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1. Introduction

Customer satisfaction has emerged as one of the most important factors that guarantee the success of online store; it has been posited as a key stimulant of purchase, repurchase intentions and customer loyalty. A comprehensive review of the literature, theories and models have been carried out to propose the models for customer activation and customer retention.

Five major factors that contributed to the success of an e-commerce store have been identified as:

- 1. service quality
- 2. system quality
- 3. information quality
- 4. trust and
- 5. net benefit.

The research has investigated the factors that influence the online customers repeat purchase intention. The combination of both useful value and pleasure-seeking values are needed to affect the repeat purchase intention (loyalty) positively. Results indicate the e-retail success factors, which are very much critical for customer satisfaction. Below figure 1 gives the roadmap in retaining the customer.



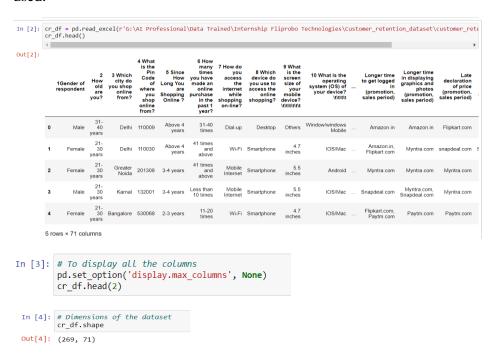
Figure 1.1 Customer retention roadmap [1]

1.1 Importing the dataset

The data was collected from the Indian online shoppers. There are two datasets which were provided one regular and the other one encoded. Dataset was provided in excel format. Before importing the data set necessary libraries required for further analysis were imported as shown below.

```
In [1]: # Importing Libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
```

Dataset without encoding was used for analyzing. After importing top 5 rows are plotted using dot head. Since the number of columns are 71, to see all the column names display.max_columns is used.



2. Exploratory Data Analysis

2.1 Null Values

Firstly, the basic information of the data is plotted as shown below.

Checking for Null values using isnull() function. The data has no null values as shown below.

```
In [6]: # Checking for null values in the data
cr_df.isnull().sum()

Out[6]: 1Gender of respondent
2 How old are you?
3 Which city do you shop online from?
4 What is the Pin Code of where you shop online from?
5 Since How Long You are Shopping Online?

Longer delivery period
Change in website/Application design
Frequent disruption when moving from one page to another
Website is as efficient as before
Which of the Indian online retailer would you recommend to a friend?
Length: 71, dtype: int64

In [7]: cr_df.isnull().sum().sum()

Out[7]: 0
```

Next, obtained the names of all columns to use the names for further analysis.

2.2 Summary Statistics

Since all the columns present in the dataset are of object datatype, we need to check the count of each value in the column along with the frequency of each value. From this we will come to know which value in each column is more dominant which will give us the how the respondants feel about using the online platforms for shopping. For loop is used for the same. Later for statistical data describe() function is used which will give the following stats of object datatype like count, number of unique values, top value and frequency of the top value as shown in Table 2.1 below. This table provides the overall picture of customer response through which we can come to known whether the customer will continue buying online or not.

Table 1 Summary Statistics of Customer Retention

Column Names	count	unique	top	freq
1Gender of respondent	269	2	Female	181
2 How old are you?	269	5	31-40 years	81
3 Which city do you shop online from?	269	11	Delhi	58
5 Since How Long You are Shopping Online?	269	5	Above 4 years	98
6 How many times you have made an online	269	6	Less than 10 times	114
purchase in the past 1 year?				
7 How do you access the internet while shopping on-	269	3	Mobile Internet	189
line?				
8 Which device do you use to access the online	269	4	Smartphone	141
shopping?				
9 What is the screen size of your mobile device?	269	4	Others	134
10 What is the operating system (OS) of your	269	3	Window/windows	122
device?			Mobile	

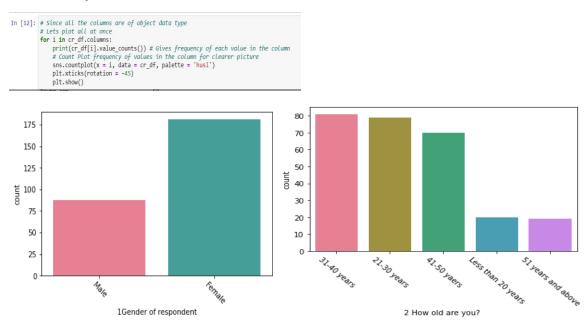
11 What browser do you run on your device to access the website?	269	4	Google chrome	216
12 Which channel did you follow to arrive at your favorite online store for the first time?	269	3	Search Engine	230
13 After first visit, how do you reach the online retail store?	269	5	Search Engine	87
14 How much time do you explore the e- retail store before making a purchase decision?	269	5	more than 15 mins	123
15 What is your preferred payment Option?	269	3	Credit/Debit cards	148
16 How frequently do you abandon (selecting an items and leaving without making payment) your shopping cart?	269	4	Sometimes	171
17 Why did you abandon the "Bag", "Shopping Cart"?	269	5	Better alternative offer	133
18 The content on the website must be easy to read and understand	269	4	Strongly agree (5)	164
19 Information on similar product to the one highlighted is important for product comparison	269	4	Strongly agree (5)	116
20 Complete information on listed seller and product being offered is important for purchase decision.	269	5	Agree (4)	101
21 All relevant information on listed products must be stated clearly	269	4	Agree (4)	132
22 Ease of navigation in website	269	4	Strongly agree (5)	141
23 Loading and processing speed	269	5	Strongly agree (5)	115
24 User friendly Interface of the website	269	5	Strongly agree (5)	189
25 Convenient Payment methods	269	3	Strongly agree (5)	159
26 Trust that the online retail store will fulfill its part of the transaction at the stipulated time	269	4	Strongly agree (5)	141
27 Empathy (readiness to assist with queries)	269	4	Strongly agree (5)	194
towards the customers				
28 Being able to guarantee the privacy of the customer	269	3	Strongly agree (5)	185
29 Responsiveness, availability of several communication channels (email, online rep, twitter, phone etc.)	269	4	Strongly agree (5)	149
30 Online shopping gives monetary benefit and discounts	269	5	Strongly agree (5)	105
31 Enjoyment is derived from shopping online	269	5	Strongly agree (5)	86
32 Shopping online is convenient and flexible	269	4	Strongly agree (5)	146
33 Return and replacement policy of the e-tailer is important for purchase decision	269	3	Strongly agree (5)	198
34 Gaining access to loyalty programs is a benefit of shopping online	269	5	Strongly agree (5)	115
35 Displaying quality Information on the website improves satisfaction of customers	269	3	Strongly agree (5)	133
36 User derive satisfaction while shopping on a good quality website or application	269	3	Strongly agree (5)	175
37 Net Benefit derived from shopping online can lead to users satisfaction	269	4	Strongly agree (5)	164
38 User satisfaction cannot exist without trust	269	5	Strongly agree (5)	122
39 Offering a wide variety of listed product in several category	269	4	Strongly agree (5)	111
40 Provision of complete and relevant product information	269	4	Strongly agree (5)	135

44.35	260	4	G. 1 (5)	1.40
41 Monetary savings	269	4	Strongly agree (5)	148
42 The Convenience of patronizing the online retailer	269	3	Agree (4)	138
43 Shopping on the website gives you the sense of adventure	269	5	Agree (4)	101
44 Shopping on your preferred e-tailer enhances your social status	269	5	indifferent (3)	100
45 You feel gratification shopping on your favorite e-tailer	269	5	indifferent (3)	101
46 Shopping on the website helps you fulfill certain roles	269	5	Agree (4)	88
47 Getting value for money spent	269	3	Agree (4)	149
From the following, tick any (or all) of the online retailers you have shopped from;	269	9	Amazon.in, Flipkart.com, Paytm.com, Myntra.com, Snapdeal.com	82
Easy to use website or application	269	10	Amazon.in, Flipkart.com, Paytm.com, Myntra.com, Snapdeal.com	64
Visual appealing web-page layout	269	10	Amazon.in, Flipkart.com	87
Wild variety of product on offer	269	9	Amazon.in, Flipkart.com	130
Complete, relevant description information of products	269	11	Amazon.in, Flipkart.com	100
Fast loading website speed of website and application	269	10	Amazon.in	51
Reliability of the website or application	269	10	Amazon.in	61
Quickness to complete purchase	269	9	Amazon.com	66
Availability of several payment options	269	11	Amazon.in, Flipkart.com	65
Speedy order delivery	269	6	Amazon.in	107
Privacy of customers' information	269	11	Amazon.in	71
Security of customer financial information	269	11	Amazon.in	51
Perceived Trustworthiness	269	9	Amazon.in	76
Presence of online assistance through multi-channel	269	10	Amazon.in, Flipkart.com, Myntra.com, Snapdeal	61
Longer time to get logged in (promotion, sales period)	269	10	Amazon.in	57
Longer time in displaying graphics and photos (promotion, sales period)	269	10	Amazon.in, Flipkart.com	60
Late declaration of price (promotion, sales period)	269	8	Myntra.com	75
Longer page loading time (promotion, sales period)	269	11	Myntra.com	61
Limited mode of payment on most products (promotion, sales period)	269	8	Snapdeal.com	87
Longer delivery period	269	6	Paytm.com	72
Change in website/Application design	269	7	Amazon.in	96
Frequent disruption when moving from one page to another	269	8	Amazon.in	53
Website is as efficient as before	269	8	Amazon.in	94

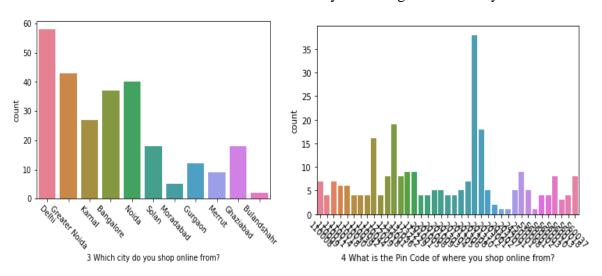
Which of the Indian online retailer would you	269	8	Amazon.in	79
recommend to a friend?				

2.3 Count Plot individual column

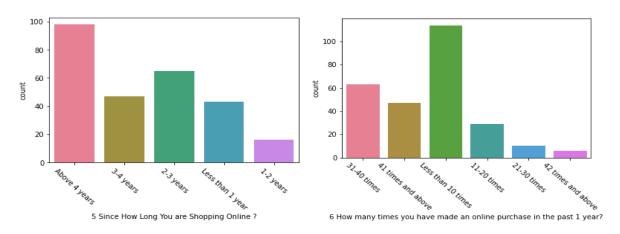
Now, let's plot some graphs like count plot of all the columns. Count plot will give us the clear picture of customer, their interest and opinion about different online shopping platforms and what medium they use such as internet facilities, mobile screen size.



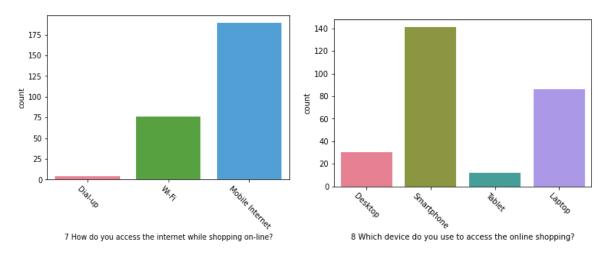
More female customers than male. Most online buyers in range of 21 to 50 yrs later it decreses.



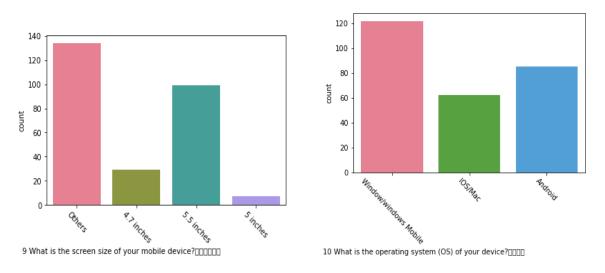
People shop more from Delhi and least from Bulandshahr.



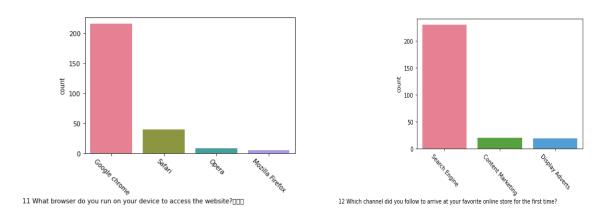
There are more people who are shopping online from past 4 years. More people who shopped less than 10 times online.



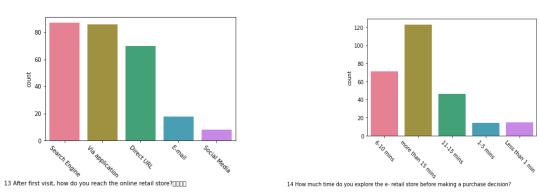
Most use smartphone for online shopping, hence mobile internet.



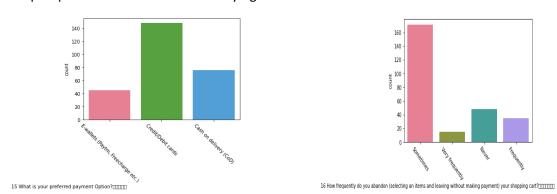
Mobile size comes of various sizes. People use all kinds of operating system.



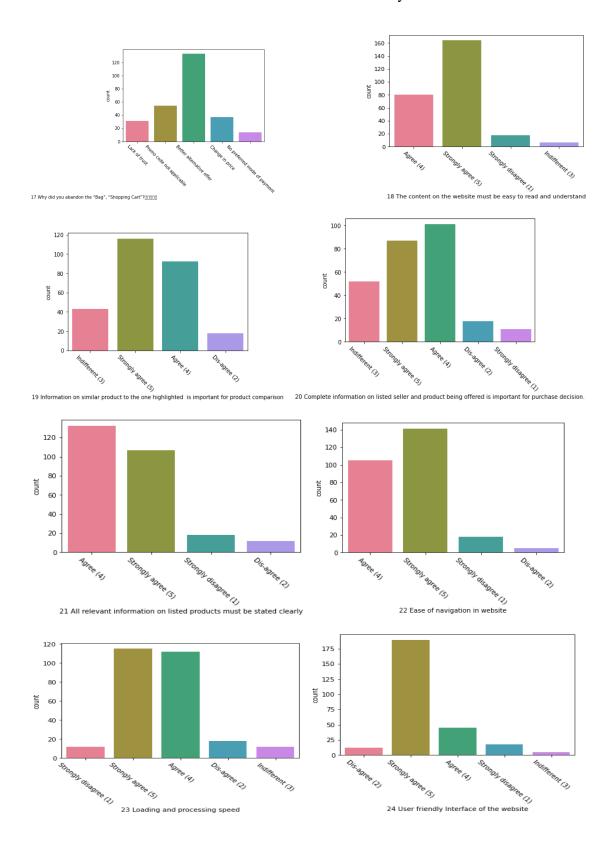
Most users use search engine for favorite online store mainly using google chrome.

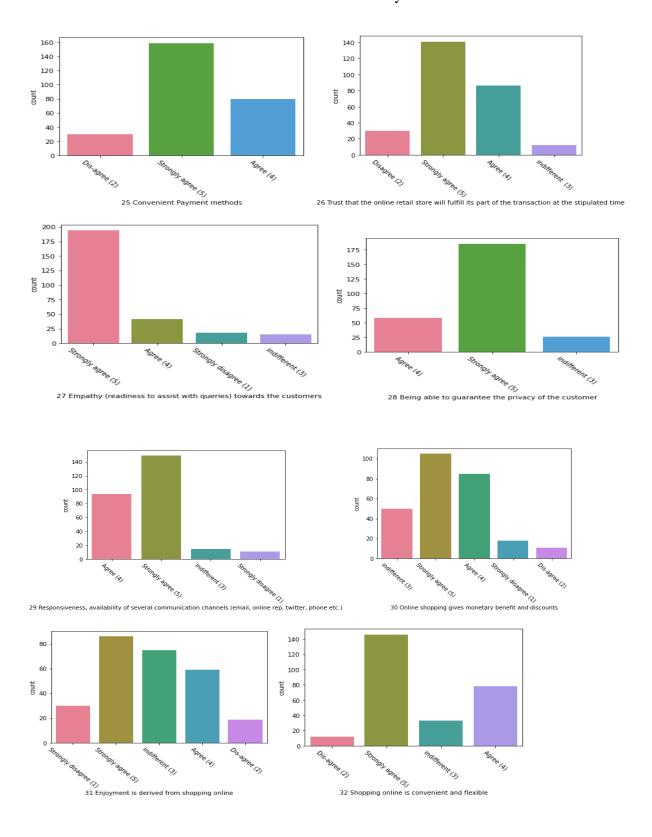


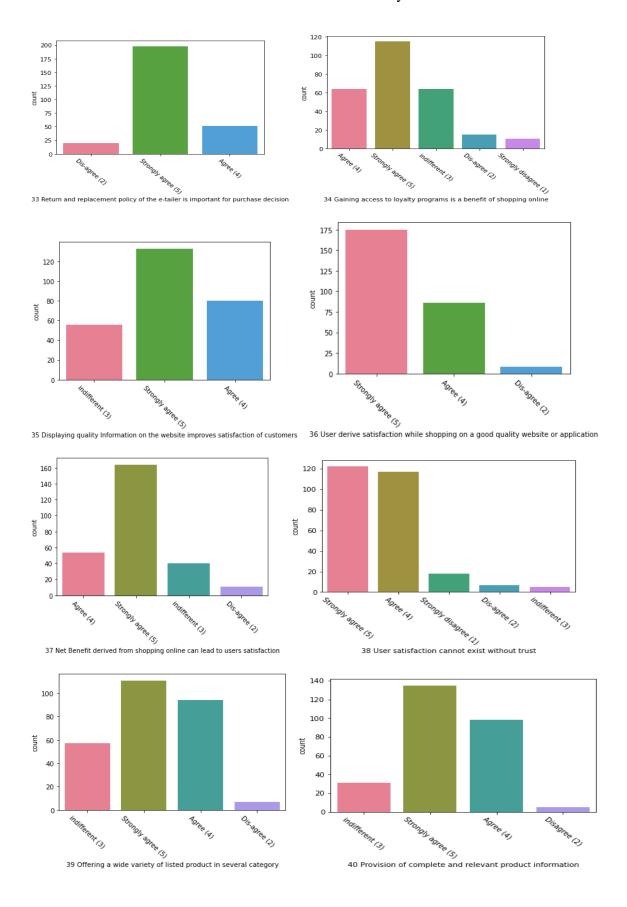
People spend more 15mins before buying.

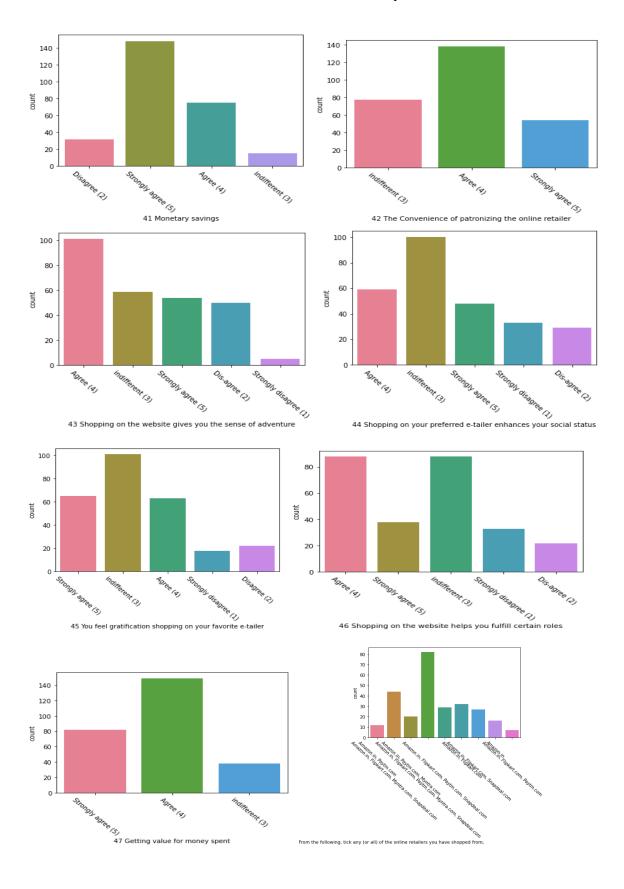


Most preferred payment is credit/debit card. Many a times after adding item to buy they discard it sometimes.

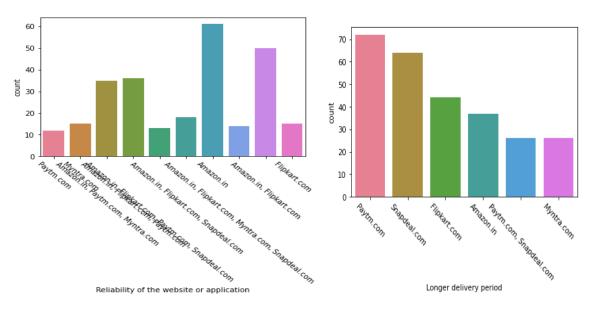








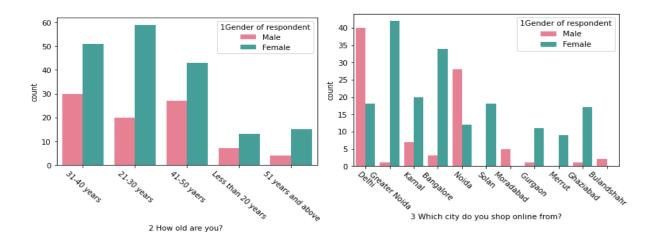
E-Retail: Customer Retention Case Study Data Visualization

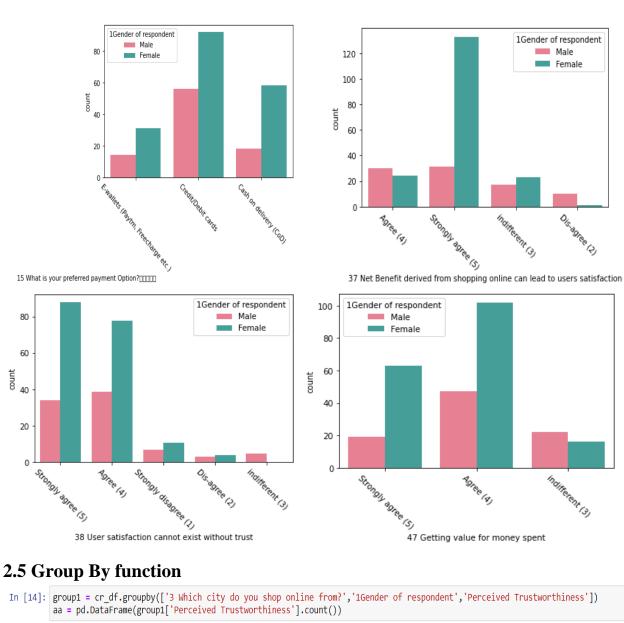


Looking at the data most preferred online shopping platform is Amazon and flipkart.

2.4 Count Plot based on Gender

Below plot clearly shows customer data with respect to gender. Only few plots are shown here and all other plots can be seen in jupyter notebook file. In most of the cases female customers are more prominent.





In [15]: aa.head()

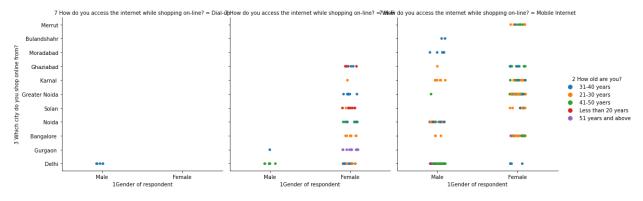
Out[15]:

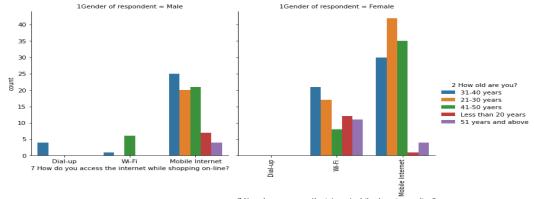
	Perceived Trustworthiness	1Gender of respondent	3 Which city do you shop online from?
11	Amazon.in	Female	Bangalore
2	Amazon.in, Flipkart.com		
4	Amazon.in, Flipkart.com, Paytm.com, Myntra.com, Snapdeal.com		
1	Amazon.in, Flipkart.com, Snapdeal.com		
9	Amazon.in, Myntra.com		

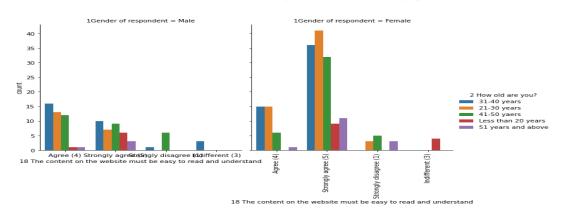
Perceived Trustworthiness

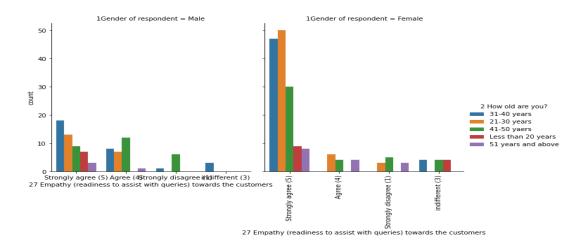
2.6 Catplot

Out[16]: <seaborn.axisgrid.FacetGrid at 0x18c59c23580>





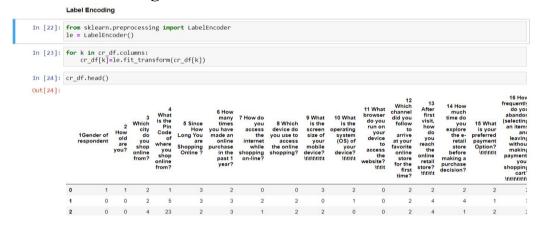




3. Model Building

In the given dataset I have consider the gender of respondents as the target variable and the remaining columns as dependent variables. So, this becomes a classification problem. From the data available we will be able to predict whether buyer is female or male.

3.1 Label Encoding



3.2 Skewness

```
In [27]: # Before removing skewness
print("Total count of numeric features: ",len(cr_df.skew()))
print("count of features which are significantly skewed: ",len(cr_df.skew().loc[abs(cr_df.skew())>0.5]))

Total count of numeric features: 71
count of features which are significantly skewed: 30

In [28]: for index in cr_df.skew().index:
    if cr_df.skew().loc[index]>0.5:
        cr_df[index]=np.log1p(cr_df[index])
    if cr_df.skew().loc[index]<-0.5:
        cr_df[index]=np.square(cr_df[index])

In [29]: # After removing skewness
    print("Total count of numeric features: ",len(cr_df.skew()))
    print("count of features which are significantly skewed: ",len(cr_df.skew().loc[abs(cr_df.skew())>0.5]))

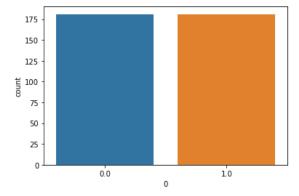
Total count of numeric features: 71
    count of features which are significantly skewed: 7
```

3.3 Scaling

Data is first split into x and y before applying scaling. Scaling is been done for both x and y.

3.4 SMOTE for imbalance

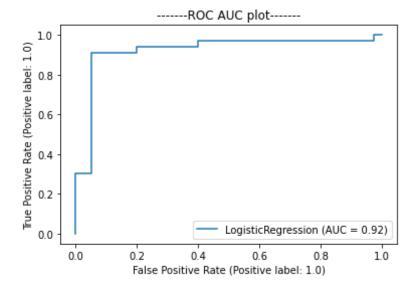
Gender is the target variable which we have considered which is imbalanced. So, we need to balance it before applying any algorithm for training. After applying SMOTE we can see the data is balanced now as shown below.



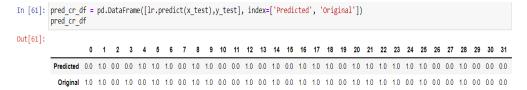
3.5 Model Training

Only one algorithm is applied here i.e. Logistic Regression. No cross validation, neither hyper parameter is applied. Only with one model training the algorithm is giving good results as shown below with all the output (accuracy, training and testing score, confusion matrix and classification report) for classification problem along with roc curve.

```
----- LogisticRegression() ------
Accuracy score of LogisticRegression() is: 0.8904109589041096
Training score of LogisticRegression() is 0.9134948096885813
Testing score of LogisticRegression() is 0.9134948096885813
Confusion lratrix:
[[35 5]
 [ 3 30]]
Classification Report:
              precision
                          recall f1-score
                                             support
        0.0
                  0.92
                           0.88
                                     0.90
                                                 40
        1.0
                  0.86
                           0.91
                                     0.88
                                                 33
                                     0.89
                                                 73
   accuracy
  macro avg
                  0.89
                           0.89
                                     0.89
                                                 73
weighted avg
                  0.89
                                     0.89
                                                 73
                           0.89
```



Data frame of Predicted value and original value.



Conclusion

From EDA of the data there are more female customers than male ones. Count plot individually as well as with respect gender was plotted. Summary statistics whose table is given above tells many things about all the columns present in the dataset. This summary will let us know all important aspects of customer response, opinion, choice and interest for online shopping websites. Group by function was used to see the trust worthiness of both male and female from various cities from where they shop online. Categorical plot also was plotted to give more clear picture.

Later, after label encoding, skewness and scaling the data was trained with Logistic Regression which gave an accuracy score of 0.9134 or 91.34%.

References

[1] [Online]. Available: https://www.dreamstime.com/stock-photo-customer-retention-image17628620.