Hotel Booking Prediction

Team 9 (سوبيا الرحماني)

CMPS451 – Big Data

Team Members

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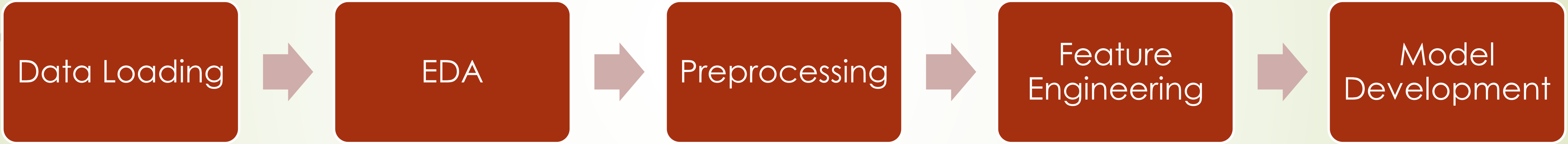
Problem Description

Hotel Cancellation Prediction with Machine Learning

- Actionable insights for hotels
- Predict cancellations to:
  - ✓ Offer discounts and prevent revenue loss
  - ✓ Adjust staffing and optimize costs

Project Pipeline



Data Loading

EDA

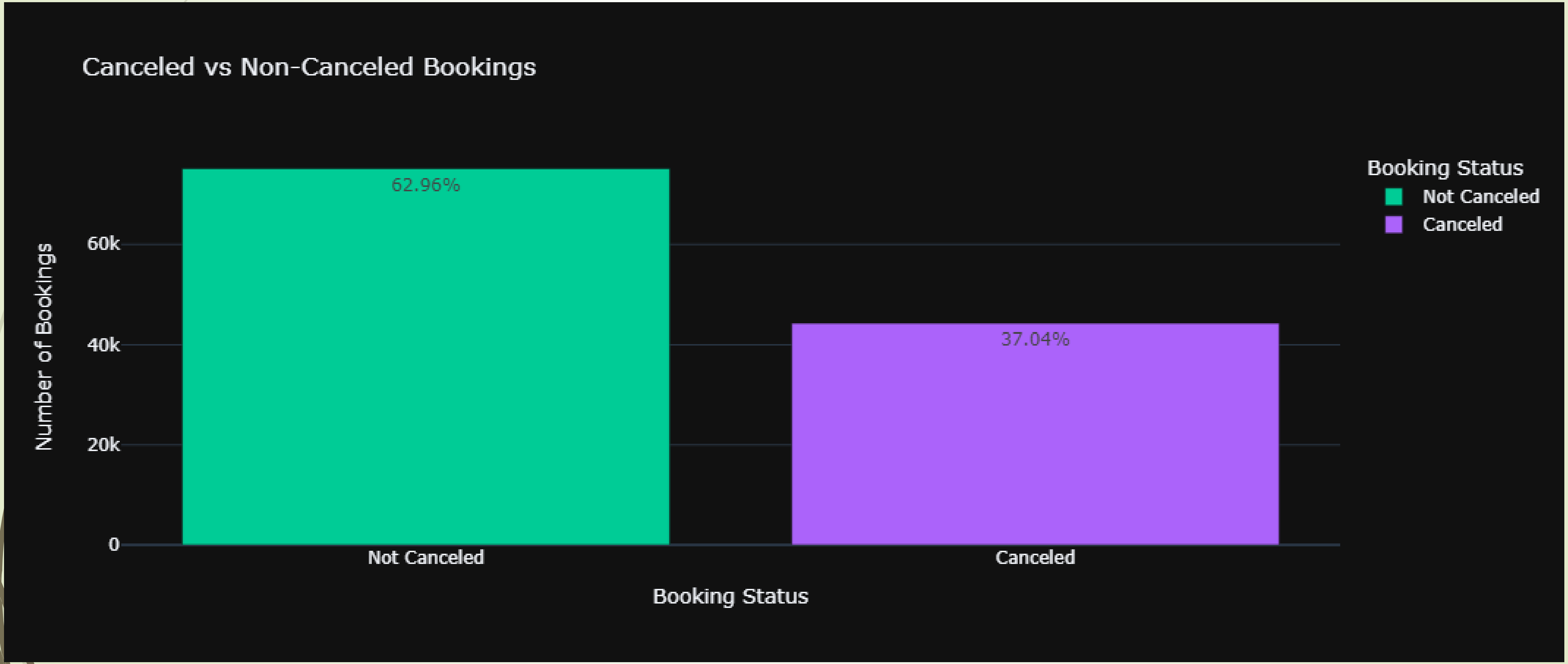
Preprocessing

Feature Engineering

Model Development

📊 Exploratory Data Analysis

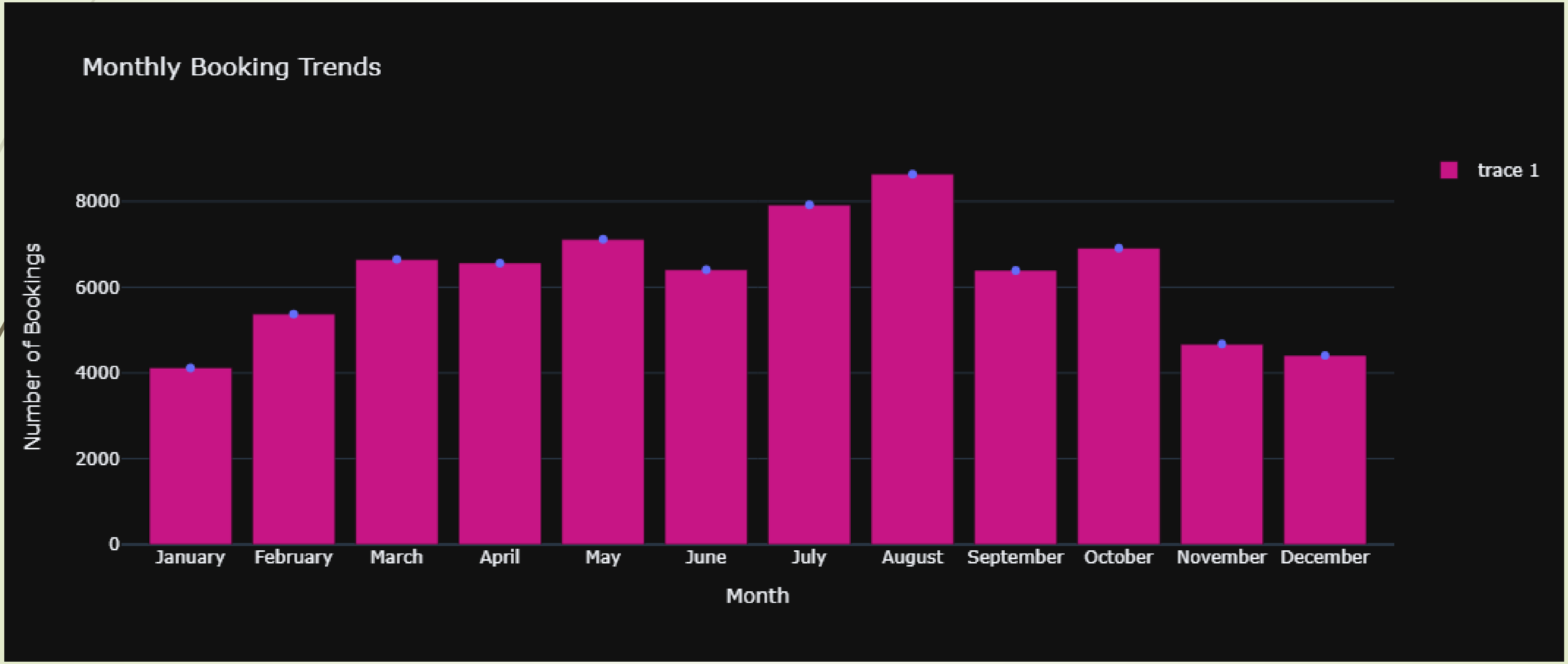
🕵️‍♂️ Cancelled vs. Not Canceled:



📊 Exploratory Data Analysis

🕵♂ First Observation:

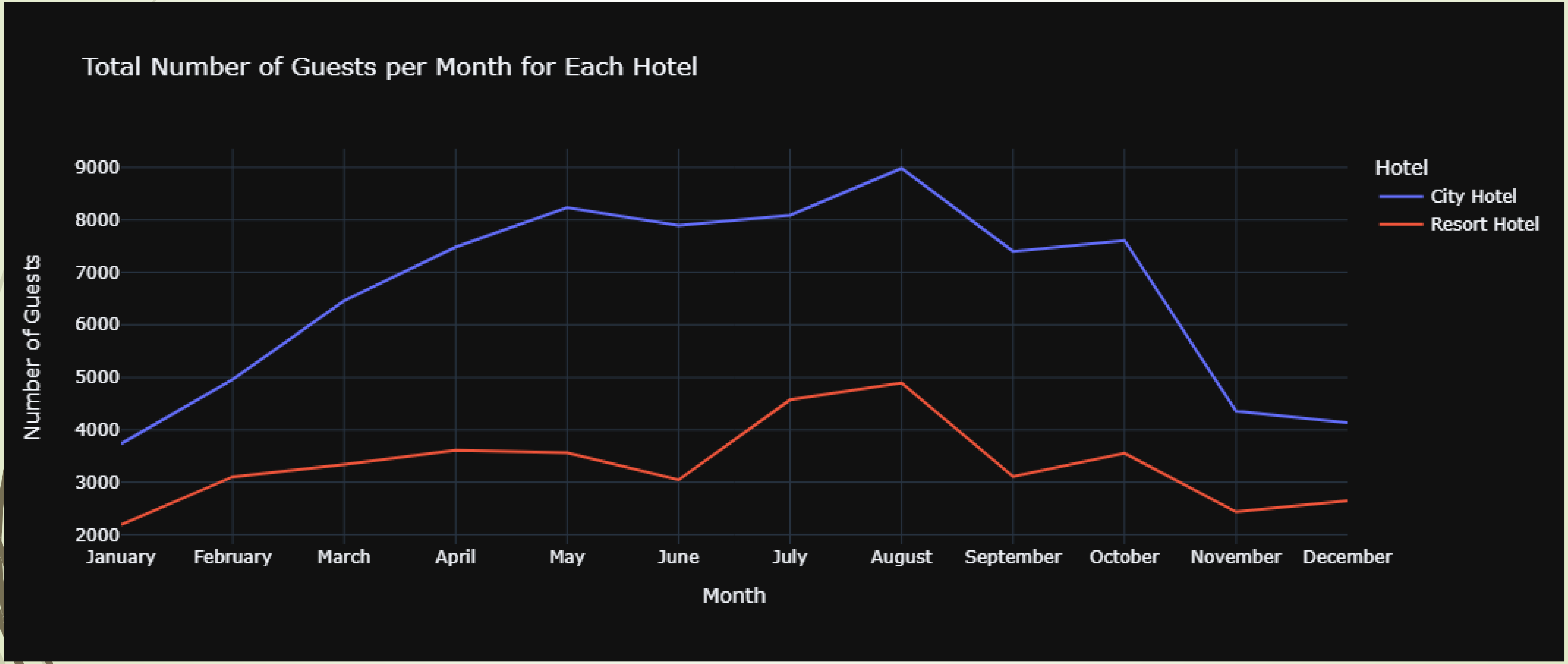
- The majority of reservations occur in the months of July and August, while the fewest bookings are made at the start and close of the year.



📊 Exploratory Data Analysis

🕵️‍♂️ Second Observation:

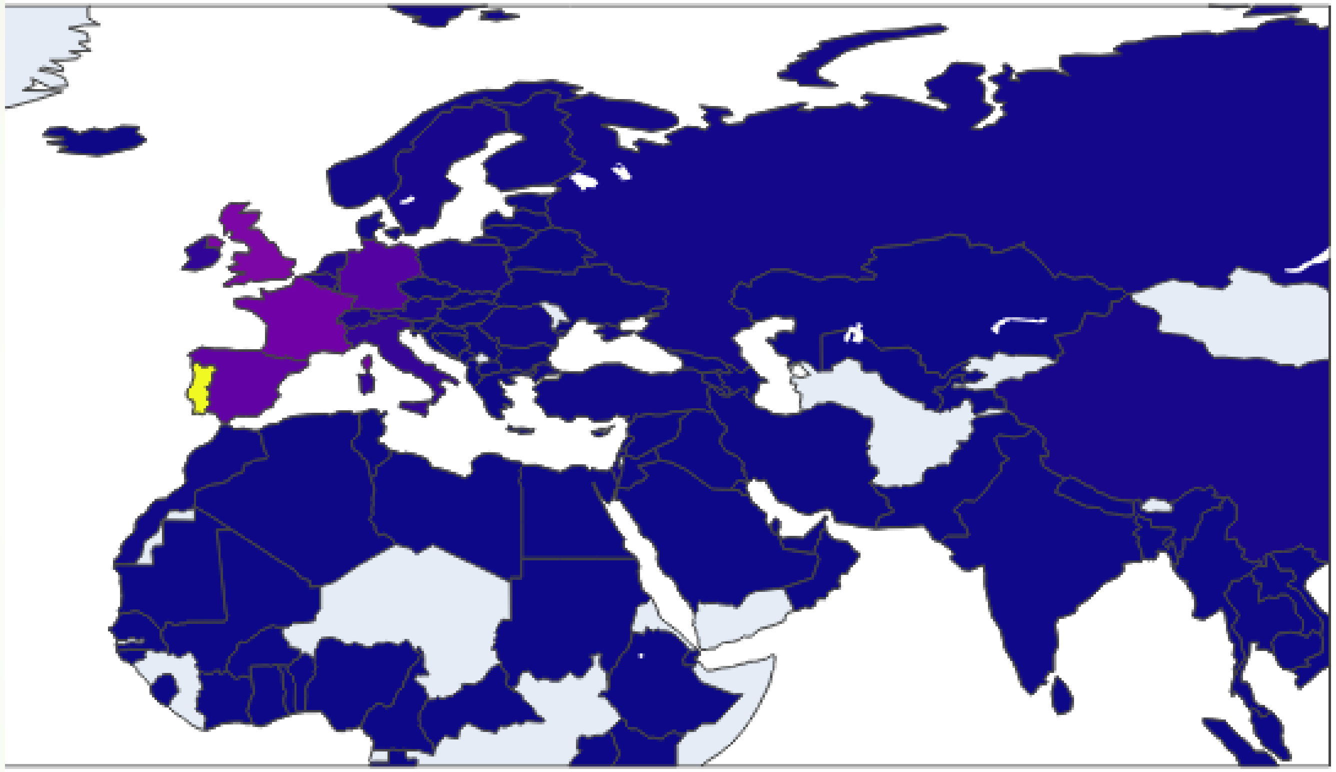
- City Hotels have more monthly bookings and overall bookings than Resort Hotels.
- Both hotels have the fewest guests during the winter.



Exploratory Data Analysis

🕵♂ **Third Observation:**

- The number of guests from Portugal is significantly higher than the other countries.
- Portugal, Great Britain and France account for 50% of the guests.



Exploratory Data Analysis

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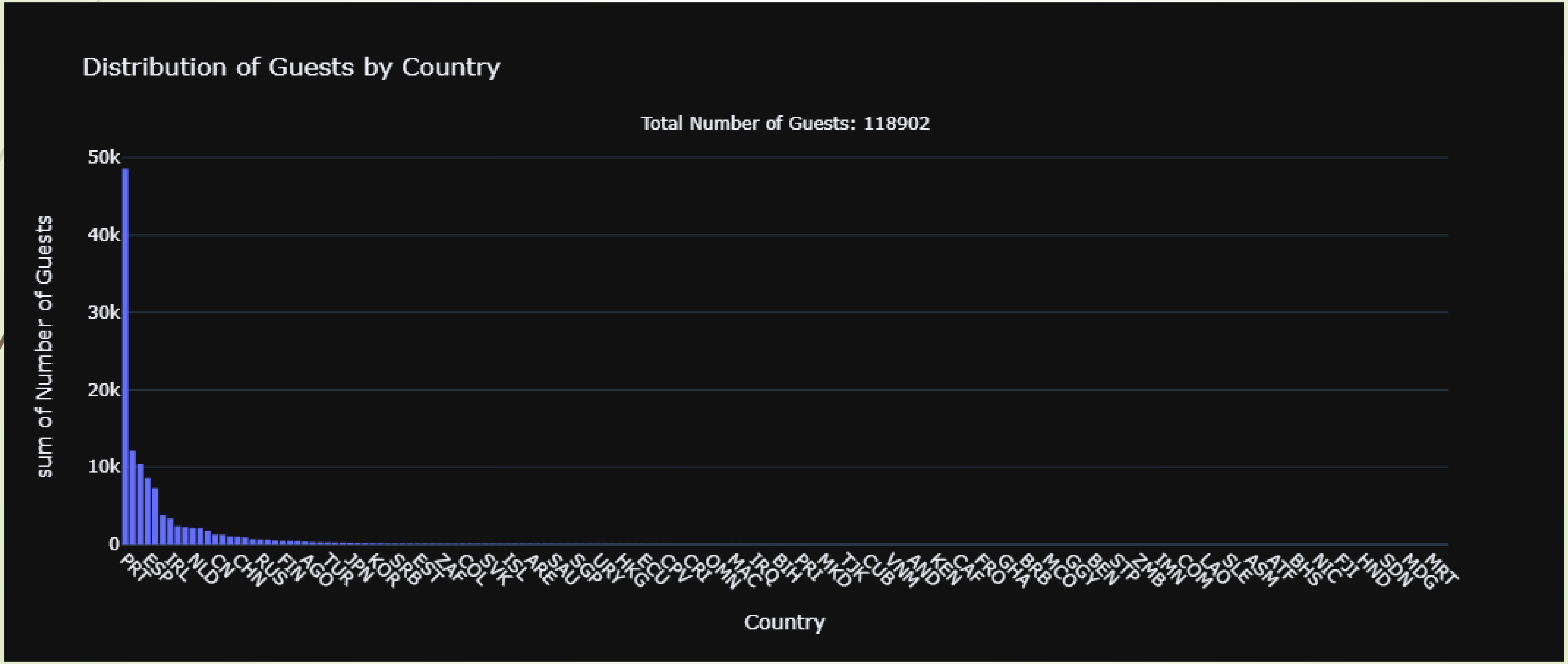

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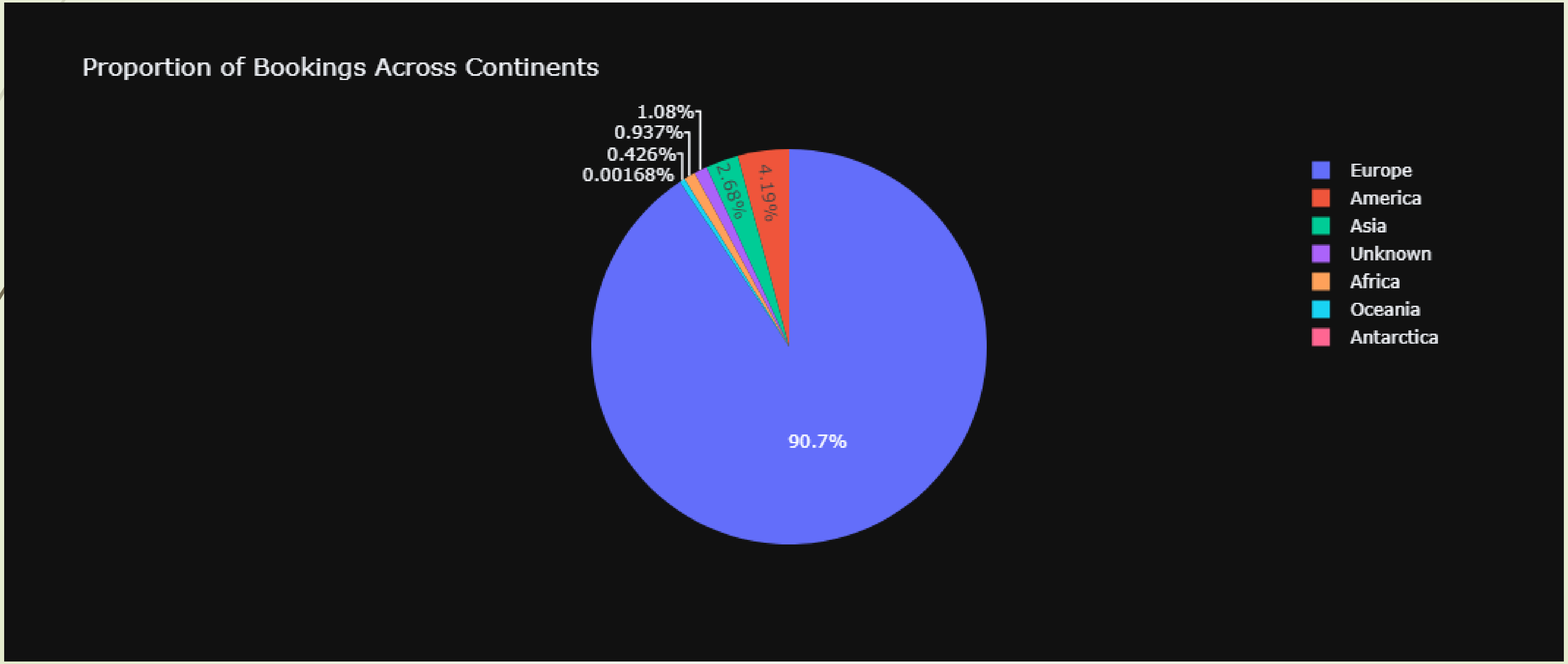
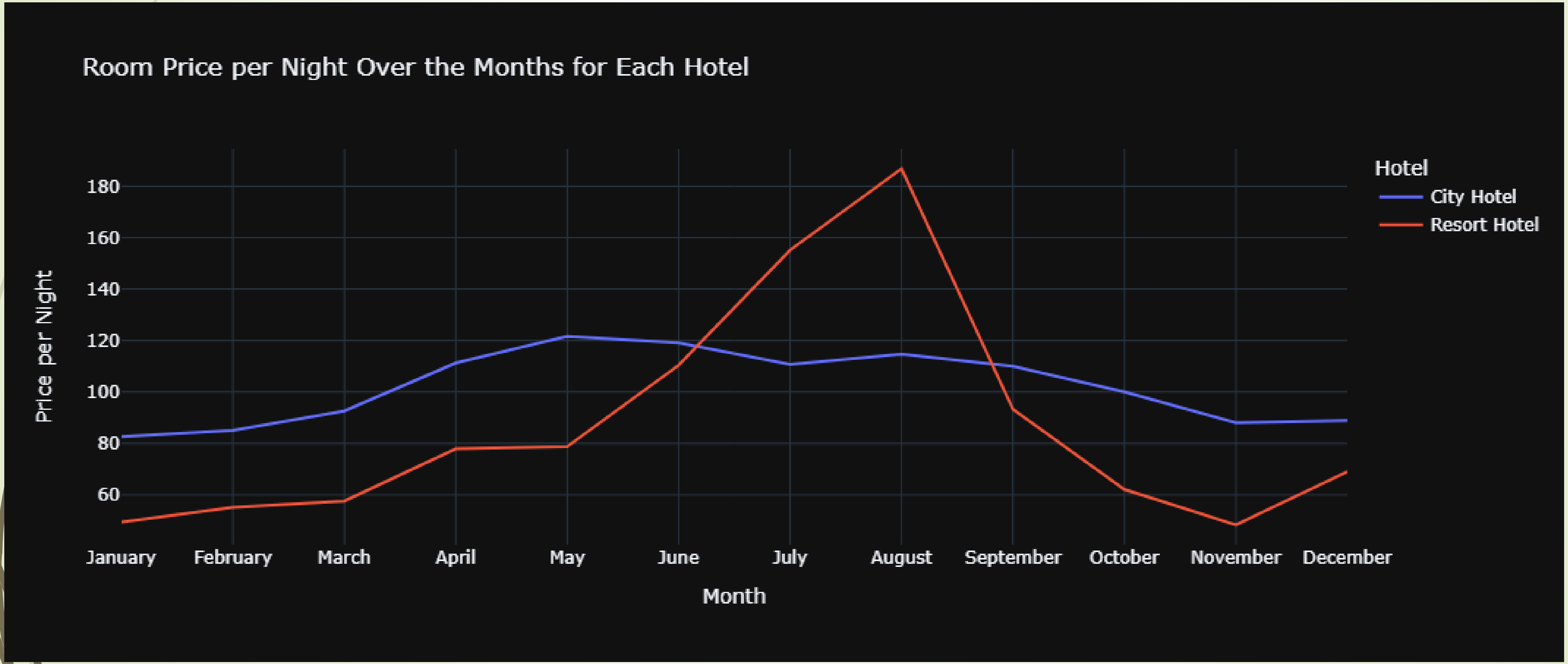


📊 Exploratory Data Analysis

🕵️‍♂️ Fourth Observation:

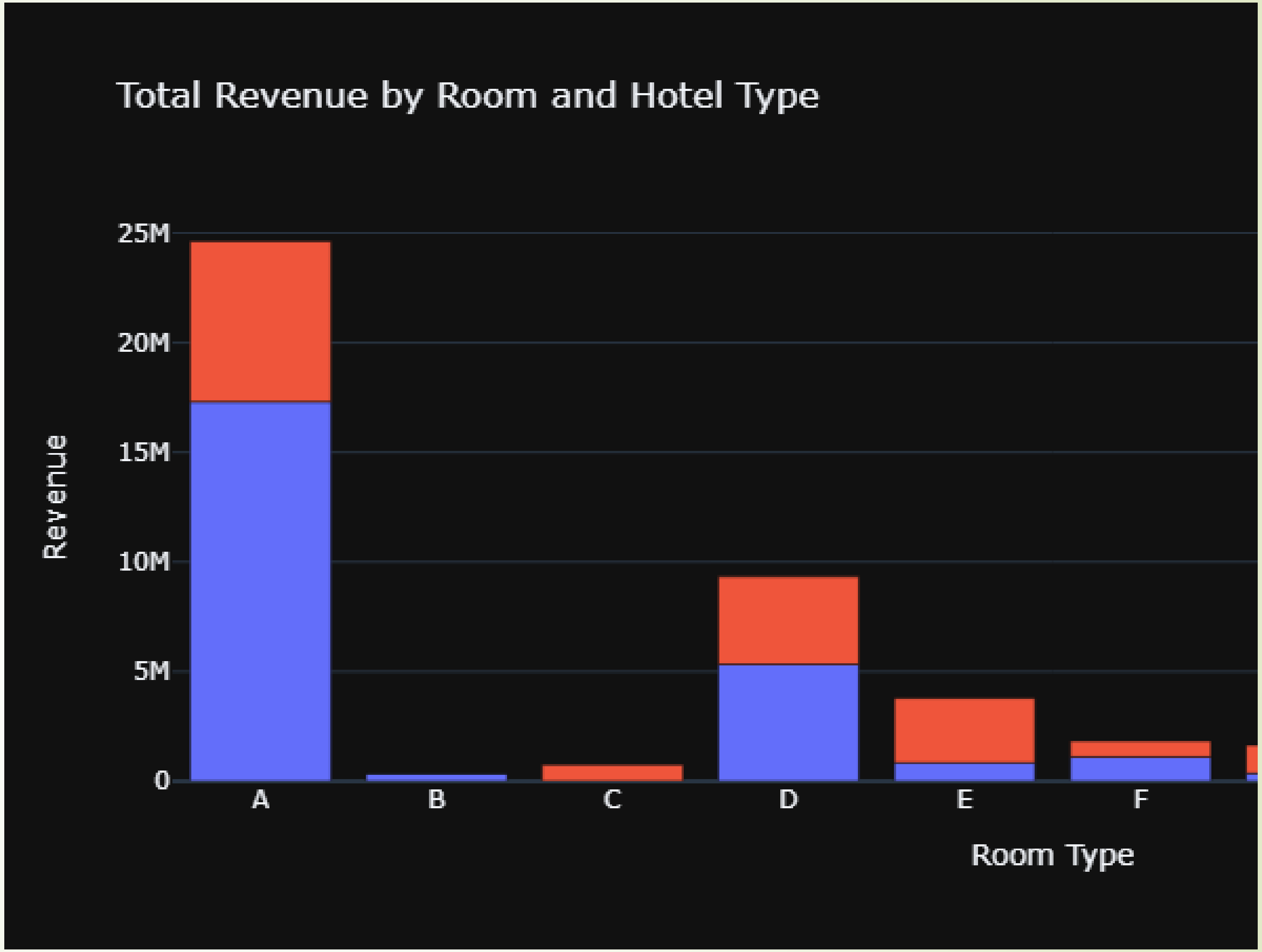
- This plot clearly shows that prices in the Resort Hotel are much higher during the summer and prices of city hotel varies less.



Exploratory Data Analysis

🕵️‍♂️ **Fifth Observation:**

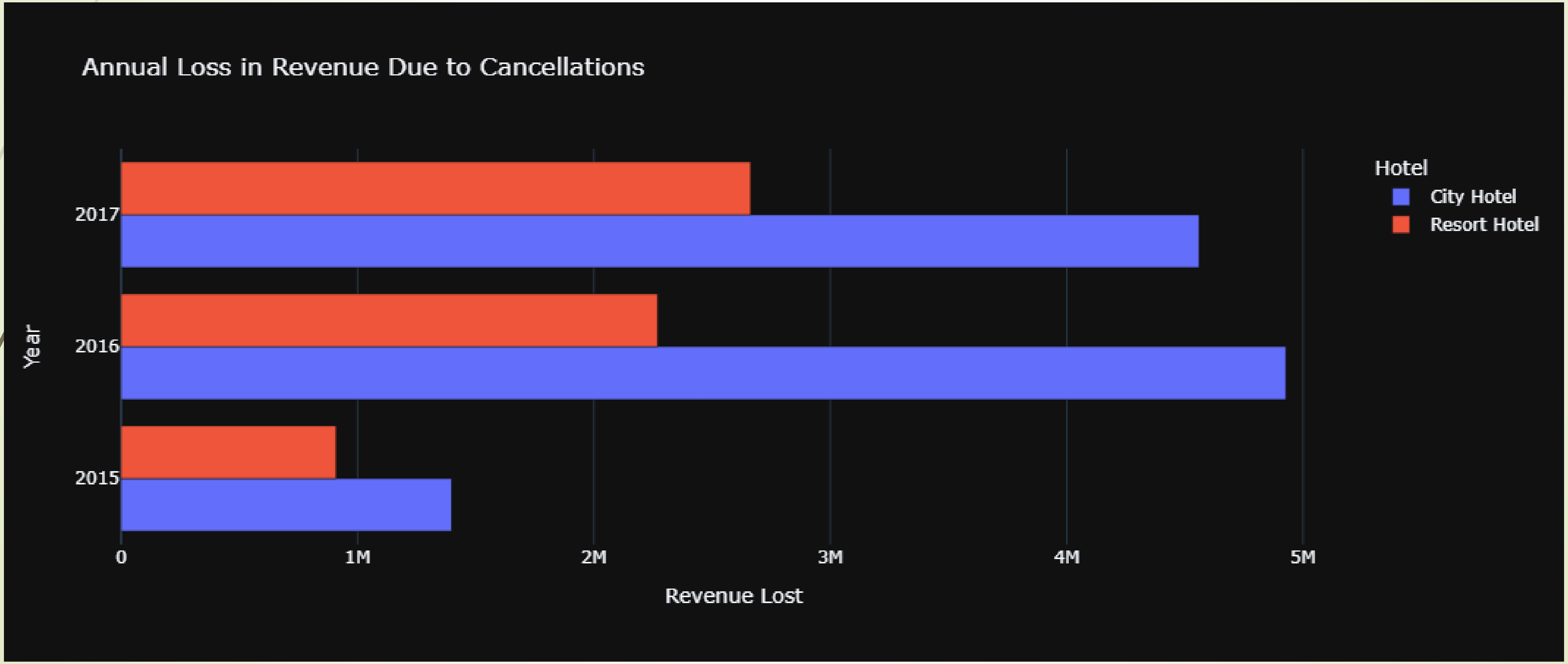
- City hotels generate higher revenues compared to resort hotels across all room types.
- Room type A are the most profitable for both city and resort hotels.



📊 Exploratory Data Analysis

🕵️‍♂️ Sixth Observation:

- There is a great loss over the years in the revenue due to cancellations for both city and resort hotels, but it is more obvious in the city hotels significantly.



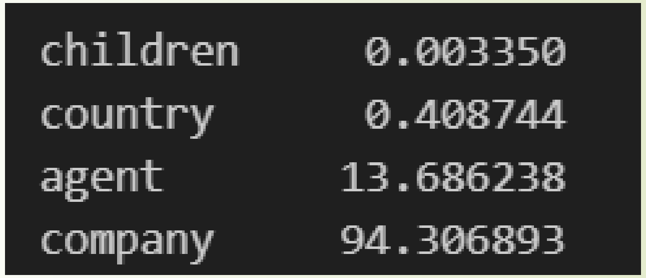
Preprocessing

⚠ Handling missing values

❑ Get percentage of missing values in each column.

❑ Drop the columns ‘agent and company’.

❑ Drop the rows with missing values in the column 'country’.



```
children     0.003350
country      0.408744
agent       13.686238
company     94.306893
```

🛠️ Feature Engineering

🔒 Preventing Data Leakage

❑ The `reservation_status` and `reservation_status_date` columns should be dropped because they provide information about when the booking was canceled or when the customer checked out of the hotel.

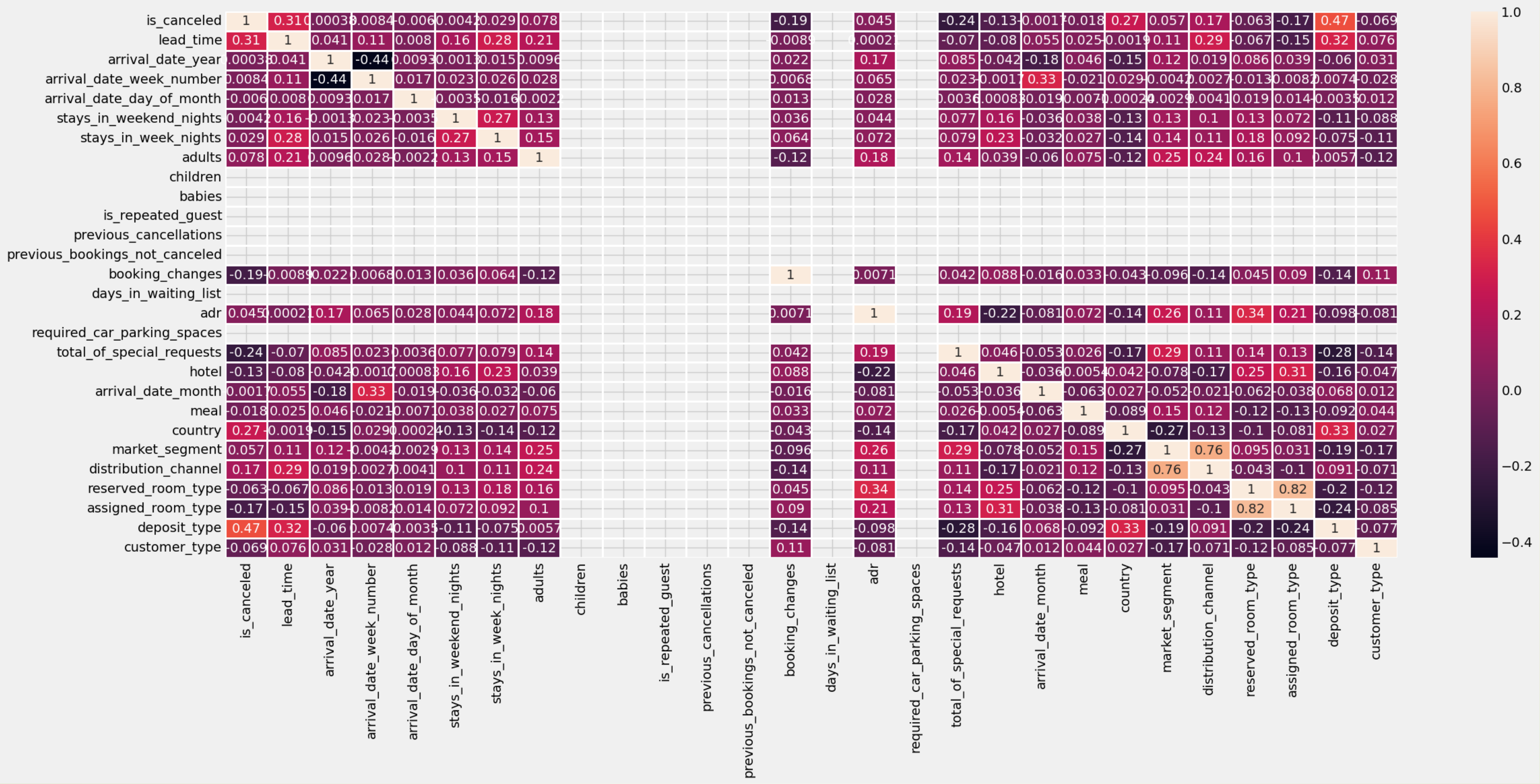
🤖 Encoding the categorical columns and discretizing the numerical columns

❑ Encoding Categorical Columns

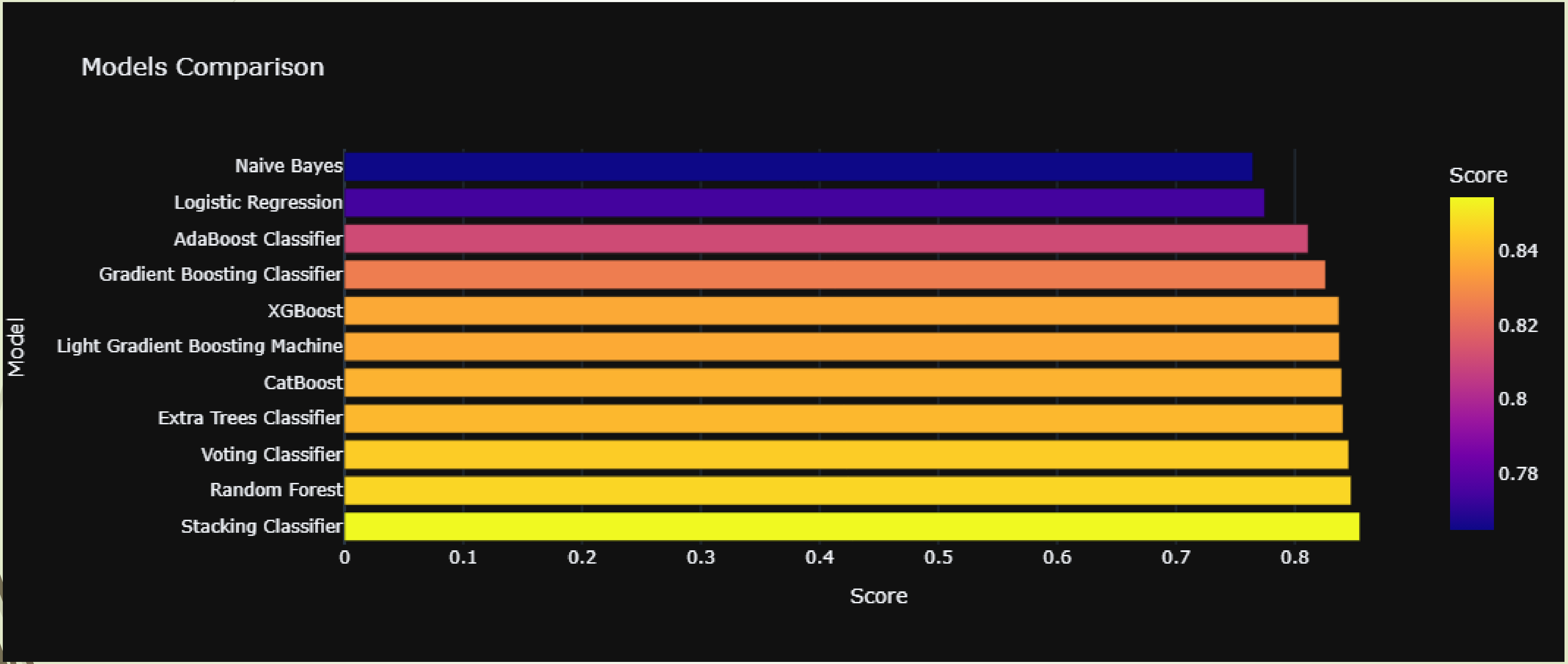
❑ Discretizing Numerical Columns

📈 Feature Selection

Analyzing the correlation between the target variable and the independent features:



🚀 Model Development



🙁 Unsuccessful Trials

ANOVA:

❑ Assumes continuous target variables and may not provide meaningful insights when applied to binary outcomes.

❑ Inappropriate for capturing the relationship between categorical predictors and binary targets, leading to ineffective feature selection.

Naïve Bayes Classifier

Prior Probabilities:

1. **Mapper:**

   Output: [(c0, 1), (c1, 1), (c0, 1), (c0, 1), (c1, 1)]

2. **Reducer:** (by key)

   Output: [(c0, 3), (c1, 2)]

Prior probability: {0.0: 0.629, 1.0: 0.3708}

Naïve Bayes Classifier

Likelihood Probabilities:

1. **Mapper:** [(c0, (f1, v1, 5)), (c0, (f1, v2, 10)), (c1, (f1, v1, 2))]
2. **Reducer1:** [(c0, (f1, v1, 50)), (c0, (f1, v2, 45)), (c1, (f1, v1, 36))]
3. **Reducer2:** [(c0, (f1, v1, 50, 100)), (c0, (f1, v2, 45, 100)), (c1, (f1, v1, 36, 80))]
4. **Reducer3:** [(c0, (f1, v1, 50/100)), (c0, (f1, v2, 45/100)), (c1, (f1, v1, 36/80))]

Training Accuracy: 0.7757330104753382

Testing Accuracy: 0.7701604413189035

Thank you!