

HOTEL REVENUE ANALYSIS



TEAM MEMBERS



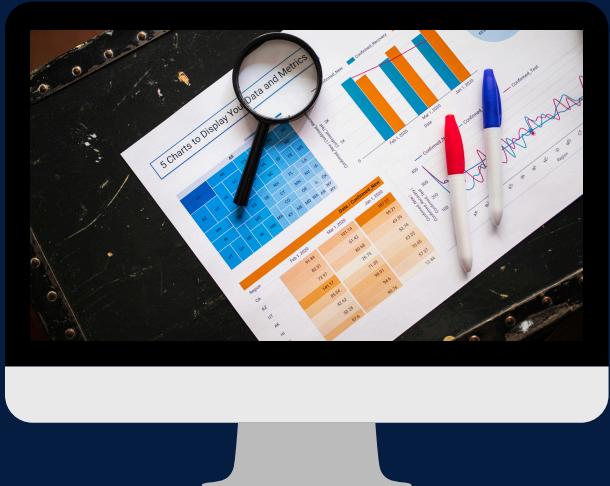
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Under Guidance of :
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OVERVIEW

- Introduction
- Project Overview
- Tech stack
- Milestones
- Star Schema
- Dashboards
- Conclusion



INTRODUCTION

Project Statement

Hotels must understand their occupancy patterns, guest demographics, and pricing effectiveness to improve revenue. This project builds an analytical solution in Power BI to track room bookings, average daily rates, guest profiles, and seasonal trends. It helps hotel management make informed decisions around promotions, upselling, pricing strategies, and room optimization.

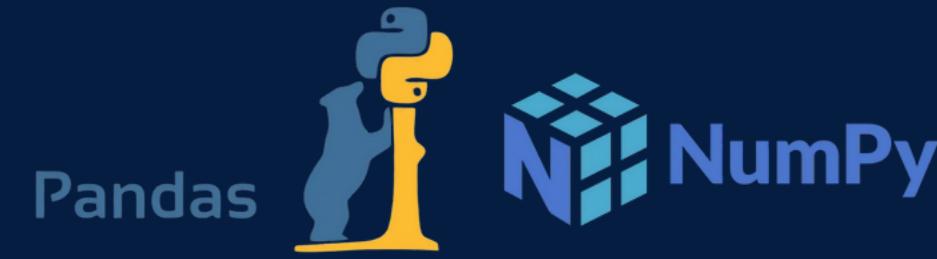
Project Overview

- Collecting and cleaning customer related data.
- Building a structured data model for analysis.
- Creating dashboards showing key metrics: occupancy, revenue, and customer behavior.
- Analyzing booking patterns and trends.
- Helps hotel management optimize resources and make data-driven decisions.



TECH STACK

- Business Intelligence Tool : Power BI
- Data Transformation : Power Query
- Python-based Data App : Streamlit , NumPy , Pandas



MILESTONE



1

Completed ingestion of booking, customer, and room data, performed cleaning and transformation, and designed a validated star schema with relationships.



2

Developed KPI measures (Occupancy %, ADR, RevPAR), created interactive dashboards, and visualized performance trends across time, location, and booking sources.



3

Analyzed guest profiles by nationality, booking channels, and stay duration, and segmented customers into first-timers, loyal guests, and high spenders.



4

Built forecasting visuals to predict occupancy and revenue, and analyzed cancellation rates, no-shows, and lead-time patterns affecting hotel performance.

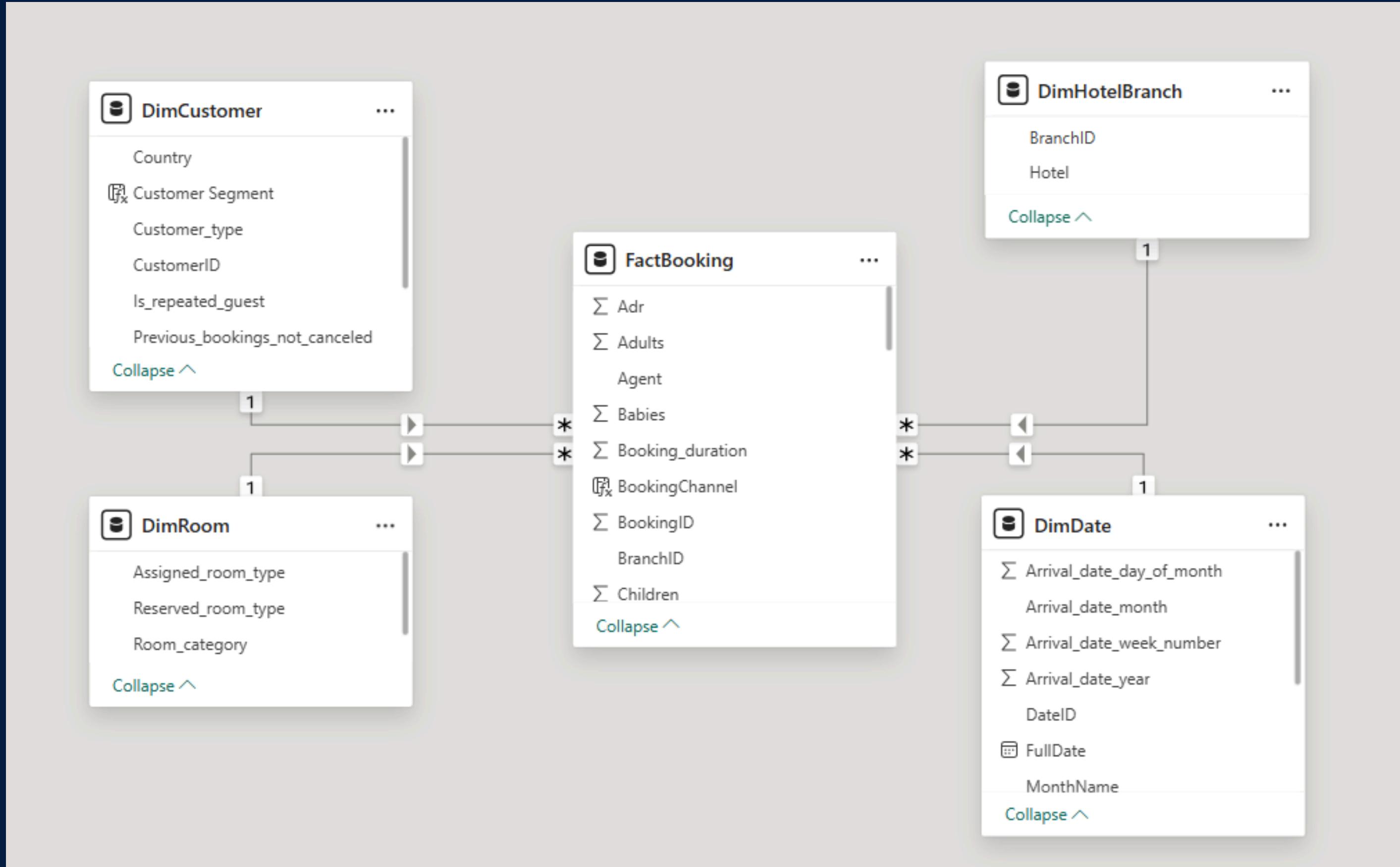


5

Designed a strategic dashboard highlighting pricing tiers, seasonal demand, and upsell opportunities, delivering actionable insights for data-driven decisions.



STAR SCHEMA



DATA INGESTION & MODELING

- Collected and combined hotel booking data from multiple sources.
- Checked data quality to fix missing values, duplicates, and date or room mismatches.
- Cleaned and transformed data using Power Query (formatted dates, renamed columns, standardized details).
- Created dimension tables – Customer, Room, and Date.
- Built a central FactBooking table with booking IDs, room info, customer IDs, and status.
- Designed and tested a Star Schema model with relationships and verified using summary reports

The screenshot shows a Microsoft Power BI Data Editor window. On the left, there is a preview of a table with two columns: 'Adr' and 'Total_of_special_requests'. The 'Total_of_special_requests' column contains numerical values like 0, 0, 75, 75, 98, 98, 107, 103, 82, 105.5, 123, 145, 97, 154.77, 94.71, 97, 97.5, 88.2, 107.42, 153, 97.29, 84.67, 84.67, 99.67, 94.95, 63.6, and 79.5. A context menu is open over the first few rows of this column. The menu options include: Copy, Remove, Remove Other Columns, Duplicate Column, Add Column From Examples..., Remove Duplicates, Remove Errors, Change Type, Transform, Replace Values..., Replace Errors..., Split Column, Group By..., Fill, Unpivot Columns, Unpivot Other Columns, Unpivot Only Selected Columns, Rename..., Move, Drill Down, and Add as New Query. The 'Change Type' section of the menu is expanded, showing various data types: Decimal Number (selected), Fixed decimal number, Whole Number, Percentage, Date/Time, Date, Time, Date/Time/Timezone, Duration, Text (with a checked checkbox), True/False, Binary, and Using Locale... .

Adr	Total_of_special_requests
0	0
0	0
75	0
75	0
98	0
98	0
107	0
103	1
82	1
105.5	0
123	0
145	0
97	0
154.77	0
94.71	0
97	0
97.5	0
88.2	0
107.42	0
153	0
97.29	0
84.67	0
84.67	1
99.67	0
94.95	0
63.6	0
79.5	0

DATA TRANSFORMATION

Data cleaning ways:-

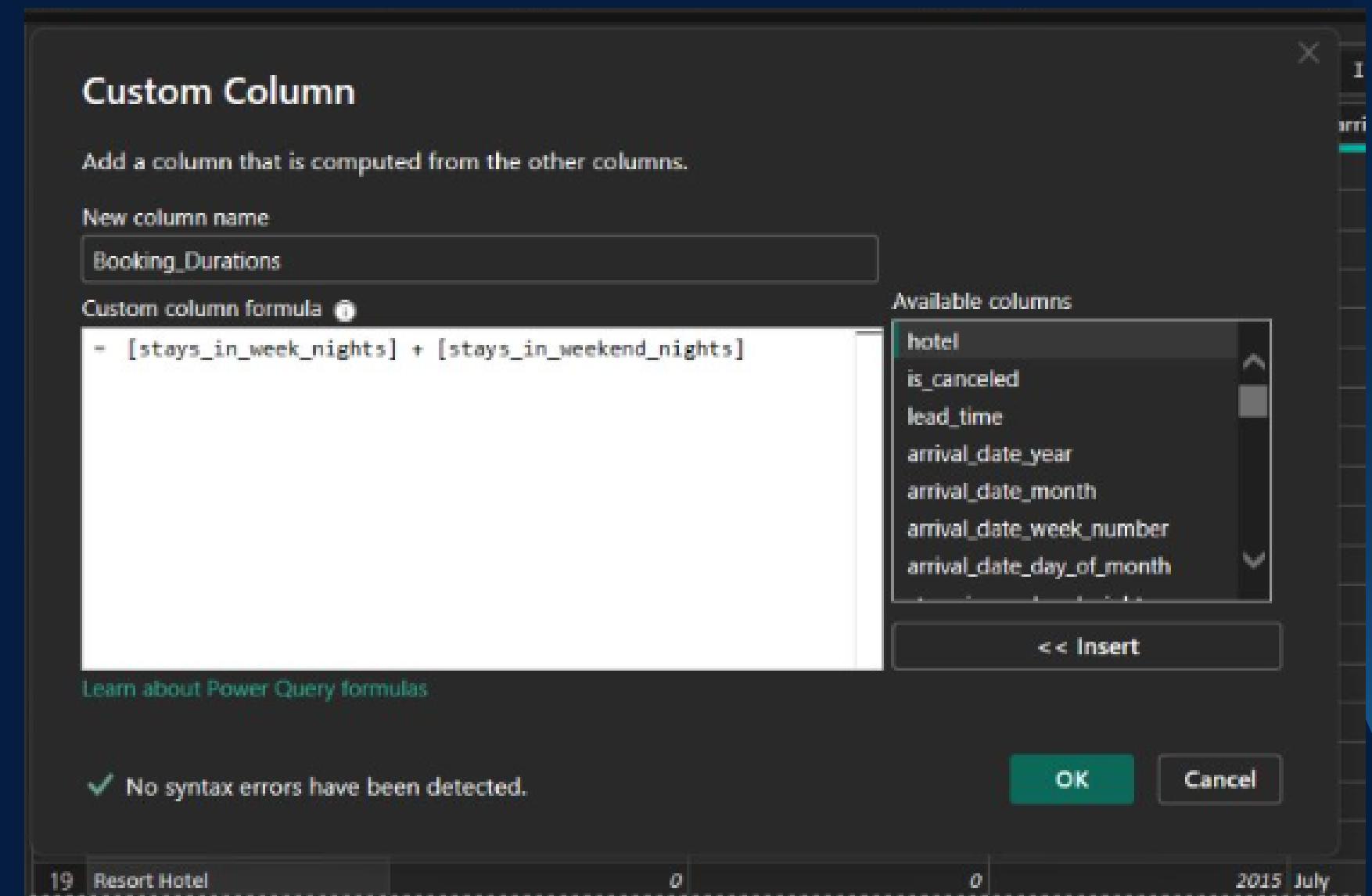
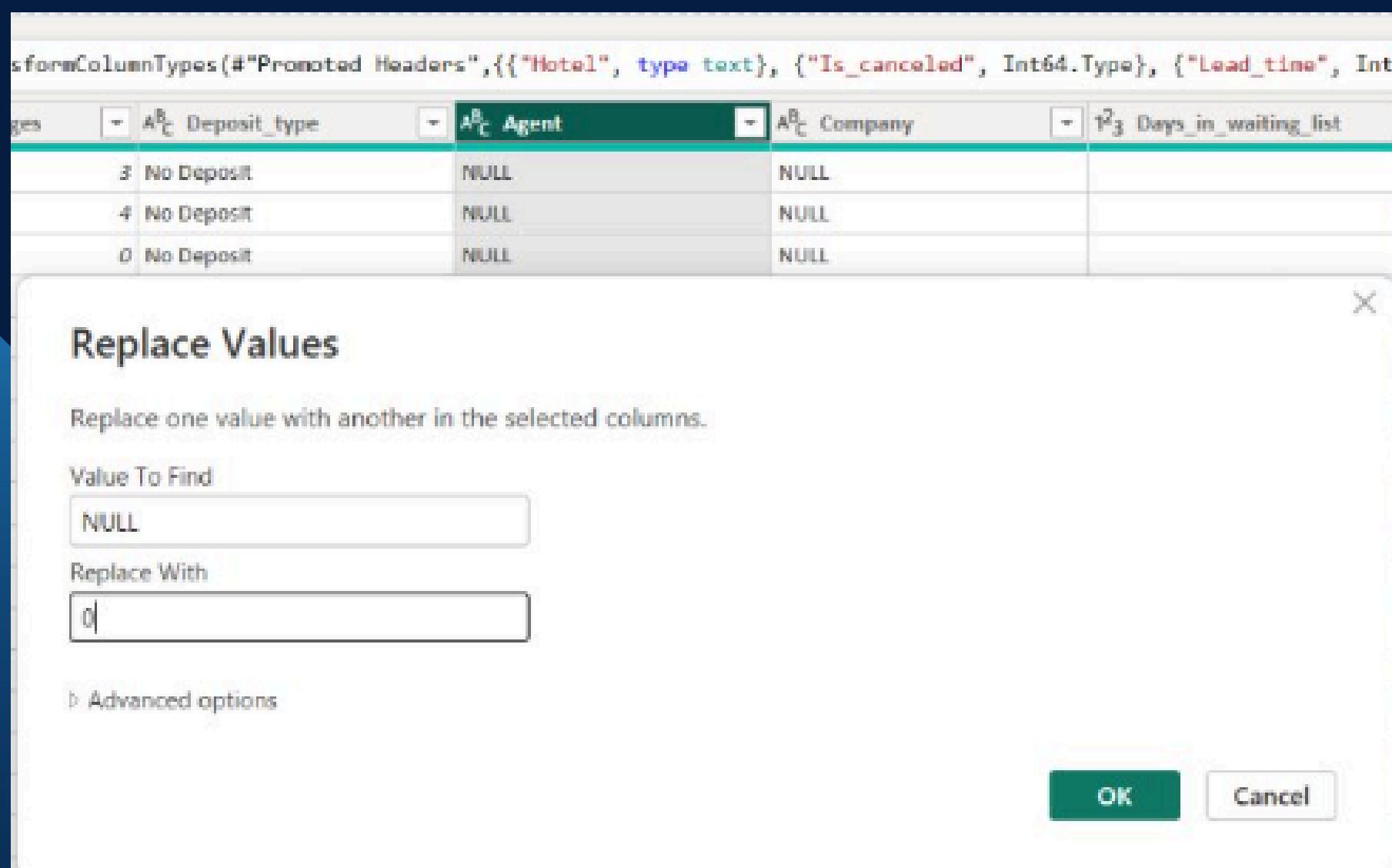
- Missing values
- Duplicate entries
- Wrong or inconsistent formats
- Extra spaces or symbols
- Invalid records

Derived Columns

BookingDuration = stays_in_weekend_nights + stays_in_week_nights

Total Guests = adults + children + babies

Revenue = adr × (stays_in_weekend_nights + stays_in_week_nights)



OCCUPANCY & REVENUE METRICS

Hotel Occupancy & Revenue Metrics

Occupancy %

12.45

Total_Revenue

13.75M

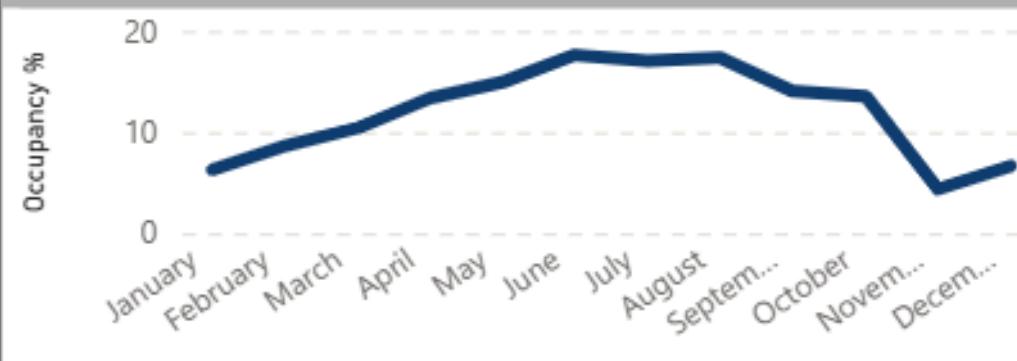
RevPAR

2.17K

hotel

- Select all
- City Hotel
- Resort Hotel

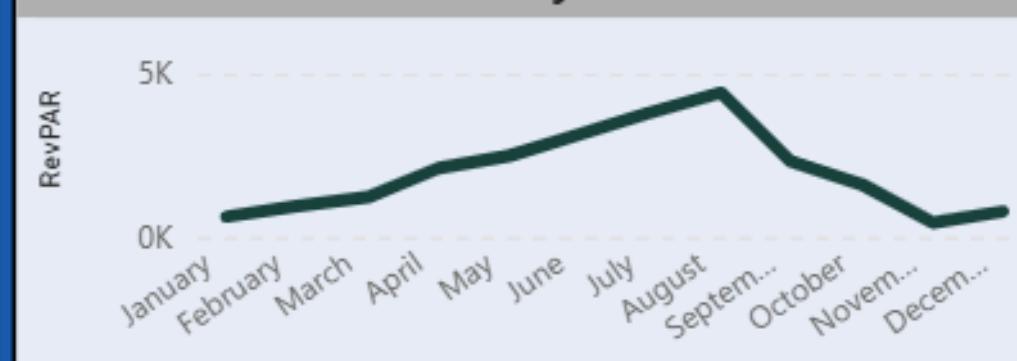
Occupancy % by Month



Avg_ADR by Month



RevPAR by Month



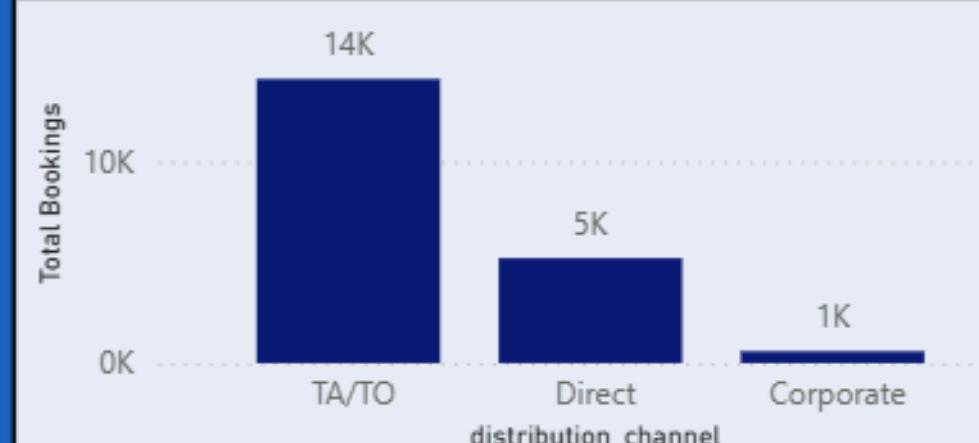
assigned_room_type

- Select all
- A
- B
- D
- E
- F

country

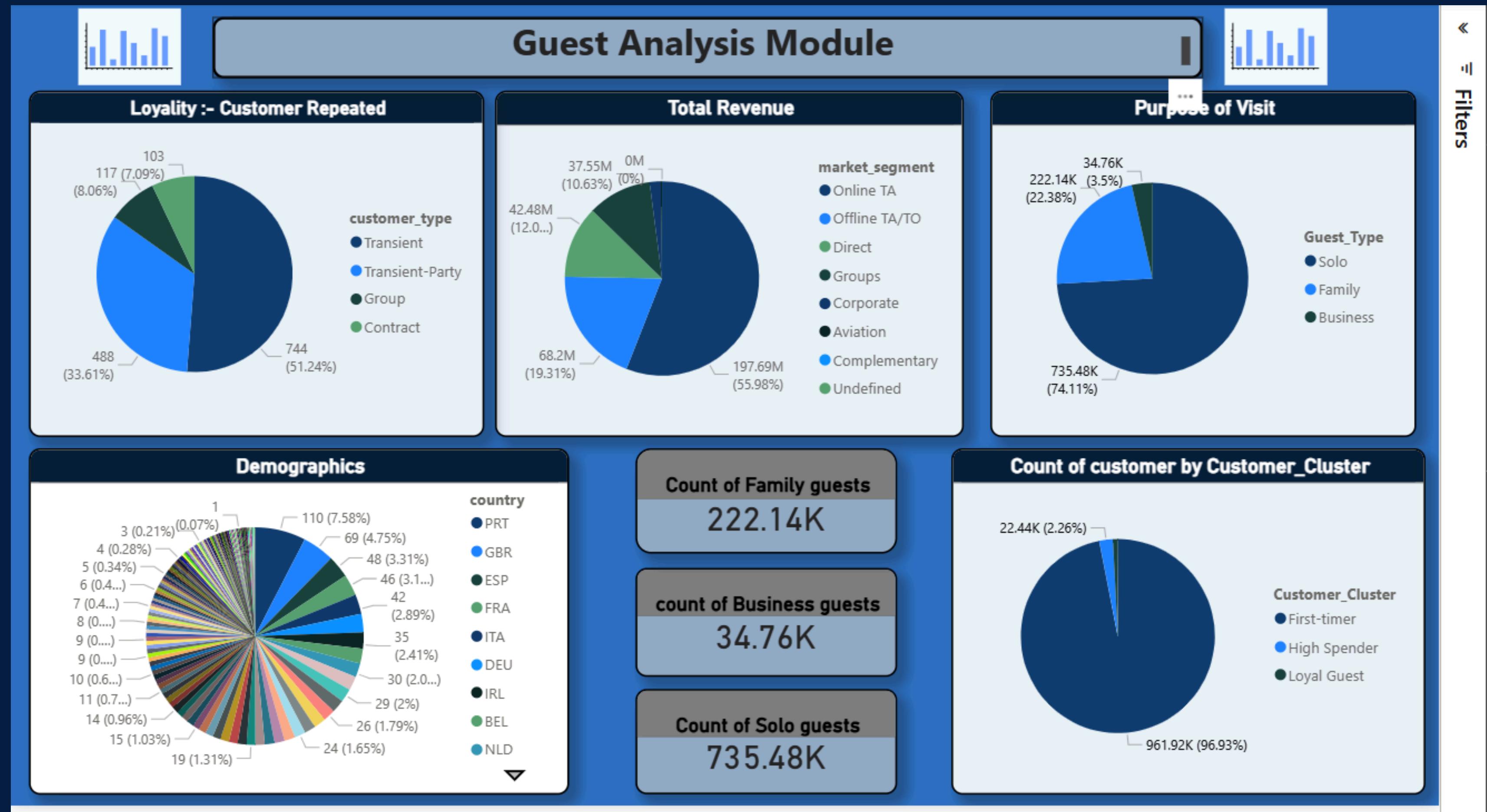
- Select all
- AUS
- AUT
- BEL
- BRA
- CHE

Total Bookings by distribution_channel

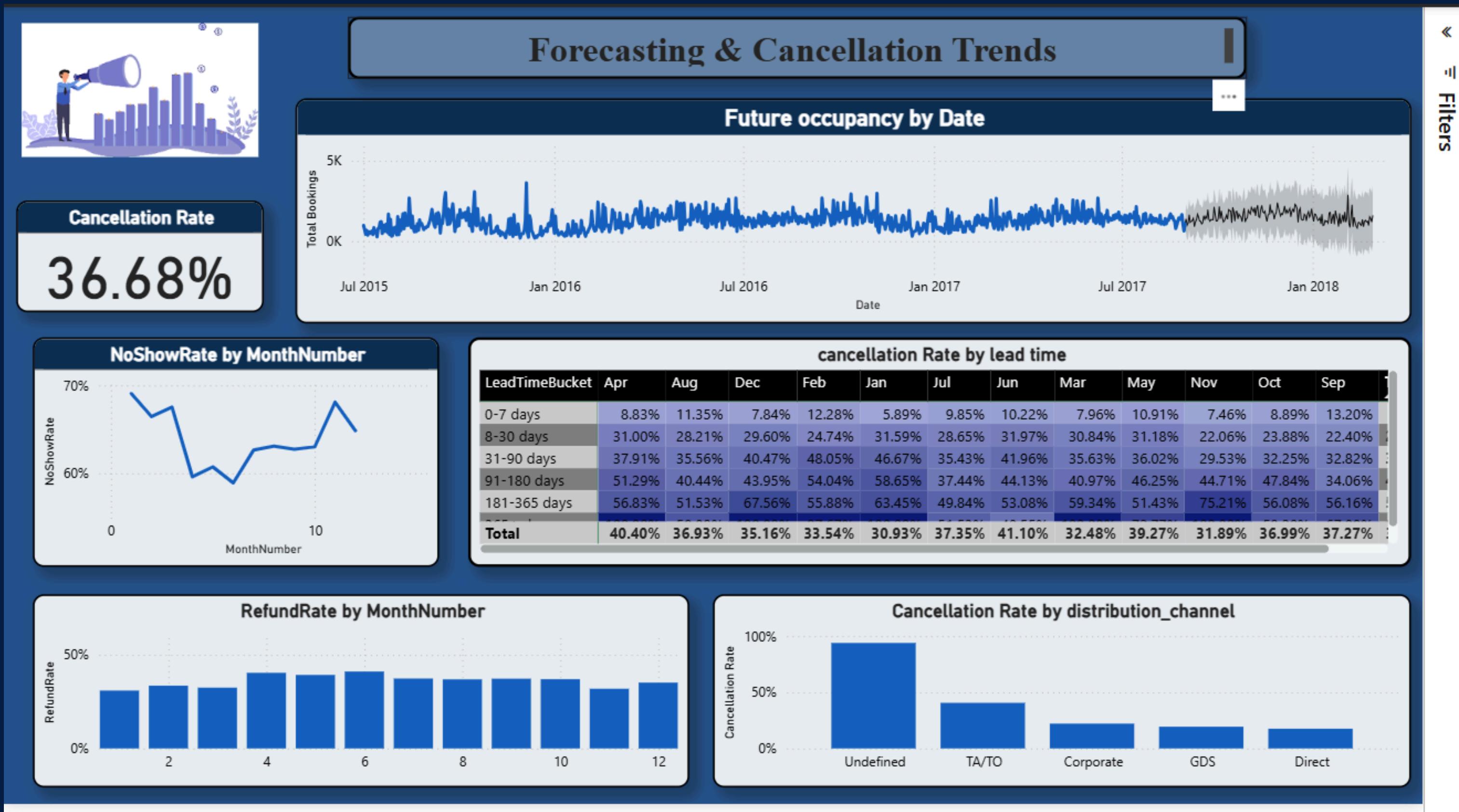


« Filters

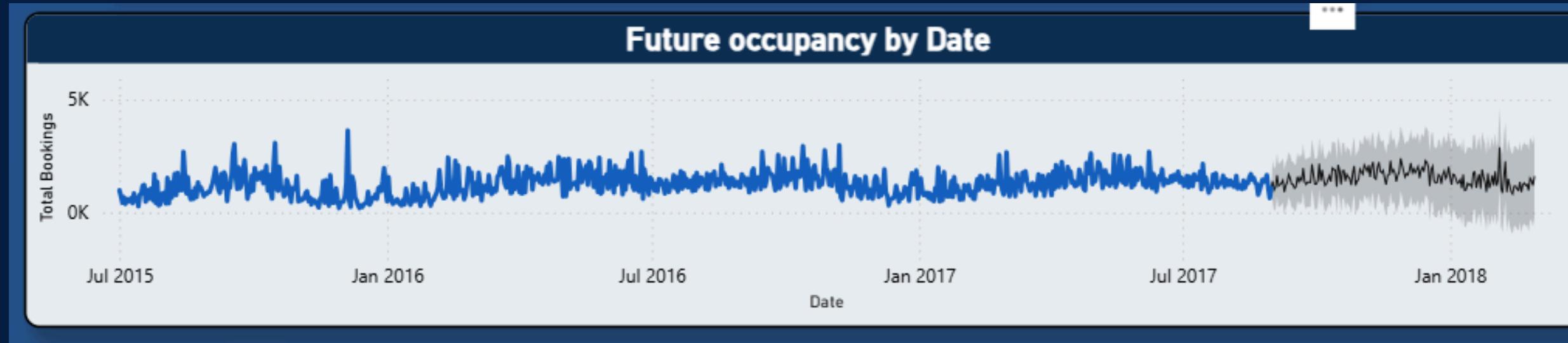
GUEST ANALYSIS MODULE



FORECASTING AND CANCELLATION TRENDS



FORECASTING AND CANCELLATION TRENDS

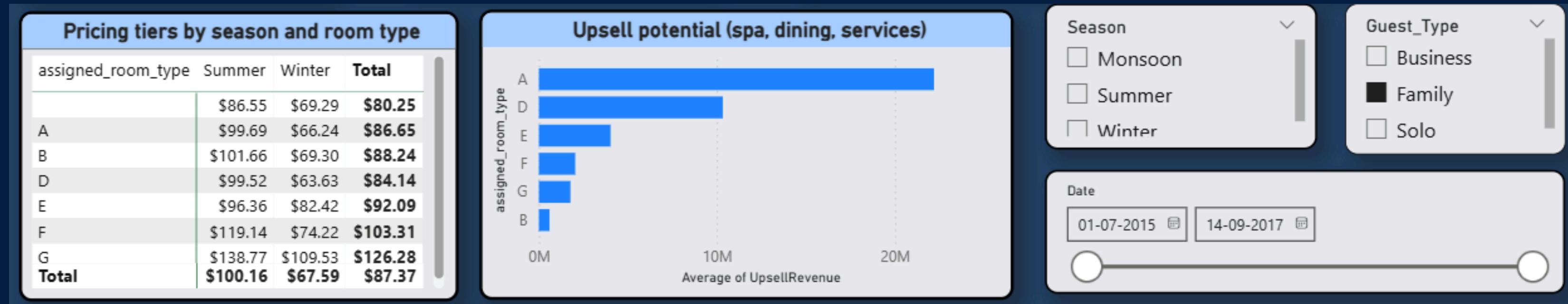


- Developed occupancy forecasts using historical booking data, revealing seasonal patterns and long-term demand trends with interactive line charts.
- Analyzed cancellation rates across room types, booking channels, and customer segments to identify high-risk areas.
- Studied lead time, no-show, and refund trends to understand guest behavior and timing of cancellations.
- Linked cancellation impact to key metrics like ADR and RevPAR to measure revenue loss and optimize pricing strategies.
- Provided actionable insights for demand planning through combined forecasting and cancellation analysis, enabling better room allocation and revenue optimization.

REVENUE STRATEGY DASHBOARD



REVENUE STRATEGY DASHBOARD



- Integrated pricing tiers and seasonal analysis by room type to support strategic decisions on rate adjustments and promotions.
- Analyzed upsell potential across spa, dining, and other services to uncover new revenue streams and customer preferences.
- Enabled interactive filtering by season, booking channel, room category, and customer segment for tailored analysis by revenue managers and GMs.
- Delivered actionable insights through visual tools like recommendation cards, seasonal pricing matrices, and upsell opportunity charts to drive revenue growth and optimization.

AI MODULE (STREAMLIT APPLICATION)

Input booking details

Lead time (days) Children
30.00 - + 0.00 - +

Stays in weekend nights Previous cancellations
0.00 - + 0.00 - +

Stays in week nights Booking changes
2.00 - + 0.00 - +

Adults
2.00 - +

Booking Type

Deposit Type Customer Type Market Segment
No Deposit Contract Aviation

Loyalty Indicators

Total special requests ADR (avg daily rate) Previous bookings not canceled
0.00 - + 100.00 - + 0.00 - +

Predict & Recommend



AI MODULE (STREAMLIT APPLICATION)

Random Forest Classifier → For Cancellation Prediction

Purpose:

To predict the probability that a hotel booking will be canceled or not based on past booking data.

How it works:

A Random Forest is an ensemble learning algorithm – it builds many decision trees and combines their results to make more accurate and stable predictions. Each tree predicts whether a booking will be canceled (1) or not (0).

The final prediction is based on majority voting or the average probability across all trees.

Input Features:

These features are used to train the model:

- lead_time , stays_in_weekend_nights, stays_in_week_nights , adults, children , previous_cancellations, booking_changes, deposit_type, customer_type, market_segment

Output:

A probability value between 0 and 1:

- > 0.7 → High cancellation risk
- 0.4–0.7 → Moderate risk
- < 0.4 → Low risk

AI MODULE (STREAMLIT APPLICATION)

K-Means Clustering → For Customer Loyalty Segmentation



Purpose:

To group customers into loyalty segments based on their booking and spending behavior.



How it works:

K-Means is an unsupervised learning algorithm that groups similar data points into k clusters based on distance

This divides customers into 3 clusters:

1. High Loyalty
2. Medium Loyalty
3. Low Loyalty



Features used:

The algorithm uses loyalty-related features:

- total_of_special_requests , adr → average daily rate , previous_bookings_not_canceled
-



Output:

Each customer gets a loyalty segment, used for personalized recommendations like:

- “💎 Recommend premium upsells” (High loyalty)
- “🌟 Standard upsells” (Medium loyalty)
- “🎁 Loyalty incentive” (Low loyalty)



CONCLUSION

1. Built a structured Star Schema data model integrating bookings, customers, rooms, and time data for efficient analysis in Power BI.
2. Cleaned, transformed, and standardized raw datasets, creating a reliable foundation for accurate business reporting.
3. Developed interactive dashboards to visualize hotel performance, including KPIs like ADR, RevPAR, Occupancy Rate, and Cancellation %.
4. Designed analytical modules, including Guest Analysis (demographics, loyalty, behavior) and Forecasting/Cancellation Trends to support strategic planning.
5. Created a Revenue Strategy Dashboard to monitor financial performance and support pricing, promotions, and upselling decisions.
6. Enabled time-based insights (year/month/season) and delivered actionable intelligence to improve room allocation, customer satisfaction, and revenue growth.



Thank
You