Importing libraries

```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import warnings
warnings.filterwarnings('ignore')
```

Loading the datasets

```
df=pd.read_csv(r'C:\Users\User\Desktop\Data Analyst Projects\Hotel
Management\hotel_bookings.csv')
```

Exploratory Data Analysis and Data Cleaning

```
df.head()
```

```
          hotel  is_canceled  lead_time  arrival_date_year
arrival_date_month  \
0  Resort Hotel            0        342               2015
July
1  Resort Hotel            0        737               2015
July
2  Resort Hotel            0          7               2015
July
3  Resort Hotel            0         13               2015
July
4  Resort Hotel            0         14               2015
July

   arrival_date_week_number  arrival_date_day_of_month  \
0                        27                          1
1                        27                          1
2                        27                          1
3                        27                          1
4                        27                          1

   stays_in_weekend_nights  stays_in_week_nights  adults  ...
deposit_type  \
0                        0                     0       2  ...    No
Deposit
1                        0                     0       2  ...    No
Deposit
2                        0                     1       1  ...    No
```

```
Deposit
3                         0                       1       1  ...    No
Deposit
4                         0                       2       2  ...    No
Deposit

   agent company days_in_waiting_list customer_type   adr  \
0    NaN     NaN                    0     Transient   0.0
1    NaN     NaN                    0     Transient   0.0
2    NaN     NaN                    0     Transient  75.0
3  304.0     NaN                    0     Transient  75.0
4  240.0     NaN                    0     Transient  98.0

   required_car_parking_spaces  total_of_special_requests
reservation_status  \
0                            0                          0
Check-Out
1                            0                          0
Check-Out
2                            0                          0
Check-Out
3                            0                          0
Check-Out
4                            0                          1
Check-Out

  reservation_status_date
0                1/7/2015
1                1/7/2015
2                2/7/2015
3                2/7/2015
4                3/7/2015

[5 rows x 32 columns]

df.shape

(119390, 32)

df.columns

Index(['hotel', 'is_canceled', 'lead_time', 'arrival_date_year',
       'arrival_date_month', 'arrival_date_week_number',
       'arrival_date_day_of_month', 'stays_in_weekend_nights',
       'stays_in_week_nights', 'adults', 'children', 'babies', 'meal',
       'country', 'market_segment', 'distribution_channel',
       'is_repeated_guest', 'previous_cancellations',
       'previous_bookings_not_canceled', 'reserved_room_type',
       'assigned_room_type', 'booking_changes', 'deposit_type',
'agent',
       'company', 'days_in_waiting_list', 'customer_type', 'adr',
```

```
       'required_car_parking_spaces', 'total_of_special_requests',
       'reservation_status', 'reservation_status_date'],
      dtype='object')

df.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 119390 entries, 0 to 119389
Data columns (total 32 columns):
 #   Column                          Non-Null Count   Dtype
---  ------                          --------------   -----
 0   hotel                           119390 non-null  object
 1   is_canceled                     119390 non-null  int64
 2   lead_time                       119390 non-null  int64
 3   arrival_date_year               119390 non-null  int64
 4   arrival_date_month              119390 non-null  object
 5   arrival_date_week_number        119390 non-null  int64
 6   arrival_date_day_of_month       119390 non-null  int64
 7   stays_in_weekend_nights         119390 non-null  int64
 8   stays_in_week_nights            119390 non-null  int64
 9   adults                          119390 non-null  int64
 10  children                        119386 non-null  float64
 11  babies                          119390 non-null  int64
 12  meal                            119390 non-null  object
 13  country                         118902 non-null  object
 14  market_segment                  119390 non-null  object
 15  distribution_channel            119390 non-null  object
 16  is_repeated_guest               119390 non-null  int64
 17  previous_cancellations          119390 non-null  int64
 18  previous_bookings_not_canceled  119390 non-null  int64
 19  reserved_room_type              119390 non-null  object
 20  assigned_room_type              119390 non-null  object
 21  booking_changes                 119390 non-null  int64
 22  deposit_type                    119390 non-null  object
 23  agent                           103050 non-null  float64
 24  company                         6797 non-null    float64
 25  days_in_waiting_list            119390 non-null  int64
 26  customer_type                   119390 non-null  object
 27  adr                             119390 non-null  float64
 28  required_car_parking_spaces     119390 non-null  int64
 29  total_of_special_requests       119390 non-null  int64
 30  reservation_status              119390 non-null  object
 31  reservation_status_date         119390 non-null  datetime64[ns]
dtypes: datetime64[ns](1), float64(4), int64(16), object(11)
memory usage: 29.1+ MB

#df['reservation_status_date']=pd.to_datetime(df['reservation_status_d
ate'])
df['reservation_status_date'] =
pd.to_datetime(df['reservation_status_date'], format='%d/%m/%Y')
```

```python
for col in df.describe(include='object').columns:
    print(col)
    print(df[col].unique())
    print('-'*50)
```

```
hotel
['Resort Hotel' 'City Hotel']
--------------------------------------------------
arrival_date_month
['July' 'August' 'September' 'October' 'November' 'December' 'January'
 'February' 'March' 'April' 'May' 'June']
--------------------------------------------------
meal
['BB' 'FB' 'HB' 'SC' 'Undefined']
--------------------------------------------------
country
['PRT' 'GBR' 'USA' 'ESP' 'IRL' 'FRA' nan 'ROU' 'NOR' 'OMN' 'ARG' 'POL'
 'DEU' 'BEL' 'CHE' 'CN' 'GRC' 'ITA' 'NLD' 'DNK' 'RUS' 'SWE' 'AUS'
'EST'
 'CZE' 'BRA' 'FIN' 'MOZ' 'BWA' 'LUX' 'SVN' 'ALB' 'IND' 'CHN' 'MEX'
'MAR'
 'UKR' 'SMR' 'LVA' 'PRI' 'SRB' 'CHL' 'AUT' 'BLR' 'LTU' 'TUR' 'ZAF'
'AGO'
 'ISR' 'CYM' 'ZMB' 'CPV' 'ZWE' 'DZA' 'KOR' 'CRI' 'HUN' 'ARE' 'TUN'
'JAM'
 'HRV' 'HKG' 'IRN' 'GEO' 'AND' 'GIB' 'URY' 'JEY' 'CAF' 'CYP' 'COL'
'GGY'
 'KWT' 'NGA' 'MDV' 'VEN' 'SVK' 'FJI' 'KAZ' 'PAK' 'IDN' 'LBN' 'PHL'
'SEN'
 'SYC' 'AZE' 'BHR' 'NZL' 'THA' 'DOM' 'MKD' 'MYS' 'ARM' 'JPN' 'LKA'
'CUB'
 'CMR' 'BIH' 'MUS' 'COM' 'SUR' 'UGA' 'BGR' 'CIV' 'JOR' 'SYR' 'SGP'
'BDI'
 'SAU' 'VNM' 'PLW' 'QAT' 'EGY' 'PER' 'MLT' 'MWI' 'ECU' 'MDG' 'ISL'
'UZB'
 'NPL' 'BHS' 'MAC' 'TGO' 'TWN' 'DJI' 'STP' 'KNA' 'ETH' 'IRQ' 'HND'
'RWA'
 'KHM' 'MCO' 'BGD' 'IMN' 'TJK' 'NIC' 'BEN' 'VGB' 'TZA' 'GAB' 'GHA'
'TMP'
 'GLP' 'KEN' 'LIE' 'GNB' 'MNE' 'UMI' 'MYT' 'FRO' 'MMR' 'PAN' 'BFA'
'LBY'
 'MLI' 'NAM' 'BOL' 'PRY' 'BRB' 'ABW' 'AIA' 'SLV' 'DMA' 'PYF' 'GUY'
'LCA'
 'ATA' 'GTM' 'ASM' 'MRT' 'NCL' 'KIR' 'SDN' 'ATF' 'SLE' 'LAO']
--------------------------------------------------
market_segment
['Direct' 'Corporate' 'Online TA' 'Offline TA/TO' 'Complementary'
'Groups'
 'Undefined' 'Aviation']
--------------------------------------------------
```

```
distribution_channel
['Direct' 'Corporate' 'TA/TO' 'Undefined' 'GDS']
--------------------------------------------------
reserved_room_type
['C' 'A' 'D' 'E' 'G' 'F' 'H' 'L' 'P' 'B']
--------------------------------------------------
assigned_room_type
['C' 'A' 'D' 'E' 'G' 'F' 'I' 'B' 'H' 'P' 'L' 'K']
--------------------------------------------------
deposit_type
['No Deposit' 'Refundable' 'Non Refund']
--------------------------------------------------
customer_type
['Transient' 'Contract' 'Transient-Party' 'Group']
--------------------------------------------------
reservation_status
['Check-Out' 'Canceled' 'No-Show']
--------------------------------------------------
```

```
df.isnull().sum()
```

```
hotel                                0
is_canceled                          0
lead_time                            0
arrival_date_year                    0
arrival_date_month                   0
arrival_date_week_number             0
arrival_date_day_of_month            0
stays_in_weekend_nights              0
stays_in_week_nights                 0
adults                               0
children                             4
babies                               0
meal                                 0
country                            488
market_segment                       0
distribution_channel                 0
is_repeated_guest                    0
previous_cancellations               0
previous_bookings_not_canceled       0
reserved_room_type                   0
assigned_room_type                   0
booking_changes                      0
deposit_type                         0
agent                            16340
company                         112593
days_in_waiting_list                 0
customer_type                        0
adr                                  0
required_car_parking_spaces          0
```

```
total_of_special_requests              0
reservation_status                     0
reservation_status_date                0
dtype: int64
```

```
df.drop(['company','agent'],axis=1,inplace=True)
df.dropna(inplace=True)
```

```
df.isnull().sum()
```

```
hotel                           0
is_canceled                     0
lead_time                       0
arrival_date_year               0
arrival_date_month              0
arrival_date_week_number        0
arrival_date_day_of_month       0
stays_in_weekend_nights         0
stays_in_week_nights            0
adults                          0
children                        0
babies                          0
meal                            0
country                         0
market_segment                  0
distribution_channel            0
is_repeated_guest               0
previous_cancellations          0
previous_bookings_not_canceled  0
reserved_room_type              0
assigned_room_type              0
booking_changes                 0
deposit_type                    0
days_in_waiting_list            0
customer_type                   0
adr                             0
required_car_parking_spaces     0
total_of_special_requests       0
reservation_status              0
reservation_status_date         0
dtype: int64
```

```
df.describe()
```

```
         is_canceled      lead_time  arrival_date_year  \
count  118897.000000  118897.000000      118897.000000
mean        0.371347     104.312018        2016.157657
min         0.000000       0.000000        2015.000000
25%         0.000000      18.000000        2016.000000
50%         0.000000      69.000000        2016.000000
```

```
75%         1.000000     161.000000        2017.000000
max         1.000000     737.000000        2017.000000
std         0.483167     106.903570           0.707462

       arrival_date_week_number  arrival_date_day_of_month  \
count             118897.000000              118897.000000
mean                  27.166674                  15.800802
min                    1.000000                   1.000000
25%                   16.000000                   8.000000
50%                   28.000000                  16.000000
75%                   38.000000                  23.000000
max                   53.000000                  31.000000
std                   13.589966                   8.780321

       stays_in_weekend_nights  stays_in_week_nights         adults  \
count            118897.000000         118897.000000  118897.000000
mean                  0.928905              2.502157       1.858390
min                   0.000000              0.000000       0.000000
25%                   0.000000              1.000000       2.000000
50%                   1.000000              2.000000       2.000000
75%                   2.000000              3.000000       2.000000
max                  16.000000             41.000000      55.000000
std                   0.996217              1.900171       0.578578

            children         babies  is_repeated_guest  \
count  118897.000000  118897.000000      118897.000000
mean        0.104208       0.007948           0.032011
min         0.000000       0.000000           0.000000
25%         0.000000       0.000000           0.000000
50%         0.000000       0.000000           0.000000
75%         0.000000       0.000000           0.000000
max        10.000000      10.000000           1.000000
std         0.399174       0.097381           0.176030

       previous_cancellations  previous_bookings_not_canceled  \
count           118897.000000                   118897.000000
mean                0.087143                        0.131635
min                 0.000000                        0.000000
25%                 0.000000                        0.000000
50%                 0.000000                        0.000000
75%                 0.000000                        0.000000
max                26.000000                       72.000000
std                 0.845872                        1.484678

       booking_changes  days_in_waiting_list            adr  \
count    118897.000000         118897.000000  118897.000000
mean          0.221175              2.330774     101.958683
min           0.000000              0.000000      -6.380000
25%           0.000000              0.000000      70.000000
50%           0.000000              0.000000      95.000000
```

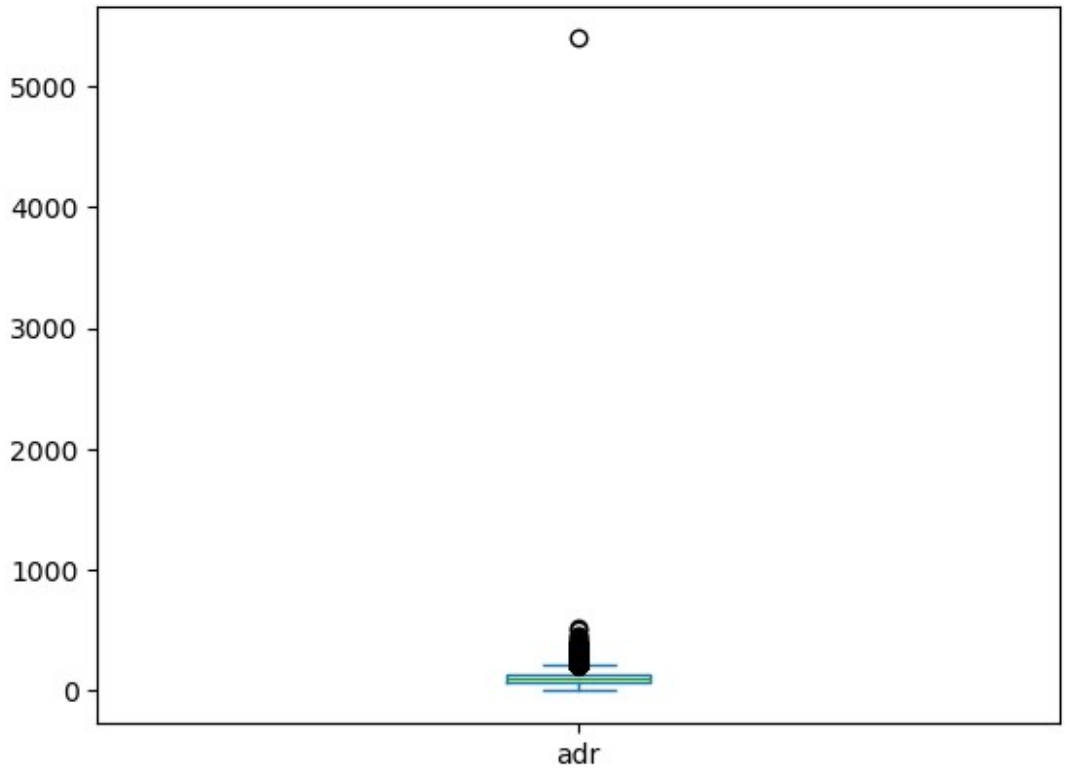
```
75%           0.000000              0.000000     126.000000
max          21.000000            391.000000     510.000000
std           0.652784             17.630525      48.091199
```

```
       required_car_parking_spaces  total_of_special_requests  \
count                118897.000000              118897.000000
mean                      0.061885                   0.571688
min                       0.000000                   0.000000
25%                       0.000000                   0.000000
50%                       0.000000                   0.000000
75%                       0.000000                   1.000000
max                       8.000000                   5.000000
std                       0.244173                   0.792680
```

```
             reservation_status_date
count                         118897
mean   2016-07-30 07:39:51.289939968
min              2014-10-17 00:00:00
25%              2016-02-02 00:00:00
50%              2016-08-08 00:00:00
75%              2017-02-09 00:00:00
max              2017-09-14 00:00:00
std                              NaN
```

```
df['adr'].plot(kind='box')
```

```
<Axes: >
```

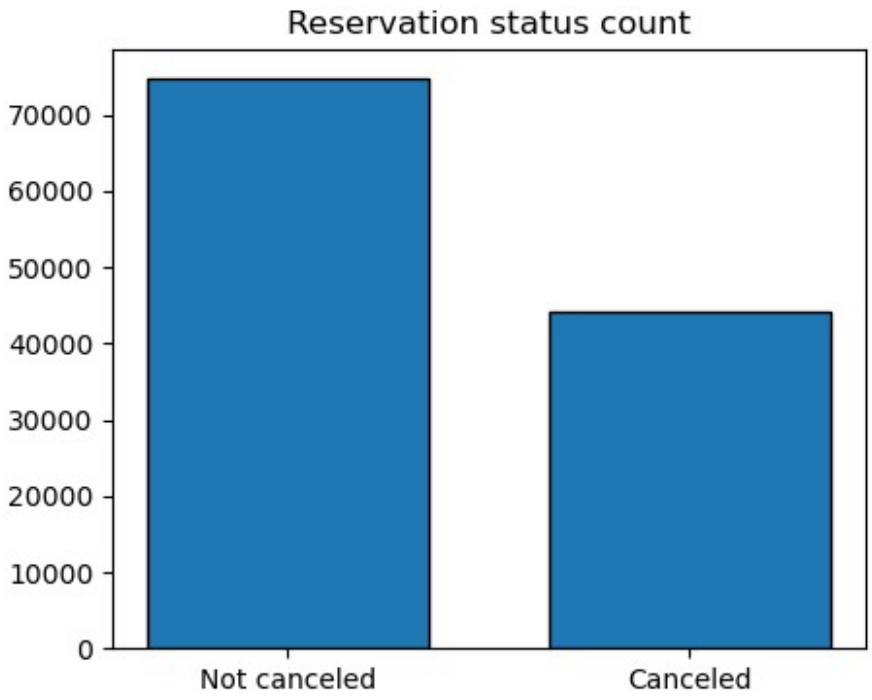



```
df=df[df['adr']< 5000]
```

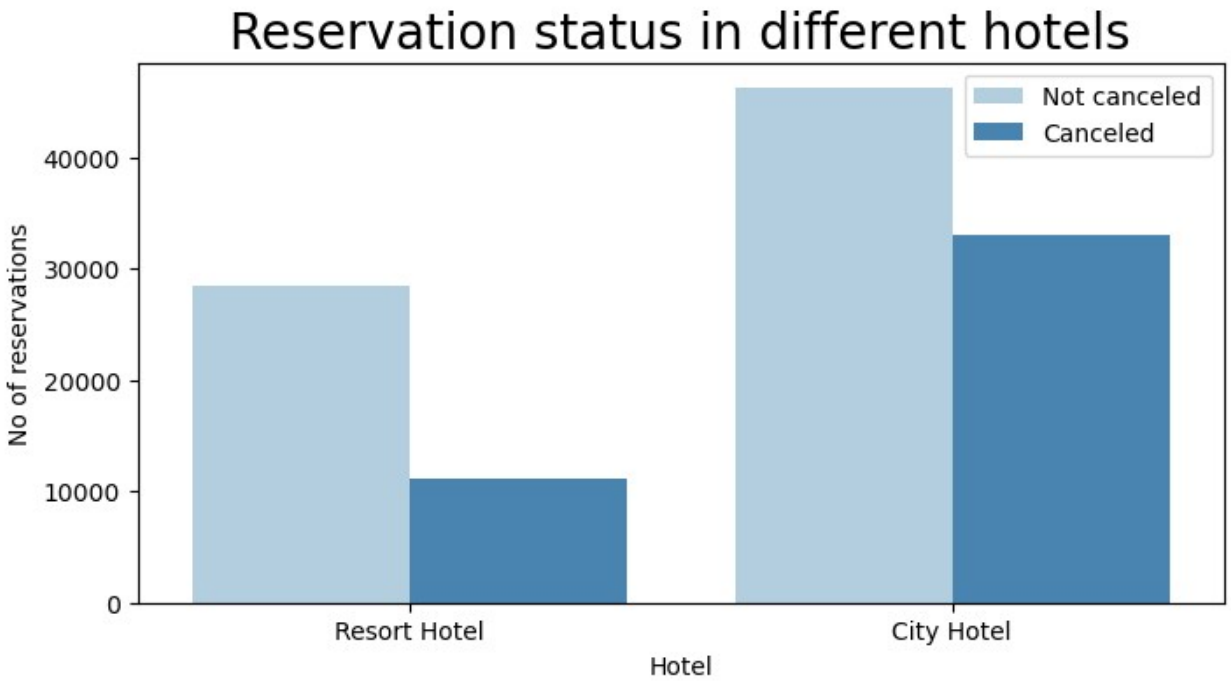
Data Analysis and visualizations

```
cancelled_perc=df['is_canceled'].value_counts(normalize=True)
print(cancelled_perc)

plt.figure(figsize=(5,4))
plt.title('Reservation status count')
plt.bar(['Not
canceled','Canceled'],df['is_canceled'].value_counts(),edgecolor='k',w
idth=0.7)
plt.show()
```

```
is_canceled
0    0.628653
1    0.371347
Name: proportion, dtype: float64
```




```
plt.figure(figsize=(8,4))
ax1=sns.countplot(x='hotel',hue='is_canceled',data=df,palette='Blues')
legend_labels, _= ax1.get_legend_handles_labels()
ax1.legend(bbox_to_anchor=(1, 1))
plt.title('Reservation status in different hotels',size=20)
plt.xlabel('Hotel')
plt.ylabel('No of reservations')
plt.legend(['Not canceled','Canceled'])
plt.show()
```



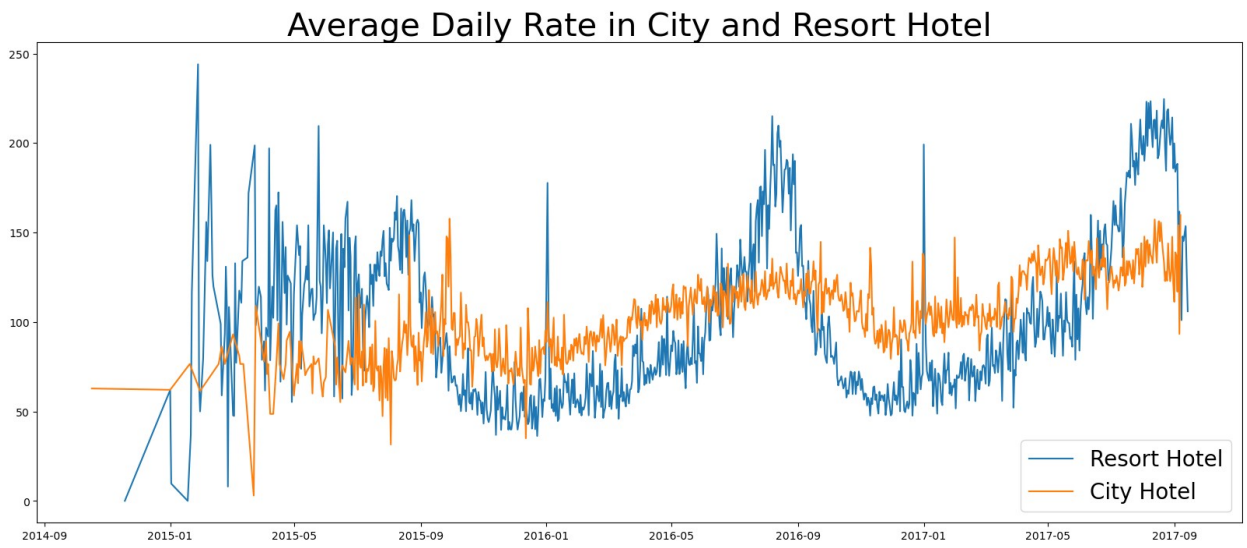

```
resort_hotel =df[df['hotel'] == 'Resort Hotel']
resort_hotel['is_canceled'].value_counts(normalize=True)
```

```
is_canceled
0    0.72025
1    0.27975
Name: proportion, dtype: float64
```

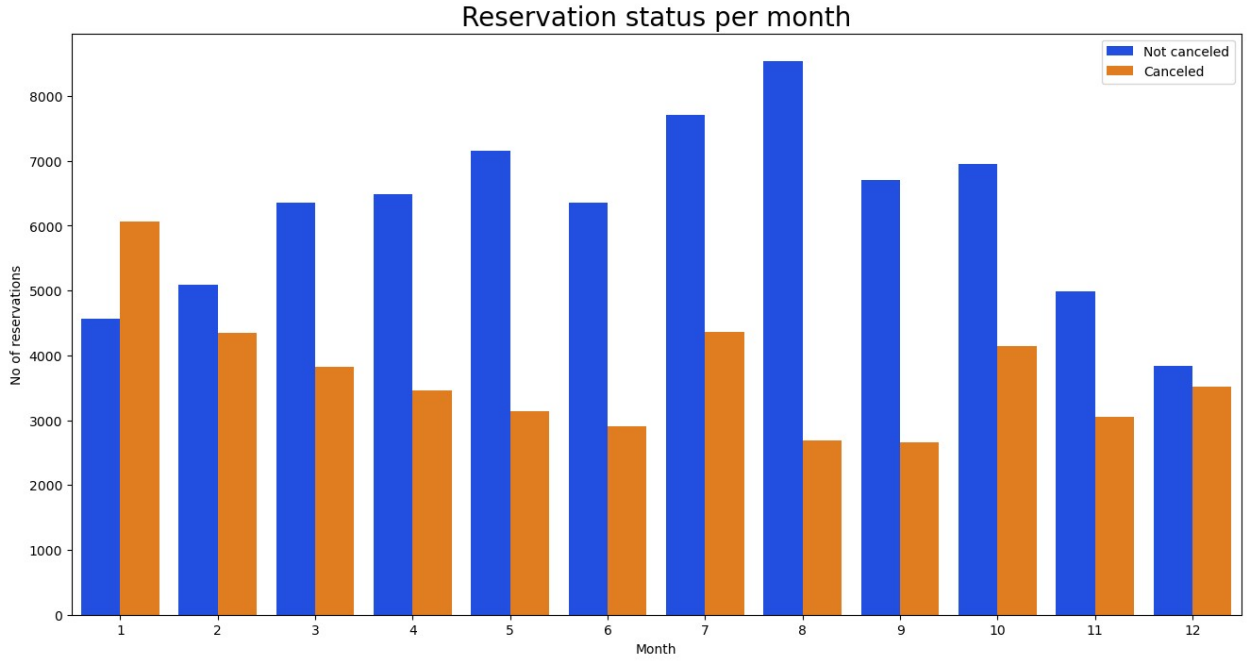
```
city_hotel =df[df['hotel'] == 'City Hotel']
city_hotel['is_canceled'].value_counts(normalize=True)
```

```
is_canceled
0    0.582918
1    0.417082
Name: proportion, dtype: float64
```

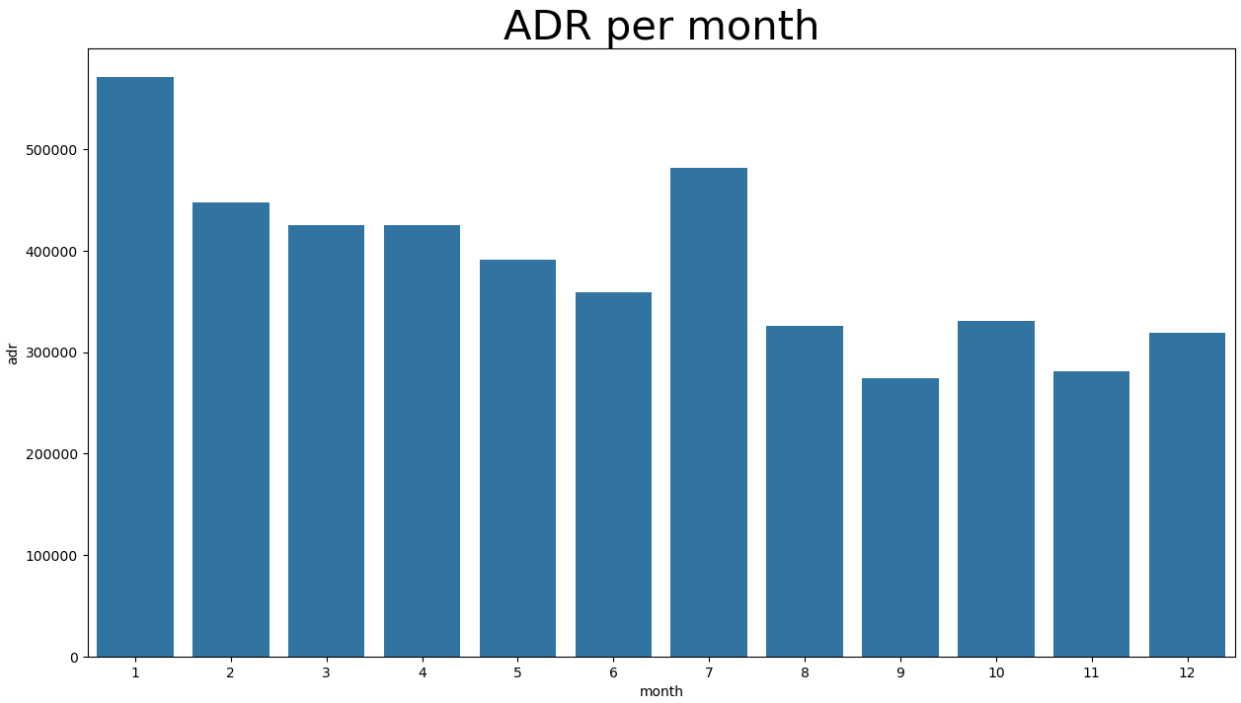
```
resort_hotel=resort_hotel.groupby('reservation_status_date')
[['adr']].mean()
city_hotel=city_hotel.groupby('reservation_status_date')
[['adr']].mean()

plt.figure(figsize=(20,8))
plt.title('Average Daily Rate in City and Resort Hotel',fontsize=30)
plt.plot(resort_hotel.index,resort_hotel['adr'],label='Resort Hotel')
plt.plot(city_hotel.index,city_hotel['adr'],label='City Hotel')
plt.legend(fontsize=20)
plt.show()
```



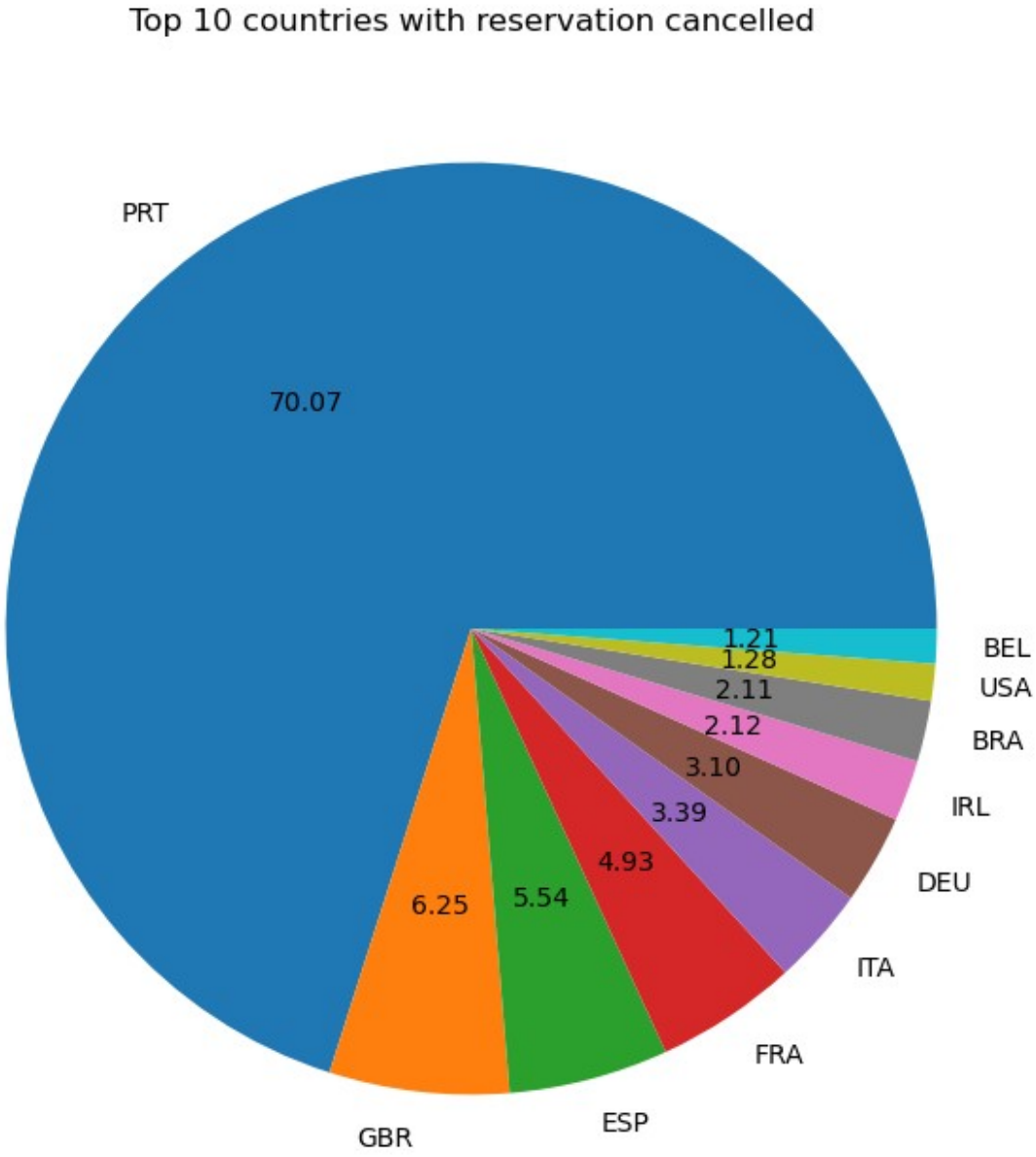

```
df['month']=df['reservation_status_date'].dt.month
plt.figure(figsize=(16,8))
ax1=sns.countplot(x='month',hue='is_canceled',data=df,palette='bright'
)
legend_labels, _ = ax1.get_legend_handles_labels()
ax1.legend(bbox_to_anchor=(1,1))
plt.title('Reservation status per month',size=20)
plt.xlabel('Month')
plt.ylabel('No of reservations')
plt.legend(['Not canceled','Canceled'])
plt.show()
```



```
plt.figure(figsize=(15,8))
plt.title('ADR per month',fontsize=30)
sns.barplot(x='month', y='adr', data=df[df['is_canceled'] ==
1].groupby('month', as_index=False)['adr'].sum())
plt.show()
```




```
cancelled_data=df[df['is_canceled']==1]
top_10_country=cancelled_data['country'].value_counts()[:10]
plt.figure(figsize=(8,8))
plt.title('Top 10 countries with reservation cancelled')
plt.pie(top_10_country,autopct='%.2f',labels=top_10_country.index)
plt.show()
```




```
df['market_segment'].value_counts()
```

```
market_segment
Online TA        56402
Offline TA/TO    24159
Groups           19806
Direct           12448
Corporate         5111
Complementary      734
Aviation           237
Name: count, dtype: int64
```

```
df['market_segment'].value_counts(normalize=True)
```

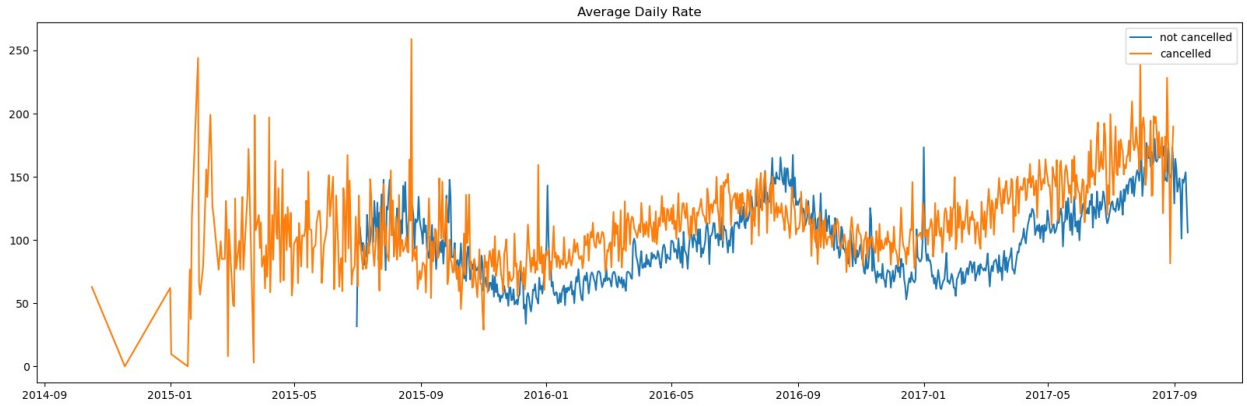
```
market_segment
Online TA        0.474377
Offline TA/TO    0.203193
Groups           0.166581
Direct           0.104696
Corporate        0.042987
Complementary    0.006173
Aviation         0.001993
Name: proportion, dtype: float64
```

```
cancelled_data['market_segment'].value_counts(normalize=True)
```

```
market_segment
Online TA        0.469696
Groups           0.273985
Offline TA/TO    0.187466
Direct           0.043486
Corporate        0.022151
Complementary    0.002038
Aviation         0.001178
Name: proportion, dtype: float64
```

```
cancelled_df_adr=cancelled_data.groupby('reservation_status_date')
[['adr']].mean()
cancelled_df_adr.reset_index(inplace=True)
cancelled_df_adr.sort_values('reservation_status_date',inplace=True)

not_cancelled_data=df[df['is_canceled']==0]
not_cancelled_df_adr=not_cancelled_data.groupby('reservation_status_da
te')[['adr']].mean()
not_cancelled_df_adr.reset_index(inplace=True)
not_cancelled_df_adr.sort_values('reservation_status_date',inplace=Tru
e)

plt.figure(figsize=(20,6))
plt.title('Average Daily Rate')
plt.plot(not_cancelled_df_adr['reservation_status_date'],
not_cancelled_df_adr['adr'], label='not cancelled')
plt.plot(cancelled_df_adr['reservation_status_date'],cancelled_df_adr[
'adr'],label='cancelled')
plt.legend()
```

```
<matplotlib.legend.Legend at 0x21643028590>
```




```
cancelled_df_adr =
cancelled_df_adr[(cancelled_df_adr['reservation_status_date']>'2016')&
(cancelled_df_adr['reservation_status_date']<'2017-09')]
not_cancelled_df_adr=not_cancelled_df_adr[(not_cancelled_df_adr['reser
vation_status_date']>'2016')&(not_cancelled_df_adr['reservation_status
_date']<'2017-09')]

plt.figure(figsize=(20,6))
plt.title('Average Daily Rate',fontsize=20)
plt.plot(not_cancelled_df_adr['reservation_status_date'],
not_cancelled_df_adr['adr'], label='not cancelled')
plt.plot(cancelled_df_adr['reservation_status_date'],cancelled_df_adr[
'adr'],label='cancelled')
plt.legend(fontsize=20)
plt.show()
```