User Guide – HotelViz Shiny App

This user guide is meant to guide the user on the effective way of navigating and using the app HotelViz - Visualization of the Hotel Dataset.

The app is divided into three sections, namely:

1. Know Your Customers
2. Know Your Business
3. Predictive Analysis

1. Introduction Page

1. Introduction Page

This page features a short description and introduction of the application.

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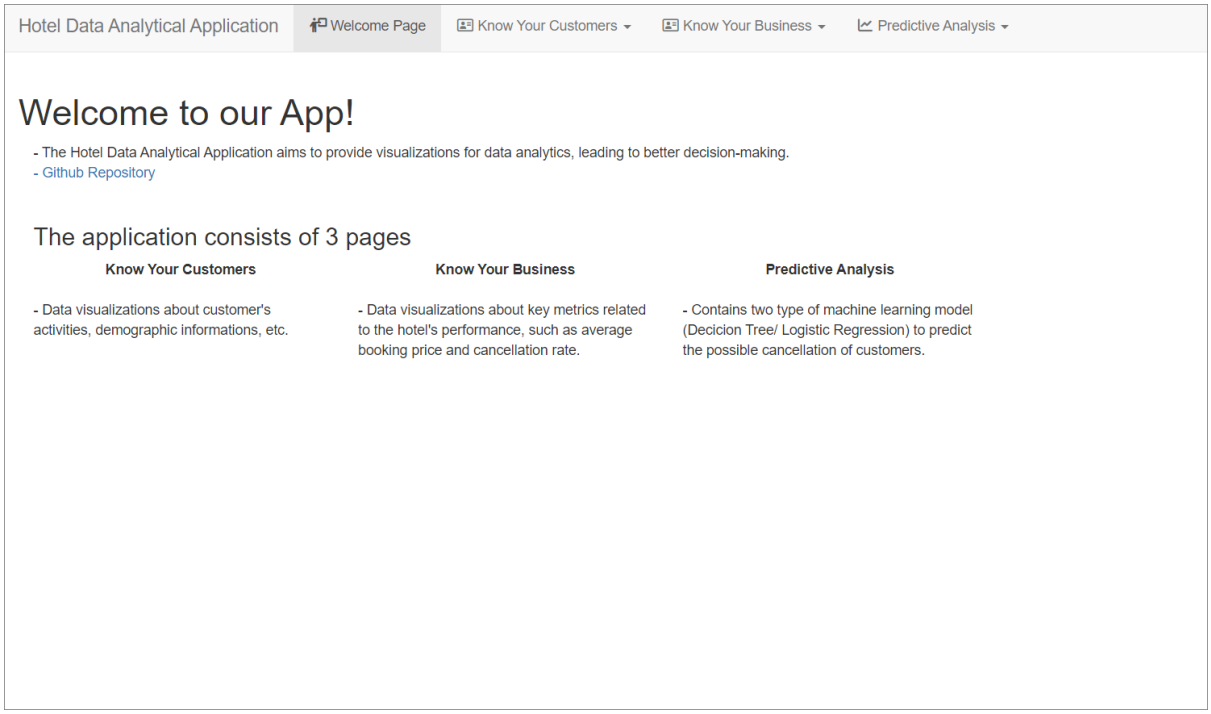


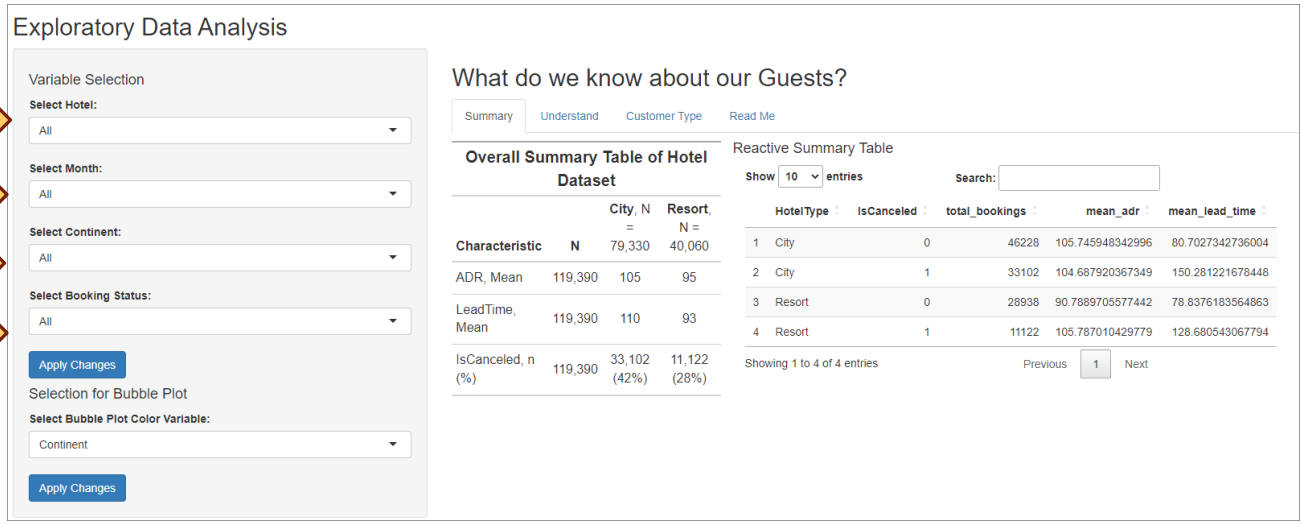
2. Know Your Customers

In this section of the app, visualizations meant to understand the distribution of Guests related parameters that help to define and understand hotel guests can be found. There are two tabs in this section, Exploratory Data Analysis and Inferential Analysis.

2.1 Exploratory Data Analysis

2.1.1 Summary Tab

In this summary table, an overall static summary table of the entire Hotel dataset is displayed.

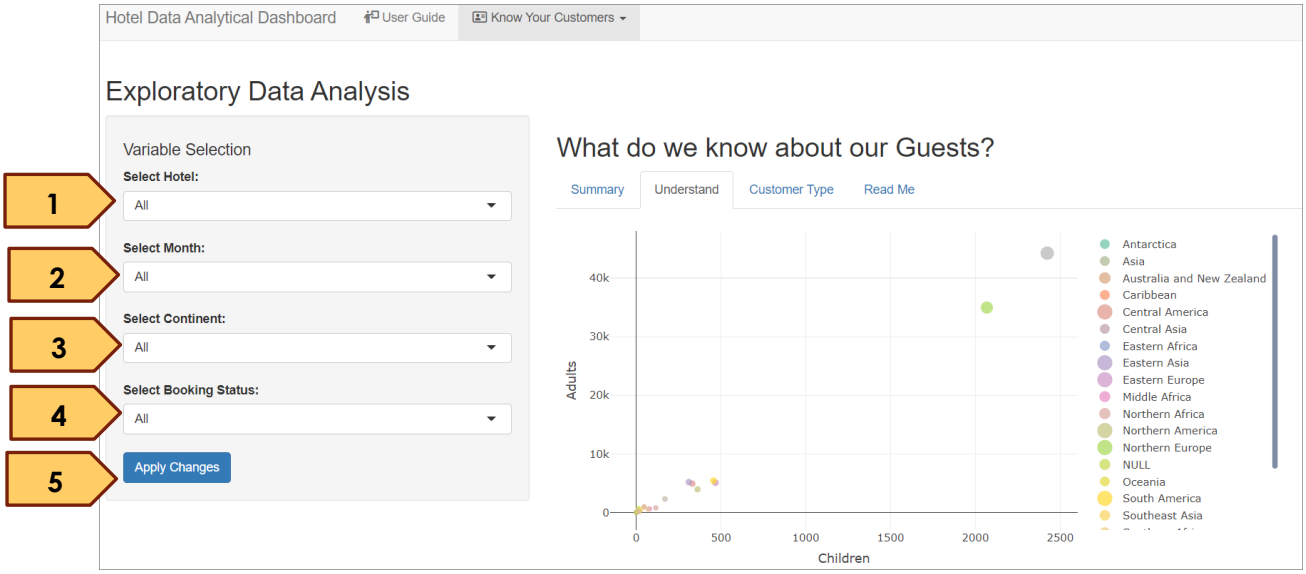


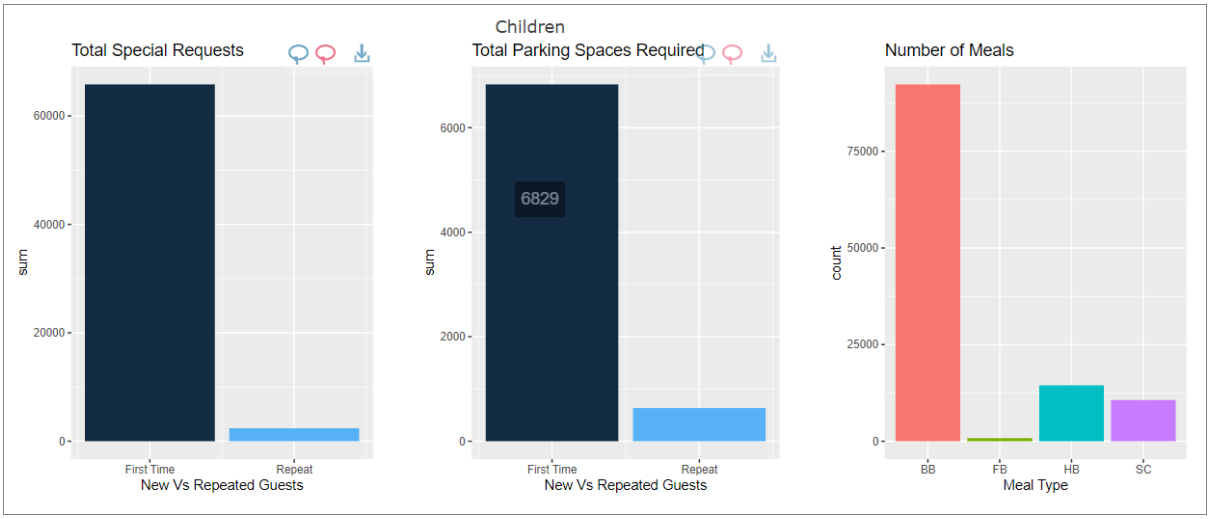
To use this tab effectively:

1. Select the desired Hotel Type (All, City, Resort)
2. Select Month (All or any month of the year)
3. Select Continent (All, or any continent)
4. Select Booking Status (All, Cancelled or Not Cancelled) in the side bar panel.
5. Click 'Apply Changes' to view filtered summary of data with calculated variables 'Total_bookings' to find the size of the data, 'mean_adr' to display the mean Average Daily Rate and 'Mean_lead_time' to display the average lead time that the filtered group has associated with it.

2.1.2 Understand Tab

In this tab, the app displays visualizations to attempt to understand the needs and wants of Hotel Guests.





With selection of the sidebar panel inputs, the various charts in the main panel are updated. The top chart is a bubble chart that shows the relationship between the number of Adults and Children + Babies for an idea of the profile of guest types according to the filters. The color of the bubbles reflects the continent profiles of the guests for further visualization. When hovered over the bubbles, the data points (x = No. of Children + Babies, y = No. of Adults) are displayed.

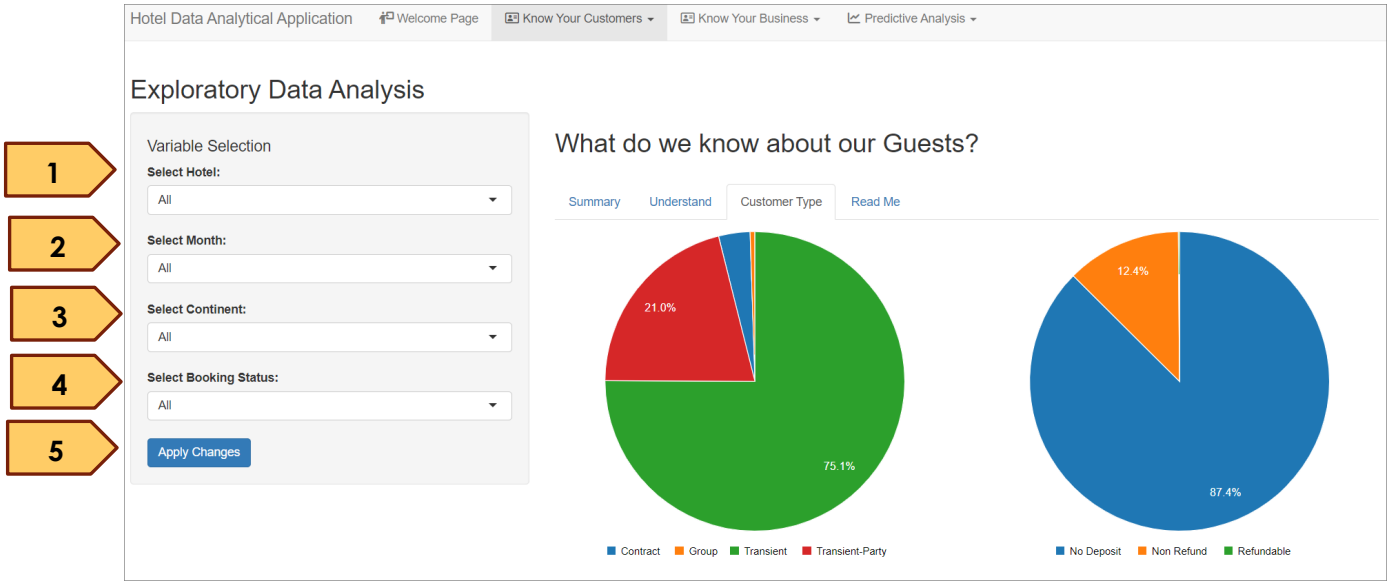
At the bottom, three bar plots are displayed. The first two display the variation in Total Special Requests and Total Parking Spaces Required respectively between first time and repeat guests. The third tab displays the variation in meal types specified by guests. By providing this additional layer of information, the Operations team can better utilize resources.

To use this tab effectively:

1. Select the desired Hotel Type (All, City, Resort)
2. Select Month (All or any month of the year)
3. Select Continent (All, or any continent)
4. Select Booking Status (All, Cancelled or Not Cancelled) in the side bar panel.
5. Click 'Apply Changes' to view the bubble plot and bar plot changes for operationally useful information.

2.1.2 Customer Type

In this tab, interactive pie charts are displayed about the customer type proportions.



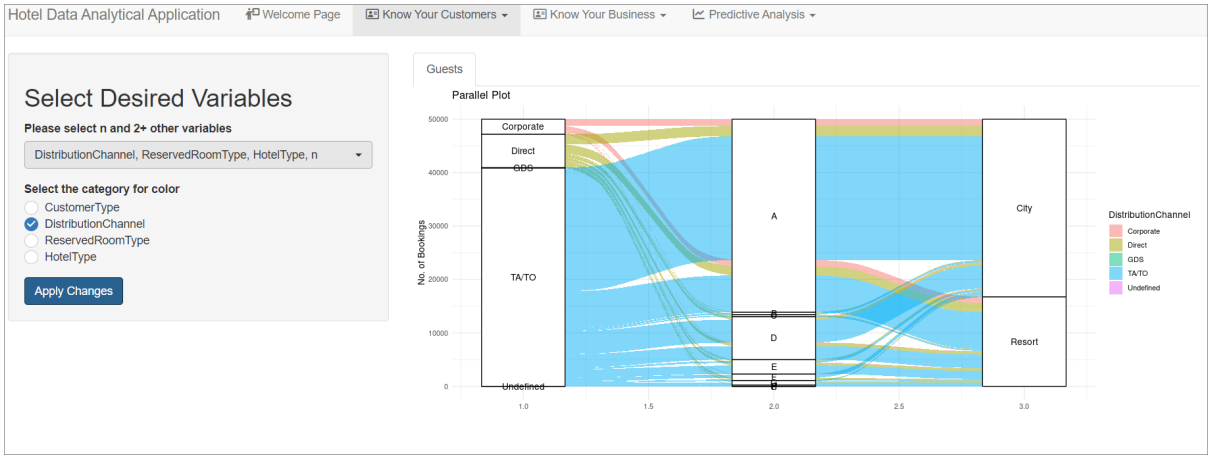
With selection of desired variables to check and apply changes, the proportion of guest types by Customer Type (Contract, Group, Transient, Transient Party) and Deposit Type (No Deposit, Non Refund, Refundable).

To use this tab effectively:

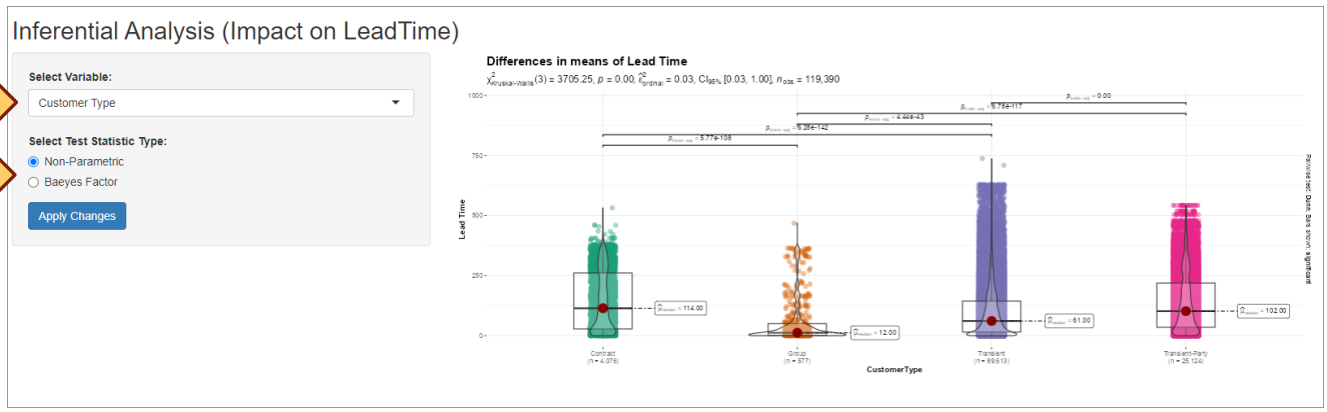
1. Select the desired Hotel Type (All, City, Resort)
2. Select Month (All or any month of the year)
3. Select Continent (All, or any continent)
4. Select Booking Status (All, Cancelled or Not Cancelled) in the side bar panel.
5. Click 'Apply Changes' to view the bubble plot and bar plot changes for operationally useful information.

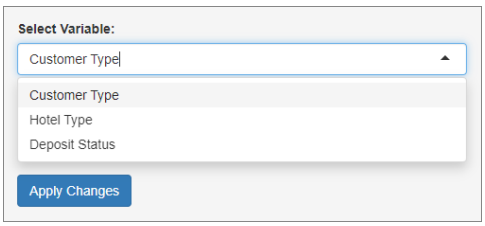
2.2 Parallel Sets

In this tab,



2.1 Inferential Analysis



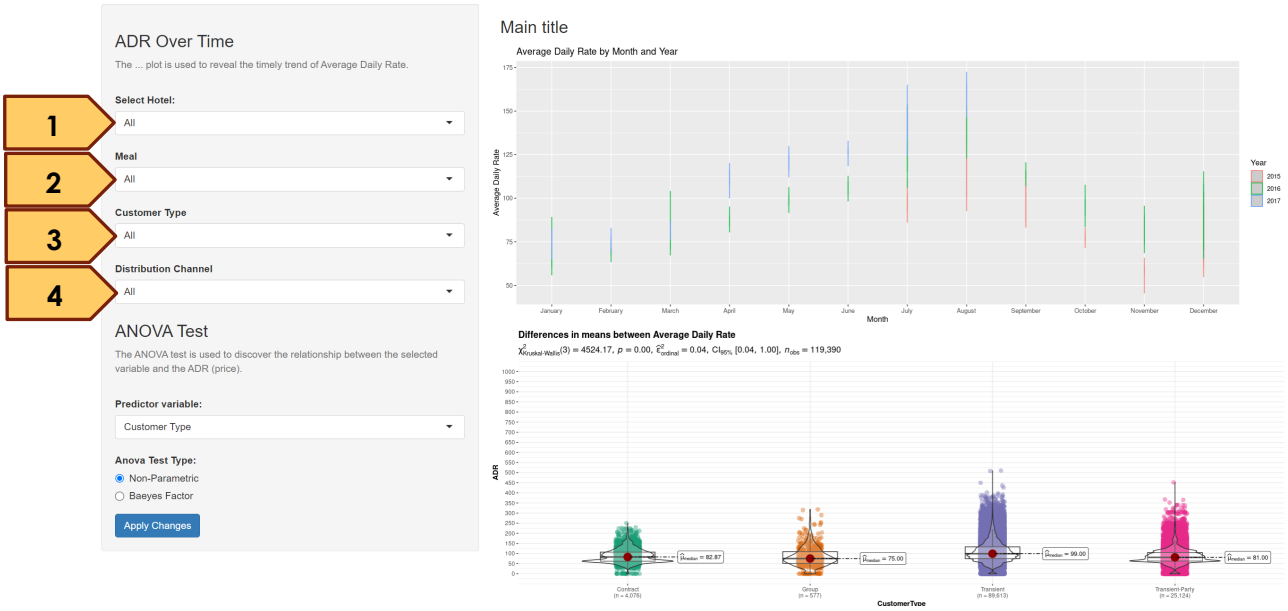


3. Know Your Business

There are two topics under "Know Your Business" drop down menu: Average booking price, and cancellation rate. In the first page, ADR (Average Daily Rate) Over Time will illustrate how the average daily rate changes by different months in a year. Users can apply different filters to see what the important factors are to consider when hotel business operators are making decisions.

3.1. Average booking price

In this page, an overall view of ADR over time will be plotted. There are two charts in a view for users to explore for their businesses.



To use this tab effectively:

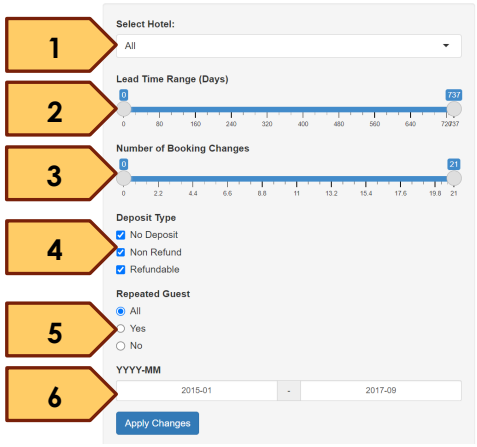
1. Select the desired Hotel Type (All, City, Resort)
2. Select Meal type (All HB, BB, SC, FB, undefined)
3. Select Customer type (All, transient, transient-party, contract, group)
4. ANOVA test: To discover the relationship between the selected variable and the ADR (price)
    a. Predictor variable:
    b. ANOVA test type: Non-parametric / Bayes factor
5. Click "Apply Changes"

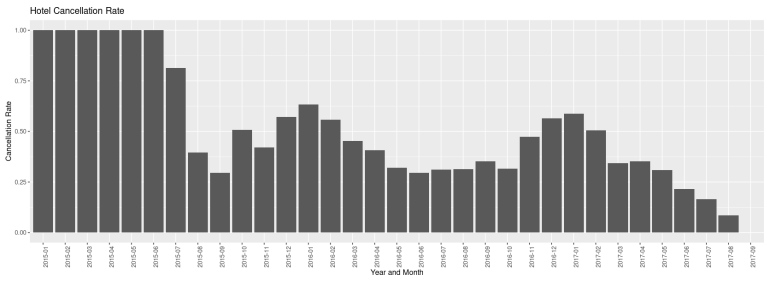
In this page, there are two different charts in a view:

1. Average daily rate by month and year: This plots ADR by month in an x-axis. Users can check out different ADR by year from the color indicated in the legend.
2. Differences in means between ADR (Average Daily Rate): Users can find out the dispersion of means for ADR. Based on the predictor variable filter selection, the plot will show the spread of means. From this view, users can find out how spread means are, as well as significant outliers they have to take a look at.

3.2. Cancellation rate

In this page, an overall view of ADR over time will be plotted. There are two charts in a view for users to explore their businesses.





To use this tab effectively:

1. Select the desired Hotel Type (All, City, Resort)
2. Slide the slicer to adjust Lead time range
3. Slide the slicer to adjust the Number of booking changes
4. Select Deposit type (No deposit, no refund, refundable)
5. Select Repeated guest (All, yes, no)
6. Select the period range
7. Click "Apply Changes"

In this page, there is a bar plot to see the fluctuation trend of hotel cancellation rate. Based on the slicer and filters applied, users can choose the period they want to take a closer look at, or change input variables such as number of booking changes, deposit type and repeated guest.

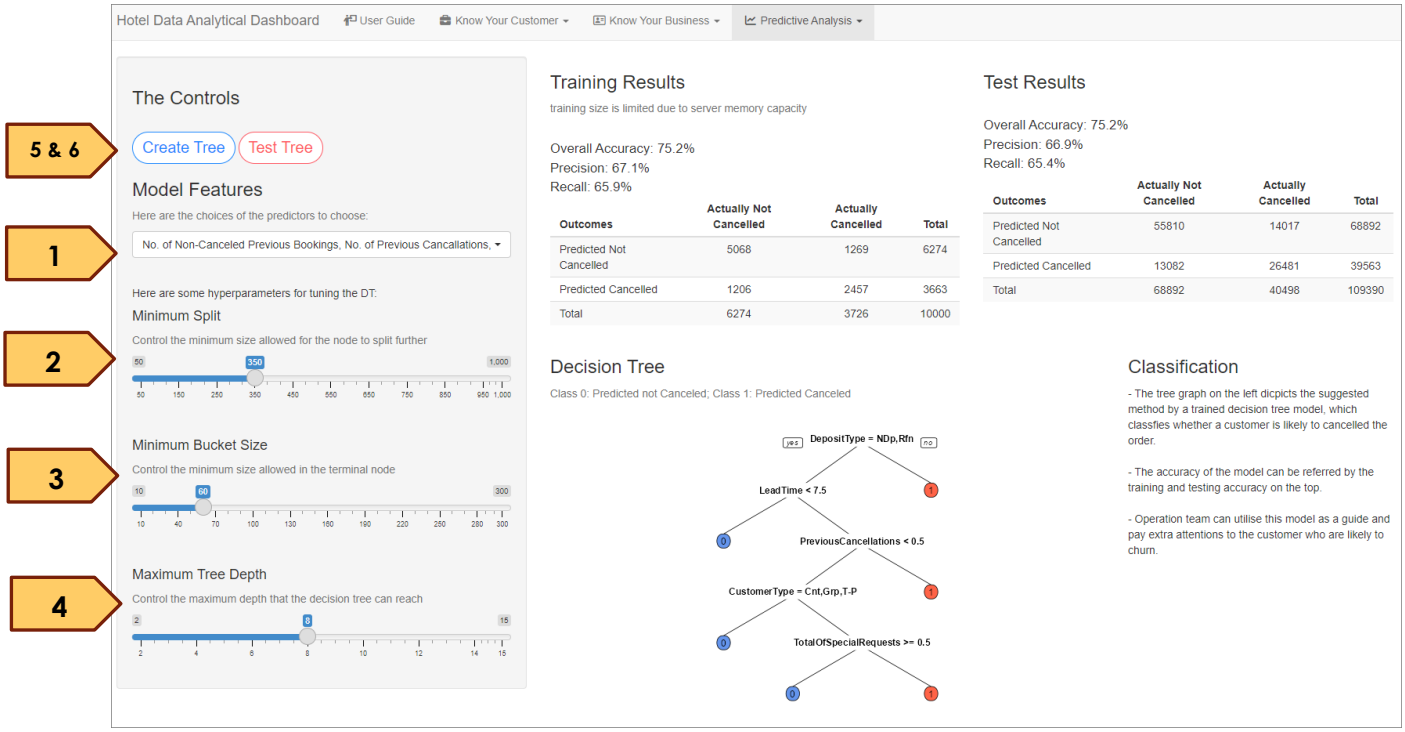
4. Predictive Analysis

In this tab, predictive analysis to predict cancellations can be done by two methods: (1) Decision Tree and (2) Logistic Regression.

4.1 Decision Tree

To apply this method, the following steps need to be applied:

1. Select desired model features to be trained in the model. There are 18 variables available to select from. After which, hyperparameters can be selected.
2. Drag the slider input to determine the minimum size splits for the nodes.
3. Drag the slider input to determine the minimum bucket size allowed in the terminal node.
4. Drag the slider input to determine the maximum depth for the decision tree to reach.
5. Click 'Create Tree'
6. To test and validate the results from the trained model, click 'Test Tree' and the test results will be updated in the top right corner.



The decision tree will then be displayed and the Operations team can obtain an indicator of which feature would be more important to monitor for guests who may have higher propensity to cancel a booking.

4.2 Logistic Regression

To apply this method, the following steps need to be applied:

1. Select desired model features to be trained in the model. There are 18 variables available to select from.
2. Click 'Create Model'
3. To test and validate the results from the trained model, click 'Test Model' and the test results will be updated in the top right corner.

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The Controls

Create Model | Test Model

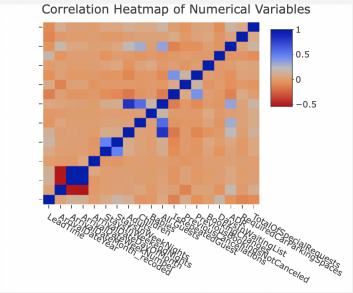
Model Features

Here are the choices of the predictors to choose:

No. of Non-Canceled Previous Bookings, No. of Previous Cancallations,

Test For Multi-Collinearity

Below shows the correlations between each of the numerical variables. Highly correlated pairs need to be excluded from the logistic regression model.



Training Results

training size is limited due to server memory capacity

Overall Accuracy: 74.3%
Precision: 70%
Recall: 54.2%

Outcomes	Actually Not Cancelled	Actually Cancelled	Total
Predicted Not Cancelled	13526	4260	15692
Predicted Cancelled	2166	5048	7214
Total	15692	9308	25000

Test Results

Overall Accuracy: 73.9%
Precision: 68.9%
Recall: 53.9%

Outcomes	Actually Not Cancelled	Actually Cancelled	Total
Predicted Not Cancelled	13465	4272	15727
Predicted Cancelled	2262	5001	7263
Total	15727	9273	25000

Importance of Variables