TDS 3301 Data Mining

Assignment Part 1

Exploratory Data Analysis

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Dataset Description

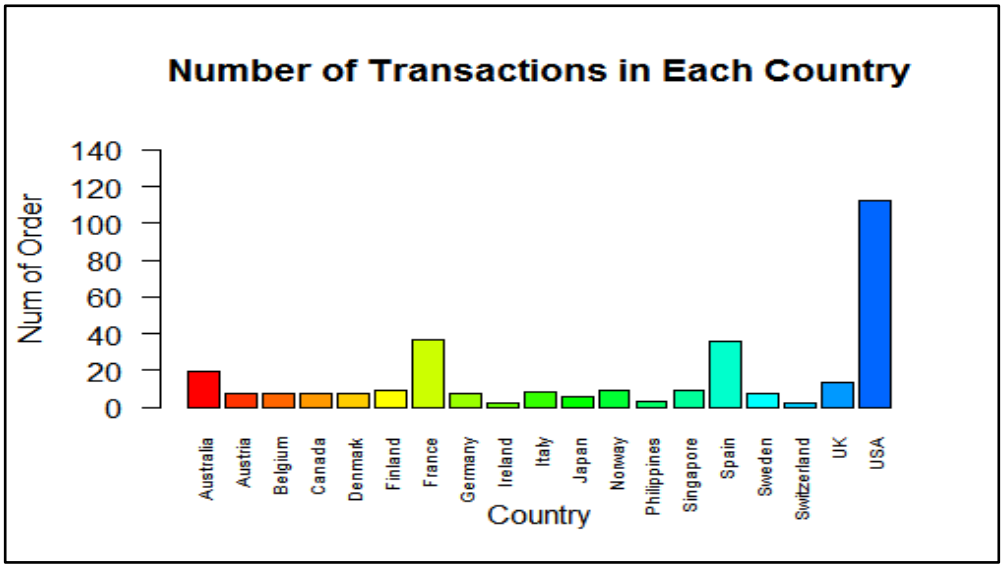
The source of this dataset is from: https://www.kaggle.com/kyanyoga/sample-sales-data
This dataset is a sample sales invoice of a toy factory outlet and has 2823 instances and 25 attributes. Each row corresponds to an order or transaction.

Attribute Name	Description
ORDERNUMBER	Order number
QUANTITYORDERED	Quantity of product ordered
PRICEEACH	Unit price for the product
ODERLINENUMBER	Based on *ORDERNUMBER* and *PRODUCTNUMBER*. A customer (*ORDERNUMBER*) can purchase multiple products (*PRODUCTCODE*), first product ordered will be numbered '1' and so on.
SALES	Product of QUANTITYORDERED and PRICEEACH
ORDERDATE	Date when order was made
STATUS	Order status (Shipped, In Process, Resolved, Cancelled, On Hold, Disputed)
QTR_ID	Quarter of the year order was made (integer)
MONTH_ID	Month when order was made (integer)
YEAR_ID	Year when order was made
PRODUCTLINE	Type of product ordered
MSRP	Manufacturer suggested retail price (Price recommended by manufacturer to retailer to sell the product)
PRODUCTCODE	Code of product
CUSTOMERNAME	Name of customer (Company name)
PHONE	Contact number of customer

ADDRESSLINE1	Customer’s street address
ADDRESSLINE2	Customer’s unit number
CITY	Customer’s city
STATE	Customer’s state
POSTALCODE	Customer’s postal code
COUNTRY	Customer’s country
TERRITORY	Area of country (NA=North America, APAC=Asia Pacific Region, EMEA = Europe, the Middle East and Africa
CONTACTLASTNAME	Contact’s last name
CONTACTFIRSTNAME	Contact’s first name
DEALSIZE	Based on SALES (Small if *SALES* < 3000, Medium if 3000 < *SALES* < 7000, Large if *SALES* > 7000)

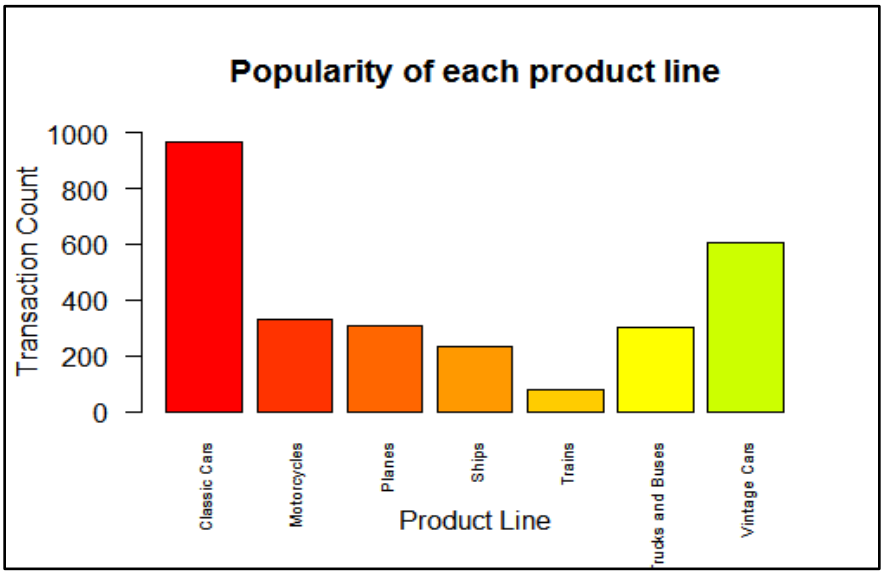
Possible Insights from Dataset Sales.csv

1. Identify the country with the highest number of purchase from this company.



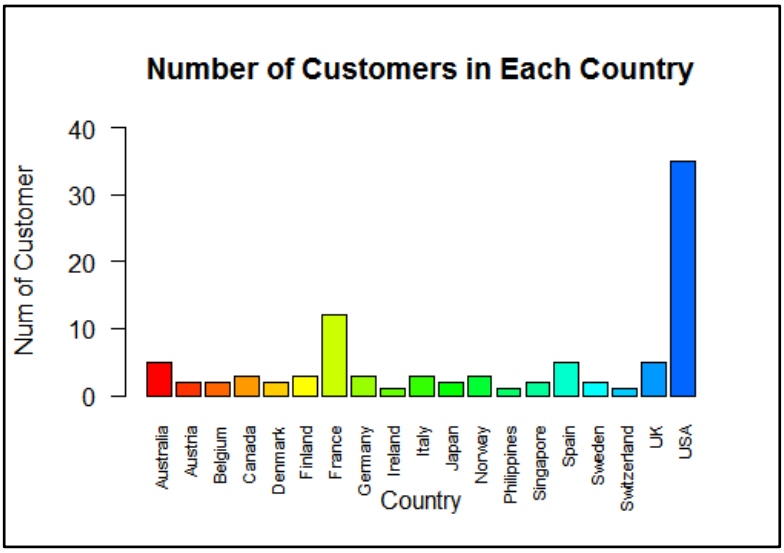
From the bar chart above, it is clear that USA has purchased the most from this company.

2. Determine the product line with the highest probability to be bought in each transaction.



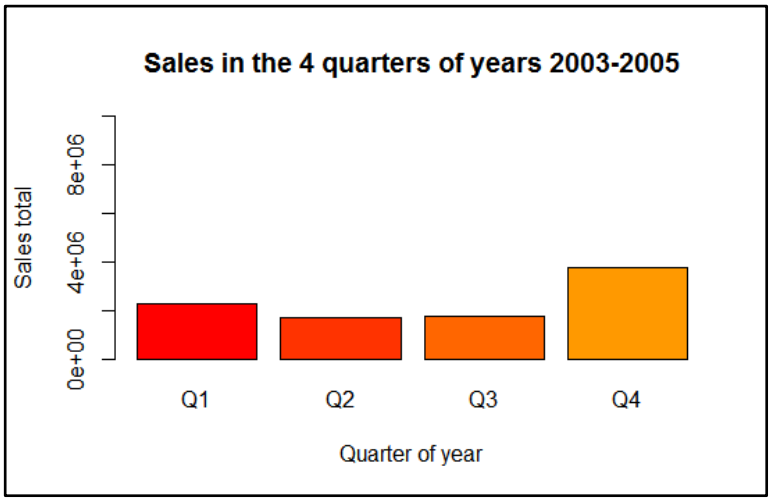
The bar chart above shows that the product line 'Classic Car' is the most popular among the customers as it has the highest rate to appear in transactions.

3. Identify the country which the customer that has made purchase with this company resides in.



This bar chart shows that USA has the highest number of customers purchasing from this company. By comparing the charts from *insight 1* and *insight 3*, we can see the clear relation of number of customers in a country affects the sales in that country. From this view, the company can make a further decision on whether to focus their sale in USA or increase their advertising in the other countries.

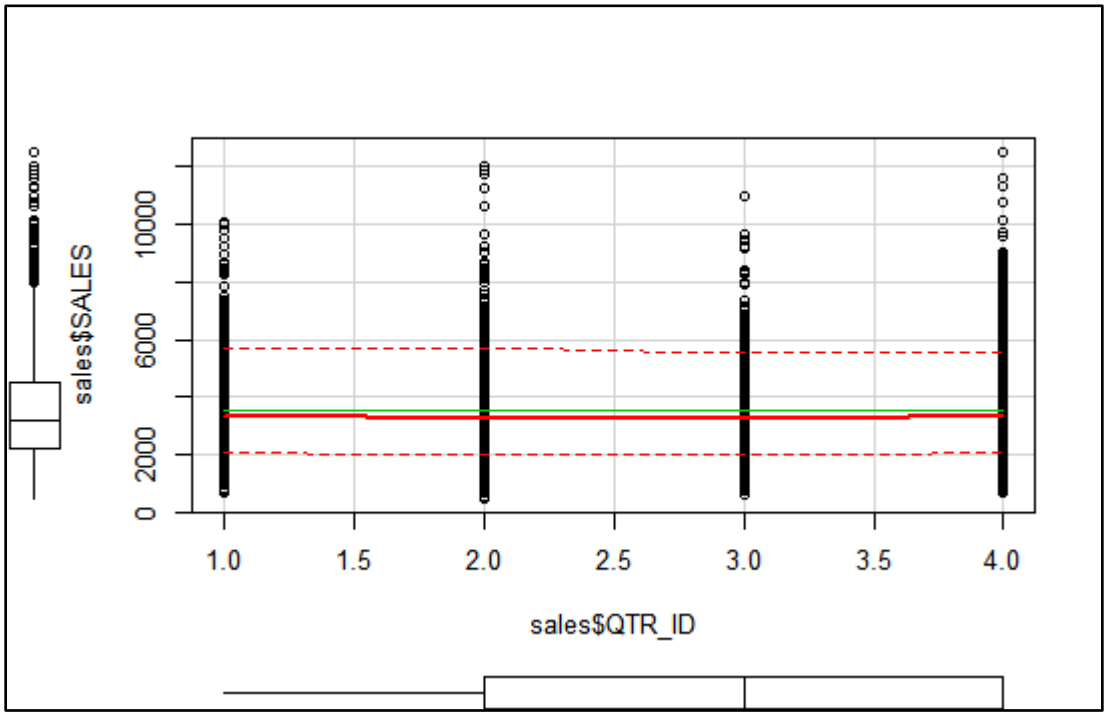
4. Determine which quarter or month of the year has the highest sales rating.



The company has the highest sales in the fourth quarter (October, November, December) of the years.

5. Examine if seasonal holidays have effect on the sales.

```
66  #INSIGHT 5
67  #to show correlation between season and sales
68  install.packages("car")
69  library(car)
70  scatterplot(sales$QTR_ID, sales$SALES)
71  season<-cor.test(sales$QTR_ID, sales$SALES)
72  season #p-value > 0.05, insignificant
73
```




```
> season

        Pearson's product-moment correlation

data:  sales$QTR_ID and sales$SALES
t = -0.36097, df = 2821, p-value = 0.7181
alternative hypothesis: true correlation is not equal to 0
95 percent confidence interval:
 -0.04367664  0.03010297
sample estimates:
         cor
-0.006796085
```

A p-value of 0.7181 is considered statistically insignificant. A negative value of cor, -0.006796085 indicates that it is a weak linear correlation. So, we can assume that seasonal holiday does not affect the sales or has a very little influence to the sales that can be ignored.

6. From the records, identify which customer has the highest probability to call off the purchase.

	CUSTOMERNAME	ORDERNUMBER	STATUS	OCCURRENCE
1	Australian Collectables, Ltd	10415	Disputed	5
2	Danish Wholesale Imports	10327	Resolved	8
3	Danish Wholesale Imports	10406	Disputed	3
4	Euro Shopping Channel	10262	Cancelled	16
5	Euro Shopping Channel	10386	Resolved	18
6	Euro Shopping Channel	10417	Disputed	6
7	Gifts4AllAges.com	10414	On Hold	14
8	Land of Toys Inc.	10248	Cancelled	14
9	Mini Auto Werke	10164	Resolved	8
10	Scandinavian Gift Ideas	10167	Cancelled	16
11	Tekni Collectables Inc.	10401	On Hold	12
12	The Sharp Gifts Warehouse	10407	On Hold	12
13	Toys4GrownUps.com	10367	Resolved	13
14	UK Collectables, Ltd.	10253	Cancelled	14
15	Volvo Model Replicas, Co	10334	On Hold	6

The above table shows list of customer (name) which purchases were either disputed, resolved, on hold or cancelled. The company should identify these customers and diagnose the cause behind each of these call offs.

Data Mining Technique

1. **Association Rule** – Identify the product lines or products that are frequently bought together and predict the sales. This can be done by referring to the *ORDERNUMBER* column. From each distinct *ORDERNUMBER* identify the set of products that are bought. From these sets then we can deduce and pinpoint the pairs or sets of products that are frequently bought together.
2. **Coverage** – Identify the products that are popular among the customers. This product line should be suitable to all the customers. The result can be used to design a product catalog for the company.

Data Quality Issues

1. Missing values in columns (*STATE, ADDRESSLINE2*)
2. Data Inconsistency (*PHONE, POSTALCODE*)
3. Naming Issues, in *TERRITORY* column, R reads "NA" as "Not Available", but in this column of the dataset, "NA" is used as an abbreviation for "North America".

Pre-processing Task

1. Correcting naming convention in *TERRITORY* column. Rename "NA" to "N.America", because in the original dataset, "NA" was meant for "North America". However, the "NA" was read as 'not available' in R.
2. Missing values in the *STATE* column are replaced with"NA", not available.
3. Convert classes of some columns to the correct ones. The *ORDERDATE* was read as character class, the "lubridate" package was used to transform the column's values into date type. On the other hand, the *DEALSIZE* column's class is transformed to factor, with levels "Small", "Medium", "Large".
4. Dropping insignificant columns from the dataset. These columns are dropped because they are inessential to the analysis and contains too many missing and wild values. The columns that are considered ignorable and dropped are *PHONE, ADDRESSLINE1, ADDRESSLINE2, POSTALCODE, CONTACTLASTNAME* and *CONTACTFIRSTNAME*.