hotel-data-analytics

October 27, 2023

AtliQ Hotels Data Analysis Project

[8]:
```
import pandas as pd
import matplotlib.pyplot as plt
%matplotlib inline
```

1. Data Import and Data Exploration

We have 5 CSV files:

dim_date.csv

dim_hotels.csv

dim_rooms.csv

fact_aggregated_bookings.csv

fact_bookings.csv

[2]:
```
df_bookings = pd.read_csv('datasets/fact_bookings.csv')
df_date = pd.read_csv('datasets/dim_date.csv')
df_hotels = pd.read_csv('datasets/dim_hotels.csv')
df_rooms = pd.read_csv('datasets/dim_rooms.csv')
df_agg_bookings = pd.read_csv('datasets/fact_aggregated_bookings.csv')
```

0.0.1 Exploratory Data Analysis

[3]:
```
df_bookings.head()
```

[3]:
```
         booking_id  property_id booking_date check_in_date checkout_date  \
0  May012216558RT11        16558     27-04-22      1/5/2022      2/5/2022
1  May012216558RT12        16558     30-04-22      1/5/2022      2/5/2022
2  May012216558RT13        16558     28-04-22      1/5/2022      4/5/2022
3  May012216558RT14        16558     28-04-22      1/5/2022      2/5/2022
4  May012216558RT15        16558     27-04-22      1/5/2022      2/5/2022

   no_guests room_category booking_platform  ratings_given booking_status  \
0       -3.0           RT1    direct online            1.0    Checked Out
1        2.0           RT1           others            NaN      Cancelled
2        2.0           RT1          logtrip            5.0    Checked Out
```

```
3        -2.0           RT1           others            NaN      Cancelled
4         4.0           RT1    direct online            5.0    Checked Out

   revenue_generated  revenue_realized
0              10010             10010
1               9100              3640
2            9100000              9100
3               9100              3640
4              10920             10920
```

```
[4]: df_bookings.shape
```

```
[4]: (134590, 12)
```

```
[5]: df_bookings.room_category.unique()
```

```
[5]: array(['RT1', 'RT2', 'RT3', 'RT4'], dtype=object)
```

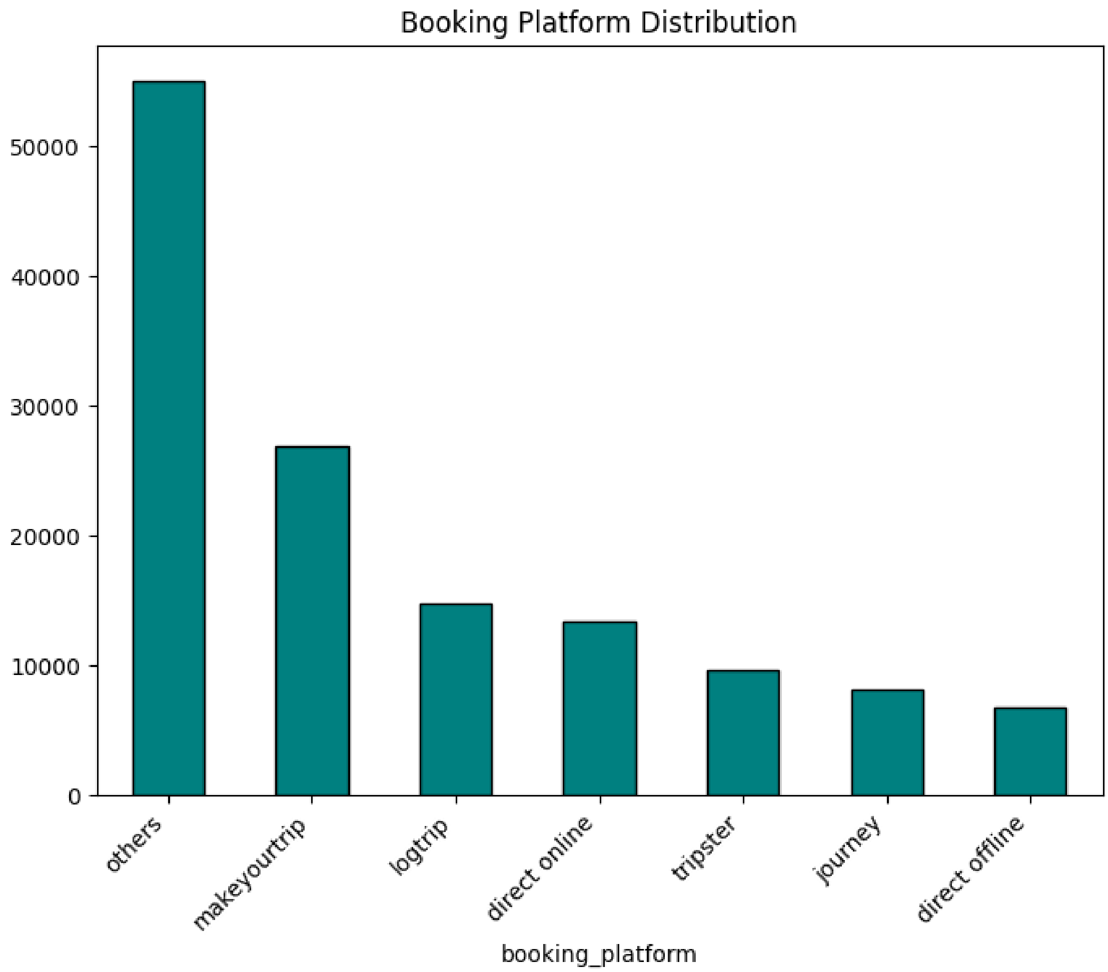
```
[6]: df_bookings.booking_platform.unique()
```

```
[6]: array(['direct online', 'others', 'logtrip', 'tripster', 'makeyourtrip',
            'journey', 'direct offline'], dtype=object)
```

```
[7]: df_bookings.booking_platform.value_counts()
```

```
[7]: booking_platform
     others            55066
     makeyourtrip      26898
     logtrip           14756
     direct online     13379
     tripster           9630
     journey            8106
     direct offline     6755
     Name: count, dtype: int64
```

```
[14]: df_bookings.booking_platform.value_counts().plot(kind = "bar",color='teal',␣
        ↪edgecolor='black', figsize=(8, 6))
      plt.title("Booking Platform Distribution")
      plt.xticks(rotation=45, ha='right')
      plt.show()
```



[15]:
```
df_bookings.describe()
```

[15]:
```
         property_id      no_guests  ratings_given  revenue_generated  \
count  134590.000000  134587.000000   56683.000000       1.345900e+05
mean    18061.113493       2.036170       3.619004       1.537805e+04
std      1093.055847       1.034885       1.235009       9.303604e+04
min     16558.000000     -17.000000       1.000000       6.500000e+03
25%     17558.000000       1.000000       3.000000       9.900000e+03
50%     17564.000000       2.000000       4.000000       1.350000e+04
75%     18563.000000       2.000000       5.000000       1.800000e+04
max     19563.000000       6.000000       5.000000       2.856000e+07

       revenue_realized
count     134590.000000
mean       12696.123256
std         6928.108124
min         2600.000000
```

```
25%        7600.000000
50%       11700.000000
75%       15300.000000
max       45220.000000
```

[16]:

```
df_hotels.shape
```

[16]:

```
(25, 4)
```

[17]:

```
df_hotels.head(3)
```

[17]:

```
   property_id  property_name  category    city
0        16558   Atliq Grands    Luxury   Delhi
1        16559  Atliq Exotica    Luxury  Mumbai
2        16560     Atliq City  Business   Delhi
```

[18]:

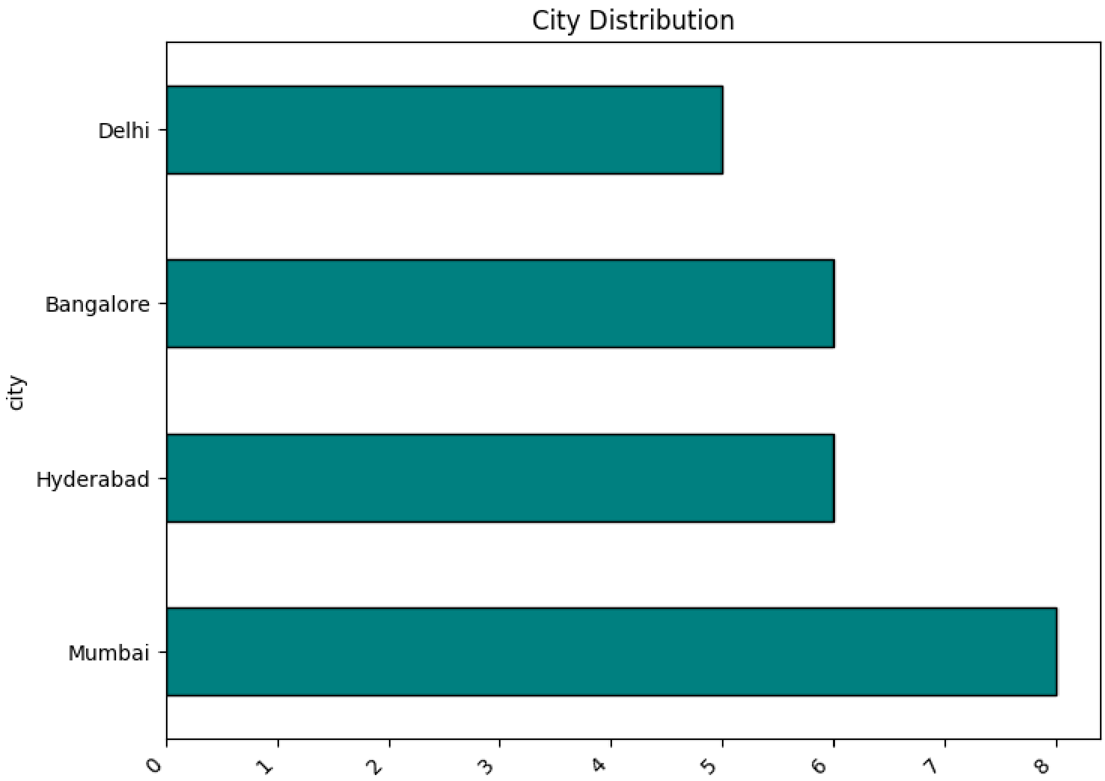
```
df_hotels.category.value_counts()
```

[18]:

```
category
Luxury      16
Business     9
Name: count, dtype: int64
```

[23]:

```
df_hotels.city.value_counts().plot(kind = "barh",color='teal', edgecolor='black', figsize=(8, 6))
plt.title("City Distribution")
plt.xticks(rotation=45, ha='right')
plt.show()
```



```
[24]: df_agg_bookings.head(3)
```

```
[24]:    property_id check_in_date room_category  successful_bookings  capacity
      0        16559       1-May-22           RT1                   25      30.0
      1        19562       1-May-22           RT1                   28      30.0
      2        19563       1-May-22           RT1                   23      30.0
```

```
[25]: df_agg_bookings.property_id.unique()
```

```
[25]: array([16559, 19562, 19563, 17558, 16558, 17560, 19558, 19560, 17561,
             16560, 16561, 16562, 16563, 17559, 17562, 17563, 18558, 18559,
             18561, 18562, 18563, 19559, 19561, 17564, 18560], dtype=int64)
```

```
[27]: df_agg_bookings.property_id.nunique()
```

```
[27]: 25
```

```
[26]: df_agg_bookings.groupby("property_id")["successful_bookings"].sum()
```

```
[26]: property_id
      16558    3153
      16559    7338
```

```
16560    4693
16561    4418
16562    4820
16563    7211
17558    5053
17559    6142
17560    6013
17561    5183
17562    3424
17563    6337
17564    3982
18558    4475
18559    5256
18560    6638
18561    6458
18562    7333
18563    4737
19558    4400
19559    4729
19560    6079
19561    5736
19562    5812
19563    5413
Name: successful_bookings, dtype: int64
```

[28]:
```
df_agg_bookings[df_agg_bookings.successful_bookings>df_agg_bookings.capacity]
```

[28]:
```
      property_id check_in_date room_category  successful_bookings  capacity
3           17558      1-May-22           RT1                   30      19.0
12          16563      1-May-22           RT1                  100      41.0
4136        19558     11-Jun-22           RT2                   50      39.0
6209        19560      2-Jul-22           RT1                  123      26.0
8522        19559     25-Jul-22           RT1                   35      24.0
9194        18563     31-Jul-22           RT4                   20      18.0
```

[29]:
```
df_agg_bookings.capacity.max()
```

[29]:
```
50.0
```

[30]:
```
df_agg_bookings[df_agg_bookings.capacity==df_agg_bookings.capacity.max()]
```

[30]:
```
      property_id check_in_date room_category  successful_bookings  capacity
27          17558      1-May-22           RT2                   38      50.0
128         17558      2-May-22           RT2                   27      50.0
229         17558      3-May-22           RT2                   26      50.0
328         17558      4-May-22           RT2                   27      50.0
428         17558      5-May-22           RT2                   29      50.0
```

```
…            …          …          …            …       …
8728         17558      27-Jul-22        RT2                 22       50.0
8828         17558      28-Jul-22        RT2                 21       50.0
8928         17558      29-Jul-22        RT2                 23       50.0
9028         17558      30-Jul-22        RT2                 32       50.0
9128         17558      31-Jul-22        RT2                 30       50.0

[92 rows x 5 columns]
```

```
[31]: df_rooms.head()
```

```
[31]:   room_id    room_class
      0     RT1      Standard
      1     RT2         Elite
      2     RT3       Premium
      3     RT4  Presidential
```

2. Data Cleaning

```
[33]: df_bookings.describe()
```

```
[33]:         property_id     no_guests  ratings_given  revenue_generated  \
      count 134590.000000  134587.000000  56683.000000       1.345900e+05
      mean   18061.113493       2.036170      3.619004       1.537805e+04
      std     1093.055847       1.034885      1.235009       9.303604e+04
      min    16558.000000     -17.000000      1.000000       6.500000e+03
      25%    17558.000000       1.000000      3.000000       9.900000e+03
      50%    17564.000000       2.000000      4.000000       1.350000e+04
      75%    18563.000000       2.000000      5.000000       1.800000e+04
      max    19563.000000       6.000000      5.000000       2.856000e+07

             revenue_realized
      count     134590.000000
      mean       12696.123256
      std         6928.108124
      min         2600.000000
      25%         7600.000000
      50%        11700.000000
      75%        15300.000000
      max        45220.000000
```

1) Cleaning invalid guests

```
[34]: df_bookings[df_bookings.no_guests<=0]
```

```
[34]:                booking_id  property_id booking_date check_in_date  \
      0        May012216558RT11        16558     27-04-22      1/5/2022
      3        May012216558RT14        16558     28-04-22      1/5/2022
```

```
17924    May122218559RT44        18559    12/5/2022     12/5/2022
18020    May122218561RT22        18561     8/5/2022     12/5/2022
18119   May122218562RT311        18562     5/5/2022     12/5/2022
18121   May122218562RT313        18562    10/5/2022     12/5/2022
56715    Jun082218562RT12        18562     5/6/2022      8/6/2022
119765  Jul202219560RT220        19560     19-07-22      20-07-22
134586   Jul312217564RT47        17564     30-07-22      31-07-22

       checkout_date  no_guests room_category booking_platform  ratings_given  \
0           2/5/2022       -3.0           RT1    direct online            1.0
3           2/5/2022       -2.0           RT1           others            NaN
17924       14-05-22      -10.0           RT4    direct online            NaN
18020       14-05-22      -12.0           RT2     makeyourtrip            NaN
18119       17-05-22       -6.0           RT3   direct offline            5.0
18121       17-05-22       -4.0           RT3    direct online            NaN
56715       13-06-22      -17.0           RT1           others            NaN
119765      22-07-22       -1.0           RT2           others            NaN
134586      1/8/2022       -4.0           RT4          logtrip            2.0

       booking_status  revenue_generated  revenue_realized
0         Checked Out              10010             10010
3           Cancelled               9100              3640
17924         No Show              20900             20900
18020       Cancelled               9000              3600
18119     Checked Out              16800             16800
18121       Cancelled              14400              5760
56715     Checked Out               6500              6500
119765    Checked Out              13500             13500
134586    Checked Out              38760             38760
```

As you can see above, number of guests having less than zero value represents data error. We can ignore these records.

```
[37]: df_bookings = df_bookings[df_bookings.no_guests>0]
```

```
[38]: df_bookings.shape
```

```
[38]: (134578, 12)
```

2) Outlier removal in revenue generated

```
[39]: df_bookings.revenue_generated.min(), df_bookings.revenue_generated.max()
```

```
[39]: (6500, 28560000)
```

```
[41]: df_bookings.revenue_generated.mean(), df_bookings.revenue_generated.median()
```

```
[41]: (15378.036937686695, 13500.0)
```

[43]:
```
avg, std = df_bookings.revenue_generated.mean(), df_bookings.revenue_generated.
 ↪std()
avg , std
```

[43]:
```
(15378.036937686695, 93040.1549314641)
```

[44]:
```
higher_limit = avg + 3*std
higher_limit
```

[44]:
```
294498.50173207896
```

[45]:
```
lower_limit = avg - 3*std
lower_limit
```

[45]:
```
-263742.4278567056
```

[46]:
```
df_bookings[df_bookings.revenue_generated<=0]
```

[46]:
```
Empty DataFrame
Columns: [booking_id, property_id, booking_date, check_in_date, checkout_date,
no_guests, room_category, booking_platform, ratings_given, booking_status,
revenue_generated, revenue_realized]
Index: []
```

[47]:
```
df_bookings[df_bookings.revenue_generated>higher_limit]
```

[47]:
```
               booking_id  property_id booking_date check_in_date  \
2        May012216558RT13        16558     28-04-22      1/5/2022
111      May012216559RT32        16559     29-04-22      1/5/2022
315      May012216562RT22        16562     28-04-22      1/5/2022
562     May012217559RT118        17559     26-04-22      1/5/2022
129176   Jul282216562RT26        16562     21-07-22      28-07-22

       checkout_date  no_guests room_category booking_platform  ratings_given  \
2           4/5/2022        2.0           RT1          logtrip            5.0
111         2/5/2022        6.0           RT3    direct online            NaN
315         4/5/2022        2.0           RT2   direct offline            3.0
562         2/5/2022        2.0           RT1           others            NaN
129176      29-07-22        2.0           RT2    direct online            3.0

       booking_status  revenue_generated  revenue_realized
2         Checked Out            9100000              9100
111       Checked Out           28560000             28560
315       Checked Out           12600000             12600
562         Cancelled            2000000              4420
129176    Checked Out           10000000             12600
```

```
[48]: df_bookings = df_bookings[df_bookings.revenue_generated<=higher_limit]
      df_bookings.shape
```

```
[48]: (134573, 12)
```

3) Outlier removal in revenue realized

```
[50]: df_bookings.revenue_realized.describe()
```

```
[50]: count    134573.000000
      mean      12695.983585
      std        6927.791692
      min        2600.000000
      25%        7600.000000
      50%       11700.000000
      75%       15300.000000
      max       45220.000000
      Name: revenue_realized, dtype: float64
```

```
[51]: higher_limit = df_bookings.revenue_realized.mean() + 3*df_bookings.
       ↪revenue_realized.std()
      higher_limit
```

```
[51]: 33479.358661845814
```

```
[52]: df_bookings[df_bookings.revenue_realized>higher_limit]
```

```
[52]:                booking_id  property_id booking_date check_in_date  \
      137       May012216559RT41        16559     27-04-22      1/5/2022
      139       May012216559RT43        16559     1/5/2022      1/5/2022
      143       May012216559RT47        16559     28-04-22      1/5/2022
      149      May012216559RT413        16559     24-04-22      1/5/2022
      222       May012216560RT45        16560     30-04-22      1/5/2022
      …                      …          …          …            …
      134328    Jul312219560RT49        19560     31-07-22      31-07-22
      134331   Jul312219560RT412        19560     31-07-22      31-07-22
      134467    Jul312219562RT45        19562     28-07-22      31-07-22
      134474   Jul312219562RT412        19562     25-07-22      31-07-22
      134581    Jul312217564RT42        17564     31-07-22      31-07-22

             checkout_date  no_guests room_category booking_platform  ratings_given  \
      137         7/5/2022        4.0           RT4           others            NaN
      139         2/5/2022        6.0           RT4         tripster            3.0
      143         3/5/2022        3.0           RT4           others            5.0
      149         7/5/2022        5.0           RT4          logtrip            NaN
      222         3/5/2022        5.0           RT4           others            3.0
      …              …        …         …             …              …
```

```
134328      2/8/2022        6.0           RT4     direct online           5.0
134331      1/8/2022        6.0           RT4            others           2.0
134467      1/8/2022        6.0           RT4      makeyourtrip           4.0
134474      6/8/2022        5.0           RT4    direct offline           5.0
134581      1/8/2022        4.0           RT4      makeyourtrip           4.0

       booking_status  revenue_generated  revenue_realized
137       Checked Out              38760             38760
139       Checked Out              45220             45220
143       Checked Out              35530             35530
149       Checked Out              41990             41990
222       Checked Out              34580             34580
…                …                …                …
134328    Checked Out              39900             39900
134331    Checked Out              39900             39900
134467    Checked Out              39900             39900
134474    Checked Out              37050             37050
134581    Checked Out              38760             38760

[1299 rows x 12 columns]
```

One observation we can have in above dataframe is that all rooms are RT4 which means presidential suit. Now since RT4 is a luxurious room it is likely their rent will be higher. To make a fair analysis, we need to do data analysis only on RT4 room types

[53]:

```
df_bookings[df_bookings.room_category=="RT4"].revenue_realized.describe()
```

[53]:

```
count    16071.000000
mean     23439.308444
std       9048.599076
min       7600.000000
25%      19000.000000
50%      26600.000000
75%      32300.000000
max      45220.000000
Name: revenue_realized, dtype: float64
```

[54]:

```
23439+3*9048
```

[54]:

```
50583
```

Here higher limit comes to be 50583 and in our dataframe above we can see that max value for revenue realized is 45220. Hence we can conclude that there is no outlier and we don't need to do any data cleaning on this particular column

[56]:

```
df_bookings.isnull().sum()
```

```
[56]: booking_id                0
      property_id               0
      booking_date              0
      check_in_date             0
      checkout_date             0
      no_guests                 0
      room_category             0
      booking_platform          0
      ratings_given         77897
      booking_status            0
      revenue_generated         0
      revenue_realized          0
      dtype: int64
```

Total values in our dataframe is 134576. Out of that 77899 rows has null rating. Since there are many rows with null rating, we should not filter these values. Also we should not replace this rating with a median or mean rating etc.

```
[57]: df_agg_bookings.isnull().sum()
```

```
[57]: property_id             0
      check_in_date           0
      room_category           0
      successful_bookings     0
      capacity                2
      dtype: int64
```

```
[58]: df_agg_bookings[df_agg_bookings.capacity.isna()]
```

```
[58]:     property_id check_in_date room_category  successful_bookings  capacity
      8         17561      1-May-22           RT1                   22       NaN
      14        17562      1-May-22           RT1                   12       NaN
```

```
[59]: df_agg_bookings.capacity.median()
```

```
[59]: 25.0
```

```
[60]: df_agg_bookings.capacity.fillna(df_agg_bookings.capacity.median(), inplace=True)
```

```
[63]: df_agg_bookings.loc[[8,14]]
```

```
[63]:     property_id check_in_date room_category  successful_bookings  capacity
      8         17561      1-May-22           RT1                   22      25.0
      14        17562      1-May-22           RT1                   12      25.0
```

```
[64]: df_agg_bookings[df_agg_bookings.successful_bookings>df_agg_bookings.capacity]
```

```
[64]:       property_id check_in_date room_category  successful_bookings  capacity
      3           17558       1-May-22           RT1                   30      19.0
      12          16563       1-May-22           RT1                  100      41.0
      4136        19558      11-Jun-22           RT2                   50      39.0
      6209        19560       2-Jul-22           RT1                  123      26.0
      8522        19559      25-Jul-22           RT1                   35      24.0
      9194        18563      31-Jul-22           RT4                   20      18.0
```

```
[65]: df_agg_bookings.shape
```

```
[65]: (9200, 5)
```

```
[66]: df_agg_bookings = df_agg_bookings[df_agg_bookings.
       ↪successful_bookings<=df_agg_bookings.capacity]
      df_agg_bookings.shape
```

```
[66]: (9194, 5)
```

```
[ ]:
```

3. Data Transformation

Creating occupancy percentage column

```
[68]: df_agg_bookings.head(3)
```

```
[68]:    property_id check_in_date room_category  successful_bookings  capacity
      0        16559      1-May-22           RT1                   25      30.0
      1        19562      1-May-22           RT1                   28      30.0
      2        19563      1-May-22           RT1                   23      30.0
```

```
[69]: df_agg_bookings['occ_pct'] = df_agg_bookings.apply(lambda row:␣
       ↪row['successful_bookings']/row['capacity'], axis=1)
```

```
[70]: new_col = df_agg_bookings.apply(lambda row: row['successful_bookings']/
       ↪row['capacity'], axis=1)
      df_agg_bookings = df_agg_bookings.assign(occ_pct=new_col.values)
      df_agg_bookings.head(3)
```

```
[70]:    property_id check_in_date room_category  successful_bookings  capacity  \
      0        16559      1-May-22           RT1                   25      30.0
      1        19562      1-May-22           RT1                   28      30.0
      2        19563      1-May-22           RT1                   23      30.0

          occ_pct
      0  0.833333
      1  0.933333
      2  0.766667
```

[71]:

```
df_agg_bookings['occ_pct'] = df_agg_bookings['occ_pct'].apply(lambda x:␣
 ↪round(x*100, 2))
df_agg_bookings.head(3)
```

[71]:

```
   property_id check_in_date room_category  successful_bookings  capacity  \
0        16559      1-May-22           RT1                   25      30.0
1        19562      1-May-22           RT1                   28      30.0
2        19563      1-May-22           RT1                   23      30.0

   occ_pct
0    83.33
1    93.33
2    76.67
```

[72]:

```
df_agg_bookings.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 9194 entries, 0 to 9199
Data columns (total 6 columns):
 #   Column               Non-Null Count  Dtype
---  ------               --------------  -----
 0   property_id          9194 non-null   int64
 1   check_in_date        9194 non-null   object
 2   room_category        9194 non-null   object
 3   successful_bookings  9194 non-null   int64
 4   capacity             9194 non-null   float64
 5   occ_pct              9194 non-null   float64
dtypes: float64(2), int64(2), object(2)
memory usage: 502.8+ KB
```

4. Insights Generation

Ad Hoc Questions

1. What is an average occupancy rate in each of the room categories?

[73]:

```
df_agg_bookings.head(3)
```

[73]:

```
   property_id check_in_date room_category  successful_bookings  capacity  \
0        16559      1-May-22           RT1                   25      30.0
1        19562      1-May-22           RT1                   28      30.0
2        19563      1-May-22           RT1                   23      30.0

   occ_pct
0    83.33
1    93.33
2    76.67
```

[74]:

```
df_agg_bookings.groupby("room_category")["occ_pct"].mean()
```

```
[74]: room_category
      RT1    57.889643
      RT2    58.009756
      RT3    58.028213
      RT4    59.277925
      Name: occ_pct, dtype: float64
```

we want room_class in place of room_category.

```
[76]: df = pd.merge(df_agg_bookings, df_rooms, left_on="room_category",␣
        ↪right_on="room_id")
      df.head(4)
```

```
[76]:    property_id check_in_date room_category  successful_bookings  capacity  \
      0        16559      1-May-22           RT1                   25      30.0
      1        19562      1-May-22           RT1                   28      30.0
      2        19563      1-May-22           RT1                   23      30.0
      3        16558      1-May-22           RT1                   18      19.0

         occ_pct room_id room_class
      0    83.33     RT1   Standard
      1    93.33     RT1   Standard
      2    76.67     RT1   Standard
      3    94.74     RT1   Standard
```

```
[77]: df.drop("room_id",axis=1, inplace=True)
      df.head(4)
```

```
[77]:    property_id check_in_date room_category  successful_bookings  capacity  \
      0        16559      1-May-22           RT1                   25      30.0
      1        19562      1-May-22           RT1                   28      30.0
      2        19563      1-May-22           RT1                   23      30.0
      3        16558      1-May-22           RT1                   18      19.0

         occ_pct room_class
      0    83.33   Standard
      1    93.33   Standard
      2    76.67   Standard
      3    94.74   Standard
```

```
[78]: df.groupby("room_class")["occ_pct"].mean()
```

```
[78]: room_class
      Elite           58.009756
      Premium         58.028213
      Presidential    59.277925
      Standard        57.889643
```

```
Name: occ_pct, dtype: float64
```

```
[ ]:
```

2. What is the average occupancy rate per city?

```
[79]: df_hotels.head(3)
```

```
[79]:    property_id  property_name  category    city
      0        16558   Atliq Grands    Luxury   Delhi
      1        16559  Atliq Exotica    Luxury  Mumbai
      2        16560     Atliq City  Business   Delhi
```

```
[80]: df = pd.merge(df, df_hotels, on="property_id")
      df.head(3)
```

```
[80]:    property_id check_in_date room_category  successful_bookings  capacity  \
      0        16559      1-May-22           RT1                   25      30.0
      1        16559      2-May-22           RT1                   20      30.0
      2        16559      3-May-22           RT1                   17      30.0

         occ_pct room_class  property_name category    city
      0    83.33   Standard  Atliq Exotica   Luxury  Mumbai
      1    66.67   Standard  Atliq Exotica   Luxury  Mumbai
      2    56.67   Standard  Atliq Exotica   Luxury  Mumbai
```

```
[81]: df.groupby("city")["occ_pct"].mean()
```

```
[81]: city
      Bangalore    56.332376
      Delhi        61.507341
      Hyderabad    58.120652
      Mumbai       57.909181
      Name: occ_pct, dtype: float64
```

```
[ ]:
```

3. When was the occupancy better? Weekday or Weekend?

```
[82]: df_date.head(3)
```

```
[82]:         date  mmm yy week no  day_type
      0  01-May-22  May 22    W 19   weekend
      1  02-May-22  May 22    W 19  weekeday
      2  03-May-22  May 22    W 19  weekeday
```

```
[83]: df = pd.merge(df, df_date, left_on="check_in_date", right_on="date")
      df.head(3)
```

```
[83]:    property_id check_in_date room_category  successful_bookings  capacity  \
      0        16559     10-May-22           RT1                   18      30.0
      1        16559     10-May-22           RT2                   25      41.0
      2        16559     10-May-22           RT3                   20      32.0

         occ_pct room_class  property_name category    city       date  mmm yy  \
      0    60.00   Standard  Atliq Exotica   Luxury  Mumbai  10-May-22  May 22
      1    60.98      Elite  Atliq Exotica   Luxury  Mumbai  10-May-22  May 22
      2    62.50    Premium  Atliq Exotica   Luxury  Mumbai  10-May-22  May 22

        week no  day_type
      0    W 20  weekeday
      1    W 20  weekeday
      2    W 20  weekeday
```

```
[84]: df.groupby("day_type")["occ_pct"].mean().round(2)
```

```
[84]: day_type
      weekeday    50.88
      weekend     72.34
      Name: occ_pct, dtype: float64
```

```
[ ]:
```

4: In the month of July, what is the occupancy for different cities?

```
[86]: df_july_22 = df[df["mmm yy"]=="Jul 22"]
      df_july_22.head(4)
```

```
[86]:       property_id check_in_date room_category  successful_bookings  capacity  \
      4299        16559     10-Jul-22           RT1                   26      30.0
      4300        16559     10-Jul-22           RT2                   38      41.0
      4301        16559     10-Jul-22           RT3                   28      32.0
      4302        16559     10-Jul-22           RT4                   17      18.0

            occ_pct    room_class  property_name category    city       date  \
      4299    86.67      Standard  Atliq Exotica   Luxury  Mumbai  10-Jul-22
      4300    92.68         Elite  Atliq Exotica   Luxury  Mumbai  10-Jul-22
      4301    87.50       Premium  Atliq Exotica   Luxury  Mumbai  10-Jul-22
      4302    94.44  Presidential  Atliq Exotica   Luxury  Mumbai  10-Jul-22

            mmm yy week no day_type
      4299  Jul 22    W 29  weekend
      4300  Jul 22    W 29  weekend
      4301  Jul 22    W 29  weekend
      4302  Jul 22    W 29  weekend
```

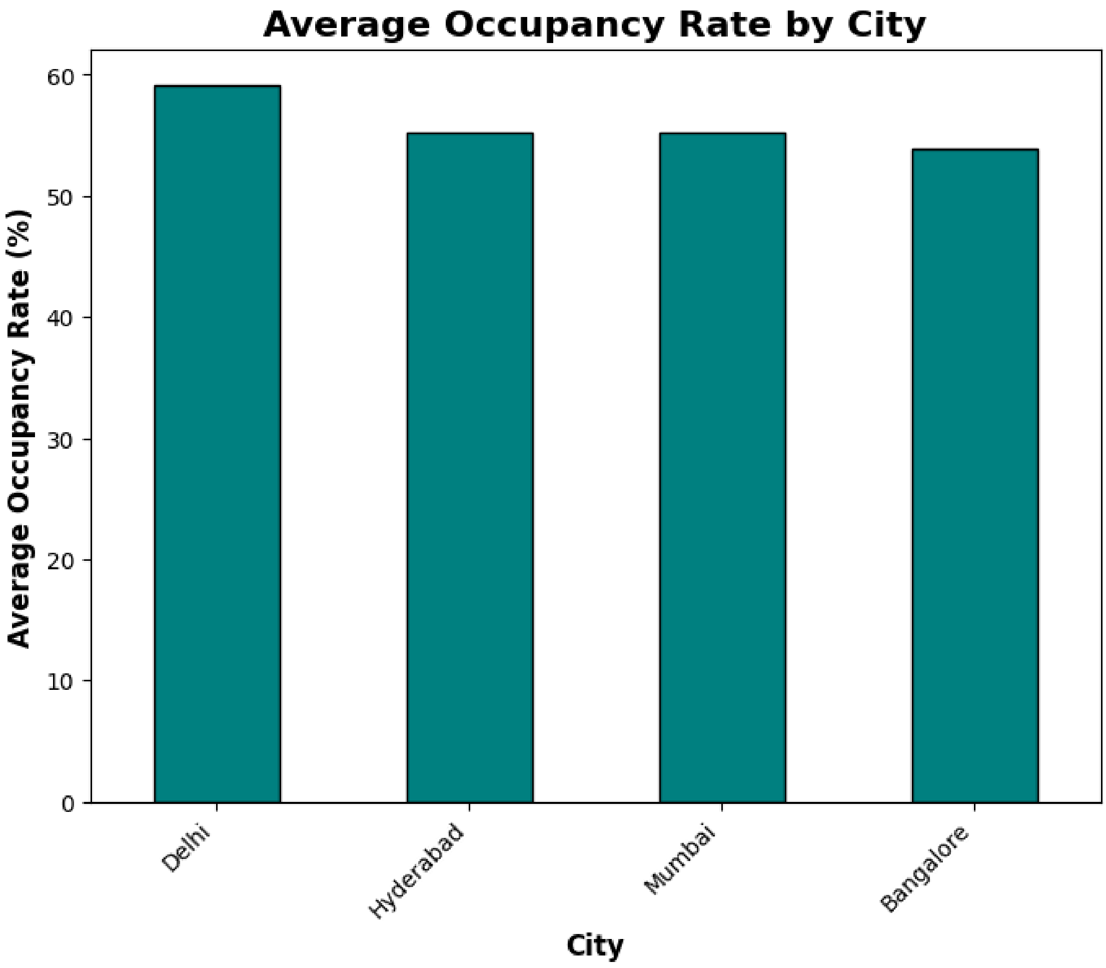
```
[87]: df_july_22.groupby('city')['occ_pct'].mean().round(2).
       ↪sort_values(ascending=False)
```

```
[87]: city
      Delhi        59.18
      Hyderabad    55.25
      Mumbai       55.24
      Bangalore    53.90
      Name: occ_pct, dtype: float64
```

```
[88]: df_july_22.groupby('city')['occ_pct'].mean().round(2).
       ↪sort_values(ascending=False).plot(kind = "bar",color='teal',␣
       ↪edgecolor='black', figsize=(8, 6))

      plt.title("Average Occupancy Rate by City", fontsize=16, fontweight='bold')

      plt.xlabel("City", fontsize=12, fontweight='bold')
      plt.ylabel("Average Occupancy Rate (%)", fontsize=12, fontweight='bold')
      plt.xticks(rotation=45, ha='right')
      plt.show()
```



5: We have received additional data for the month of August, and we need to append it to our existing dataset.

```
[89]: df_august = pd.read_csv("datasets/new_data_august.csv")
      df_august.head(3)
```

```
[89]:   property_id  property_name  category       city room_category room_class  \
      0        16559  Atliq Exotica    Luxury     Mumbai           RT1   Standard
      1        19562      Atliq Bay    Luxury  Bangalore           RT1   Standard
      2        19563   Atliq Palace  Business  Bangalore           RT1   Standard

        check_in_date  mmm yy week no  day_type  successful_bookings  capacity  \
      0     01-Aug-22  Aug-22    W 32  weekeday                   30        30
      1     01-Aug-22  Aug-22    W 32  weekeday                   21        30
      2     01-Aug-22  Aug-22    W 32  weekeday                   23        30

           occ%
```

```
0  100.00
1   70.00
2   76.67
```

[90]:
```
df_august.columns
```

[90]:
```
Index(['property_id', 'property_name', 'category', 'city', 'room_category',
       'room_class', 'check_in_date', 'mmm yy', 'week no', 'day_type',
       'successful_bookings', 'capacity', 'occ%'],
      dtype='object')
```

[91]:
```
df.columns
```

[91]:
```
Index(['property_id', 'check_in_date', 'room_category', 'successful_bookings',
       'capacity', 'occ_pct', 'room_class', 'property_name', 'category',
       'city', 'date', 'mmm yy', 'week no', 'day_type'],
      dtype='object')
```

[93]:
```
df_august.rename(columns={'occ%': 'occ_pct'}, inplace=True)
```

[94]:
```
df_august.columns
```

[94]:
```
Index(['property_id', 'property_name', 'category', 'city', 'room_category',
       'room_class', 'check_in_date', 'mmm yy', 'week no', 'day_type',
       'successful_bookings', 'capacity', 'occ_pct'],
      dtype='object')
```

[95]:
```
df_august.shape
```

[95]:
```
(7, 13)
```

[96]:
```
df.shape
```

[96]:
```
(6497, 14)
```

[97]:
```
latest_df = pd.concat([df, df_august], ignore_index = True, axis = 0)
latest_df.tail(10)
```

[97]:
```
      property_id check_in_date room_category  successful_bookings  capacity  \
6494        16563     31-Jul-22           RT2                   32      38.0
6495        16563     31-Jul-22           RT3                   14      20.0
6496        16563     31-Jul-22           RT4                   13      18.0
6497        16559     01-Aug-22           RT1                   30      30.0
6498        19562     01-Aug-22           RT1                   21      30.0
6499        19563     01-Aug-22           RT1                   23      30.0
6500        19558     01-Aug-22           RT1                   30      40.0
6501        19560     01-Aug-22           RT1                   20      26.0
```

```
6502        17561     01-Aug-22           RT1                   18      26.0
6503        17564     01-Aug-22           RT1                   10      16.0

      occ_pct    room_class  property_name  category       city       date  \
6494    84.21         Elite   Atliq Palace  Business      Delhi  31-Jul-22
6495    70.00       Premium   Atliq Palace  Business      Delhi  31-Jul-22
6496    72.22  Presidential   Atliq Palace  Business      Delhi  31-Jul-22
6497   100.00      Standard  Atliq Exotica    Luxury     Mumbai        NaN
6498    70.00      Standard      Atliq Bay    Luxury  Bangalore        NaN
6499    76.67      Standard   Atliq Palace  Business  Bangalore        NaN
6500    75.00      Standard   Atliq Grands    Luxury  Bangalore        NaN
6501    76.92      Standard     Atliq City  Business  Bangalore        NaN
6502    69.23      Standard      Atliq Blu    Luxury     Mumbai        NaN
6503    62.50      Standard  Atliq Seasons  Business     Mumbai        NaN

      mmm yy week no  day_type
6494  Jul 22    W 32   weekend
6495  Jul 22    W 32   weekend
6496  Jul 22    W 32   weekend
6497  Aug-22    W 32  weekeday
6498  Aug-22    W 32  weekeday
6499  Aug-22    W 32  weekeday
6500  Aug-22    W 32  weekeday
6501  Aug-22    W 32  weekeday
6502  Aug-22    W 32  weekeday
6503  Aug-22    W 32  weekeday
```

[98]:

```
latest_df.shape
```

[98]:

```
(6504, 14)
```

[ ]:

```

```

6. what is the revenue realized per city ?

[99]:

```
df_bookings.head()
```

[99]:

```
         booking_id  property_id booking_date check_in_date checkout_date  \
1  May012216558RT12        16558     30-04-22      1/5/2022      2/5/2022
4  May012216558RT15        16558     27-04-22      1/5/2022      2/5/2022
5  May012216558RT16        16558     1/5/2022      1/5/2022      3/5/2022
6  May012216558RT17        16558     28-04-22      1/5/2022      6/5/2022
7  May012216558RT18        16558     26-04-22      1/5/2022      3/5/2022

  no_guests room_category booking_platform  ratings_given booking_status  \
1       2.0           RT1           others            NaN      Cancelled
4       4.0           RT1    direct online            5.0    Checked Out
```

```
5        2.0           RT1          others            4.0    Checked Out
6        2.0           RT1          others            NaN      Cancelled
7        2.0           RT1         logtrip            NaN        No Show

   revenue_generated  revenue_realized
1               9100              3640
4              10920             10920
5               9100              9100
6               9100              3640
7               9100              9100
```

[130]:

```
df_bookings_all = pd.merge(df_bookings, df_hotels, on="property_id")
df_bookings_all.head(3)
```

[130]:

```
         booking_id  property_id booking_date check_in_date checkout_date  \
0  May012216558RT12        16558     30-04-22      1/5/2022      2/5/2022
1  May012216558RT15        16558     27-04-22      1/5/2022      2/5/2022
2  May012216558RT16        16558     1/5/2022      1/5/2022      3/5/2022

   no_guests room_category booking_platform  ratings_given booking_status  \
0        2.0           RT1           others            NaN      Cancelled
1        4.0           RT1    direct online            5.0    Checked Out
2        2.0           RT1           others            4.0    Checked Out

   revenue_generated  revenue_realized property_name category   city
0               9100              3640  Atliq Grands   Luxury  Delhi
1              10920             10920  Atliq Grands   Luxury  Delhi
2               9100              9100  Atliq Grands   Luxury  Delhi
```

[131]:

```
df_bookings_all.groupby("city")["revenue_realized"].sum()
```

[131]:

```
city
Bangalore    420383550
Delhi        294404488
Hyderabad    325179310
Mumbai       668569251
Name: revenue_realized, dtype: int64
```

[ ]:

```

```

7. What is the month by month revenue ?

[132]:

```
df_date.head(3)
```

[132]:

```
        date  mmm yy week no  day_type
0 2022-05-01  May 22    W 19   weekend
1 2022-05-02  May 22    W 19  weekeday
```

```
2 2022-05-03  May 22    W 19  weekeday
```

[133]:
```
df_date["mmm yy"].unique()
```

[133]:
```
array(['May 22', 'Jun 22', 'Jul 22'], dtype=object)
```

[134]:
```
df_bookings_all.head(3)
```

[134]:
```
        booking_id  property_id booking_date check_in_date checkout_date  \
0  May012216558RT12        16558     30-04-22      1/5/2022      2/5/2022
1  May012216558RT15        16558     27-04-22      1/5/2022      2/5/2022
2  May012216558RT16        16558     1/5/2022      1/5/2022      3/5/2022

   no_guests room_category booking_platform  ratings_given booking_status  \
0        2.0           RT1           others            NaN      Cancelled
1        4.0           RT1   direct online            5.0    Checked Out
2        2.0           RT1           others            4.0    Checked Out

   revenue_generated  revenue_realized property_name category   city
0               9100              3640  Atliq Grands   Luxury  Delhi
1              10920             10920  Atliq Grands   Luxury  Delhi
2               9100              9100  Atliq Grands   Luxury  Delhi
```

[135]:
```
df_date.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 92 entries, 0 to 91
Data columns (total 4 columns):
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   date      92 non-null     datetime64[ns]
 1   mmm yy    92 non-null     object
 2   week no   92 non-null     object
 3   day_type  92 non-null     object
dtypes: datetime64[ns](1), object(3)
memory usage: 3.0+ KB
```

[141]:
```
df_date["date"] = pd.to_datetime(df_date["date"], format='mixed')
df_date.head(3)
```

[141]:
```
        date  mmm yy week no  day_type
0 2022-05-01  May 22    W 19   weekend
1 2022-05-02  May 22    W 19  weekeday
2 2022-05-03  May 22    W 19  weekeday
```

[142]:
```
df_date.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 92 entries, 0 to 91
Data columns (total 4 columns):
 #   Column    Non-Null Count  Dtype
---  ------    --------------  -----
 0   date      92 non-null     datetime64[ns]
 1   mmm yy    92 non-null     object
 2   week no   92 non-null     object
 3   day_type  92 non-null     object
dtypes: datetime64[ns](1), object(3)
memory usage: 3.0+ KB
```

[143]:

```
df_bookings_all.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 134573 entries, 0 to 134572
Data columns (total 15 columns):
 #   Column             Non-Null Count   Dtype
---  ------             --------------   -----
 0   booking_id         134573 non-null  object
 1   property_id        134573 non-null  int64
 2   booking_date       134573 non-null  object
 3   check_in_date      134573 non-null  object
 4   checkout_date      134573 non-null  object
 5   no_guests          134573 non-null  float64
 6   room_category      134573 non-null  object
 7   booking_platform   134573 non-null  object
 8   ratings_given      56676 non-null   float64
 9   booking_status     134573 non-null  object
 10  revenue_generated  134573 non-null  int64
 11  revenue_realized   134573 non-null  int64
 12  property_name      134573 non-null  object
 13  category           134573 non-null  object
 14  city               134573 non-null  object
dtypes: float64(2), int64(3), object(10)
memory usage: 15.4+ MB
```

[144]:

```
df_bookings_all["check_in_date"]=pd.
 ↪to_datetime(df_bookings_all["check_in_date"],format='mixed')
df_bookings_all.head(4)
```

[144]:

```
         booking_id  property_id booking_date check_in_date checkout_date  \
0  May012216558RT12        16558     30-04-22    2022-01-05      2/5/2022
1  May012216558RT15        16558     27-04-22    2022-01-05      2/5/2022
2  May012216558RT16        16558     1/5/2022    2022-01-05      3/5/2022
3  May012216558RT17        16558     28-04-22    2022-01-05      6/5/2022
```

```
   no_guests room_category booking_platform  ratings_given booking_status  \
0        2.0           RT1           others            NaN      Cancelled
1        4.0           RT1    direct online            5.0    Checked Out
2        2.0           RT1           others            4.0    Checked Out
3        2.0           RT1           others            NaN      Cancelled

   revenue_generated  revenue_realized property_name category   city
0               9100              3640  Atliq Grands   Luxury  Delhi
1              10920             10920  Atliq Grands   Luxury  Delhi
2               9100              9100  Atliq Grands   Luxury  Delhi
3               9100              3640  Atliq Grands   Luxury  Delhi
```

[145]:

```
df_bookings_all.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 134573 entries, 0 to 134572
Data columns (total 15 columns):
 #   Column             Non-Null Count   Dtype
---  ------             --------------   -----
 0   booking_id         134573 non-null  object
 1   property_id        134573 non-null  int64
 2   booking_date       134573 non-null  object
 3   check_in_date      134573 non-null  datetime64[ns]
 4   checkout_date      134573 non-null  object
 5   no_guests          134573 non-null  float64
 6   room_category      134573 non-null  object
 7   booking_platform   134573 non-null  object
 8   ratings_given      56676 non-null   float64
 9   booking_status     134573 non-null  object
 10  revenue_generated  134573 non-null  int64
 11  revenue_realized   134573 non-null  int64
 12  property_name      134573 non-null  object
 13  category           134573 non-null  object
 14  city               134573 non-null  object
dtypes: datetime64[ns](1), float64(2), int64(3), object(9)
memory usage: 15.4+ MB
```

[146]:

```
df_bookings_all = pd.merge(df_bookings_all, df_date, left_on="check_in_date",␣
 ↪right_on="date")
df_bookings_all.head(3)
```

[146]:

```
         booking_id  property_id booking_date check_in_date checkout_date  \
0  May052216558RT11        16558     15-04-22    2022-05-05      7/5/2022
1  May052216558RT12        16558     30-04-22    2022-05-05      7/5/2022
2  May052216558RT13        16558     1/5/2022    2022-05-05      6/5/2022

   no_guests room_category booking_platform  ratings_given booking_status  \
0        3.0           RT1         tripster            5.0    Checked Out
1        2.0           RT1           others            NaN      Cancelled
2        3.0           RT1   direct offline            5.0    Checked Out

   revenue_generated  revenue_realized property_name category   city  \
0              10010             10010  Atliq Grands   Luxury  Delhi
1               9100              3640  Atliq Grands   Luxury  Delhi
2              10010             10010  Atliq Grands   Luxury  Delhi

        date  mmm yy week no  day_type
0 2022-05-05  May 22    W 19  weekeday
1 2022-05-05  May 22    W 19  weekeday
2 2022-05-05  May 22    W 19  weekeday
```

[147]:

```
df_bookings_all.groupby("mmm yy")["revenue_realized"].sum()
```

[147]:

```
mmm yy
Jul 22    389940912
Jun 22    377191229
May 22    408375641
Name: revenue_realized, dtype: int64
```

[ ]:

```

```

8. What is the revenue realized per hotel type?

[148]:

```
df_bookings_all.property_name.unique()
```

[148]:

```
array(['Atliq Grands', 'Atliq Exotica', 'Atliq City', 'Atliq Blu',
       'Atliq Bay', 'Atliq Palace', 'Atliq Seasons'], dtype=object)
```

[151]:

```
df_bookings_all.groupby("property_name")["revenue_realized"].sum().round(2).
  ↪sort_values(ascending = False)
```

[151]:

```
property_name
Atliq Exotica    219076161
Atliq Palace     209474575
Atliq City       196555383
Atliq Bay        179416721
Atliq Blu        179203544
Atliq Grands     145860641
Atliq Seasons     45920757
Name: revenue_realized, dtype: int64
```

[ ]:

```

```

9. What is the average rating per city?

[153]:

```
df_bookings_all.groupby("city")["ratings_given"].mean().round(2).
  ↪sort_values(ascending = False)
```

[153]:

```
city
Delhi        3.78
Hyderabad    3.66
Mumbai       3.64
Bangalore    3.40
Name: ratings_given, dtype: float64
```

[ ]:

```

```

10. Print a pie chart of revenue realized per booking platform

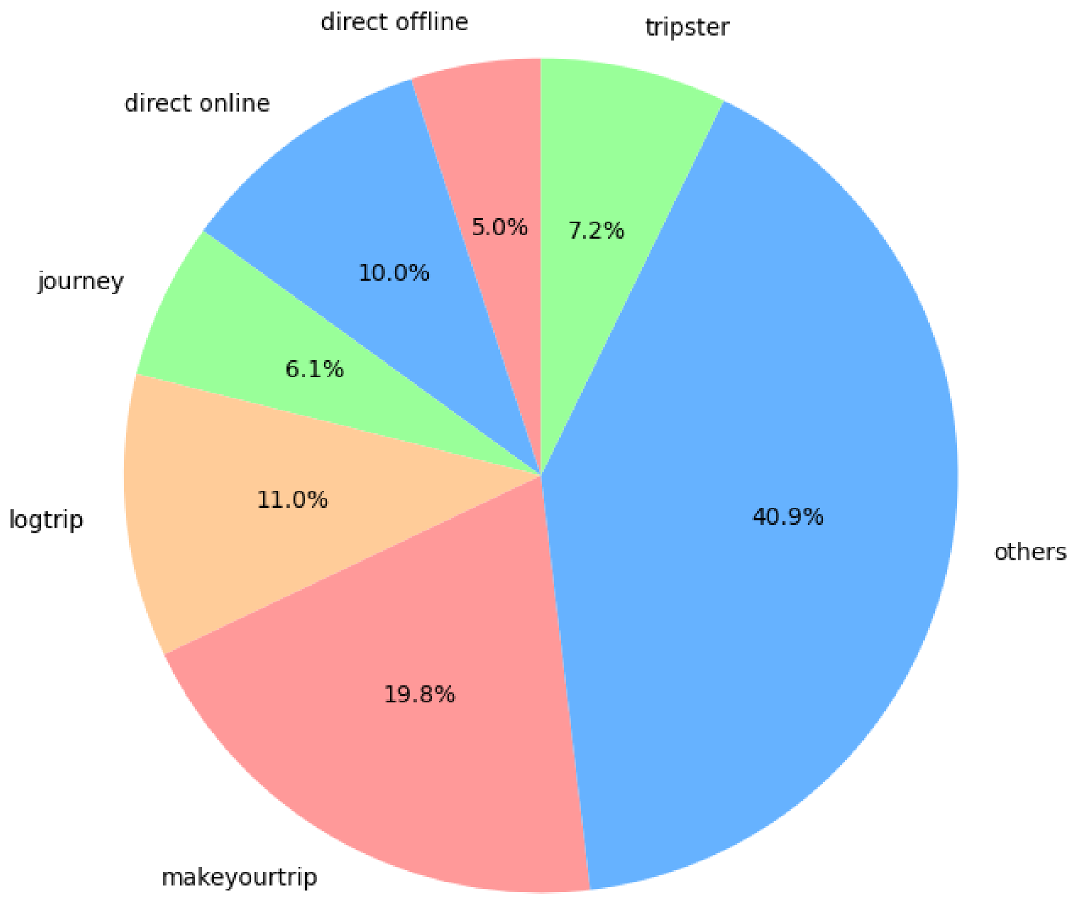
[156]:

```
platform_revenue = df_bookings_all.
  ↪groupby("booking_platform")["revenue_realized"].sum()

colors = ['#FF9999', '#66B2FF', '#99FF99', '#FFCC99']

plt.figure(figsize=(8, 8))
plt.pie(platform_revenue, labels=platform_revenue.index, autopct='%1.1f%%',␣
  ↪colors=colors, startangle=90)
plt.title("Revenue Realized Distribution by Booking Platform", fontsize=16,␣
  ↪fontweight='bold')

plt.show()
```



Revenue Realized Distribution by Booking Platform