Story Telling –Case-Study-Airbnb-NYC

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Problem Statement

Problem background

Suppose that you are working as a data analyst at Airbnb. For the past few months, Airbnb has seen a major decline in revenue. Now that the restrictions have started lifting and people have started to travel more, Airbnb wants to make sure that it is fully prepared for this change.
The different leaders at Airbnb want to understand some important insights based on various attributes in the dataset so as to increase the revenue such as -

1.Which type of hosts to acquire more and where?

2.The categorisation of customers based on their preferences.

- What are the neighbourhoods they need to target?
- What is the pricing ranges preferred by customers?
- The various kinds of properties that exist w.r.t. customer preferences.
- Adjustments in the existing properties to make it more customer-oriented.

3.What are the most popular localities and properties in New York currently?

4.How to get unpopular properties more traction? and so on...

In [1]:
```
# Importing required libraries
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
import seaborn as sns

#Remove warnings in kernel while running a cell
import warnings
warnings.filterwarnings('ignore')

#notebook setting to display all the rowns and columns .
pd.set_option('display.max_rows', 500)
pd.set_option('display.max_columns', 500)
pd.set_option('display.width', 1000)
pd.set_option('display.expand_frame_repr', False)
pd.set_option('display.max_columns',None)
```

Dataset - "AB_NYC_2019.csv"

Reading and Understanding the Data

In [2]:
```
# Importing df_Leads.csv and vewing the dataframe

df_nyc = pd.read_csv('AB_NYC_2019.csv')
df_nyc.head()
```

Out[2]:

	id	name	host_id	host_name	neighbourhood_group	neighbourhood	latitude	longitude	room_type	price	minimum_nights	number_of_revie
0	2539	Clean & quiet apt home by the park	2787	John	Brooklyn	Kensington	40.64749	-73.97237	Private room	149	1	
1	2595	Skylit Midtown Castle	2845	Jennifer	Manhattan	Midtown	40.75362	-73.98377	Entire home/apt	225	1	
2	3647	THE VILLAGE OF HARLEM....NEW YORK !	4632	Elisabeth	Manhattan	Harlem	40.80902	-73.94190	Private room	150	3	
3	3831	Cozy Entire Floor of Brownstone	4869	LisaRoxanne	Brooklyn	Clinton Hill	40.68514	-73.95976	Entire home/apt	89	1	
4	5022	Entire Apt: Spacious Studio/Loft by central park	7192	Laura	Manhattan	East Harlem	40.79851	-73.94399	Entire home/apt	80	10	

In [3]:
```
df_nyc.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 48895 entries, 0 to 48894
Data columns (total 16 columns):
 #   Column                          Non-Null Count  Dtype  
---  ------                          --------------  -----  
 0   id                              48895 non-null  int64  
 1   name                            48879 non-null  object 
 2   host_id                         48895 non-null  int64  
 3   host_name                       48874 non-null  object 
 4   neighbourhood_group             48895 non-null  object 
 5   neighbourhood                   48895 non-null  object 
 6   latitude                        48895 non-null  float64
 7   longitude                       48895 non-null  float64
 8   room_type                       48895 non-null  object 
 9   price                           48895 non-null  int64  
 10  minimum_nights                  48895 non-null  int64  
 11  number_of_reviews               48895 non-null  int64  
 12  last_review                     38843 non-null  object 
 13  reviews_per_month               38843 non-null  float64
 14  calculated_host_listings_count  48895 non-null  int64  
 15  availability_365                48895 non-null  int64  
dtypes: float64(3), int64(7), object(6)
memory usage: 6.0+ MB
```

Inspecting the Dataframe

In [4]:
```
# Let's see how many rows and columns we have

df_nyc.shape
```

Out[4]: (48895, 16)

In [5]:
```
df_nyc.describe()
```

Out[5]:

	id	host_id	latitude	longitude	price	minimum_nights	number_of_reviews	reviews_per_month	calculated_host_listings
count	4.889500e+04	4.889500e+04	48895.000000	48895.000000	48895.000000	48895.000000	48895.000000	38843.000000	48895.
mean	1.901714e+07	6.762001e+07	40.728949	-73.952170	152.720687	7.029962	23.274466	1.373221	7.
std	1.098311e+07	7.861097e+07	0.054530	0.046157	240.154170	20.510550	44.550582	1.680442	32.
min	2.539000e+03	2.438000e+03	40.499790	-74.244420	0.000000	1.000000	0.000000	0.010000	1.
25%	9.471945e+06	7.822033e+06	40.690100	-73.983070	69.000000	1.000000	1.000000	0.190000	1.
50%	1.967728e+07	3.079382e+07	40.723070	-73.955680	106.000000	3.000000	5.000000	0.720000	1.
75%	2.915218e+07	1.074344e+08	40.763115	-73.936275	175.000000	5.000000	24.000000	2.020000	2.
max	3.648724e+07	2.743213e+08	40.913060	-73.712990	10000.000000	1250.000000	629.000000	58.500000	327.

In [6]:
```
df_nyc.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 48895 entries, 0 to 48894
Data columns (total 16 columns):
 #   Column                          Non-Null Count  Dtype  
---  ------                          --------------  -----  
 0   id                              48895 non-null  int64  
 1   name                            48879 non-null  object 
 2   host_id                         48895 non-null  int64  
 3   host_name                       48874 non-null  object 
 4   neighbourhood_group             48895 non-null  object 
 5   neighbourhood                   48895 non-null  object 
 6   latitude                        48895 non-null  float64
 7   longitude                       48895 non-null  float64
 8   room_type                       48895 non-null  object 
 9   price                           48895 non-null  int64  
 10  minimum_nights                  48895 non-null  int64  
 11  number_of_reviews               48895 non-null  int64  
 12  last_review                     38843 non-null  object 
 13  reviews_per_month               38843 non-null  float64
 14  calculated_host_listings_count  48895 non-null  int64  
 15  availability_365                48895 non-null  int64  
dtypes: float64(3), int64(7), object(6)
memory usage: 6.0+ MB
```

Data Cleaning

Duplicate values check

In [7]:
```
# Checking Duplicates
df_nyc.duplicated().sum()
```

Out[7]:
```
0
```

Missing values check

In [8]:
```
List =  list(df_nyc.columns)
print(List)
```

```
['id', 'name', 'host_id', 'host_name', 'neighbourhood_group', 'neighbourhood', 'latitude', 'longitude', 'room_type', 'price',
'minimum_nights', 'number_of_reviews', 'last_review', 'reviews_per_month', 'calculated_host_listings_count', 'availability_36
5']
```

In [9]:
```
#looking to find out first what columns have null values
#using 'sum' function will show us how many nulls are found in each column in dataset
df_nyc.isnull().sum()
```

Out[9]:

id	0
name	16
host_id	0
host_name	21
neighbourhood_group	0
neighbourhood	0
latitude	0
longitude	0
room_type	0
price	0
minimum_nights	0
number_of_reviews	0
last_review	10052
reviews_per_month	10052
calculated_host_listings_count	0
availability_365	0

dtype: int64

In [10]:
```
# Checking Null Values Percentage in the dataset
(df_nyc.isnull().sum()/len(df_nyc)*100).sort_values(ascending=False)
```

Out[10]:
```
last_review                     20.558339
reviews_per_month               20.558339
host_name                        0.042949
name                             0.032723
id                               0.000000
host_id                          0.000000
neighbourhood_group              0.000000
neighbourhood                    0.000000
latitude                         0.000000
longitude                        0.000000
room_type                        0.000000
price                            0.000000
minimum_nights                   0.000000
number_of_reviews                0.000000
calculated_host_listings_count   0.000000
availability_365                 0.000000
dtype: float64
```

In [11]:
```
# checking row wise missing values
((df_nyc.isnull().sum(axis=1))/(df_nyc.shape[1])*100).sort_values(ascending=False)
```

Out[11]:
```
6605     18.75
38992    18.75
18047    18.75
6567     18.75
16071    18.75
         ...
17948     0.00
17949     0.00
17950     0.00
17951     0.00
24447     0.00
Length: 48895, dtype: float64
```

In [12]:
```
for i in List:
    print(i)
```

```
id
name
host_id
host_name
neighbourhood_group
neighbourhood
latitude
longitude
room_type
price
minimum_nights
number_of_reviews
last_review
reviews_per_month
calculated_host_listings_count
availability_365
```

```
In [13]: df_nyc.neighbourhood_group.value_counts()
```

```
Out[13]: Manhattan        21661
         Brooklyn         20104
         Queens            5666
         Bronx             1091
         Staten Island      373
         Name: neighbourhood_group, dtype: int64
```

```
In [14]: df_nyc.neighbourhood.value_counts()
```

```
Out[14]: Williamsburg                 3920
         Bedford-Stuyvesant           3714
         Harlem                       2658
         Bushwick                     2465
         Upper West Side              1971
         Hell's Kitchen               1958
         East Village                 1853
         Upper East Side              1798
         Crown Heights                1564
         Midtown                      1545
         East Harlem                  1117
         Greenpoint                   1115
         Chelsea                      1113
         Lower East Side               911
         Astoria                       900
         Washington Heights            899
         West Village                  768
         Financial District            744
         Flatbush                      621
```

```
In [15]: df_nyc.room_type.value_counts()
```

```
Out[15]: Entire home/apt    25409
         Private room       22326
         Shared room         1160
         Name: room_type, dtype: int64
```

In [16]:
```
df_nyc[df_nyc.last_review.isna() == True]
```

Out[16]:

	id	name	host_id	host_name	neighbourhood_group	neighbourhood	latitude	longitude	room_type	price	minimum_nights	numbe
2	3647	THE VILLAGE OF HARLEM....NEW YORK !	4632	Elisabeth	Manhattan	Harlem	40.80902	-73.94190	Private room	150	3	
19	7750	Huge 2 BR Upper East Cental Park	17985	Sing	Manhattan	East Harlem	40.79685	-73.94872	Entire home/apt	190	7	
26	8700	Magnifique Suite au N de Manhattan - vue Cloitres	26394	Claude & Sophie	Manhattan	Inwood	40.86754	-73.92639	Private room	80	4	
36	11452	Clean and Quiet in Brooklyn	7355	Vt	Brooklyn	Bedford-Stuyvesant	40.68876	-73.94312	Private room	35	60	
38	11943	Country space in the city	45445	Harriet	Brooklyn	Flatbush	40.63702	-73.96327	Private room	150	1	
...	...	...	...	...	...	...	...	...	...	...	...	
48890	36484665	Charming one bedroom - newly renovated rowhouse	8232441	Sabrina	Brooklyn	Bedford-Stuyvesant	40.67853	-73.94995	Private room	70	2	
48891	36485057	Affordable room in Bushwick/East Williamsburg	6570630	Marisol	Brooklyn	Bushwick	40.70184	-73.93317	Private room	40	4	
48892	36485431	Sunny Studio at Historical Neighborhood	23492952	Ilgar & Aysel	Manhattan	Harlem	40.81475	-73.94867	Entire home/apt	115	10	
48893	36485609	43rd St. Time Square-cozy single bed	30985759	Taz	Manhattan	Hell's Kitchen	40.75751	-73.99112	Shared room	55	1	
48894	36487245	Trendy duplex in the very heart of Hell's Kitchen	68119814	Christophe	Manhattan	Hell's Kitchen	40.76404	-73.98933	Private room	90	7	

10052 rows × 16 columns

In [17]:
```
df_nyc.last_review.value_counts()
```

Out[17]:
```
23-06-2019    1413
01-07-2019    1359
30-06-2019    1341
24-06-2019     875
07-07-2019     718
              ...
25-12-2012       1
01-10-2013       1
29-05-2014       1
19-04-2014       1
29-03-2018       1
Name: last_review, Length: 1764, dtype: int64
```

In [18]:
```
df_nyc['last_review'] = pd.to_datetime(df_nyc['last_review'])
```

In [19]:
```
df_nyc.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 48895 entries, 0 to 48894
Data columns (total 16 columns):
 #   Column                          Non-Null Count  Dtype         
---  ------                          --------------  -----         
 0   id                              48895 non-null  int64         
 1   name                            48879 non-null  object        
 2   host_id                         48895 non-null  int64         
 3   host_name                       48874 non-null  object        
 4   neighbourhood_group             48895 non-null  object        
 5   neighbourhood                   48895 non-null  object        
 6   latitude                        48895 non-null  float64       
 7   longitude                       48895 non-null  float64       
 8   room_type                       48895 non-null  object        
 9   price                           48895 non-null  int64         
 10  minimum_nights                  48895 non-null  int64         
 11  number_of_reviews               48895 non-null  int64         
 12  last_review                     38843 non-null  datetime64[ns]
 13  reviews_per_month               38843 non-null  float64       
 14  calculated_host_listings_count  48895 non-null  int64         
 15  availability_365                48895 non-null  int64         
dtypes: datetime64[ns](1), float64(3), int64(7), object(5)
memory usage: 6.0+ MB
```

In [20]:
```
df_nyc.drop(['name','host_name'], axis=1, inplace=True)
df_nyc.head()
```

Out[20]:

	id	host_id	neighbourhood_group	neighbourhood	latitude	longitude	room_type	price	minimum_nights	number_of_reviews	last_review	reviews_per_r
0	2539	2787	Brooklyn	Kensington	40.64749	-73.97237	Private room	149	1	9	2018-10-19	
1	2595	2845	Manhattan	Midtown	40.75362	-73.98377	Entire home/apt	225	1	45	2019-05-21	
2	3647	4632	Manhattan	Harlem	40.80902	-73.94190	Private room	150	3	0	NaT	
3	3831	4869	Brooklyn	Clinton Hill	40.68514	-73.95976	Entire home/apt	89	1	270	2019-05-07	
4	5022	7192	Manhattan	East Harlem	40.79851	-73.94399	Entire home/apt	80	10	9	2018-11-19	

In [21]:
```
Q1 = df_nyc["reviews_per_month"].quantile(0.25)
Q3 = df_nyc["reviews_per_month"].quantile(0.75)
Q4 = df_nyc["reviews_per_month"].quantile(0.95)
IQR = Q3 - Q1
upper = Q3 + 1.5*IQR
lower = Q1 - 1.5*IQR
```

In [22]:
```
print(Q1)
print(Q4)
print(Q3)
print(IQR)
print(upper)
print(lower)
```

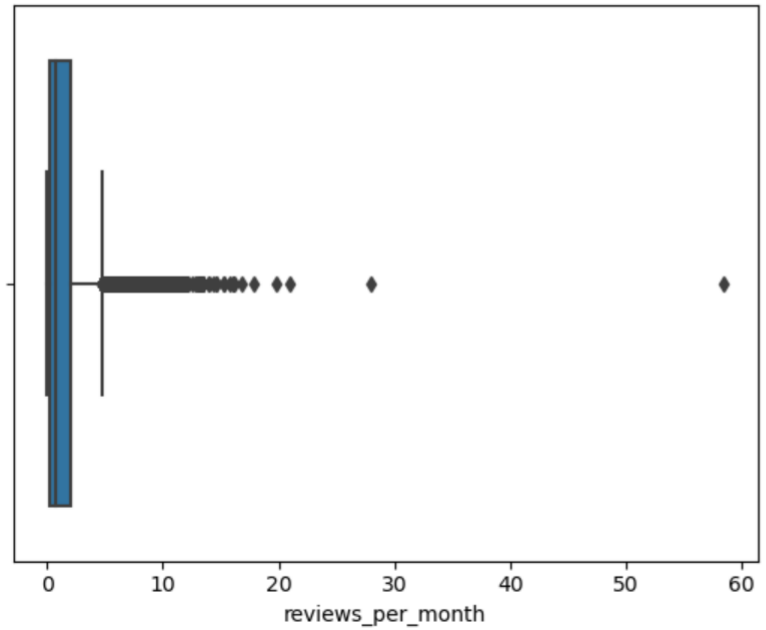
```
0.19
4.64
2.02
1.83
4.765000000000001
-2.555
```

In [23]:
```
if (df_nyc["reviews_per_month"].max() - upper == 0) or (abs(df_nyc["reviews_per_month"].min()) - abs(lower)== 0):
    print(True)
```

In [23]:
```
if (df_nyc["reviews_per_month"].max() - upper == 0) or (abs(df_nyc["reviews_per_month"].min()) - abs(lower)== 0):
    print(True)
```

In [24]:
```
sns.boxplot(data=df_nyc,x="reviews_per_month")
```

Out[24]:
```
<AxesSubplot:xlabel='reviews_per_month'>
```



In [25]:
```
df_nyc['reviews_per_month'] = df_nyc['reviews_per_month'].fillna(df_nyc['reviews_per_month'].median())
```

In [26]:
```
df_nyc.describe()
```

Out[26]:

	id	host_id	latitude	longitude	price	minimum_nights	number_of_reviews	reviews_per_month	calculated_host_listings
count	4.889500e+04	4.889500e+04	48895.000000	48895.000000	48895.000000	48895.000000	48895.000000	48895.000000	48895.
mean	1.901714e+07	6.762001e+07	40.728949	-73.952170	152.720687	7.029962	23.274466	1.238930	7.
std	1.098311e+07	7.861097e+07	0.054530	0.046157	240.154170	20.510550	44.550582	1.520861	32.
min	2.539000e+03	2.438000e+03	40.499790	-74.244420	0.000000	1.000000	0.000000	0.010000	1.
25%	9.471945e+06	7.822033e+06	40.690100	-73.983070	69.000000	1.000000	1.000000	0.280000	1.
50%	1.967728e+07	3.079382e+07	40.723070	-73.955680	106.000000	3.000000	5.000000	0.720000	1.
75%	2.915218e+07	1.074344e+08	40.763115	-73.936275	175.000000	5.000000	24.000000	1.580000	2.
max	3.648724e+07	2.743213e+08	40.913060	-73.712990	10000.000000	1250.000000	629.000000	58.500000	327.

In [27]:
```
df_nyc
```

Out[27]:

	id	host_id	neighbourhood_group	neighbourhood	latitude	longitude	room_type	price	minimum_nights	number_of_reviews	last_review	rev
0	2539	2787	Brooklyn	Kensington	40.64749	-73.97237	Private room	149	1	9	2018-10-19	
1	2595	2845	Manhattan	Midtown	40.75362	-73.98377	Entire home/apt	225	1	45	2019-05-21	
2	3647	4632	Manhattan	Harlem	40.80902	-73.94190	Private room	150	3	0	NaT	
3	3831	4869	Brooklyn	Clinton Hill	40.68514	-73.95976	Entire home/apt	89	1	270	2019-05-07	
4	5022	7192	Manhattan	East Harlem	40.79851	-73.94399	Entire home/apt	80	10	9	2018-11-19	
...	...	...	...	...	...	...	...	...	...	...	...	...
48890	36484665	8232441	Brooklyn	Bedford-Stuyvesant	40.67853	-73.94995	Private room	70	2	0	NaT	
48891	36485057	6570630	Brooklyn	Bushwick	40.70184	-73.93317	Private room	40	4	0	NaT	
48892	36485431	23492952	Manhattan	Harlem	40.81475	-73.94867	Entire home/apt	115	10	0	NaT	
48893	36485609	30985759	Manhattan	Hell's Kitchen	40.75751	-73.99112	Shared room	55	1	0	NaT	
48894	36487245	68119814	Manhattan	Hell's Kitchen	40.76404	-73.98933	Private room	90	7	0	NaT	

48895 rows × 14 columns

In [28]:
```
df_nyc.to_csv("Final_Nyc.csv")
```

Thank you