
CAPSTONE PROJECT

HOTEL BOOKING ANALYSIS

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OUTLINE

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PROBLEM STATEMENT

Have you ever wondered when the best time of year to book a hotel room is? Or the optimal length of stay in order 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? This hotel booking dataset can help you explore those questions! This data set contains booking information for a city hotel and a resort hotel, and includes information such as when the booking was made, length of stay, the number of adults, children, and/or babies, and the number of available parking spaces, among other things. All personally identifying information has been removed from the data. Explore and analyse the data to discover important factors that govern the bookings.

PROPOSED SOLUTION

The goal is to analyze hotel booking data to uncover insights on optimal booking times, length of stay, and factors influencing special requests. The analysis will involve data loading, cleaning, exploration, and visualization using Python libraries such as Pandas, Matplotlib, Seaborn, and NumPy

1. User Interaction

- User Interface: Develop an interactive dashboard using tools like Jupyter Notebook or a web-based interface using Plotly Dash or Streamlit.
- Data Input: Allow users to upload their own dataset or select from a predefined list of datasets.

2. Information Collection

- Data Loading: Load the dataset from a local file or an online source.
- Initial Exploration: Display the first few rows, summary statistics, and check for missing values.

3. Query Handling

- Data Cleaning and Preprocessing: Handle missing values, convert date columns to datetime format, and create new features.

4. User Guidance

- Interactive Visualizations: Provide users with interactive charts and graphs to explore trends and patterns.
- Tutorials and Tooltips: Include step-by-step guides and tooltips to help users understand how to use the dashboard and interpret the visualizations.

5. Feedback Mechanism

- User Feedback: Collect user feedback through surveys or feedback forms integrated into the dashboard.
- Iterative Improvement: Use feedback to continuously improve the dashboard's usability and functionality.

SYSTEM APPROACH

1. Requirements Gathering

- Define objectives: Identify goals like optimizing booking times and understanding guest preferences.
- Stakeholder engagement: Gather requirements from hotel management, marketing teams, and customer service.

2. Data Collection

- Source selection: Obtain datasets from reliable sources like Kaggle.
- Data acquisition: Download and store datasets for analysis.

3. Data Processing

- Data loading: Load datasets into a Python environment using Pandas.
- Initial exploration: Perform preliminary analysis to understand data structure and identify missing values.

4. Data Cleaning and Preprocessing

- Handle missing values: Impute or remove missing data to ensure dataset completeness.
- Data transformation: Convert data types and create new features for deeper analysis.

5. Exploratory Data Analysis (EDA)

- Visual exploration: Use Matplotlib and Seaborn to create visualizations that reveal booking trends, length of stay impacts, and special requests distributions.
- Insights generation: Extract meaningful insights to guide decision-making.

6. User Interaction and Feedback

- Dashboard development: Build interactive dashboards to allow users to explore data insights.
- Feedback mechanism: Incorporate user feedback to enhance usability and relevance of analyses.

7. Reporting and Recommendations

- Generate summary reports: Compile findings and insights from the analysis.
- Actionable recommendations: Provide strategic suggestions based on data-driven insights to improve hotel operations and guest experiences.

RESULT

Implementing a systematic approach to hotel booking analysis yields actionable insights crucial for optimizing revenue and guest satisfaction. By leveraging comprehensive data collection and preprocessing, insightful exploratory data analysis, and interactive visualization techniques, stakeholders gain a clear understanding of optimal booking times, the impact of length of stay on rates, and factors influencing special requests. This approach supports informed decision-making, facilitates operational improvements aligned with demand patterns, and enhances guest experiences through targeted strategies and service enhancements. Continuous feedback integration ensures ongoing refinement and relevance of insights, ultimately driving strategic growth and efficiency in hotel management and operations.

RESULT

```
[1] import pandas as pd
```

```
[2] df=pd.read_csv("hotel_bookings.csv")
```

```
[3] df
```

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	...	de
0	Resort Hotel	0	342	2015	July	27	1	0	0	...	
1	Resort Hotel	0	737	2015	July	27	1	0	0	...	
2	Resort Hotel	0	7	2015	July	27	1	0	1	...	
3	Resort Hotel	0	13	2015	July	27	1	0	1	...	
4	Resort Hotel	0	14	2015	July	27	1	0	2	...	
...	
119385	City Hotel	0	23	2017	August	35	30	2	5	...	
119386	City Hotel	0	102	2017	August	35	31	2	5	...	

```
df['reservation_status_date']
```

```
0      2015-01-07
1      2015-01-07
2      2015-02-07
3      2015-02-07
4      2015-03-07
...
119385  2017-06-09
119386  2017-07-09
119387  2017-07-09
119388  2017-07-09
119389  2017-07-09
Name: reservation_status_date, Length: 119390, dtype: datetime64[ns]
```

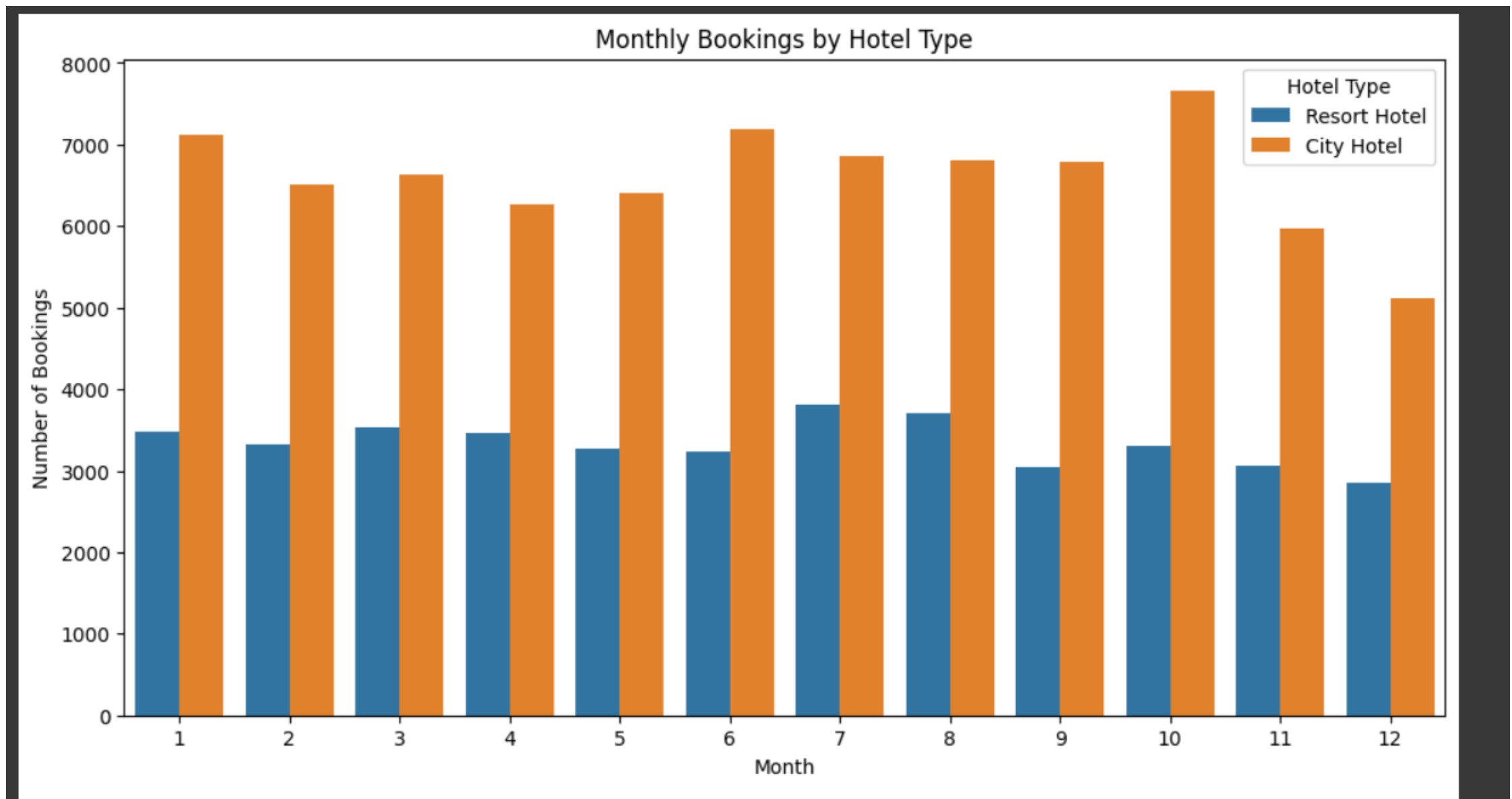

Code + Text

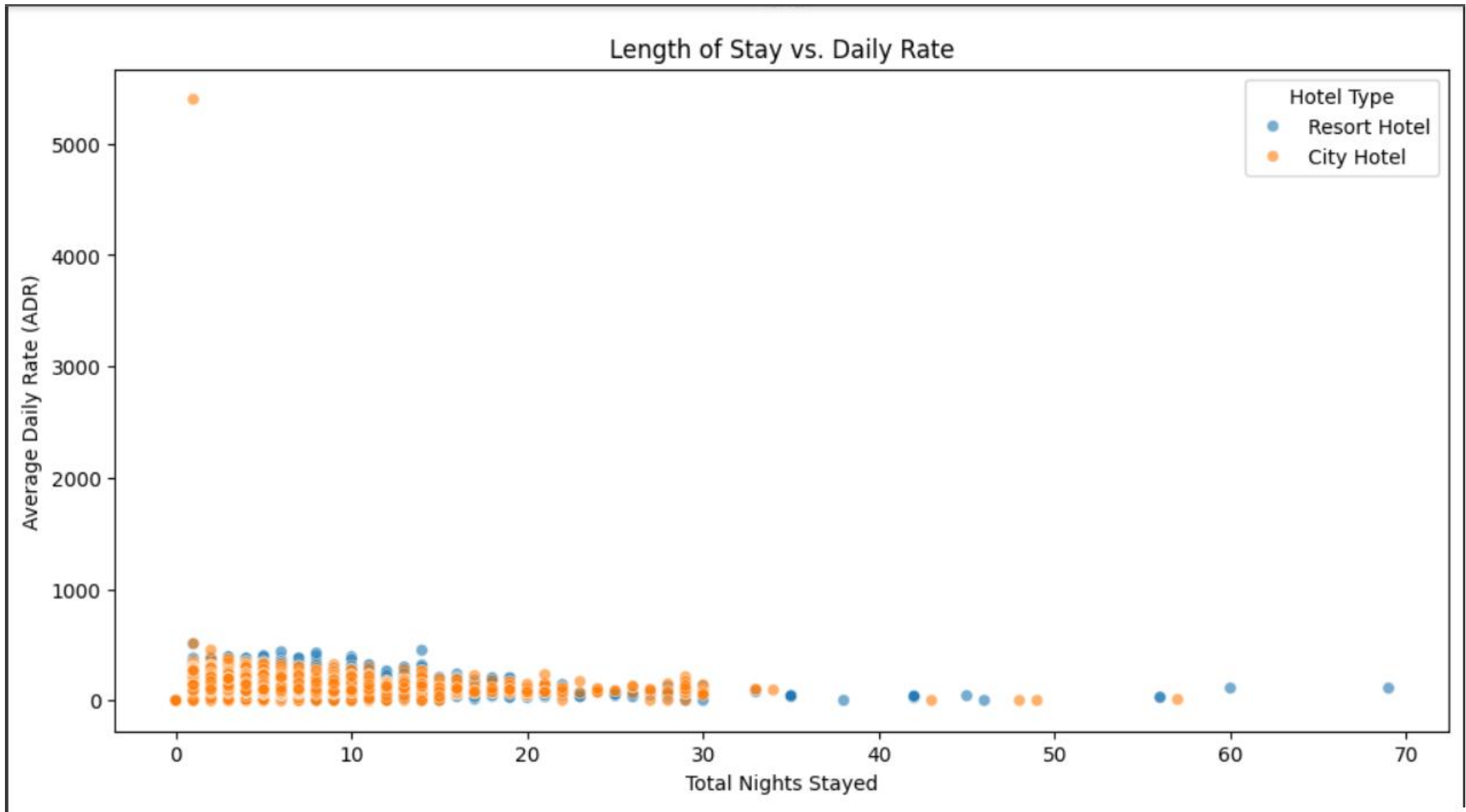
```
import matplotlib.pyplot as plt
import seaborn as sns

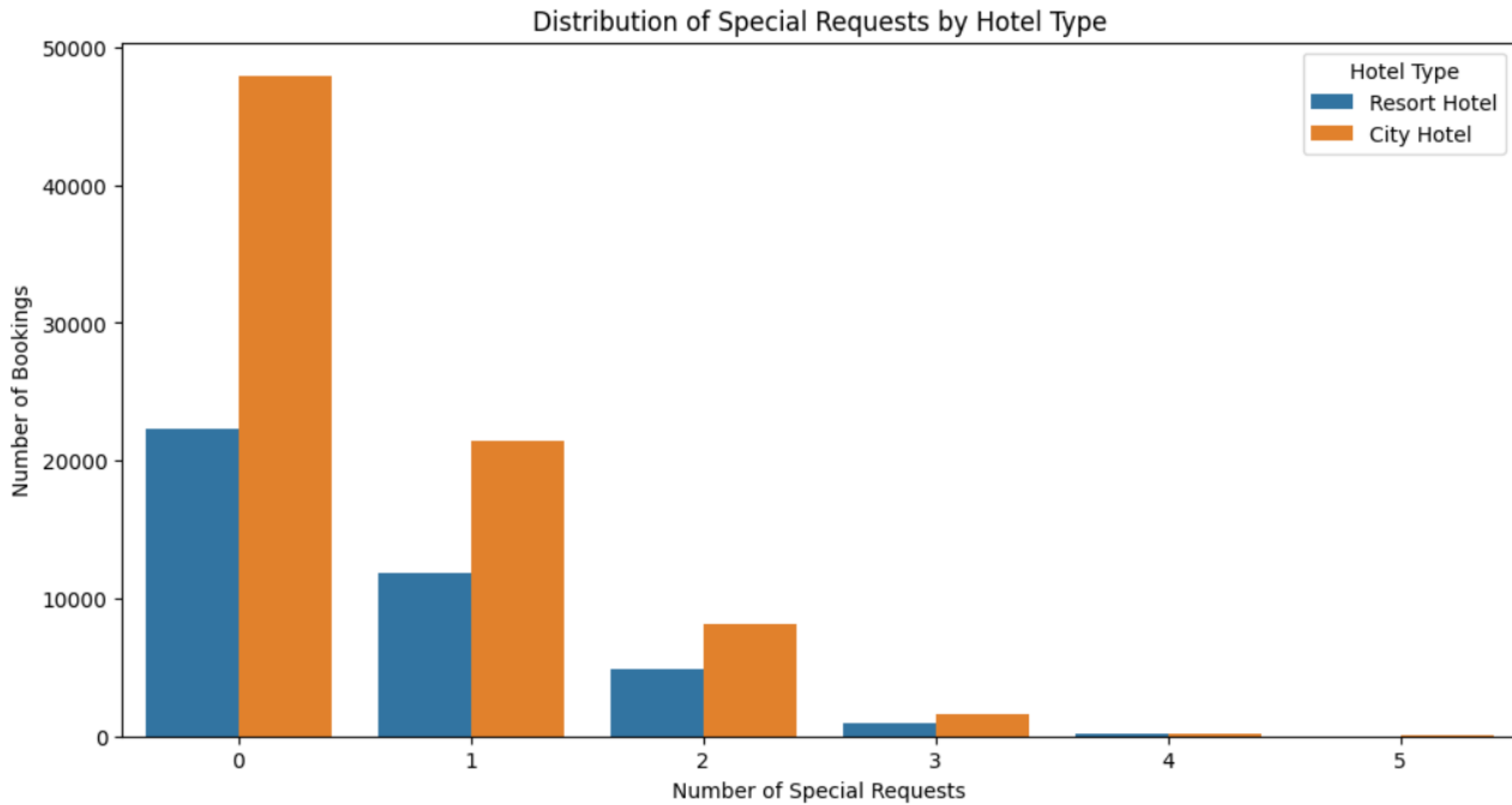
# Plot seasonal trends in bookings
plt.figure(figsize=(12, 6))
sns.countplot(data=df, x='booking_month', hue='hotel')
plt.title('Monthly Bookings by Hotel Type')
plt.xlabel('Month')
plt.ylabel('Number of Bookings')
plt.legend(title='Hotel Type')
plt.show()

# Length of stay vs. daily rate
plt.figure(figsize=(12, 6))
sns.scatterplot(data=df, x='total_nights', y='adr', hue='hotel', alpha=0.6)
plt.title('Length of Stay vs. Daily Rate')
plt.xlabel('Total Nights Stayed')
plt.ylabel('Average Daily Rate (ADR)')
plt.legend(title='Hotel Type')
plt.show()

# Special requests distribution
plt.figure(figsize=(12, 6))
sns.countplot(data=df, x='total_of_special_requests', hue='hotel')
plt.title('Distribution of Special Requests by Hotel Type')
plt.xlabel('Number of Special Requests')
plt.ylabel('Number of Bookings')
plt.legend(title='Hotel Type')
plt.show()
```







CONCLUSION

The system approach ensures a comprehensive and systematic analysis of hotel booking data. By following these steps, we can provide valuable insights to stakeholders, improve decision-making processes and, enhance the overall user experience. Data processing and cleaning are critical steps to ensure data quality and integrity, enabling accurate analysis. Handling missing values and transforming data types prepare the dataset for exploratory data analysis (EDA), where visualizations using tools like Matplotlib and Seaborn unveil trends in booking patterns, guest preferences, and other pertinent factors.

FUTURE SCOPE

1. Personalization and Customer Insights : Utilizing advanced analytics and machine learning algorithms can enable hotels to personalize guest experiences further. By analyzing booking patterns, preferences, and behavior, hotels can tailor offerings and services to individual guest needs, enhancing satisfaction and loyalty.
2. Predictive Analytics for Demand Forecasting : Implementing predictive models can help hotels forecast demand more accurately. By analyzing historical booking data alongside external factors such as events, seasons, and economic indicators, hotels can optimize pricing strategies, inventory management, and staffing levels.
3. Sentiment Analysis and Feedback Integration : Integrating sentiment analysis tools with customer feedback can provide deeper insights into guest sentiment and satisfaction levels. Real-time analysis of reviews and social media sentiments can inform immediate responses and service improvements.
4. Revenue Management Optimization : Applying advanced analytics techniques like dynamic pricing algorithms can optimize revenue management strategies. By analyzing booking trends, market demand, competitor pricing, and customer segments, hotels can adjust pricing dynamically to maximize revenue while maintaining occupancy rates.

REFERENCES

- Google colab
- <https://www.kaggle.com/datasets/abdurahmankhaled1/hotel-booking-dataset>
- https://colab.research.google.com/drive/1wJIfDEKogfJlkr_dbMeUv2nP91a20y-

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