Business Analytics-Assignment-3

shiva gadila

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#Importing the Dataset

```
Online.Retail<- read.csv("~/Downloads/Online Retail.csv")
summary(Online.Retail)
```

```
##   InvoiceNo          StockCode         Description           Quantity
##  Length:541909      Length:541909      Length:541909      Min.   :-80995.0
0
##  Class :character   Class :character   Class :character   1st Qu.:     1.0
0
##  Mode  :character   Mode  :character   Mode  :character   Median :     3.0
0
##                                                           Mean   :     9.5
5
##                                                           3rd Qu.:    10.0
0
##                                                           Max.   : 80995.0
0
##
##  InvoiceDate          UnitPrice           CustomerID       Country
##  Length:541909      Min.   :-11062.06   Min.   :12346    Length:541909
##  Class :character   1st Qu.:     1.25   1st Qu.:13953    Class :character
##  Mode  :character   Median :     2.08   Median :15152    Mode  :character
##                     Mean   :     4.61   Mean   :15288
##                     3rd Qu.:     4.13   3rd Qu.:16791
##                     Max.   : 38970.00   Max.   :18287
##                                         NA's   :135080
```

#Loading the Packages

```
library(magrittr)
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(zoo)

##
## Attaching package: 'zoo'

## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric
```

#QUESTION 1: Show the breakdown of the number of transactions by country, or how many transactions are in each country's dataset (take into account all records, including transactions that were cancelled). Give this as a percentage and a total number. Only countries that account for more than one per cent of all transactions should be shown.

```
Online.Retail %>% group_by(Country) %>% summarise(n())

## # A tibble: 38 × 2
##    Country         `n()`
##    <chr>           <int>
##  1 Australia        1259
##  2 Austria           401
##  3 Bahrain            19
##  4 Belgium          2069
##  5 Brazil             32
##  6 Canada            151
##  7 Channel Islands   758
##  8 Cyprus            622
##  9 Czech Republic     30
## 10 Denmark           389
## # … with 28 more rows

Online.Retail %>% group_by(Country) %>% summarise(percent =100 *n()/nrow(Onli
ne.Retail))

## # A tibble: 38 × 2
##    Country         percent
##    <chr>             <dbl>
##  1 Australia       0.232
##  2 Austria         0.0740
##  3 Bahrain         0.00351
##  4 Belgium         0.382
##  5 Brazil          0.00591
##  6 Canada          0.0279
##  7 Channel Islands 0.140
##  8 Cyprus          0.115
##  9 Czech Republic  0.00554
## 10 Denmark         0.0718
## # … with 28 more rows

Online.Retail %>% group_by(Country) %>% summarise(percent =100 *n()/nrow(Onli
ne.Retail)) %>% filter(Country>0.01)
```

```
## # A tibble: 38 × 2
##    Country         percent
##    <chr>             <dbl>
##  1 Australia       0.232
##  2 Austria         0.0740
##  3 Bahrain         0.00351
##  4 Belgium         0.382
##  5 Brazil          0.00591
##  6 Canada          0.0279
##  7 Channel Islands 0.140
##  8 Cyprus          0.115
##  9 Czech Republic  0.00554
## 10 Denmark         0.0718
## # … with 28 more rows
```

#QUESTION 2 :Create a new variable 'TransactionValue' that is the product of the exising 'Quantity' and 'UnitPrice' variables. Add this variable to the dataframe.

```
TransactionValue <-  Online.Retail$Quantity * Online.Retail$UnitPrice
Online.Retail <- cbind(Online.Retail, TransactionValue)
head(Online.Retail)
```

```
##   InvoiceNo StockCode                          Description Quantity
## 1    536365    85123A  WHITE HANGING HEART T-LIGHT HOLDER        6
## 2    536365     71053                 WHITE METAL LANTERN        6
## 3    536365    84406B      CREAM CUPID HEARTS COAT HANGER        8
## 4    536365    84029G KNITTED UNION FLAG HOT WATER BOTTLE        6
## 5    536365    84029E      RED WOOLLY HOTTIE WHITE HEART.        6
## 6    536365     22752        SET 7 BABUSHKA NESTING BOXES        2
##      InvoiceDate UnitPrice CustomerID        Country TransactionValue
## 1 12/1/2010 8:26      2.55      17850 United Kingdom            15.30
## 2 12/1/2010 8:26      3.39      17850 United Kingdom            20.34
## 3 12/1/2010 8:26      2.75      17850 United Kingdom            22.00
## 4 12/1/2010 8:26      3.39      17850 United Kingdom            20.34
## 5 12/1/2010 8:26      3.39      17850 United Kingdom            20.34
## 6 12/1/2010 8:26      7.65      17850 United Kingdom            15.30
```

```
colnames(Online.Retail)
```

```
## [1] "InvoiceNo"        "StockCode"        "Description"      "Quantity"
## [5] "InvoiceDate"      "UnitPrice"        "CustomerID"       "Country"
## [9] "TransactionValue"
```

#Question 3:-Using the newly created variable, TransactionValue, show the breakdown of transaction values by countries i.e. how much money in total has been spent each country. Show this in total sum of transaction values. Show only countries with total transaction exceeding 130,000 British Pound.

```
Online.Retail%>%group_by(Country) %>% summarise(Sum_of_Transaction_values = s
um(TransactionValue)) %>% filter(Sum_of_Transaction_values > 130000)
```

```
## # A tibble: 6 × 2
##   Country        Sum_of_Transaction_values
##   <chr>                              <dbl>
## 1 Australia                        137077.
## 2 EIRE                             263277.
## 3 France                           197404.
## 4 Germany                          221698.
## 5 Netherlands                      284662.
## 6 United Kingdom                  8187806.
```

#Question 4:

```
Retail<- strptime(Online.Retail$InvoiceDate,format='%m/%d/%Y %H:%M',tz='GMT')
head(Retail)

## [1] "2010-12-01 08:26:00 GMT" "2010-12-01 08:26:00 GMT"
## [3] "2010-12-01 08:26:00 GMT" "2010-12-01 08:26:00 GMT"
## [5] "2010-12-01 08:26:00 GMT" "2010-12-01 08:26:00 GMT"

Online.Retail$New_Invoice_Date<-as.Date(Retail)

Online.Retail$Invoice_Day_week <- weekdays(Online.Retail$New_Invoice_Date)
Online.Retail$New_Invoice_Hour <-as.numeric (format(Retail,"%H"))
Online.Retail$New_Invoice_Month <- as.numeric(format(Retail, "%m"))
head(Online.Retail)

##   InvoiceNo StockCode                          Description Quantity
## 1    536365    85123A  WHITE HANGING HEART T-LIGHT HOLDER        6
## 2    536365     71053                 WHITE METAL LANTERN        6
## 3    536365    84406B      CREAM CUPID HEARTS COAT HANGER        8
## 4    536365    84029G KNITTED UNION FLAG HOT WATER BOTTLE        6
## 5    536365    84029E      RED WOOLLY HOTTIE WHITE HEART.        6
## 6    536365     22752        SET 7 BABUSHKA NESTING BOXES        2
##      InvoiceDate UnitPrice CustomerID        Country TransactionValue
## 1 12/1/2010 8:26      2.55      17850 United Kingdom            15.30
## 2 12/1/2010 8:26      3.39      17850 United Kingdom            20.34
## 3 12/1/2010 8:26      2.75      17850 United Kingdom            22.00
## 4 12/1/2010 8:26      3.39      17850 United Kingdom            20.34
## 5 12/1/2010 8:26      3.39      17850 United Kingdom            20.34
## 6 12/1/2010 8:26      7.65      17850 United Kingdom            15.30
##   New_Invoice_Date Invoice_Day_week New_Invoice_Hour New_Invoice_Month
## 1       2010-12-01        Wednesday                8                12
## 2       2010-12-01        Wednesday                8                12
## 3       2010-12-01        Wednesday                8                12
## 4       2010-12-01        Wednesday                8                12
## 5       2010-12-01        Wednesday                8                12
## 6       2010-12-01        Wednesday                8                12
```

#A.Show the percentage of transactions (by numbers) by days of the week

```
Online.Retail %>%
group_by(Invoice_Day_week) %>%
tally(sort=TRUE) %>%
summarise(Invoice_Day_week,TransactionCounts = n ,percent = n/sum(n)*100) %>%
arrange(desc(TransactionCounts))
```

```
## Warning: Returning more (or less) than 1 row per `summarise()` group was d
eprecated in
## dplyr 1.1.0.
## ℹ Please use `reframe()` instead.
## ℹ When switching from `summarise()` to `reframe()`, remember that `refram
e()`
##   always returns an ungrouped data frame and adjust accordingly.
```

```
## # A tibble: 6 × 3
##   Invoice_Day_week TransactionCounts percent
##   <chr>                       <int>   <dbl>
## 1 Thursday                   103857    19.2
## 2 Tuesday                    101808    18.8
## 3 Monday                      95111    17.6
## 4 Wednesday                   94565    17.5
## 5 Friday                      82193    15.2
## 6 Sunday                      64375    11.9
```

#B.Show the percentage of transactions (by transaction volume) by days of the week

```
Online.Retail %>%
group_by(Invoice_Day_week) %>%
summarise(TransValueSum = sum(TransactionValue)) %>%
mutate(TransValuepercent= TransValueSum/sum(TransValueSum))%>%
arrange(desc(TransValueSum))
```

```
## # A tibble: 6 × 3
##   Invoice_Day_week TransValueSum TransValuepercent
##   <chr>                    <dbl>             <dbl>
## 1 Thursday              2112519.            0.217
## 2 Tuesday               1966183.            0.202
## 3 Wednesday             1734147.            0.178
## 4 Monday                1588609.            0.163
## 5 Friday                1540611.            0.158
## 6 Sunday                 805679.            0.0827
```

#C. Show the percentage of transactions (by transaction volume) by month of the year

```
Online.Retail %>%
group_by(New_Invoice_Month) %>%
summarise(TransValueSum = sum(TransactionValue)) %>%
mutate(TransValuePercent=TransValueSum/sum(TransValueSum)) %>%
arrange(desc(TransValuePercent))
```

```
## # A tibble: 12 × 3
##    New_Invoice_Month TransValueSum TransValuePercent
##                <dbl>         <dbl>             <dbl>
##  1                11      1461756.            0.150
##  2                12      1182625.            0.121
##  3                10      1070705.            0.110
##  4                 9      1019688.            0.105
##  5                 5       723334.            0.0742
##  6                 6       691123.            0.0709
##  7                 3       683267.            0.0701
##  8                 8       682681.            0.0700
##  9                 7       681300.            0.0699
## 10                 1       560000.            0.0574
## 11                 2       498063.            0.0511
## 12                 4       493207.            0.0506
```

#D. What was the date with the highest number of transactions from Australia?

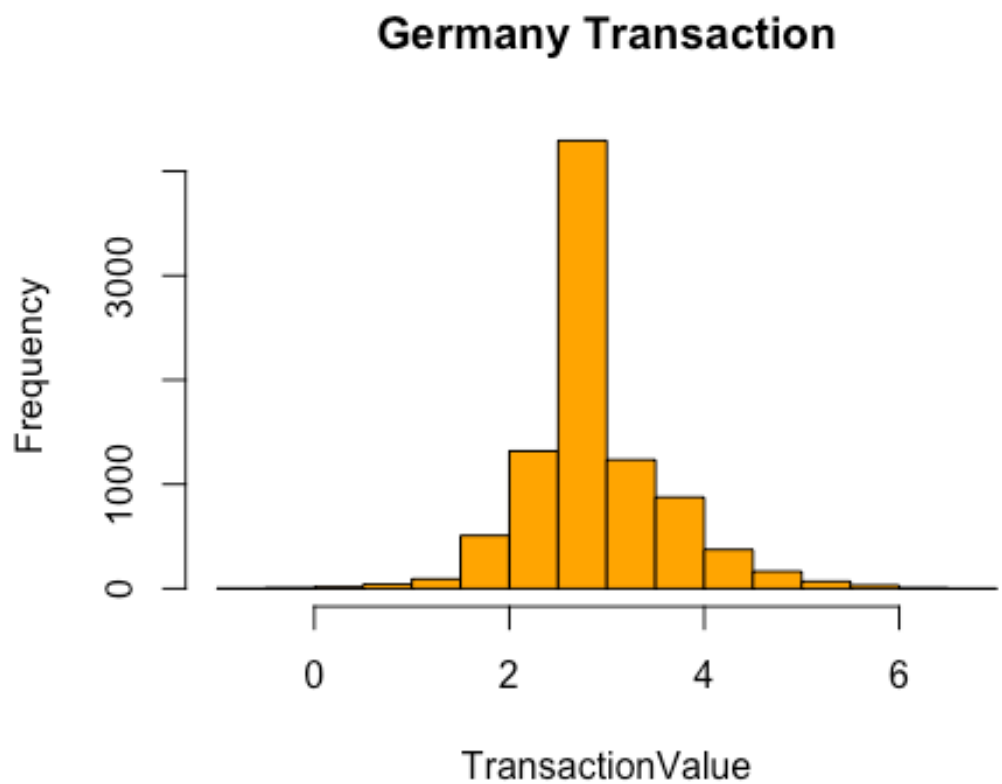
```
Online.Retail %>%
filter(Country == "Australia") %>%
group_by(InvoiceDate) %>%
tally(sort = TRUE) %>%
filter(n == max(n))
```

```
## # A tibble: 1 × 2
##   InvoiceDate         n
##   <chr>           <int>
## 1 6/15/2011 13:37   139
```

#QUESTION 5: Plot the histogramof transaction values from Germany.

```
hist(x=log(Online.Retail$TransactionValue[Online.Retail$Country=="Germany"]),
xlab = "TransactionValue",col = 'orange' ,main = 'Germany Transaction',ylab =
'Frequency')
```

```
## Warning in log(Online.Retail$TransactionValue[Online.Retail$Country ==
## "Germany"]): NaNs produced
```



#QUESTION 6: Which customer had the highest number of transactions? Which customer is most valuable i.e. highest total sum of transactions

```
#The customer who carried out the most transactions.
Online.Retail %>%group_by(CustomerID)%>%summarise(CustomerTransaction = n())%
>%filter(CustomerID != "NA")%>%filter(CustomerTransaction ==max(CustomerTrans
action))

## # A tibble: 1 × 2
##   CustomerID CustomerTransaction
##        <int>               <int>
## 1      17841                7983

#The customer with the highest total transaction sum and highest value.
Online.Retail%>%group_by(CustomerID)%>%summarise(total.transaction.by.each.cu
stomer = sum(TransactionValue))%>%arrange(desc(total.transaction.by.each.cust
omer))%>%filter(CustomerID != "NA")%>%filter(total.transaction.by.each.custom
er ==max(total.transaction.by.each.customer) )

## # A tibble: 1 × 2
##   CustomerID total.transaction.by.each.customer
##        <int>                              <dbl>
## 1      14646                           279489.
```

#QUESTION 7 :Calculate the percentage of missing values for each variable in the dataset

```
colMeans(is.na(Online.Retail))

##         InvoiceNo         StockCode       Description          Quantity
##         0.0000000         0.0000000         0.0000000         0.0000000
##       InvoiceDate         UnitPrice        CustomerID           Country
##         0.0000000         0.0000000         0.2492669         0.0000000
##  TransactionValue  New_Invoice_Date  Invoice_Day_week  New_Invoice_Hour
##         0.0000000         0.0000000         0.0000000         0.0000000
## New_Invoice_Month
##         0.0000000
```

#QUESTION 8 :What are the number oftransactions withmissing CustomerID records by countries?

```
Online.Retail %>% group_by(Country) %>% filter(is.na(CustomerID)) %>% summari
se(Missing_CustomerID=n())

## # A tibble: 9 × 2
##   Country        Missing_CustomerID
##   <chr>                       <int>
## 1 Bahrain                         2
## 2 EIRE                          711
## 3 France                         66
## 4 Hong Kong                     288
## 5 Israel                         47
## 6 Portugal                       39
## 7 Switzerland                   125
## 8 United Kingdom             133600
## 9 Unspecified                   202
```

#9.On average, how often the costumers comeback to the website for their next shopping?

```
Online.Retail %>%
select(CustomerID, New_Invoice_Date) %>%
group_by(CustomerID) %>%
distinct(New_Invoice_Date) %>%
arrange(desc(CustomerID)) %>%
mutate(DaysBetween = New_Invoice_Date - lag(New_Invoice_Date))->
custDaysBtwVisit

custDaysBtwVisit %>%
filter(!is.na(DaysBetween)) -> RetcustDaysBtwVisits
mean(RetcustDaysBtwVisits$DaysBetween)

## Time difference of 38.4875 days
```

#QUESTION 10: In the retail sector, it is very important to understand the return rate of the goods purchased by customers. In this example, we can define this quantity, simply,as the ratio of the numberof transactions cancelled (regardless of the transaction value) over the total number of transactions. With this definition, what is the return rate for the French

customers? Consider the cancelled transactions as those where the 'Quantity' variable hasa negative value

```
Returns <-nrow(Online.Retail%>%group_by(CustomerID)%>%filter((Country=='Franc
e')&(TransactionValue<0)&(CustomerID != 'Na')))
Totalfrenchcustomer<-nrow(Online.Retail%>%group_by(CustomerID)%>%filter((Coun
try=='France')&(CustomerID != 'Na')))
Returns/Totalfrenchcustomer*100

## [1] 1.754799
```

#QUESTION 11: What is the product that has generated the highest revenue for the retailer?

```
Total_customer1<-Online.Retail%>%group_by(Description,StockCode)%>%summarise(
n=sum(TransactionValue))%>%arrange(desc(n))

## `summarise()` has grouped output by 'Description'. You can override using
the
## `.groups` argument.

Total_customer1[Total_customer1['n']==max(Total_customer1['n']),]

## # A tibble: 1 × 3
## # Groups:   Description [1]
##   Description    StockCode       n
##   <chr>          <chr>       <dbl>
## 1 DOTCOM POSTAGE DOT       206245.
```

#QUESTION 12: How many unique customers are represented in the dataset?

```
length(unique(Online.Retail$CustomerID))

## [1] 4373

#There are 4373 unique customers represented in the dataset.
```