Exploratory Data Analysis on Hotel Booking Analysis

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Abstract:

Have you ever wondered when the best time of year to book a hotel room is? Or the optimal length of stay to get the best daily rate? What if you wanted to predict whether or not a hotel was likely to receive a disproportionately high number of special requests?

Exploratory Data Analysis helps us in understanding the data and in exploring some questions related to users on the data provided.

Keywords: Numpy, Pandas, EDA, Data Frames, Visualizations

1. Problem Statement

This Dataset contains data that compares various booking information between two hotels, City Hotel and Resort Hotel. We will be using the data to analyze the factors affecting the hotel bookings. These factors can be used for reporting trends and predicting future bookings.

- hotel– There are two types of hotels one is City Hotel and another is Resort Hotel.
- Is_canceled– Here 0 and 1 value indicates booking was canceled(1) or not(0).
- lead_time– Time-lapse between reservation and actual arrival date.
- arrival_date_year – Year of arrival date
- arrival_date_month– month of arrival date
- arrival_date_week_number– Week number of arrival date.
- arrival_date_day_of_month–Day of arrival date.
- Stays_in_weekend_nights– Number of weekend nights(sat sun) guests are staying at hotel.
- Stays_in_week_nights– Number of week nights(mon-fri) guests are staying at the hotel.
- adults – Number of adults
- children– Number of children.
- babies – Number of babies.
- meal– Type of food provided at hotel and guests ordered.
- country– Country from where guests came
- Market_segment– Which market
- segment is used for booking.
- Distribution_channel – Booking Distribution Channel(TA/TO/Direct/Corporate etc.)
- Is_repeated_guests– Is customer made booking previously yes(1) or no(0)
- Previous_cancellations– Number of previous cancellations.
- Previous_bookins_not_canelled – Number of previous bookings which are not canceled.
- reserved_room_type– Type of room customer reserved.
- assigned_room_type– Type of room assigned to customer.

- Deposit_type–Deposit type at the time of booking(No deposit/Refundable/No refund)
- agent– Id of agent that made the booking.
- company – Id of the company that made the booking.
- Customer_type– Type of customer.Contract,Group,Transient,Transient Party
- adr– Average Daily Rate.
- required_car_parking_spaces– Number of car parking asked by customer.
- total_of_special_requests– Number of special requests made by customers.
- reservation_status– Last Status of reservation like checked out, canceled or no show.
- reservation_status_date– date of reservation status done.

Questions we want to answer are and doing analysis:

- Which Hotel has more bookings? (City or Resort)
- Percentage of bookings of cancellation
- Which month has more number of bookings
- Which year has more number of bookings?
- Which meal is preferred more by customers?
- From which country more guests came?
- How Long People Stay at hotels?
- Bookings are more on Weekdays or weekends?
- How often assigned rooms are different from reserved and do having children and/or babies have any impact ?
- Do non repeated guests cancel more often than repeated ones ?
- Do customers who were on the waiting list for a long time have less cancellation compared to others ?
- Do a number of special requests have any correlation with having children/babies?
- Number of bookings per year for two hotels.
- Customer distribution based on type.
- Booking distribution based on assigned room type.
- Which Agent made the most bookings?
- Does a meal type have any correlation with Cancellation ?
- Which market segment has the most number of bookings?
- Which hotel has the most number of repeated guests/customers?
- Correlation between Deposit type vs Cancellation
- Car Parking Space

2. Introduction

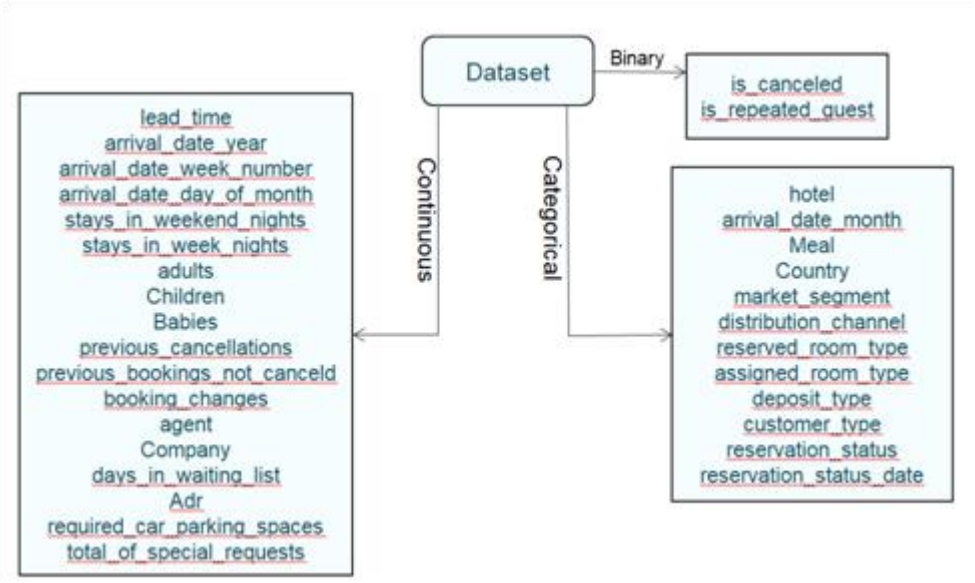
Each observation represents hotel bookings. Bookings arrive between the 1st of July of 2015 and the 31st of August 2017, including bookings that effectively arrived and bookings that were canceled. Since this is hotel real data, all data elements personal data or customer identification was deleted.

The dataset contains over 119,390 rows and 32 columns. Columns have the data type object, int64 and float64. It appears that a few columns contain some empty values since the Non-Null count for a few columns is lower than the total number of rows (119390).

```
 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  object
dtypes: float64(4), int64(16), object(12)
memory usage: 29.1+ MB
```

We'll need to deal with empty values. Filled all null values like company and agent with 0, children with mean value of children and country with others as this is string datatype.

- **Data Architecture**-



3. Exploratory Data Analysis

3.1 Which hotel has the highest number of guests?

To compare this first we calculated the percentage of each hotel and then plotted it in a graph with the help of seaborn library.

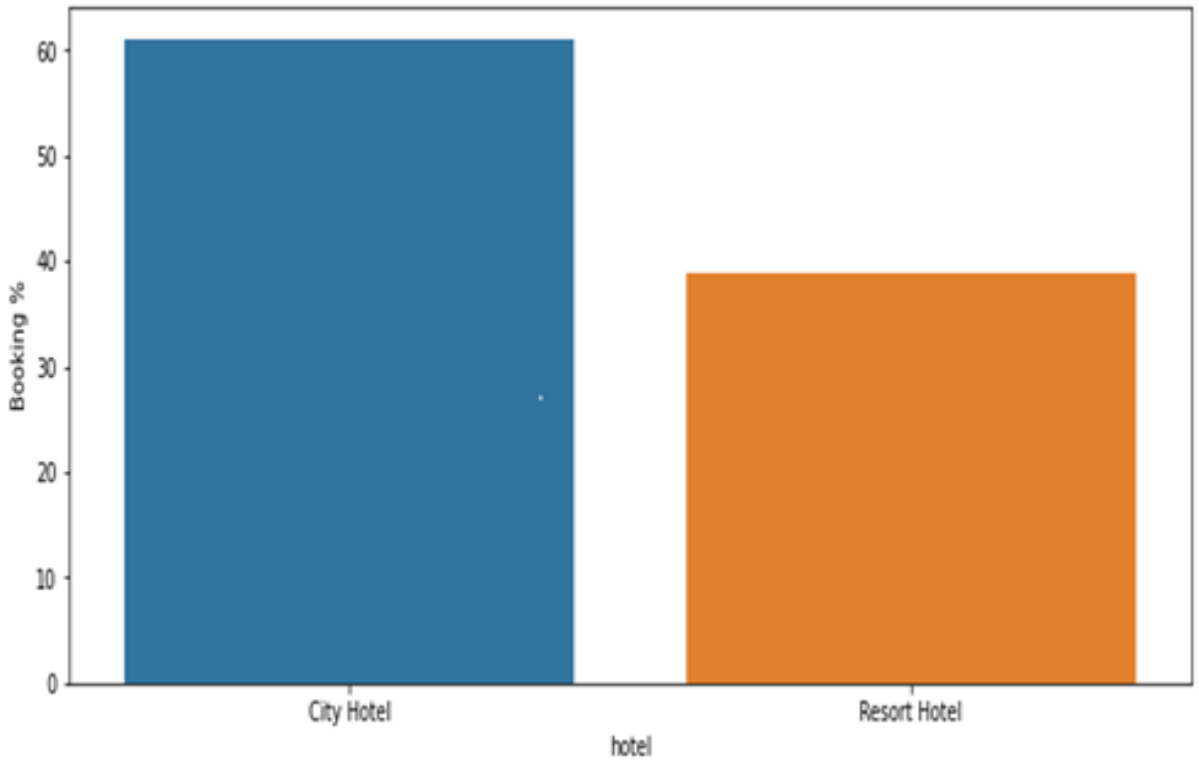


Figure 3.1a

The figure 3.1a around 60% booking are for city hotels and 40% are for resort hotel. So we can say city hotels have more bookings as compared to resort hotel.

3.2 Percentage of bookings of cancellation

Now we calculated the total percentage of booking canceled with the help of the value count method and plotting pie charts using matplotlib library.

So here when we can see there is 27.5% of bookings were cancelled.0 indicates not canceled bookings and 1 indicates canceled bookings.

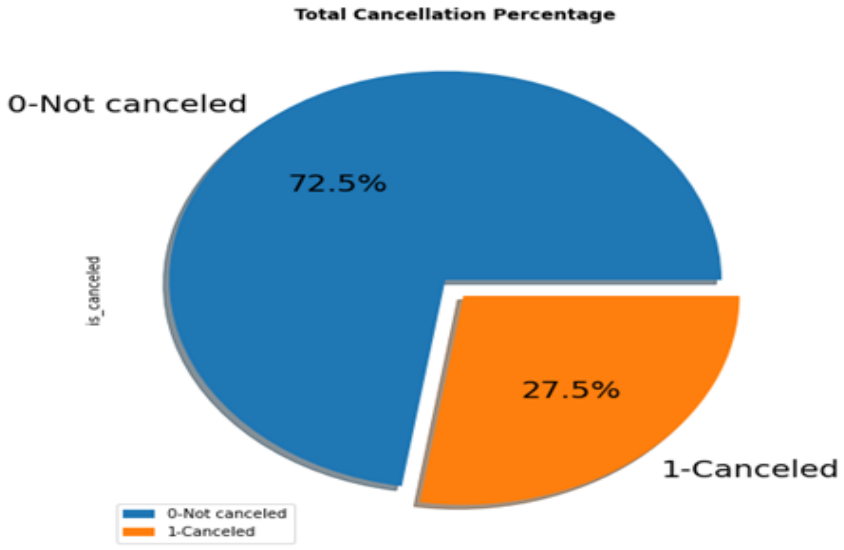


Figure 3.2a

3.3 Which month has more number of bookings?

August and July have more bookings which is around 11257 and 10057 in both the hotels. January has the least number of bookings which is 4693.

I plotted this in the graph below. Also we can city hotel has more number of bookings than resort hotel.

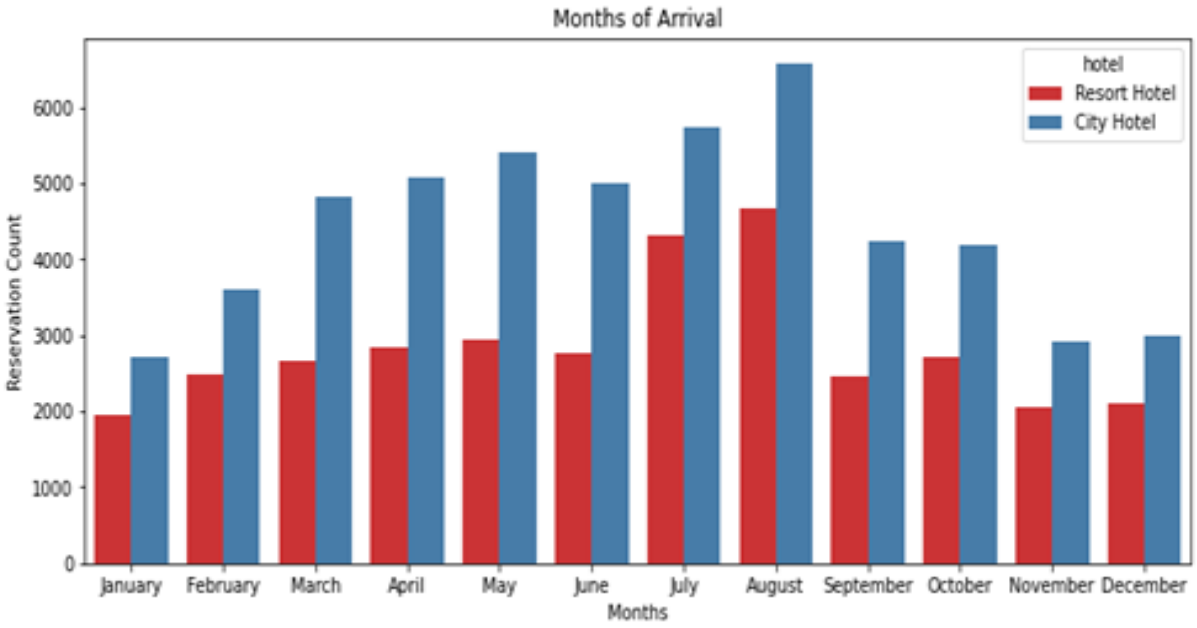


Figure 3.3a

```
August        11257
July          10057
May            8355
April          7908
June           7765
March          7513
October        6934
September      6690
February       6098
December       5131
November       4995
January        4693
Name: arrival_date_month, dtype: int64
```

3.4 Which year has more number of bookings?

Here we did Analysis based on the year users belong to. There were 3 years of data available in the given dataset from 2015-2017.

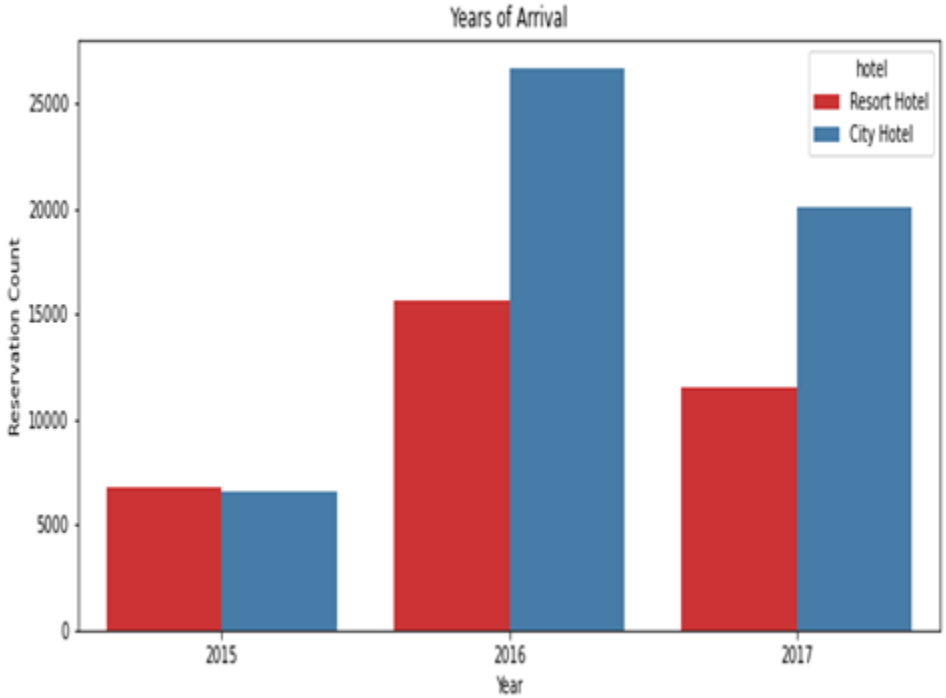


Figure 3.4b

```
2016    42391
2017    31692
2015    13313
Name: arrival_date_year, dtype: int64
```

In the above plot we can see in the year 2016 there was more number of bookings as compared to 2015 and 2017 in both the hotels.

3.5 Which meal is preferred more by the customer?

Here we are going to see which meal type is the favorite one of most of the customers. We have plotted pie chart and calculated the percentage of each meal type.

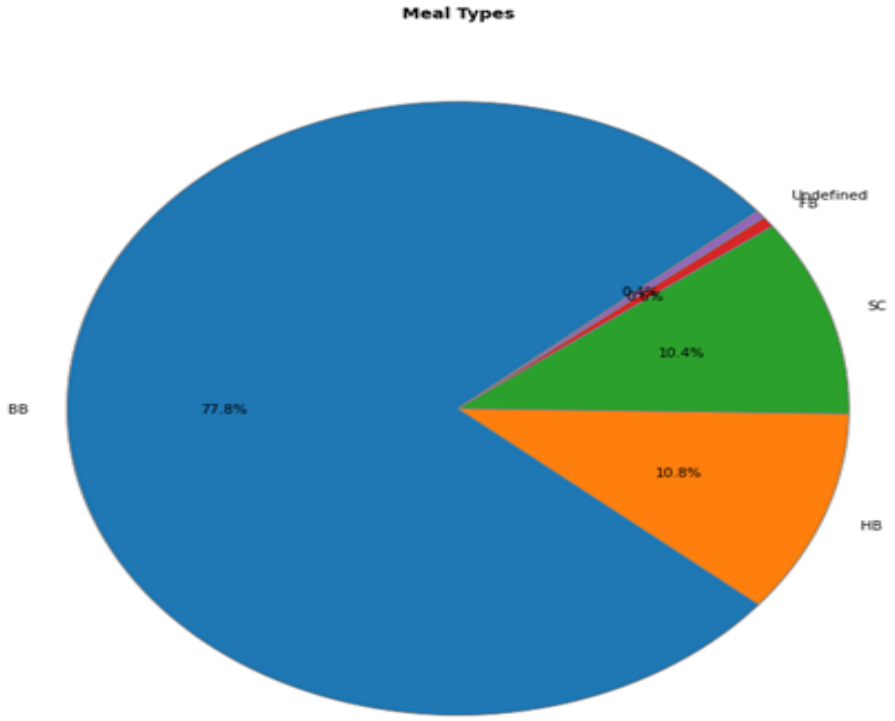


Figure 3.5a

It is clearly evident that users mostly prefer BB meals. FB is the least preferred meal and HB and SC are equally preferred meals.

3.6 From which country most guests are coming?

Here we checked country guests that both the hotels in total have received. The data on canceled bookings will not be included here. We are going to do the same analysis on top 10 countries from where most guests are coming.

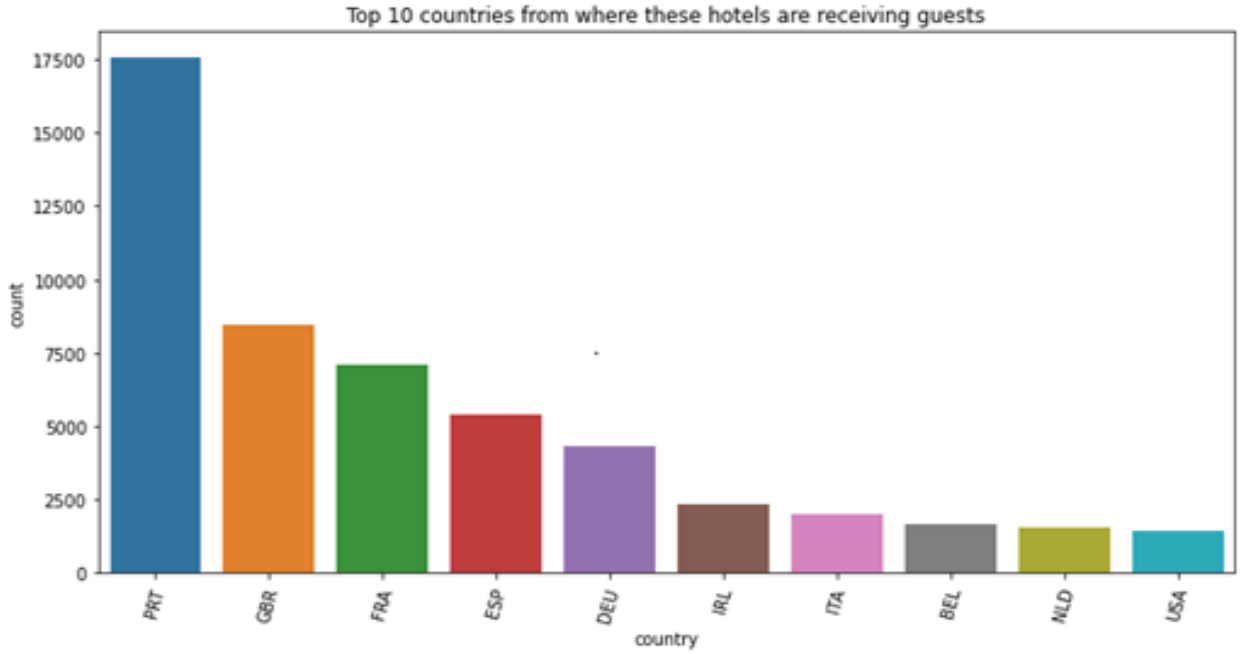


Figure 3.6a

Most of the customers are from European countries like PRT(Portugal), GBR(Great Britain), FRA(France).

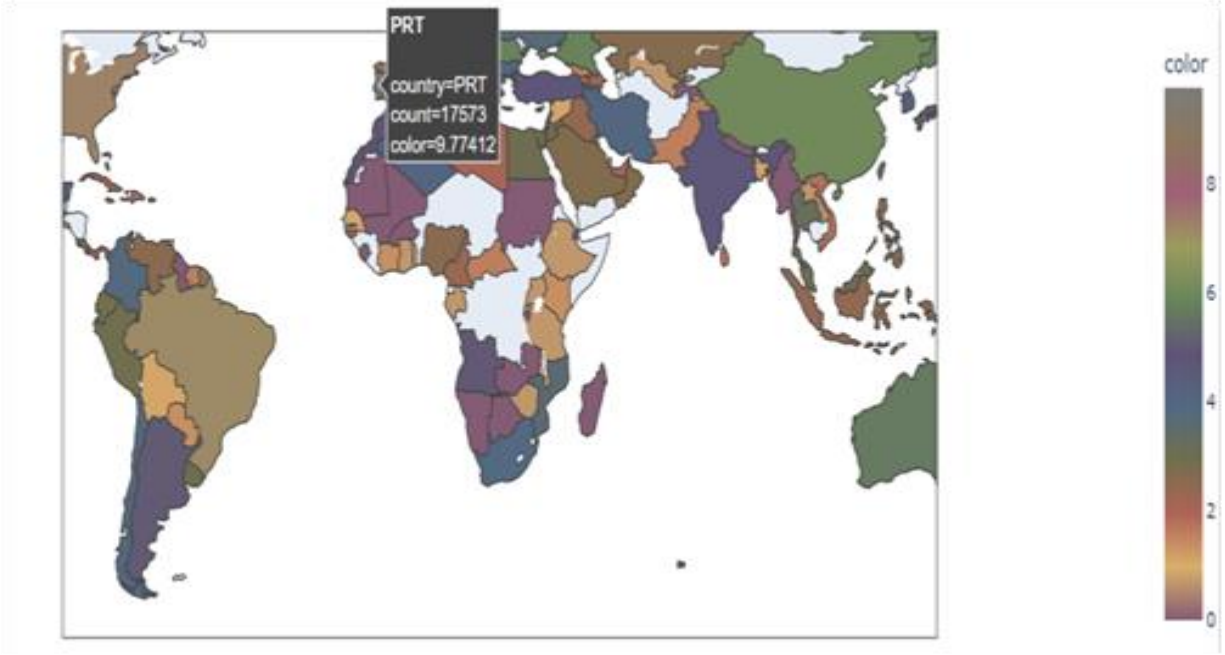


Figure 3.7b

Also plotted countries on the world map.

3.7 How long do people stay at hotels?

Now we want to perform an analysis to see how long people are staying at a hotel. For this first we created a different table by combining stay in weekend nights and stay in week days which is total nights spent by customers.
And then plot it on bar plot.

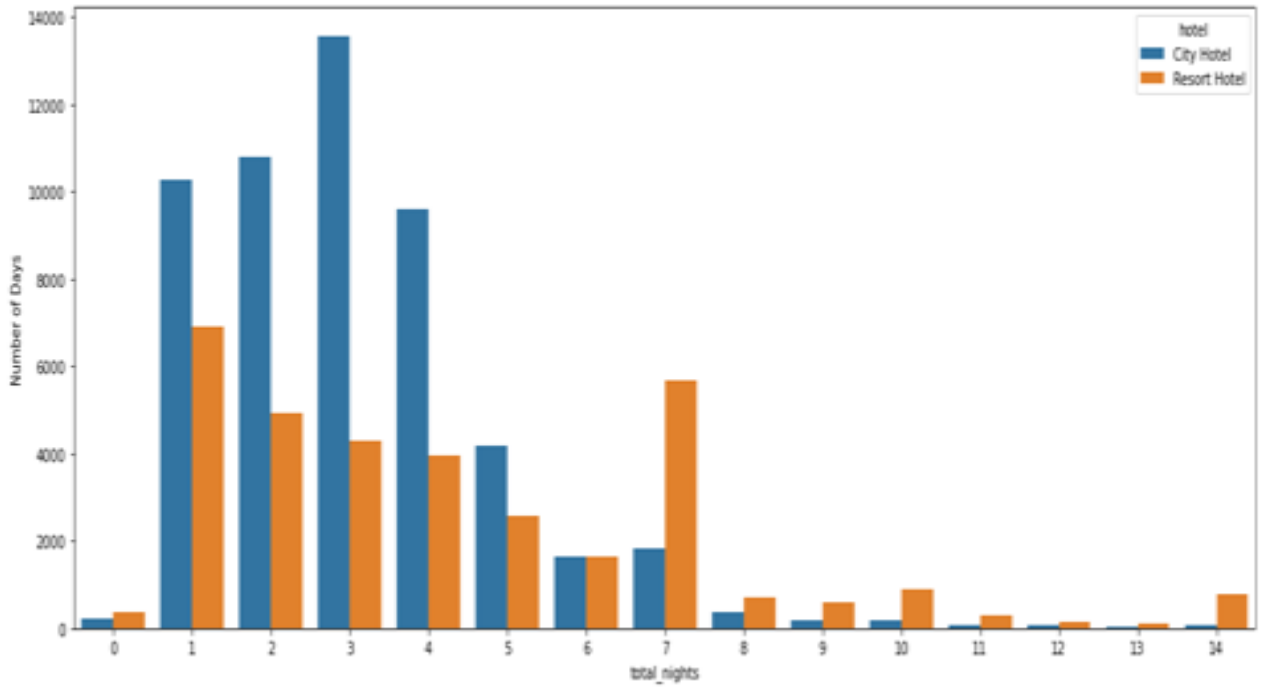


Figure 3.7a

Above figure indicates that most people stay at the hotel for less than 7 days.

3.8 Bookings are more on weekdays or weekends?

Now we calculated weekend and week days nights by sum function. And then plotted it in two different graphs weekdays and weekends with seaborn countplot.

Below two figures indicate that there are more bookings at week nights as compared to weekend nights. Usually there are more outing on weekends but here it seems different.

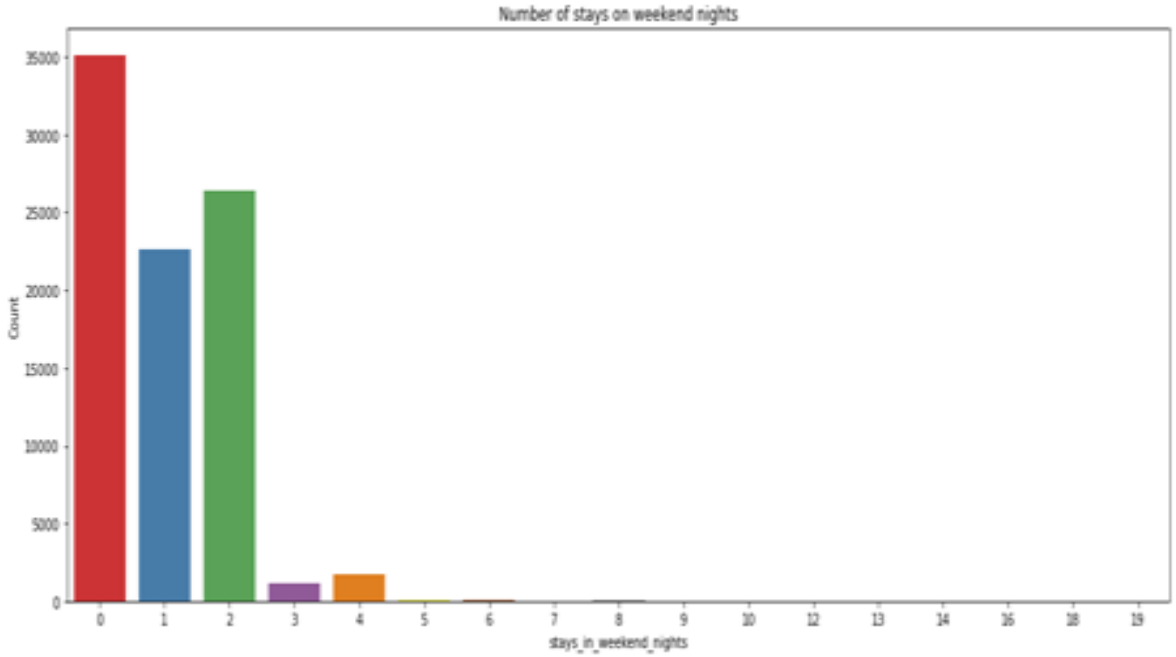


Figure 3.8a

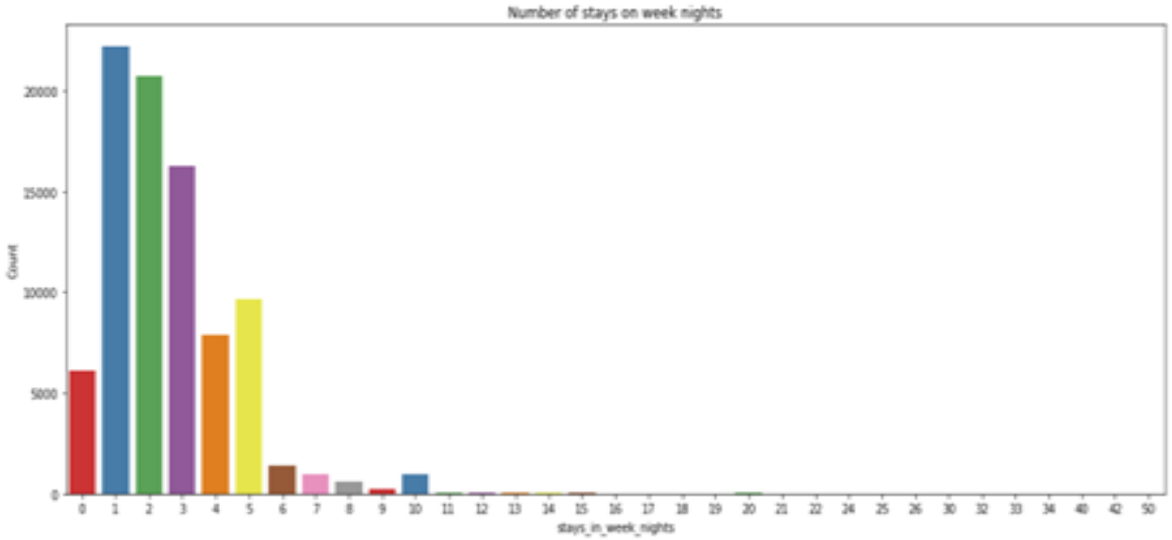


Figure 3.8b

3.9 How often assigned rooms are different from reserved and do having children and babies have any impact?

It's Interesting to see that when we find correlation between assigning different room and having children/babies is negligible but when we segregate the data to City and Resort Hotel then we can clearly see having children/babies has low probability of getting different room in Resort hotel when compared to City Hotel.

	got_different_room	any_child_or_babies
got_different_room	1.000000	-0.010806
any_child_or_babies	-0.010806	1.000000

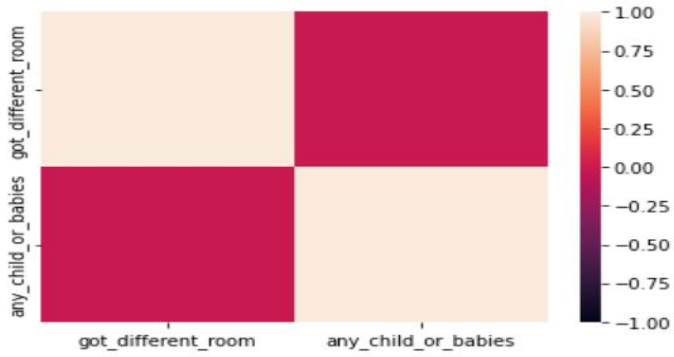


Figure 3.9a

3.10 Do non-repeated guests cancel more often than repeated once?

	is_repeated_guest	is_canceled
is_repeated_guest	1.000000	-0.088764
is_canceled	-0.088764	1.000000

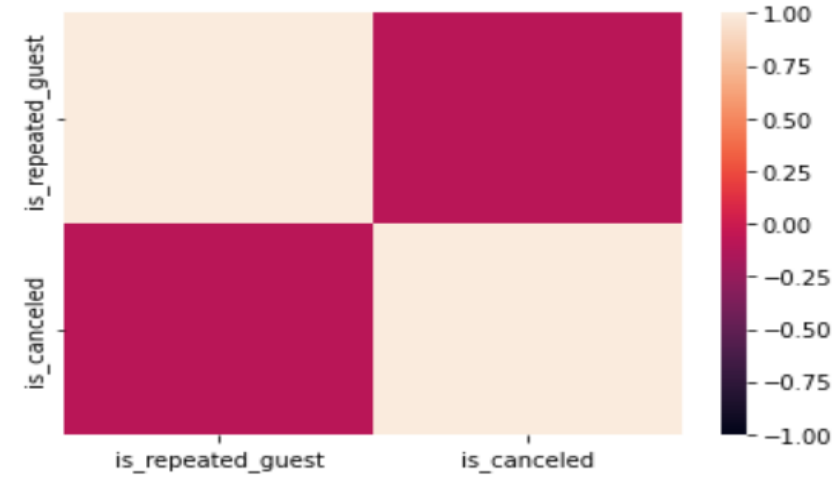


Figure 3.10a

We can clearly see the percentage of cancellation for Non Repeated User is higher when compared to repeated users for both City and Resort Hotels.

3.11 Do customers who were on the waiting list for a long time have less cancellation compared to others?

We can clearly see there's some positive correlation between lead_time and cancellation status i.e., the higher the lead time the more chances of cancellation and avg lead time of canceled booking is 40 days more when compared to not canceled bookings

	lead_time	is_canceled
lead_time	1.000000	0.184515
is_canceled	0.184515	1.000000

Figure 3.11a

3.12 Do the number of special requests have any correlation with having children/babies?

	total_of_special_requests	any_child_or_babies
total_of_special_requests	1.000000	0.094623
any_child_or_babies	0.094623	1.000000

Figure 3.12a(City Hotel)

	total_of_special_requests	any_child_or_babies
total_of_special_requests	1.000000	0.072321
any_child_or_babies	0.072321	1.000000

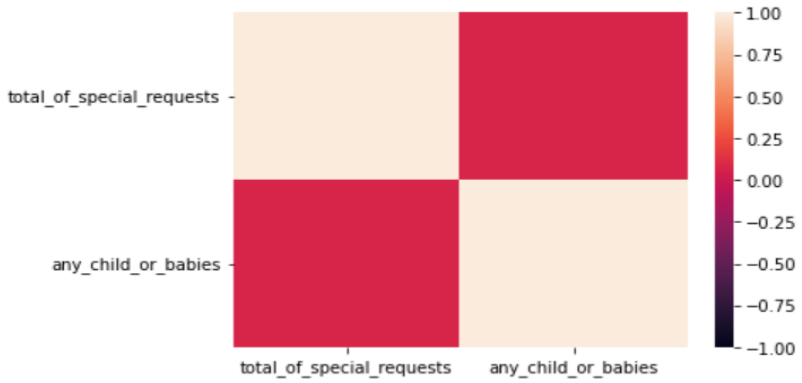


Figure 3.12b(Resort Hotel)

From above comparisons we can see having children/babies have less special requests in Resort Hotel when compared to Resort hotel.

3.13 Number of bookings per year for two hotels.

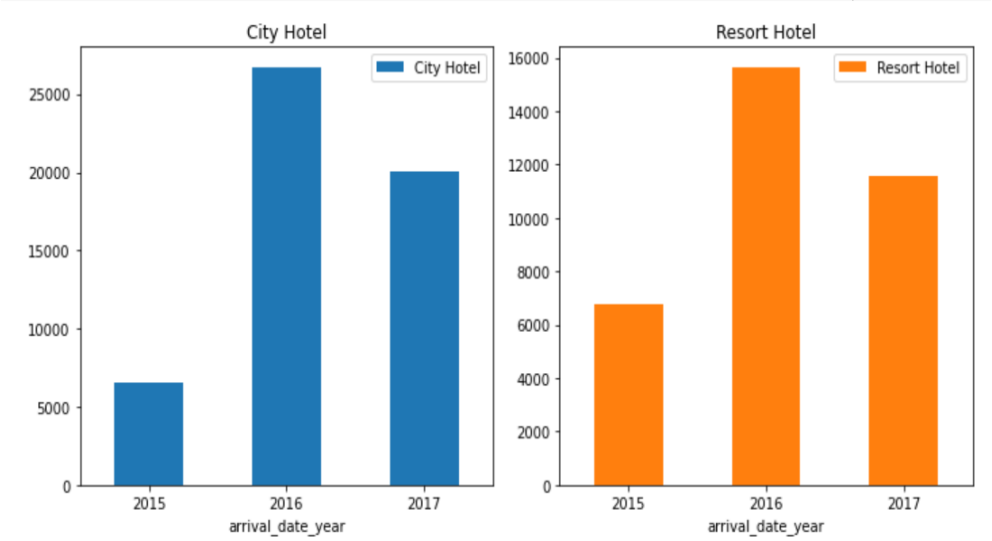


Figure 3.13a

Overall bookings of City Hotel is higher when compared to Resort Hotel we can observe the percent of growth in number of booking from 2015 to 2017 is much higher in City Hotel

3.14 Customers distribution based on type

Customer Type distribution has the same trend in both types of Hotels, no significant difference. The Transient type of hotel has more bookings.

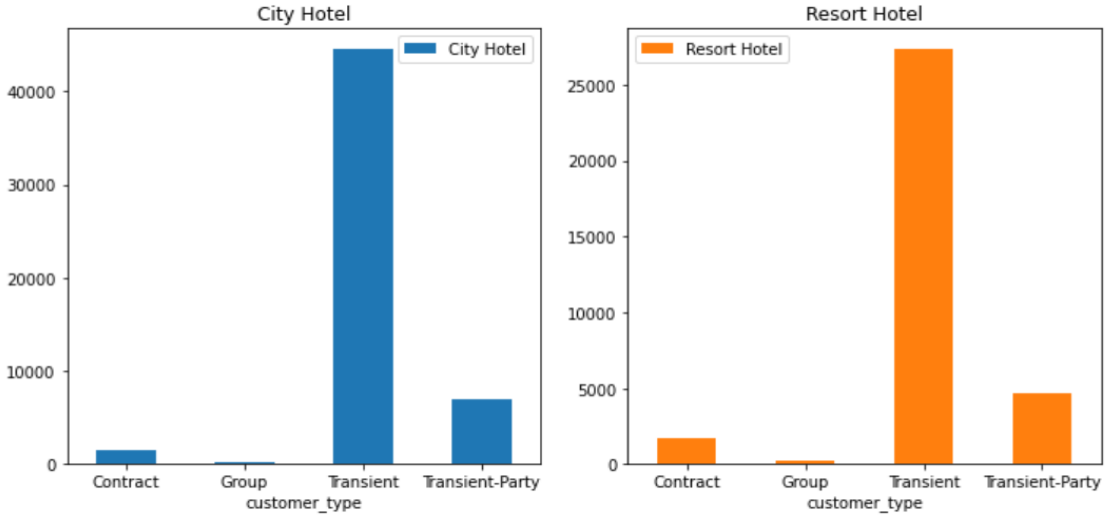


Figure 3.14a

3.15 Booking distribution based on assigned room type.

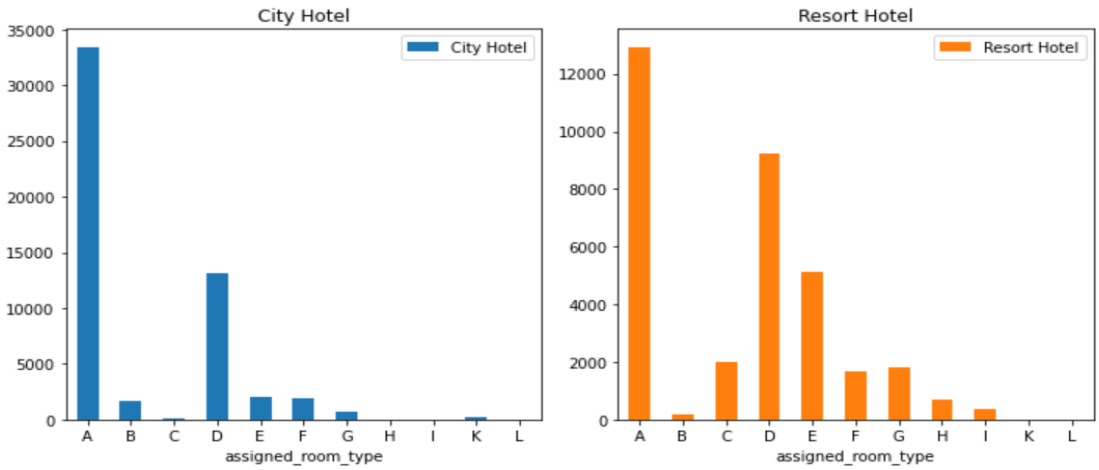
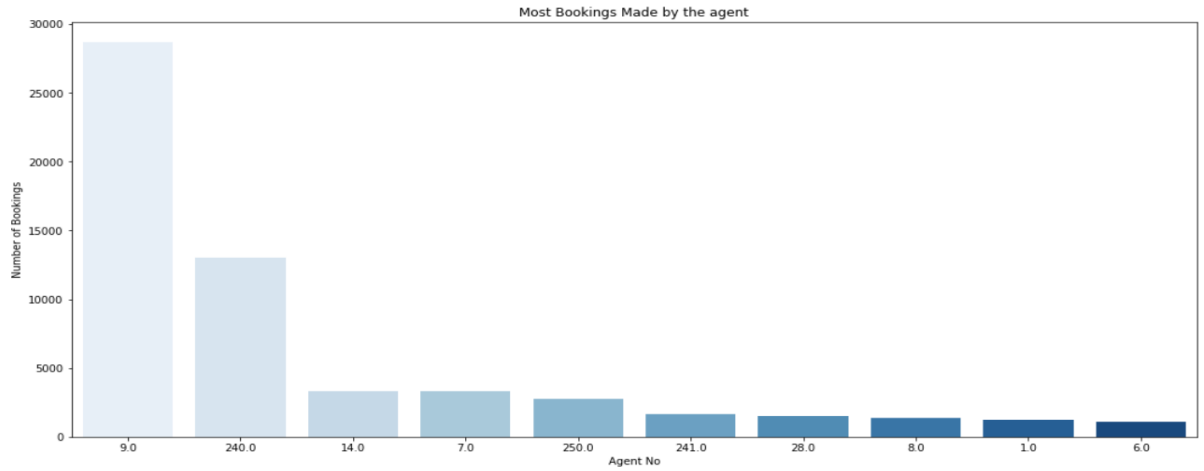


Figure 3.15a

Type A rooms are more preferred room type by customers.One clear difference in assigned room type between City Hotel and Resort hotel is that B type rooms are assigned more than C type rooms in City Hotel but in Resort Hotel it is the reverse.

3.16 Which agent made the most bookings?



. Figure 3.16a

Agent ID no: 9 made most of the bookings
Agent ID no: 6 made the least number of bookings
Agent ID no: 14 and 7 have almost same number of bookings
Agent ID no: 28, 8 and 1 have almost same number of bookings

3.17 Does a meal type have any correlation with cancellation?

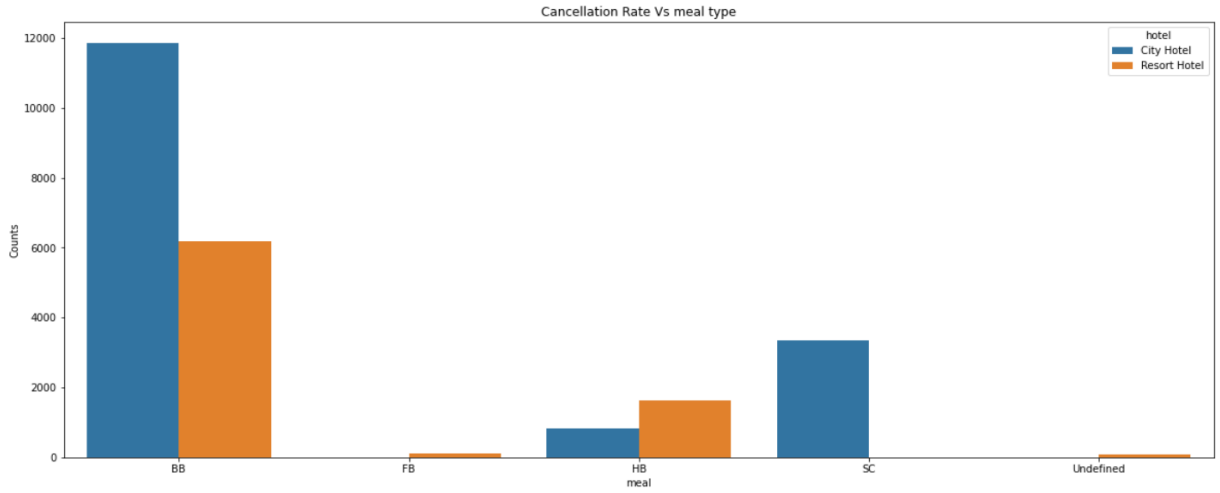


Figure 3.17a

Above figure indicates Most canceled bookings preferred BB meal.And more canceled bookings are from resort hotels only for HB meal there is slight high cancellation from resort hotel.

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3.18 Which market segment has the most number of bookings?

For this we plotted a bar plot .

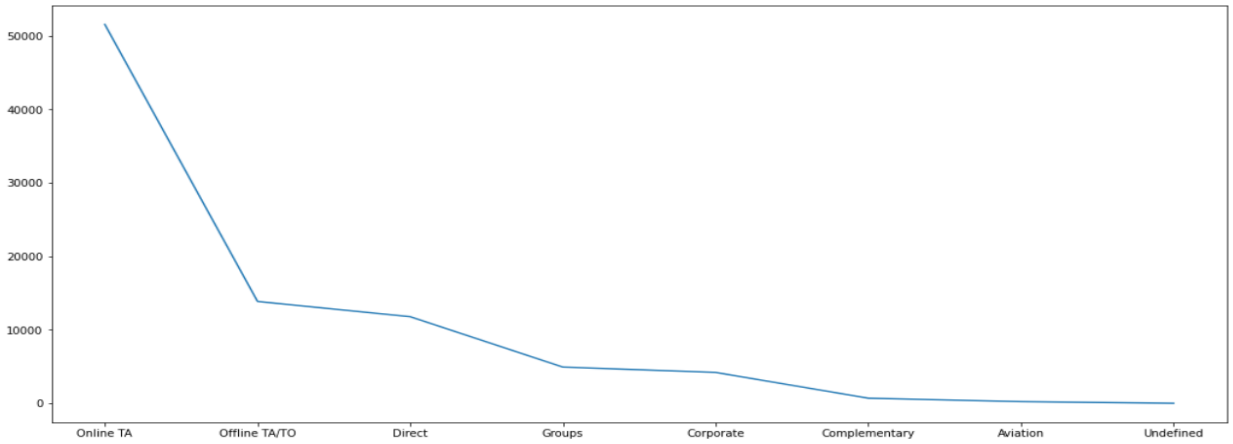

Figure 3.18a

Most bookings are through Online TA. But it is really important to see how many people actually show up after booking through Online TA. So we next compare Cancellation rates among different market segments

3.19 Which market segment has the most cancellation?

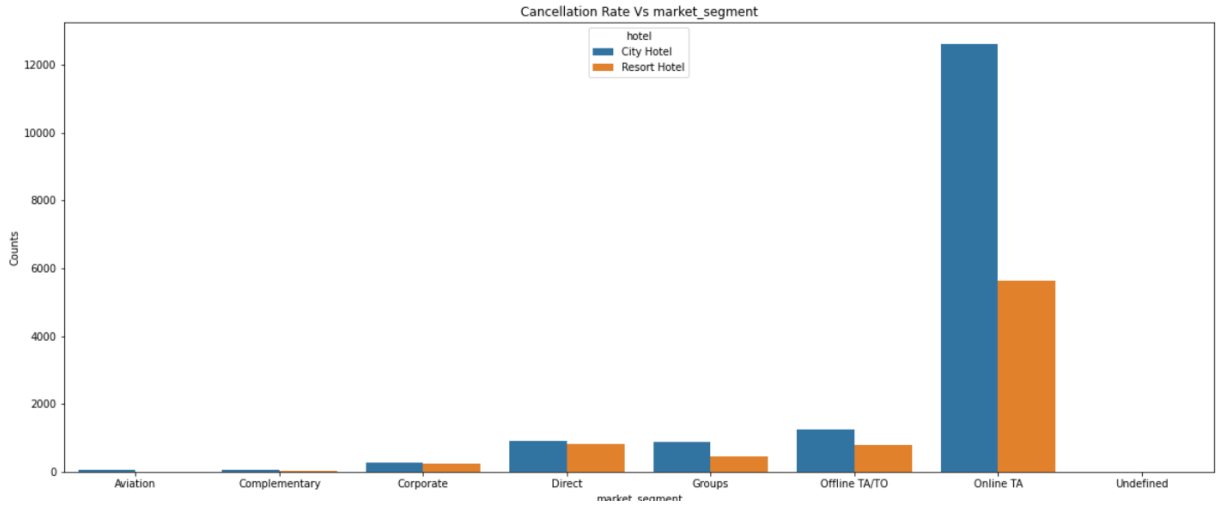

Figure 3.19a

Online TA' has the highest cancellation rate in both types of hotels. To avoid this the hotels can give additional discounts or offers to people who book through Online TA's.

3.20 Which hotel has the most number of repeated guests/customers?

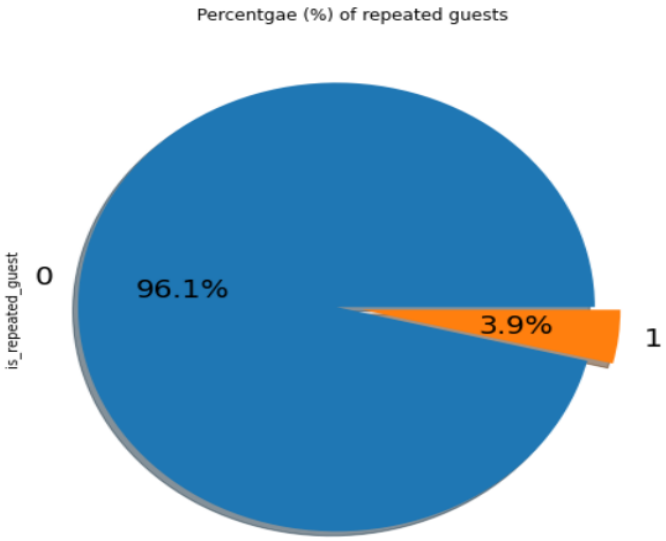

Figure 3.20a

Repeated guests are very few, only 3.9 %. In order to retain the customers,the management should take feedback and try improving their services.They should also keep a track of reviews from guests and try to improve the services.

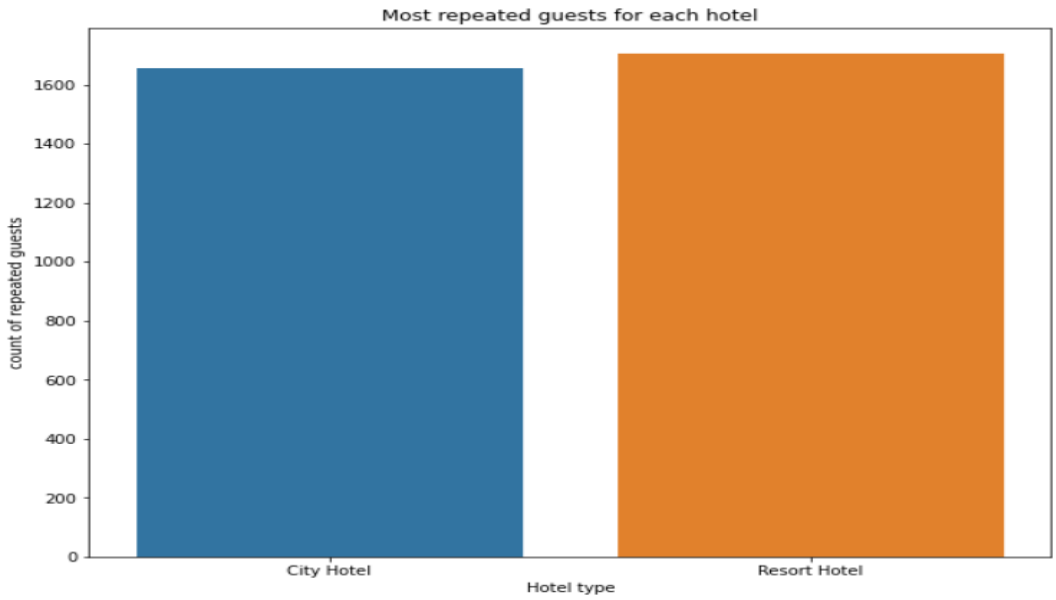

Figure 3.20b

We observe that the repeated guests are almost the same in both the hotels, but it is slightly higher for Resort hotels.

3.21 Correlation between deposit type and cancellation.

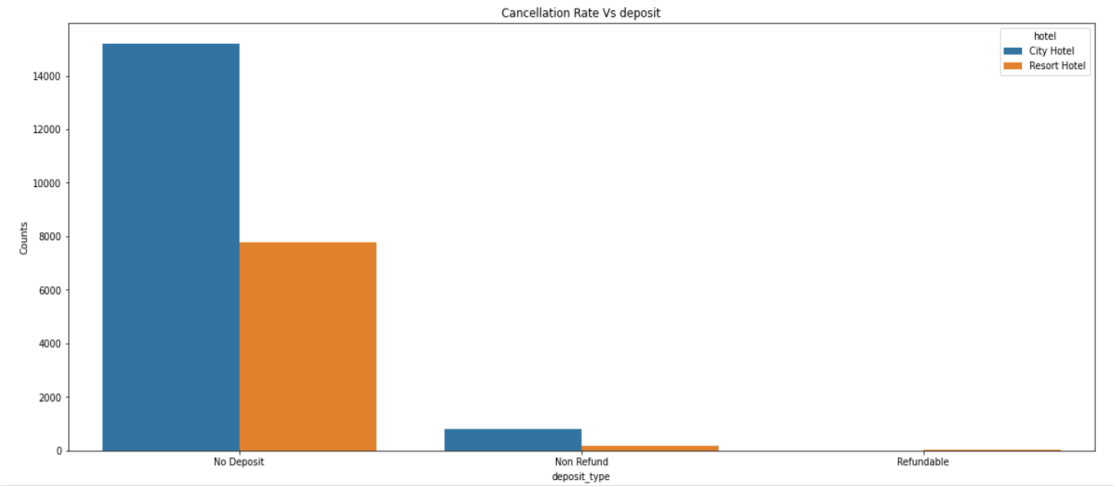

Figure 3.21a

We observe that the most cancellations happen in city hotels.Cancellations are more when there is no deposit, because there is nothing that the customer loses.But the surprising fact is that the cancellations are slightly higher in non-refundable type when compared to refundable deposit

3.22 Correlation between car parking space and cancellation.

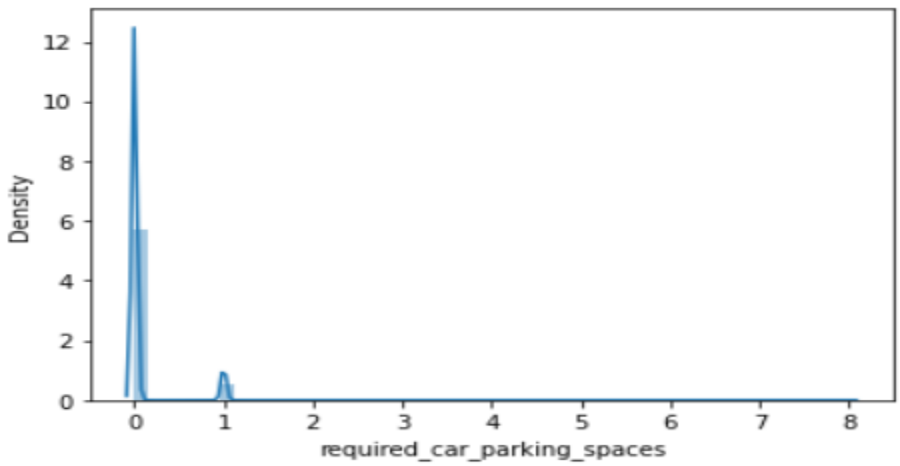

Figure 3.22a

We notice that most of the records require no or at most 1 car parking spaces, though there are records that show more number of parking spaces. This could be families traveling together and larger business trips.

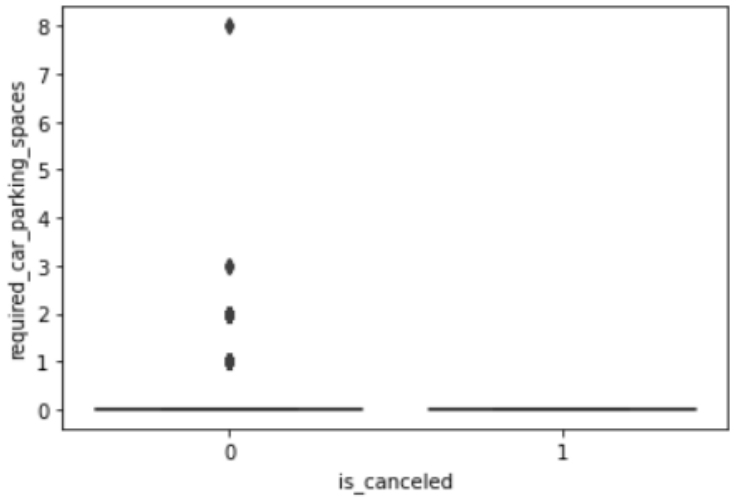

Figure 3.22b

We see that non-cancelled bookings required more number of car parking spaces compared to canceled bookings

4. Conclusion:

That's it! We reached the end of our analysis. The following are our observations:

- Majority of hotel bookings are from city hotels.
- The cancellation rate for hotels is 27.5%
- We should target July and August as most of the bookings. Those are peak months due to the summer period.
- The number of bookings seems to be high in 2016 while the bookings seem to be less in 2015 and 2017. This is majorly due to more data points being available in 2016.
- BB meal is the most preferred meal by customers.
- It appears that a disproportionately high number of bookings are from Portugal, probably because the hotel is located in Portugal itself.
- Most people do not seem to prefer to stay at the hotel for more than 1 week.
- We observe that Weekday bookings are higher than the Weekend numbers. That is an interesting finding.
- When we find a correlation between assigning different rooms for having children/babies there is a low probability of getting a room in a resort hotel as compared to a city hotel.
- The percentage of cancellation for Non Repeated User is higher when compared to repeated users for both City and Resort Hotels.

- There's some positive correlation between lead_time and cancellation status i.e., the higher the lead time the more chances of cancellation and avg lead time of canceled booking is 40 days more when compared to not canceled bookings.
- Having children/babies have less special requests in Resort Hotel when compared to City hotel.
- Even though overall bookings of City Hotel are higher when compared to Resort Hotel the percent of growth in number of booking from 2015 to 2016 is much higher in City Hotel.
- Customer Type distribution has the same trend in both types of Hotels, as transient type of customers are higher in both hotels.
- Type A room is assigned to most of the customers in both the hotels.
- Agent 9 is made most bookings in both the hotels.So we can focus more on agent 9 for more profitable business.
- Most bookings are through Online TA. Also 'Online T A' has the highest cancellation rate of both types of hotels. To avoid this the hotels can give additional discounts or offers to people who book through Online TA's.
- Repeated guests are very few which only 3.9 %.we should target our advertisement on guests to increase returning guests. Also should take feedback and reviews and should work on that.
- We also realize that the high rate of cancellations can be due high no deposit policies
- We notice that most of the records require no or at most 1 car parking spaces, though there are records that show more number of parking spaces. This could be families traveling together and larger business trips.

References-

1. Numpy, Pandas, Matplotlib & seaborn documentation.
2. Alma Better recorded classes
3. Articles on Towards Data Science.