie and least sold product is lunch bad red retrospot

- **Here we can see most revenue generated product is Paper craft, little birdie and least revenue generated product is jumbo bag pink polkadot.**

Highest quantity of products purchased by customer and Customers who buy often but spend very little:

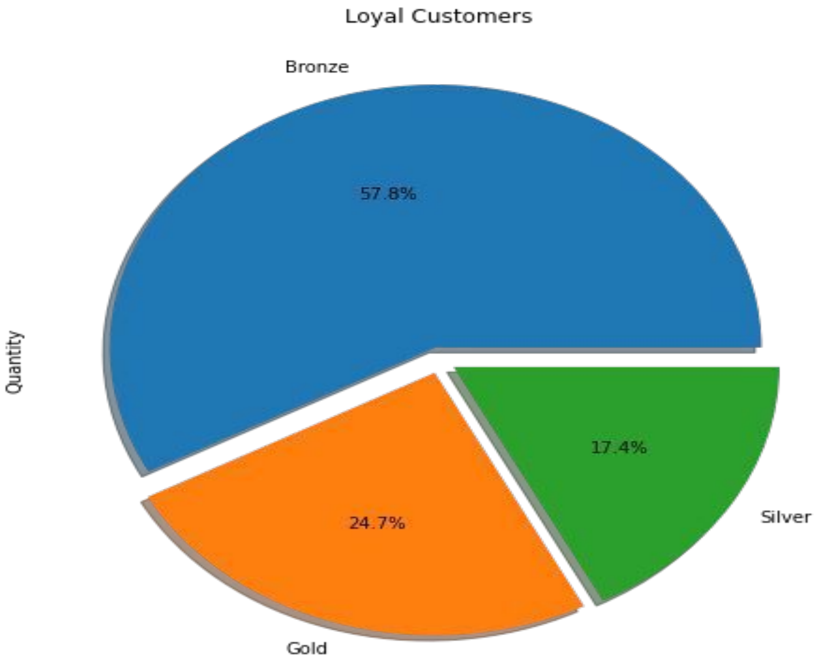

Highest Quantity of Products Purchased by Customers

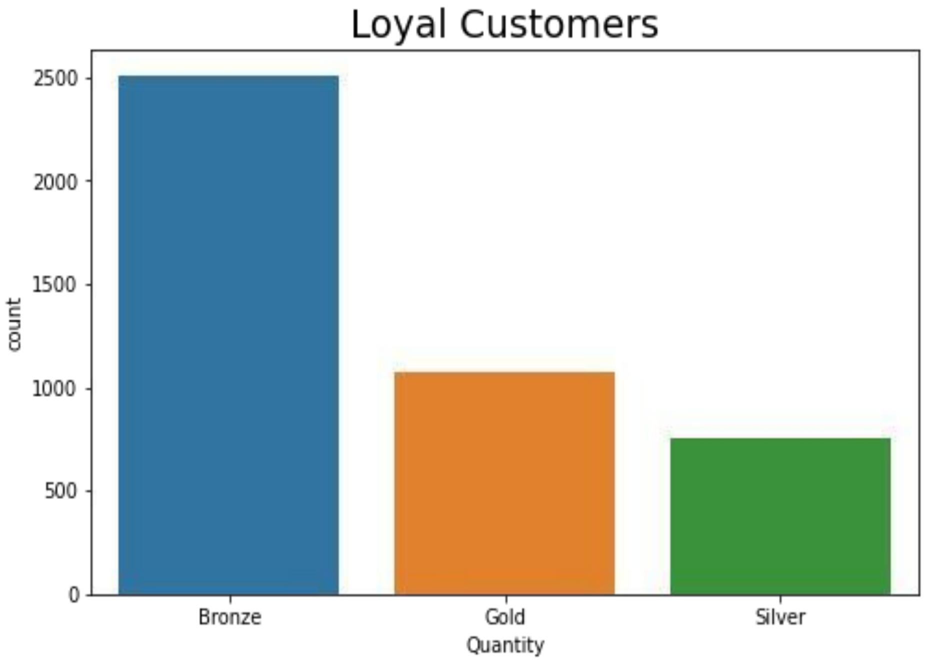

Customers who buy often, but spent little

- Above are the customer id who purchased highest quantity of products.

Above we can see Customers who buy often, but spent little

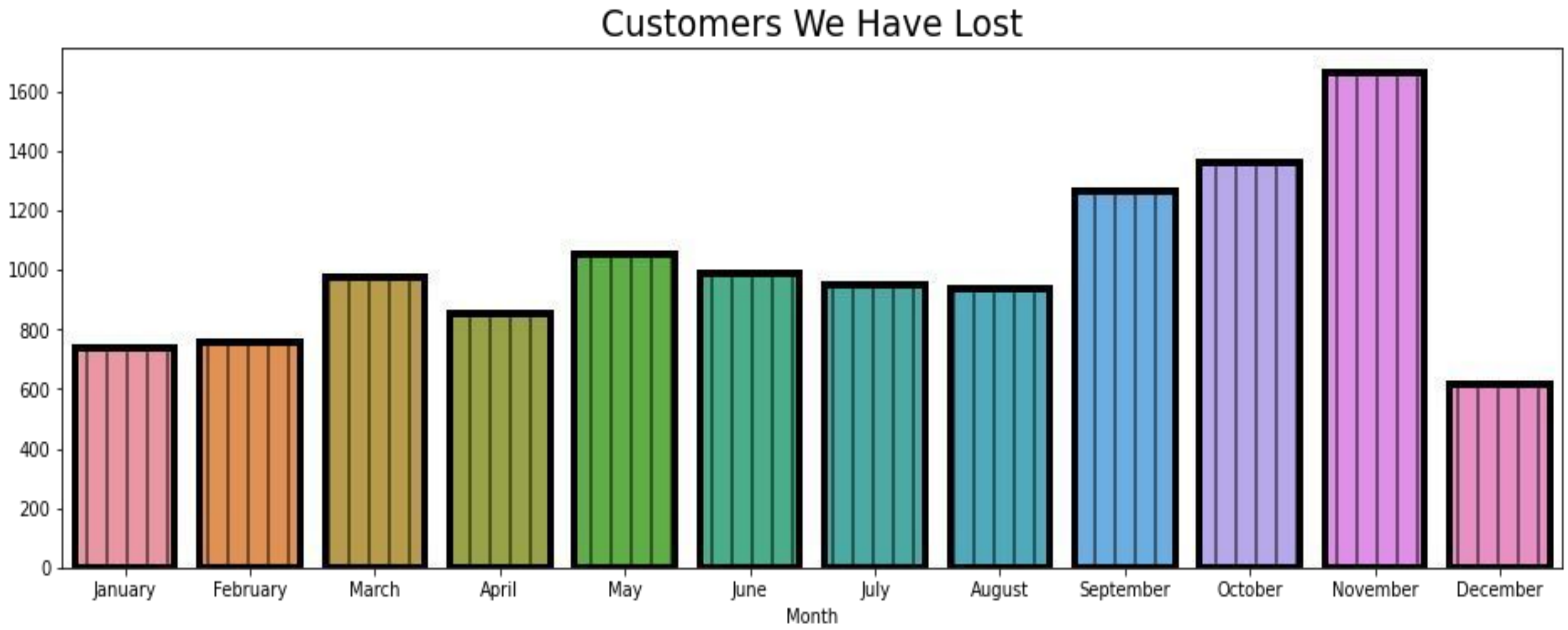
Customers category:





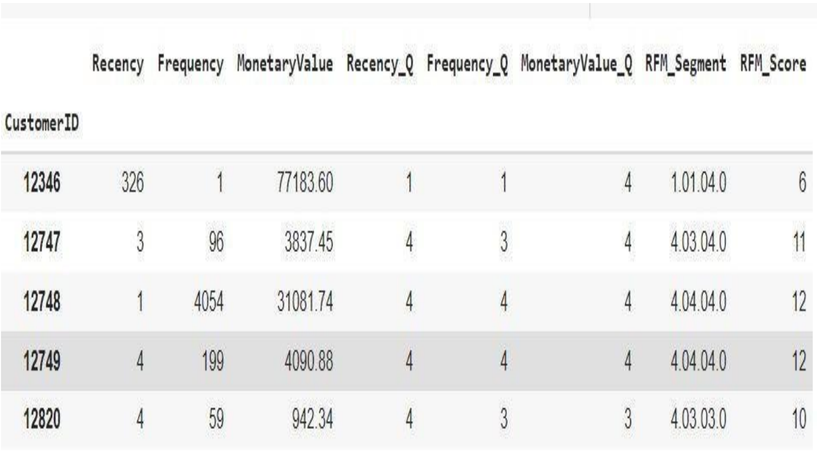
- **Here we can see we have more no. of bronze customers.**

Most customers lost in month:

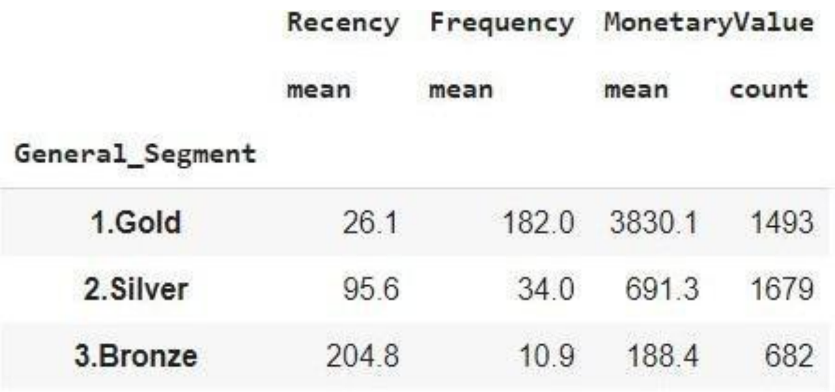


- We can observe that very number of customers are lost visiting the store. At the end of the year many customers are lost.

Recency, Frequency and Monetary Value score:

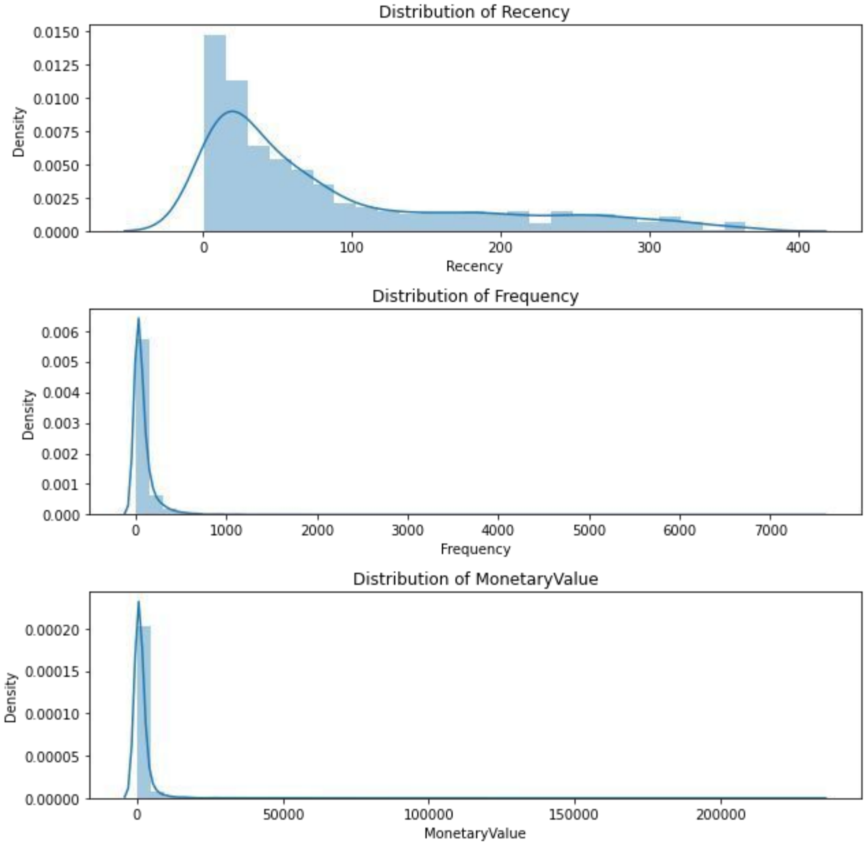


	Recency	Frequency	MonetaryValue	Recency_Q	Frequency_Q	MonetaryValue_Q	RFM_Segment	RFM_Score
CustomerID								
12346	326	1	77183.60	1	1	4	1.01.04.0	6
12747	3	96	3837.45	4	3	4	4.03.04.0	11
12748	1	4054	31081.74	4	4	4	4.04.04.0	12
12749	4	199	4090.88	4	4	4	4.04.04.0	12
12820	4	59	942.34	4	3	3	4.03.03.0	10

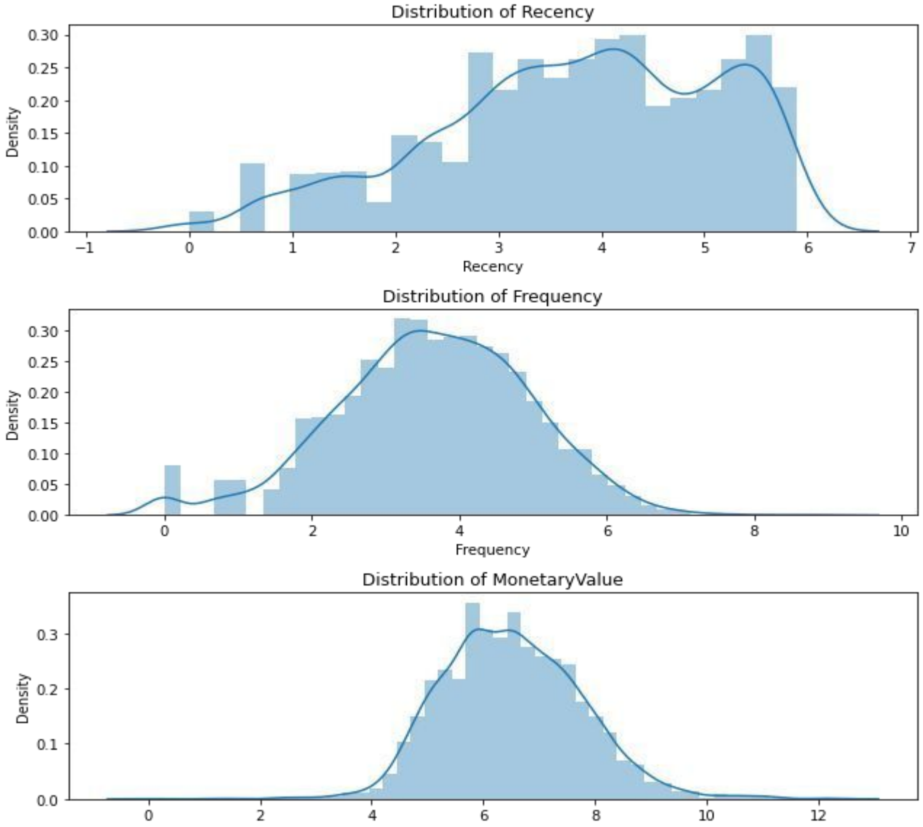


	Recency	Frequency	MonetaryValue	
	mean	mean	mean	count
General_Segment				
1.Gold	26.1	182.0	3830.1	1493
2.Silver	95.6	34.0	691.3	1679
3.Bronze	204.8	10.9	188.4	682

Before and after log transformation:

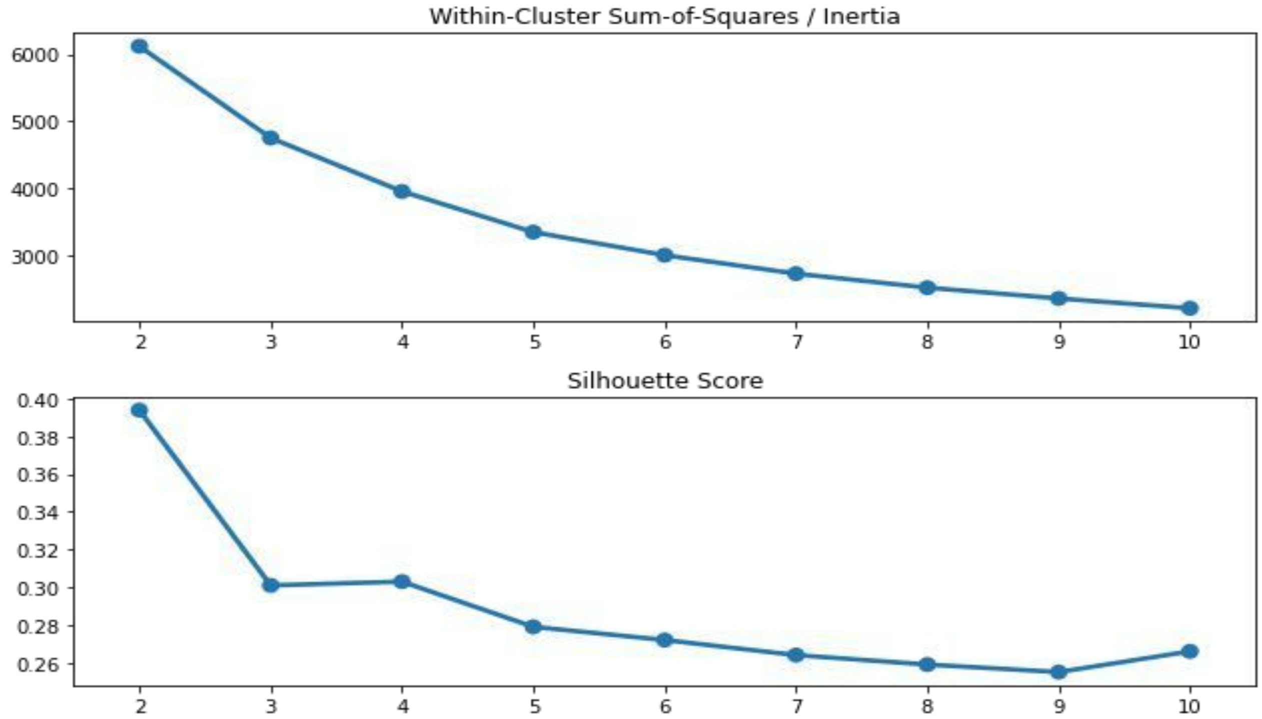


Above we can see all the 3 graphs are positively skewed.



after log transformation we can see data is normally distributed(normal distribution).

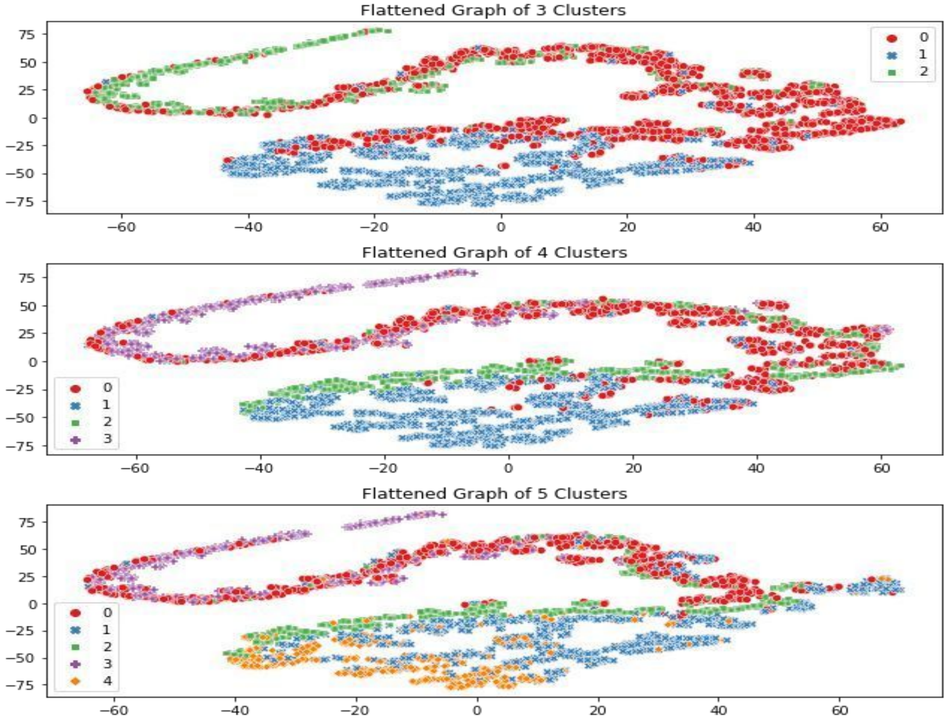
Finding Optimal Cluster:



Based on the inertia and silhouette score, the optimal number of cluster is 3. However, during the implemention of KMeans, cluster of 3, 4, and 5 will be tested to experiment which cluster makes most business sense.

Model used:

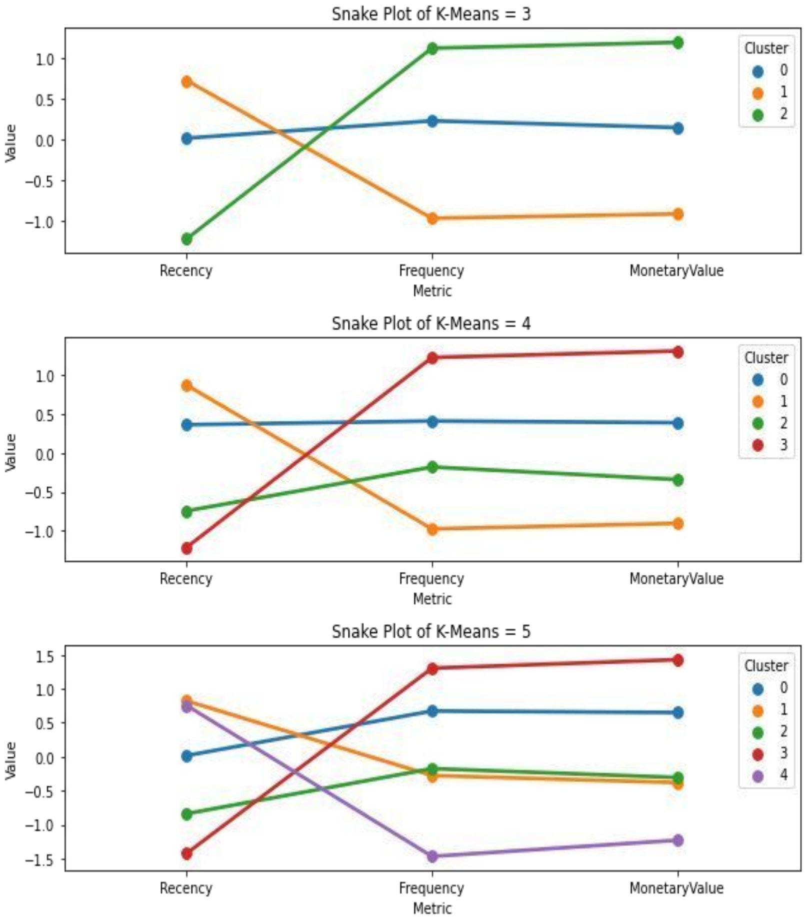
★ KMeans Clustering:



Flattened Graph of 3 Clusters

Flattened Graph of 4 Clusters

Flattened Graph of 5 Clusters



Snake Plot of K-Means = 3

Snake Plot of K-Means = 4

Snake Plot of K-Means = 5

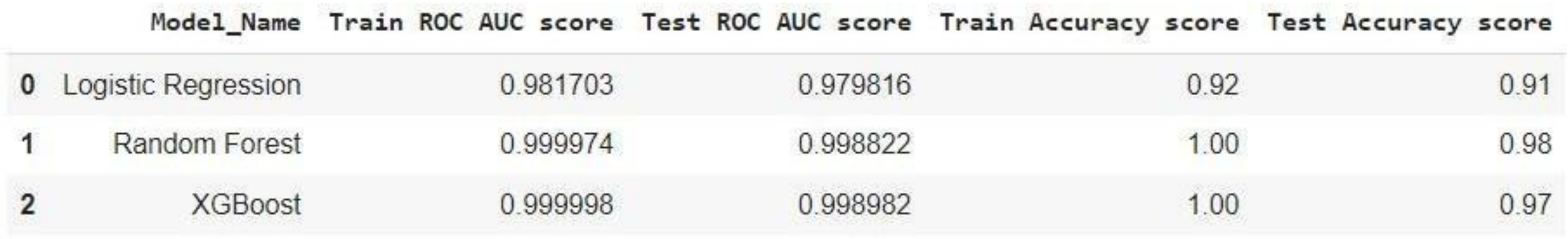
Classification models used for prediction:

1. Logistic Regression:
2. Random Forest:
3. XGBoost:

Observation:

I’ve used logistic Regression at first but the score was bit less, after that I’ve used Tree based algorithm i.e. Random forest and XGBoost and with Random forest I got highest score as compared to other two so, random forest is my optimal model which can be used for further.

Evaluation Matrix:



	Model_Name	Train ROC AUC score	Test ROC AUC score	Train Accuracy score	Test Accuracy score
0	Logistic Regression	0.981703	0.979816	0.92	0.91
1	Random Forest	0.999974	0.998822	1.00	0.98
2	XGBoost	0.999998	0.998982	1.00	0.97

Challenges:

- Loading dataset takes time.
- As there were many null values present in data set it took time to clean the dataset.
- Difficulty in selecting the appropriate graph for trend.

Summary of conclusion:

The customer segments thus deduced can be very useful in targeted marketing, scouting for new customers and ultimately revenue growth. After knowing the types of customers, it depends upon the retailer policy whether to chase the high value customers and offer them better service and discounts or try and encourage low/ medium value customers to shop more frequently or of higher monetary values.