

# Analytics Case Study

## Shivank Garg

Analyzing the  
Decline: Insights,  
Root Causes, and  
Strategic  
Recommendations



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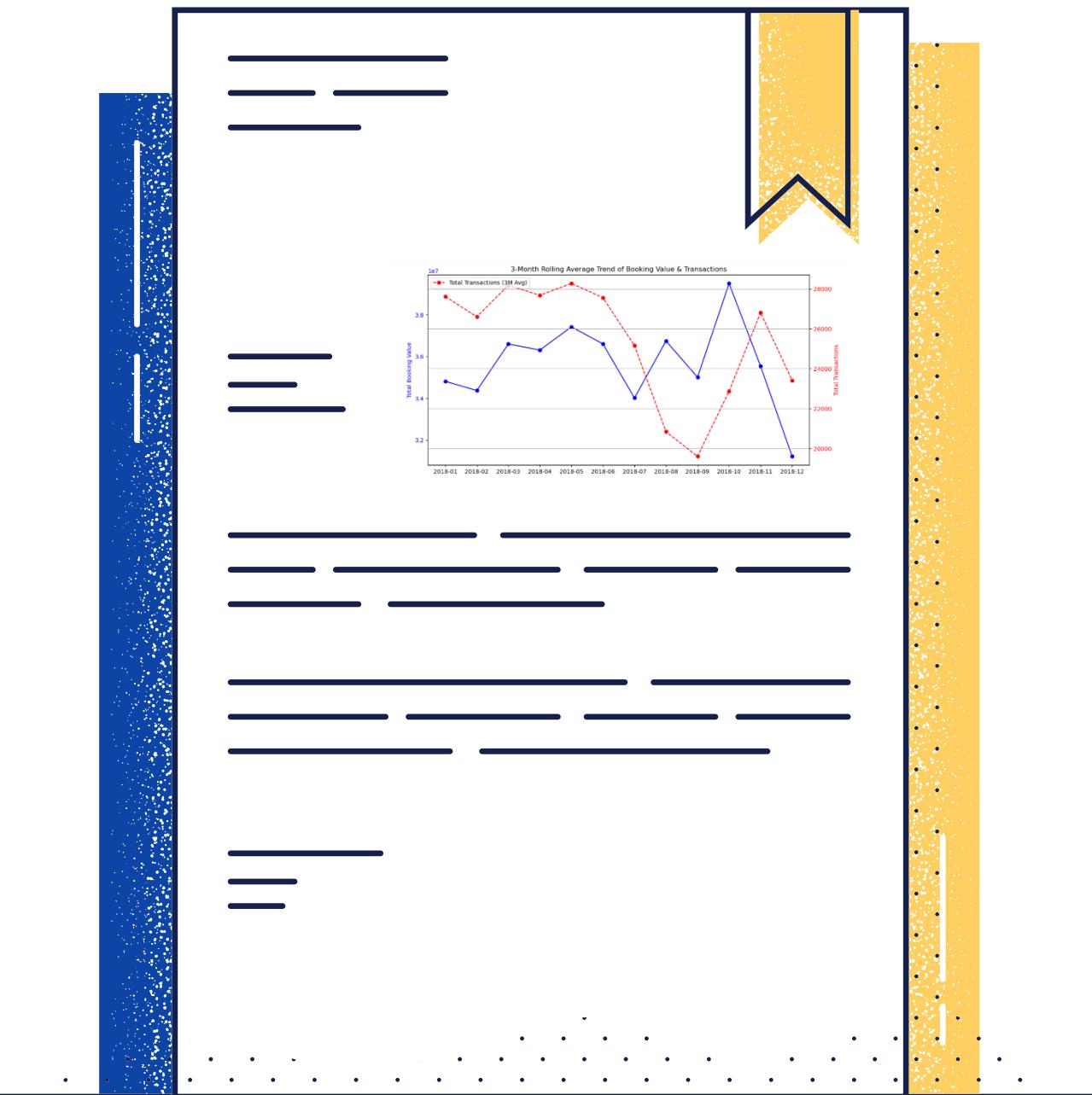
# Background

Over the course of the year, we have seen a decline in our total booking value and transactions. We have theories as to what is causing this drop, however, it would be good if we could get a data driven answer to help steer our business decisions as to what actions we could take to reverse this trend. Due to the uncertainty of root cause, we have provided a wide set of data to do you analysis.

# Assignment

Please prepare a short presentation explaining what the data suggests on why we might be experiencing this decline. Please use any measures you think would be insightful and can help drive the point across. Also, don't be afraid to explore new metrics using a combination to potentially uncover additional analysis.

In the presentation, along with the causation, please provide specific recommendations on trends, on what you think root cause could be, and potential further areas to focus or deep dive if you had additional time. Consider what other data or information you would request in order to gain additional insight if you were to take this analysis further.



# Causation Summary

## Key Insights on Decline

- **Air Travel Trend Declining:** Overall reduction in air travel bookings
- **Seasonal Impact:** Significant drop in transactions from **June to August**, possibly due to low-demand periods
- **External Market Shifts:** Competitor pricing changes or market conditions affecting customer choices
- **Business Strategy Adjustments:** Internal changes influencing customer retention and engagement
- **Customer Behavior Analysis:**
  - **Customers 1018 & 1071** show a **high cancellation rate**, indicating dissatisfaction or policy-related or expense related issues
  - **Customer 1025 churned in 2018**, requiring deeper investigation into churn patterns

# Strategic Recommendations

## Key Recommendations

- **Align Marketing with Trends:** Leverage seasonal insights for targeted holiday campaigns
- **Product Performance Review:** Assess demand for car rentals and compare with competitor offerings
- **Operational Improvements:** Investigate potential issues at pickup locations or invoicing concerns
- **Strategic Promotions:**
  - Target peak booking days (Monday & Friday) for promotions
  - Focus on underperforming platforms and high-cancellation customers
- **Optimize User Experience:** Enhance mobile and desktop platforms based on customer behavior
- **Churn Reduction Strategies:** Identify key triggers like cancellation policies or pricing shifts
- **Data-Driven Pricing & Inventory:** Adjust pricing, inventory, and bundling strategies dynamically
- **Personalized Product Recommendations:** Suggest the best product using customer segmentation insights

# EDA: EXPLORATORY DATA ANALYSIS



Dataset is explored, transformed and treated in Python

# Insights from EDA: Exploratory Data Analysis

## OUTLIER REMOVAL

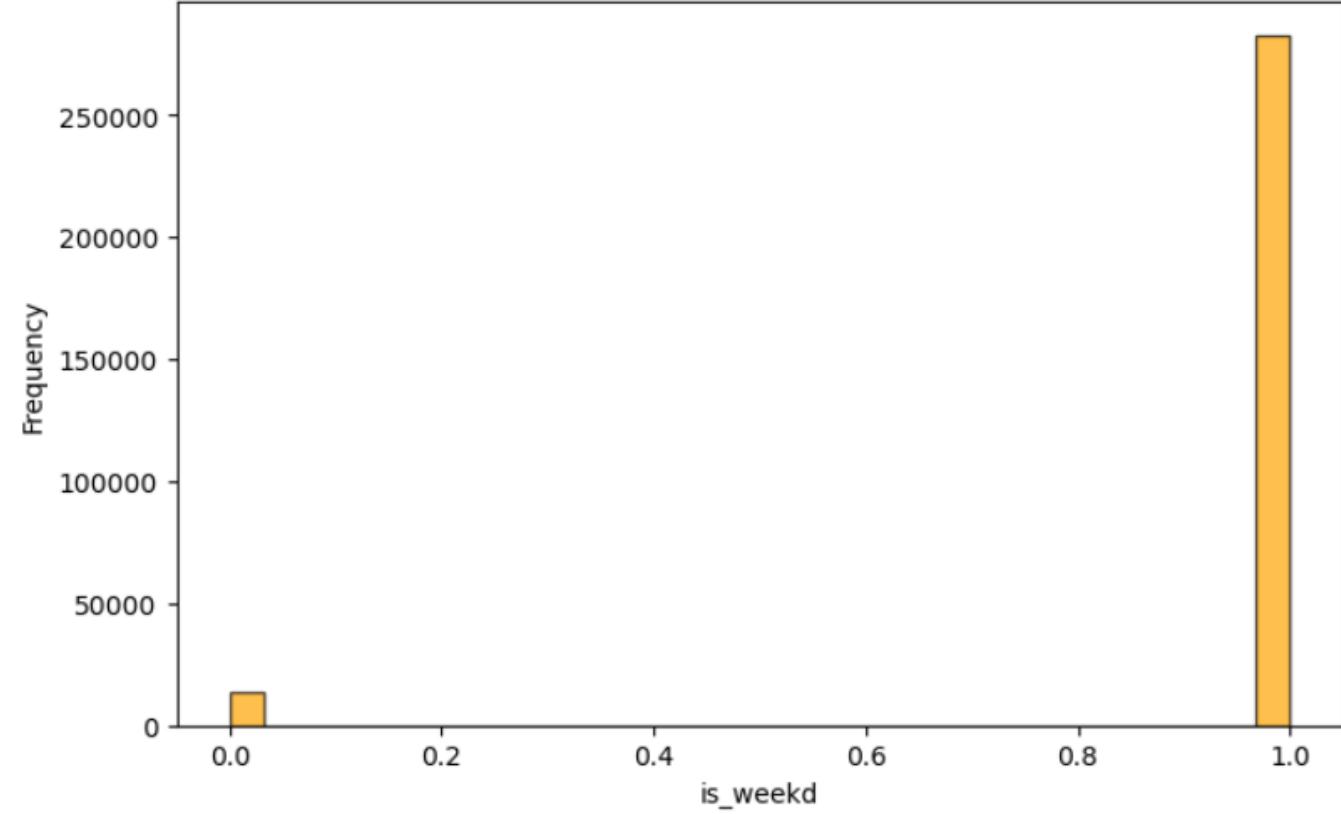
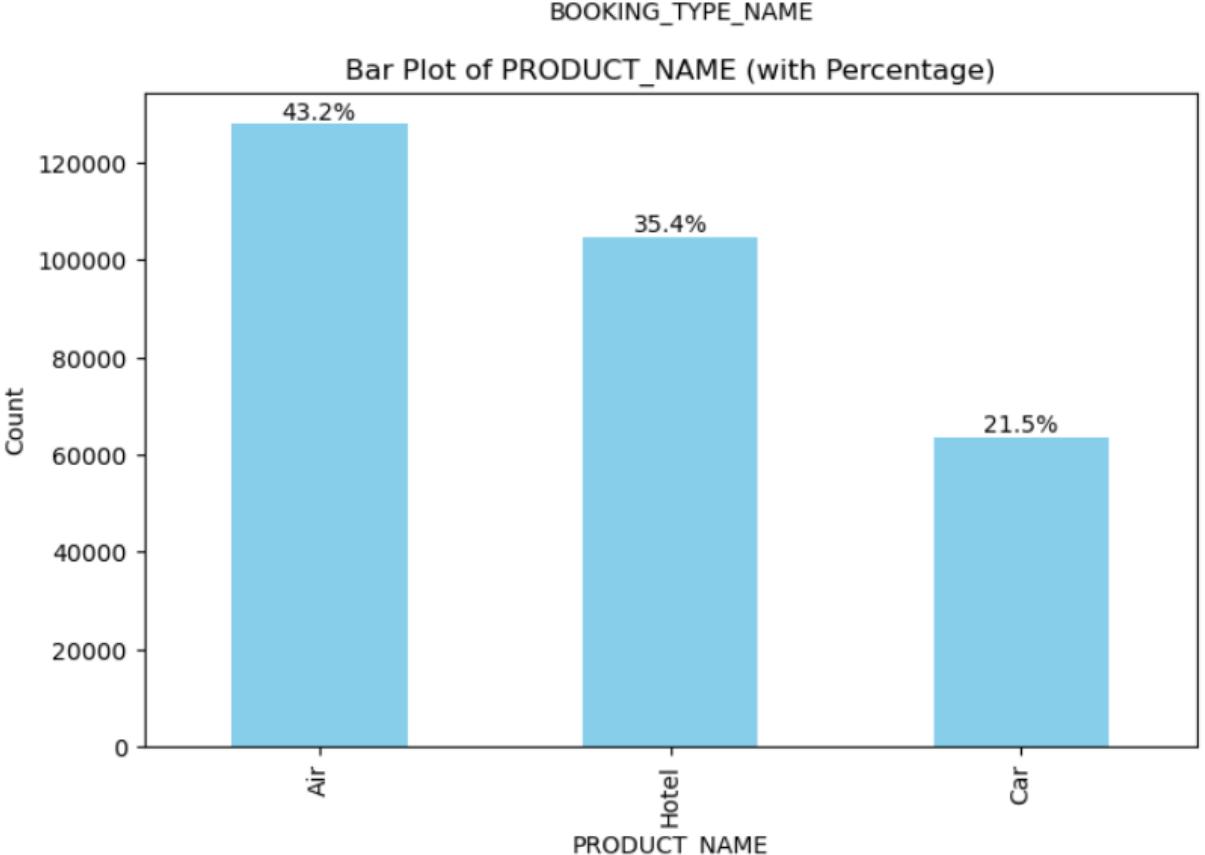
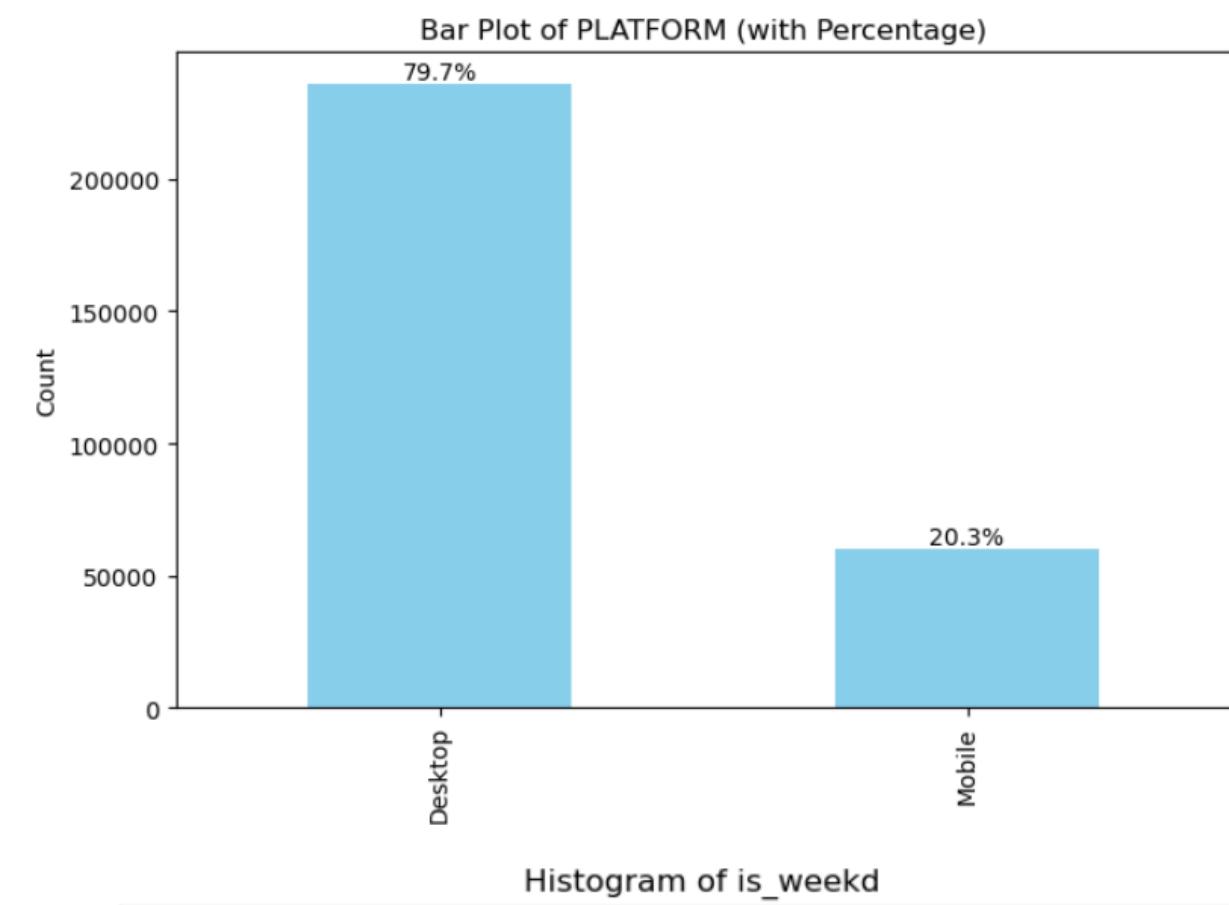
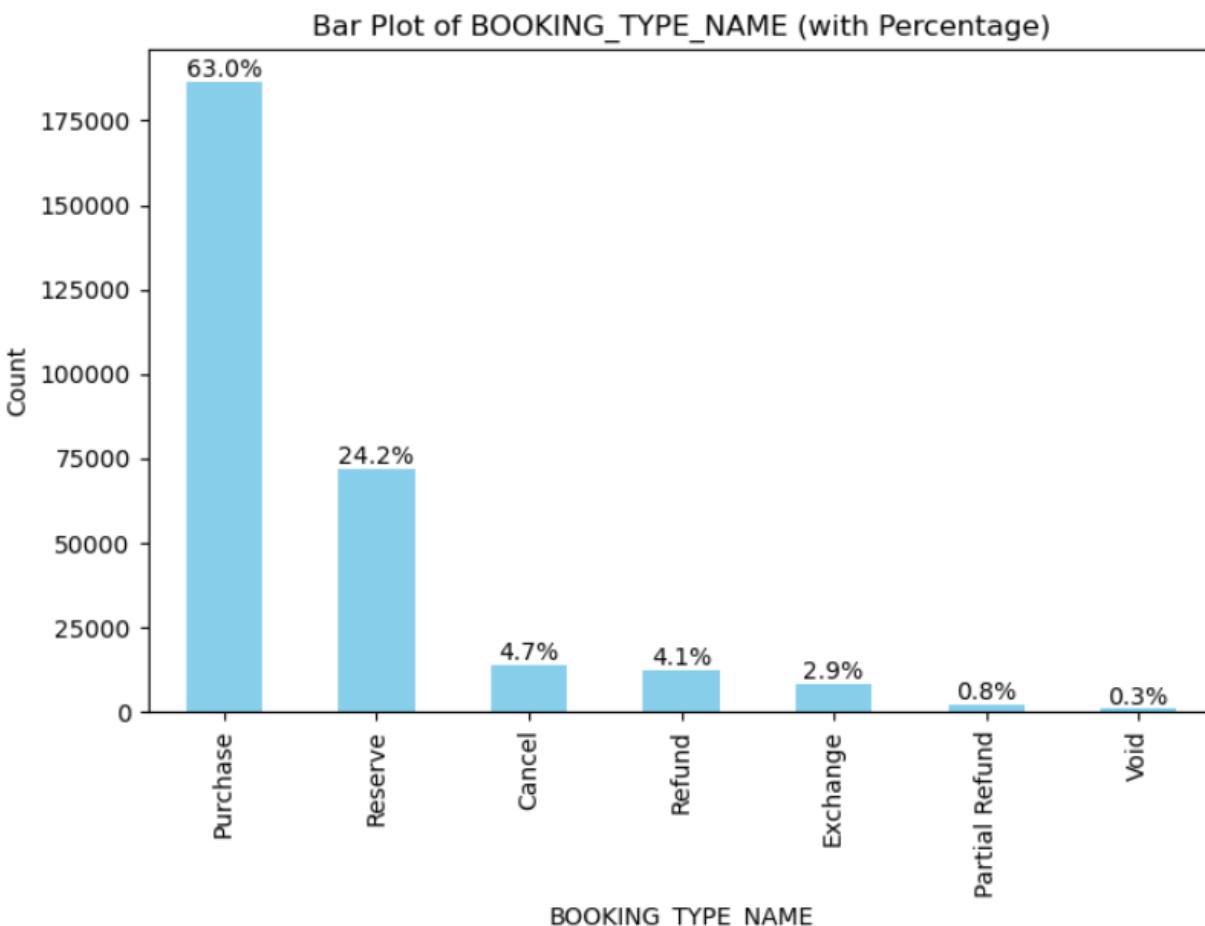
1. Refund amount of 100 Million
2. BOOKING\_DATE is later than TRAVEL\_START
3. TRAVEL\_END is earlier than TRAVEL\_START

## DATA TRANSFORMATION

1. Correct Timestamp issues
2. Create duration days
3. Add calendar table for day of week, weekend, holiday, moon phase

## DATASET

1. Total Transactions: ~30k
2. Most transactions in 2018
3. 65 unique customers
4. 6478 unique travelers
5. Avg booking amount is ~1300
6. Avg Savings amount is 60
7. 88% Mostly Purchase followed by Reserve
8. 80% Mostly on desktop
9. Air(43%), Hotel (35%)
10. Booking mostly done on weekends
11. Most transactions done online
12. Trip duration is generally short (0-5 days)



# Insights from Monthly Trend Analysis

## INSIGHTS

### Booking Value & Transaction Count Decline

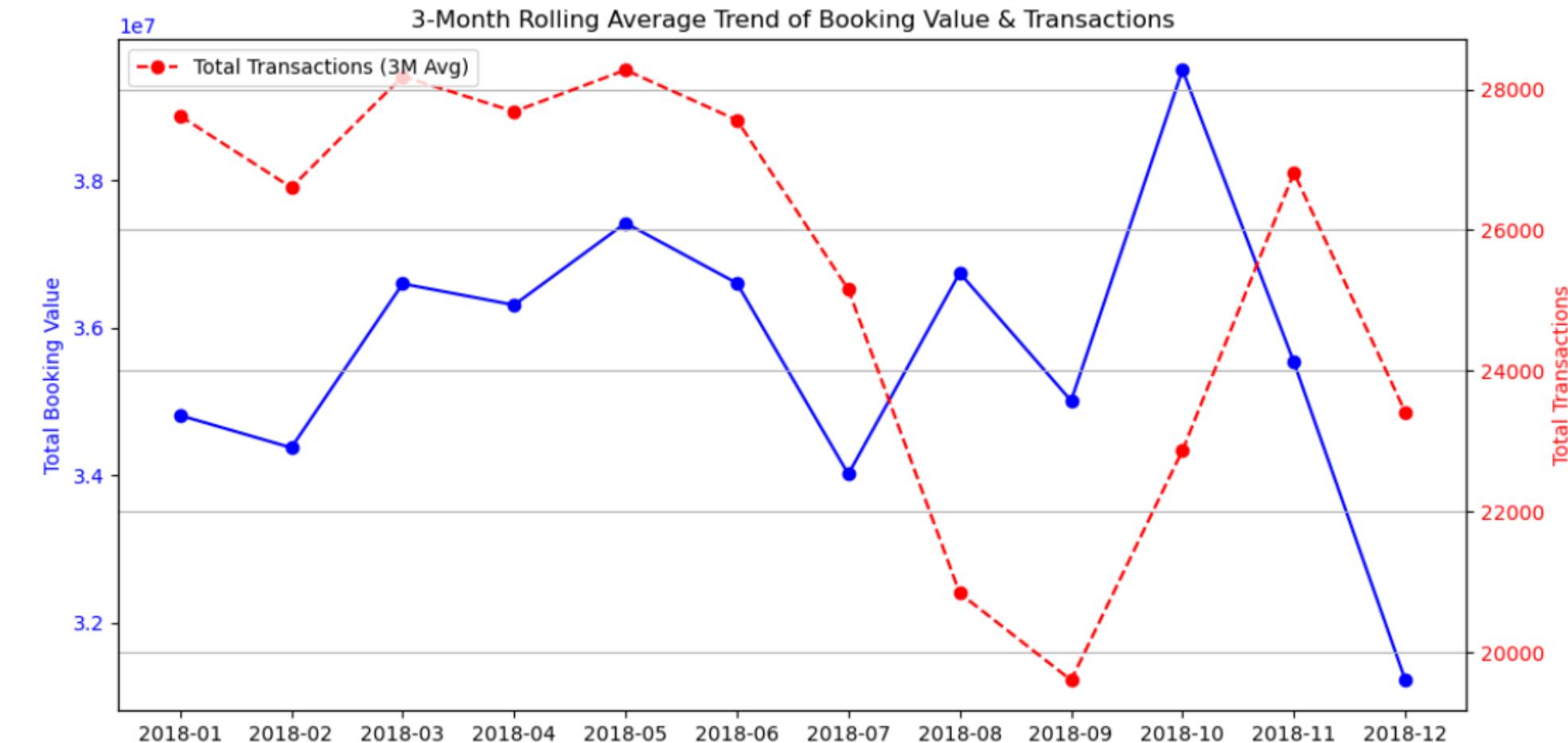
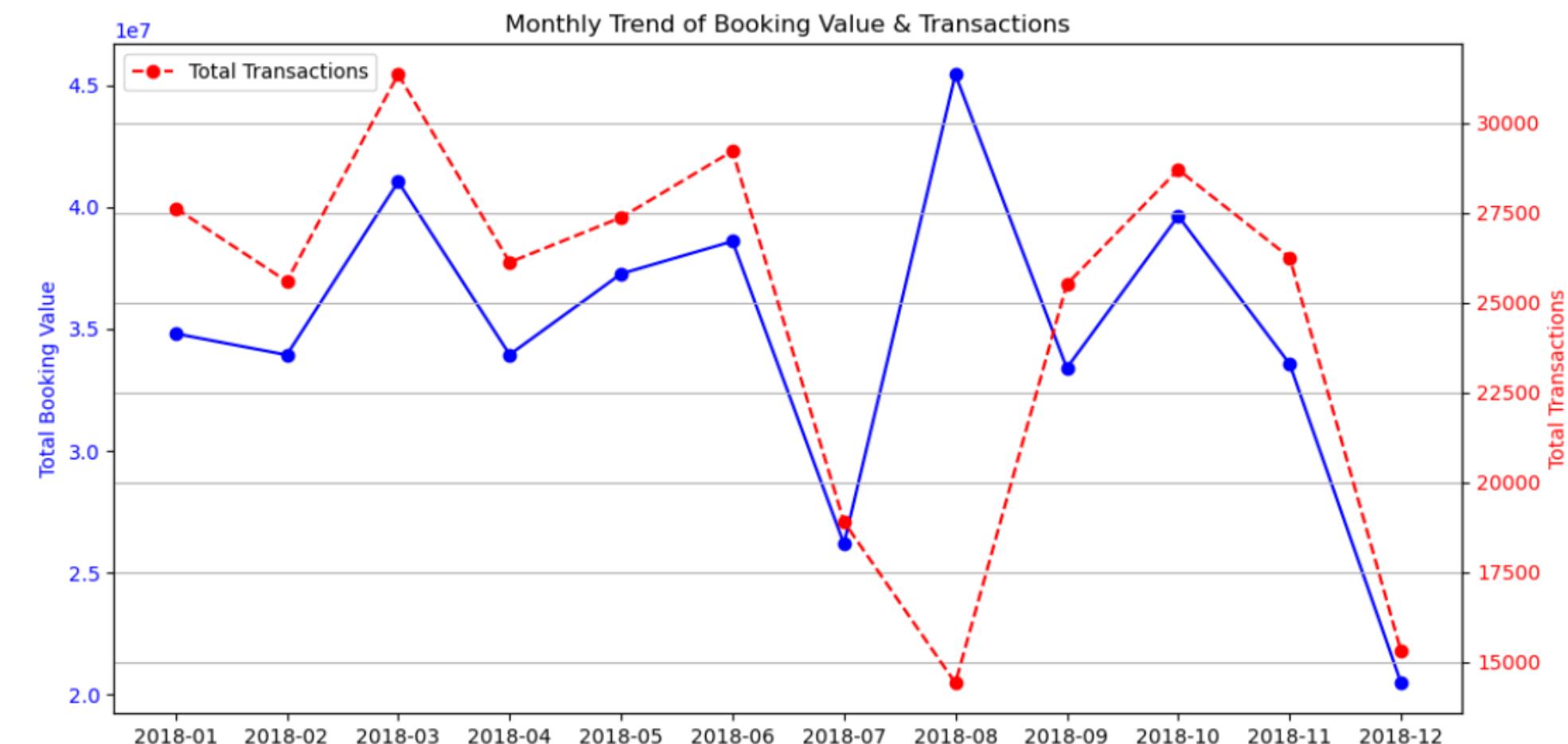
- Noticeable decline in both booking value and transaction count in certain months
- Sharp drop is observed mid-year, followed by a temporary recovery and another decline
- Sudden increase in average booking value whereas count of transactions has reduced

### Potential Causes of the Decline

- Could be seasonal effects (low demand periods)
- External market shifts like competitor pricing changes
- Changes in business strategy affecting customer retention

## NEXT STEPS

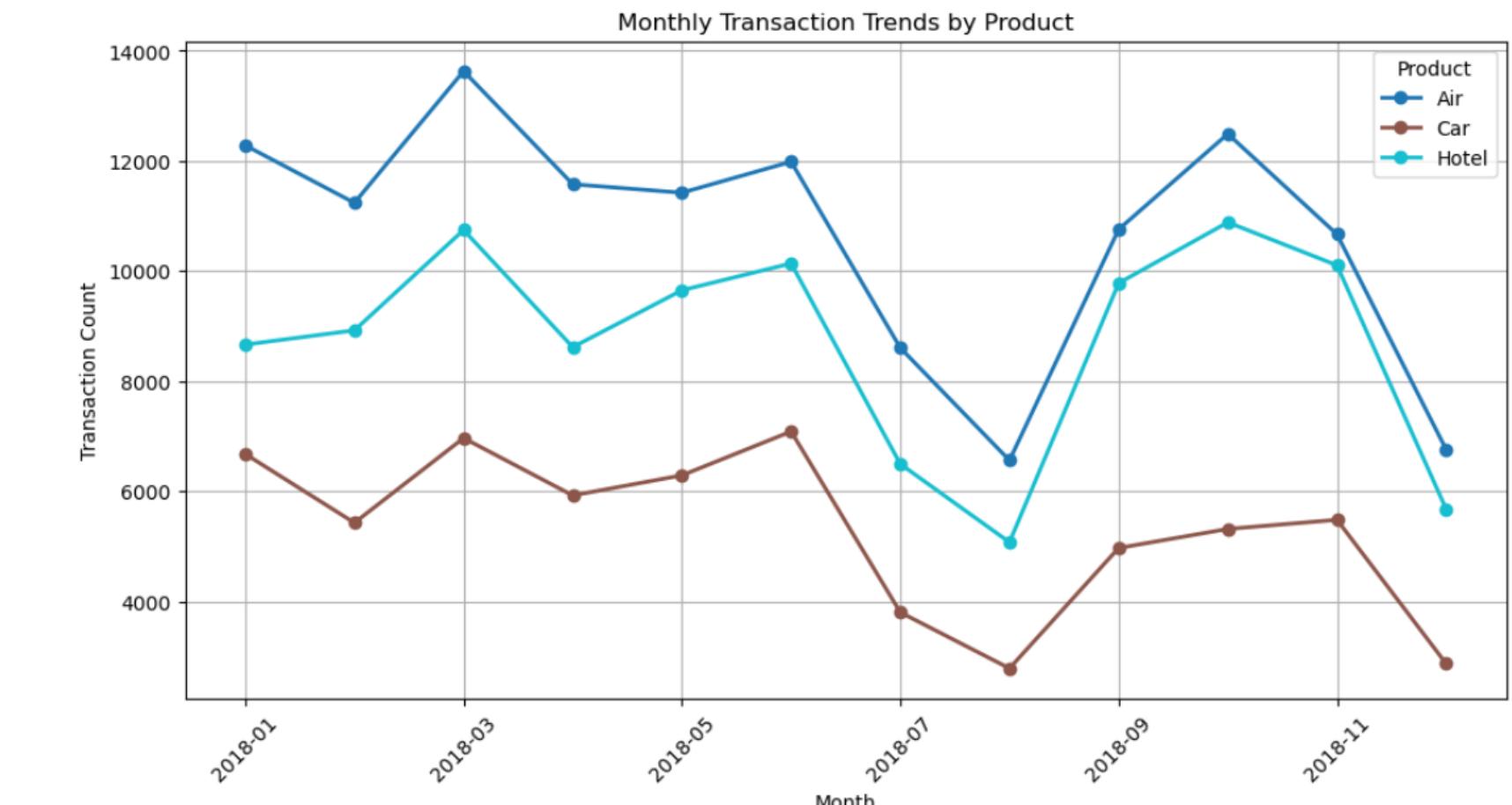
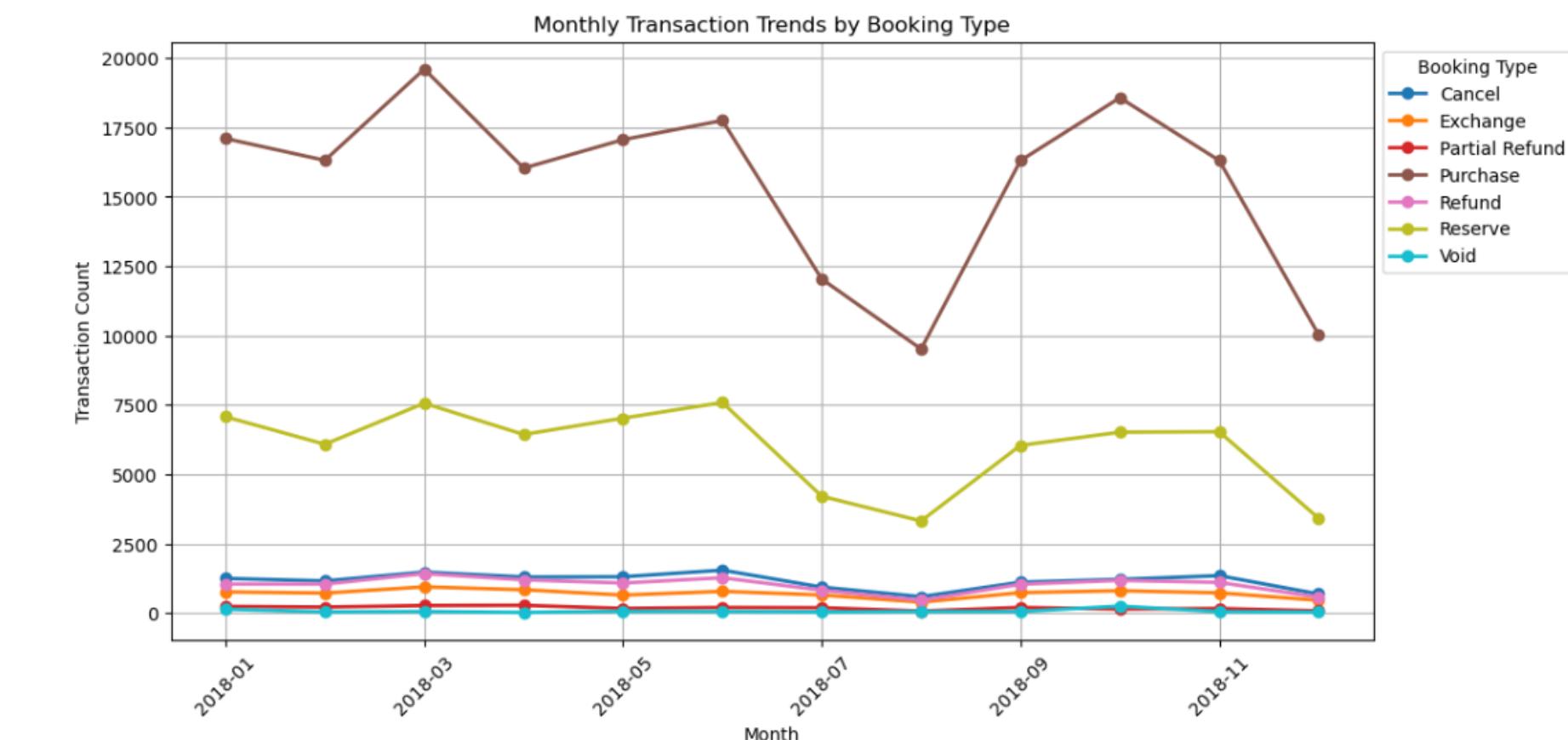
- Analyze churn trends: Are fewer customers making repeat bookings?
- Check product-wise performance: Did specific products drive the decline?
- Platform analysis: Are mobile or desktop users dropping off?
- External factors impact: Holidays, days of the week.



# Booking Type and Product-Wise Performance

## INSIGHTS

- Purchase and Reserve both dropped sharply from June to August and then in December
- Air travel generates the highest revenue followed by Hotel and then car
- Car rentals have the highest cancellation rate
- Air travel bookings have declined in the frequency of transactions



# Platform-Wise Performance

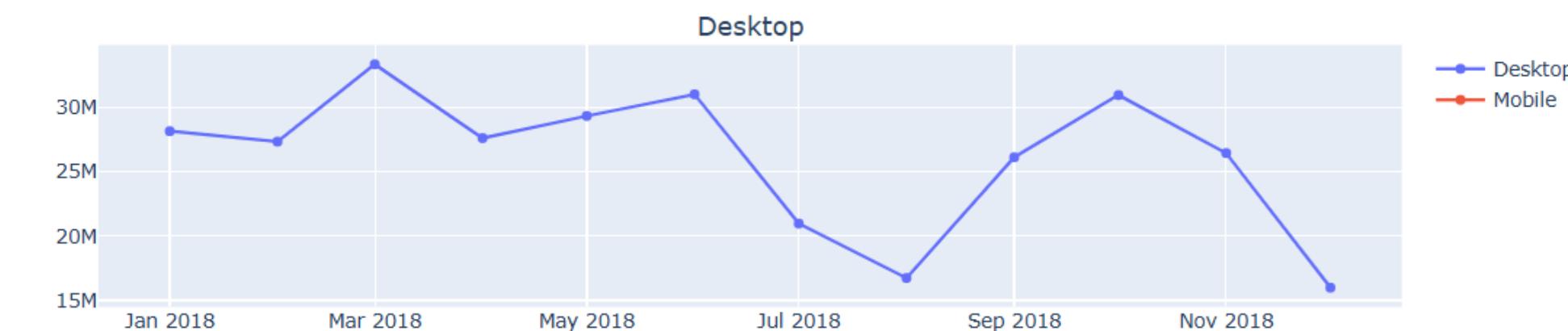
## INSIGHTS

- Desktop bookings dominate the total revenue (~80%)
- Mobile bookings had a sudden spike in booking amount in August 2018, but it was not sustained. However, the booking count reduced during August 2018
- Might be an issue with mobile engagement or a lack of consistent adoption due to corporate customers

Monthly Transaction Count Trends per Platform



Monthly Booking Amount Trends per Platform



Desktop  
Mobile

Mobile



Mobile



# Customer Insights

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Data is visualized in Python

# Customer Insights (Top Corporate Accounts)

## INSIGHTS

### Top Customers by Booking Value

- Customer ID 1018 leads significantly with \$84.2M in bookings followed by 1068 with \$47.8M, and 1027 with \$43.6M.
- The top 3 customers account for a major share of revenue.

CUSTOMER_ID	total_transactions	total_booking_value
18	1018	85756
54	1068	29901
16	1016	23863
22	1027	15093
64	1078	12218
...	...	...
30	1037	56
56	1070	44
11	1010	35
8	1007	4
21	1025	1

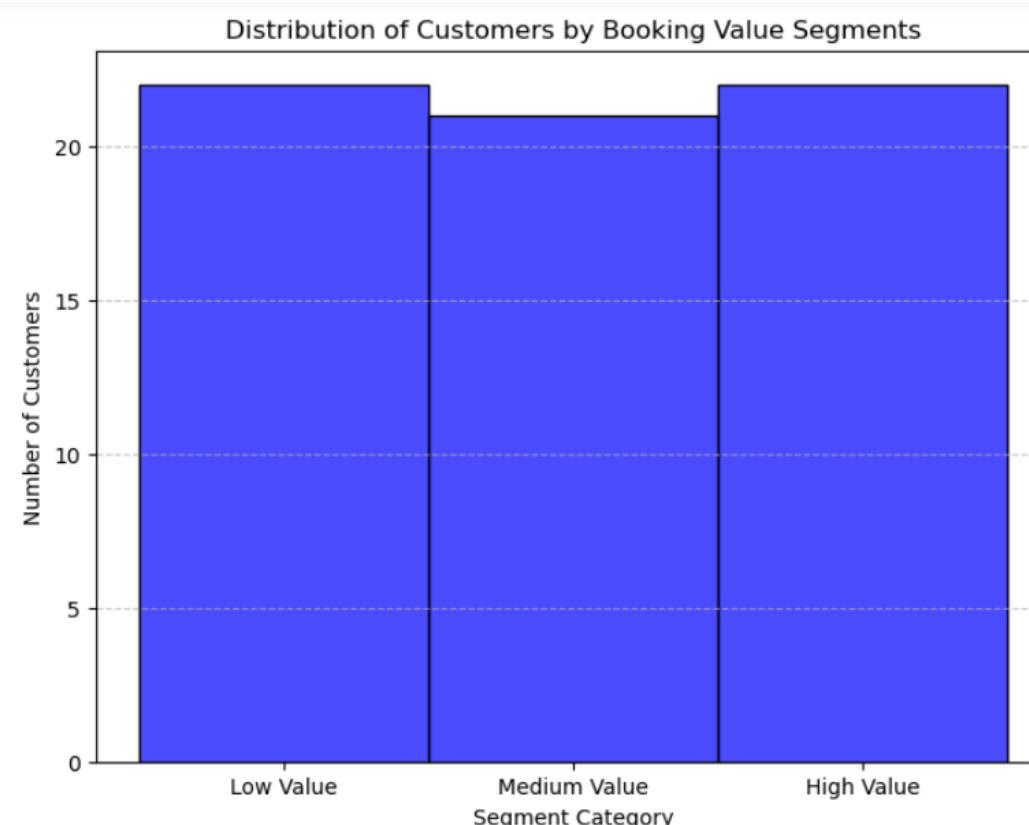
### Top Customers by Cancellations

- Customer 1018 has an exceptionally high number of cancellations (6,479) with 15% cancel ratio
- Customers 1068, 1016, and 1027 also have a significant number of cancellations, but much lower than 1018.
- The large difference suggests that certain customers might be abusing cancellation policies or experiencing frequent booking issues.

Customers can be segmented into 3 segments based on transaction amount and equal number split

## RECOMMENDATION

- Deep dive into the data of Customer 1018 and 1071 and do RCA for them (Maybe survey)



Top Customers with Frequent Cancellations:				
BOOKING_TYPE_NAME	Cancel	Purchase	Cancel_Ratio	CUSTOMER_ID
			0.142540	1018
			0.055146	1068
			0.068769	1016
			0.038343	1027
			0.079689	1049
			0.134291	1071
			0.052360	1011
			0.047982	1061
			0.058240	1063
			0.059487	1030

Customer Segmentation Metrics:			
Segment	Customer Count	Total Booking Amount	Average Booking Amount
0 High Value	22	3.705814e+08	1.684461e+07
1 Low Value	22	7.394331e+06	3.361060e+05
2 Medium Value	21	4.030751e+07	1.919405e+06



# Customer Insights Churn

## INSIGHTS

Customers who churned in 2018

- Customer ID 1025 churned in 2018
- Travelers churned month by month increased (could)

Top Customers Who Churned After Q1 and Q2:  
CUSTOMER\_ID Last\_Transaction\_Quarter  
21 1025 2018Q1

## RECOMMENDATION

1. Survey customer ID 1025

Churned Travellers Over Time (3 months)



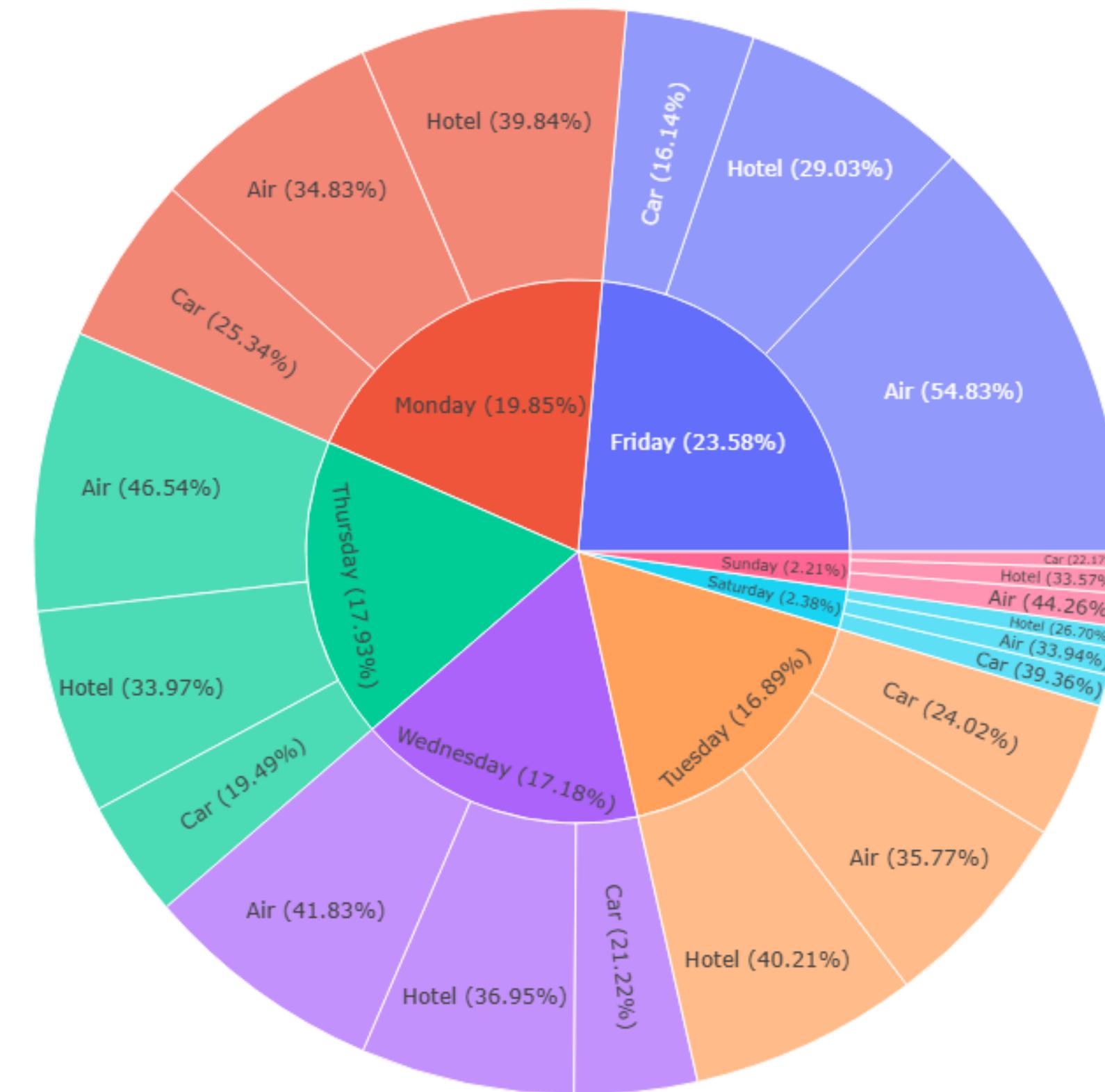
# Day of Week Insights

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Data is visualized in Python

# Booking Date vs Day of Week and Holidays

Sunburst Chart of Transactions by Booking Date Day of Week and Product Type



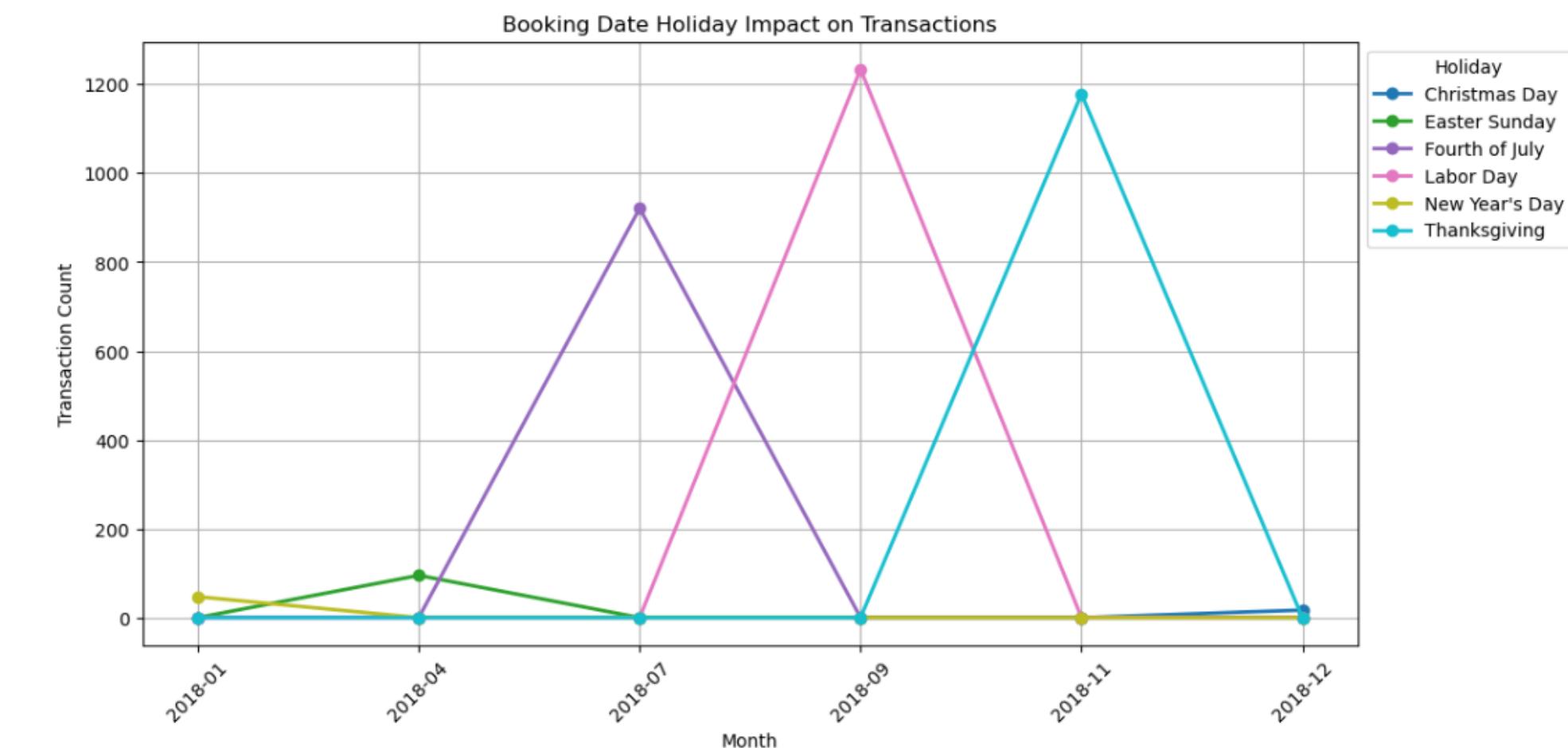
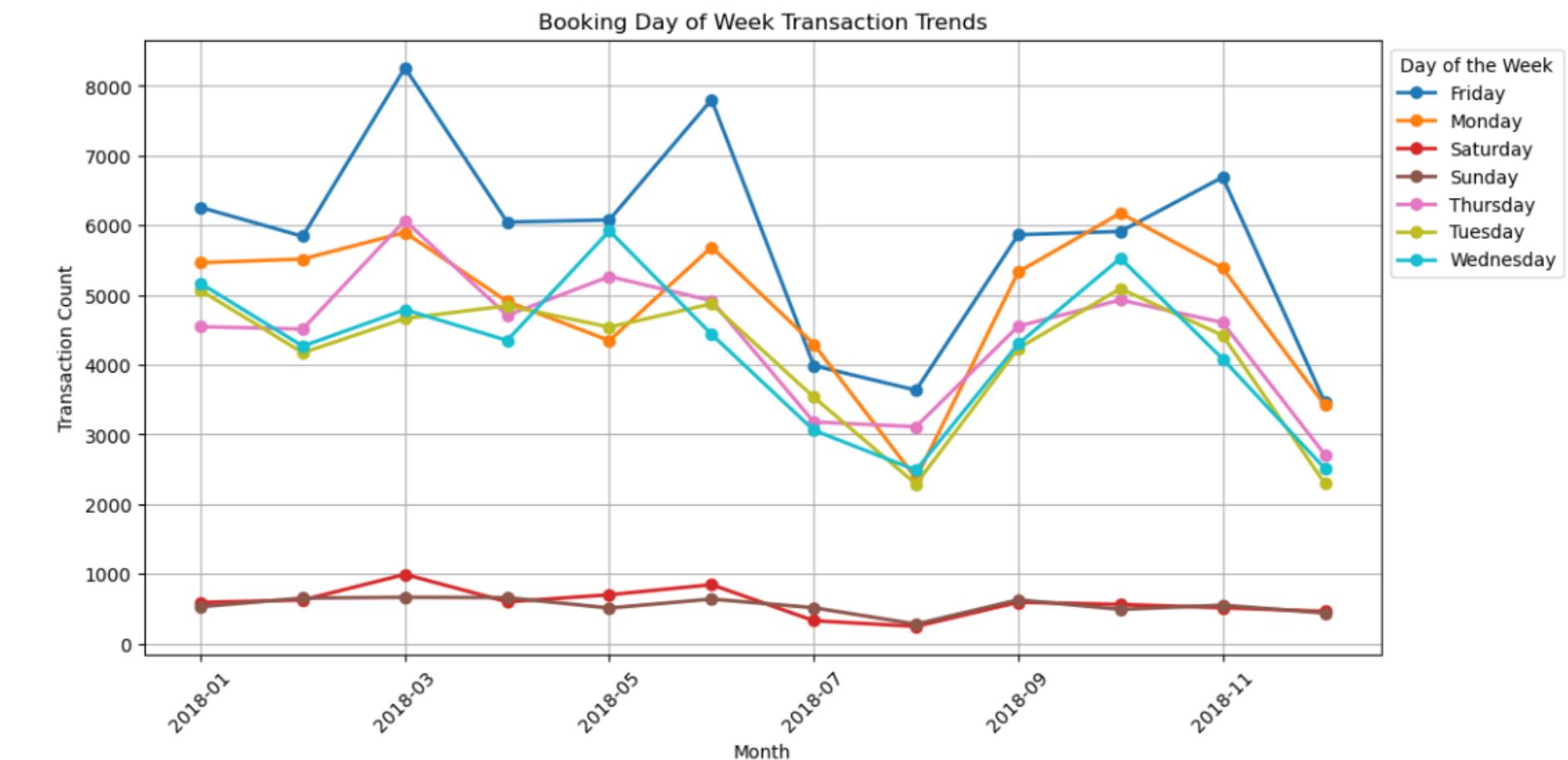
# Booking Date vs Day of Week and Holidays

## INSIGHTS

- Booking transactions peak on Fridays and Mondays, suggesting weekend and start-of-week travel bookings are dominant.
- Lowest transactions occur on Saturdays and Sundays, possibly indicating that users book in advance rather than on weekends.
- Holidays drive higher booking amounts, especially during events like Thanksgiving, Fourth of July, and Labor Day.

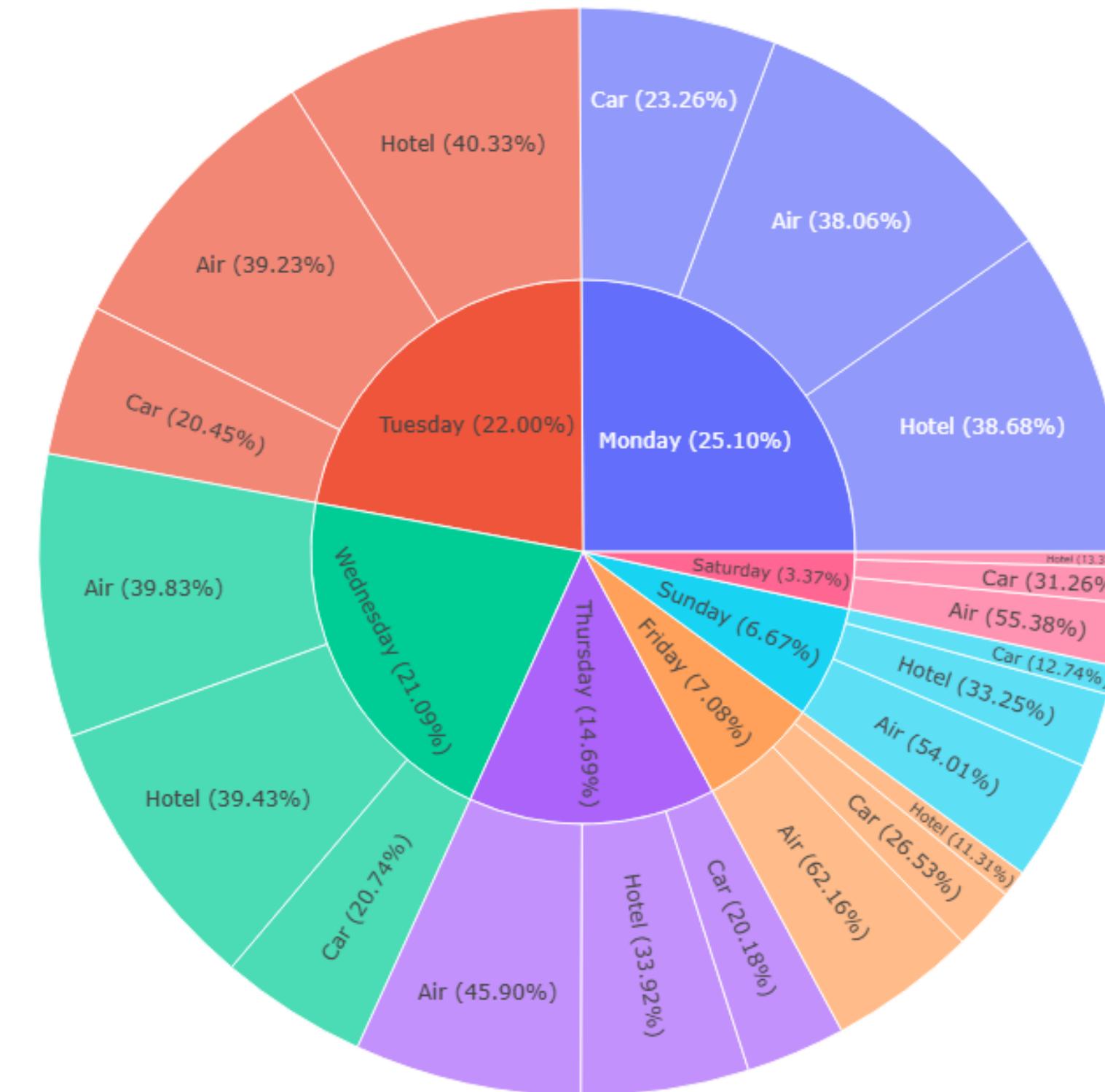
## RECOMMENDATION

1. Send CTA or marketing emails before Friday and Monday
2. Optimize best rates algorithm and smart sort right before Friday and Monday
3. Optimize marketing campaigns for Labor day, July 4 and Thanksgiving



# Travel Start Date vs Day of Week and Holidays

Sunburst Chart of Transactions by Travel Start Date Day of Week and Product Type



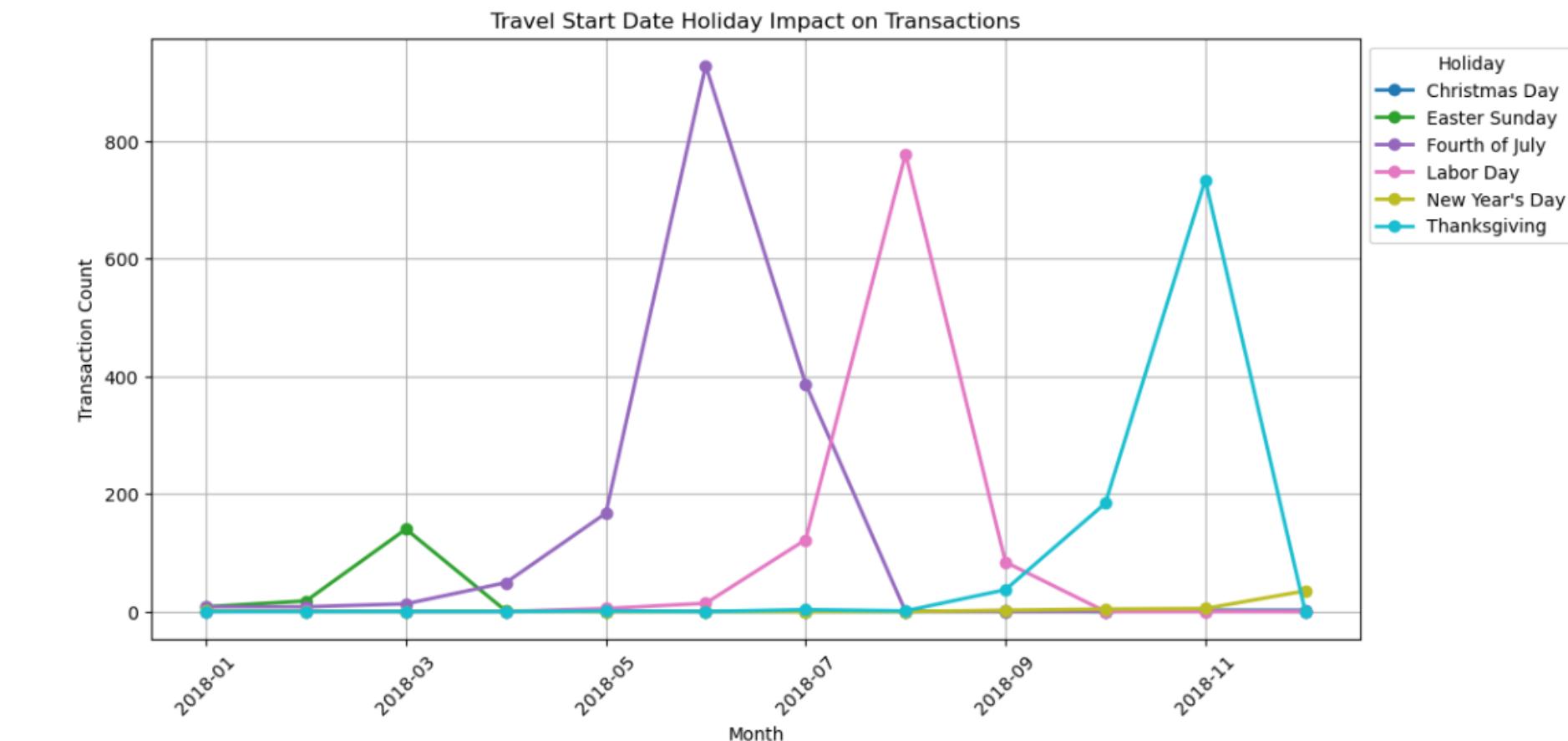
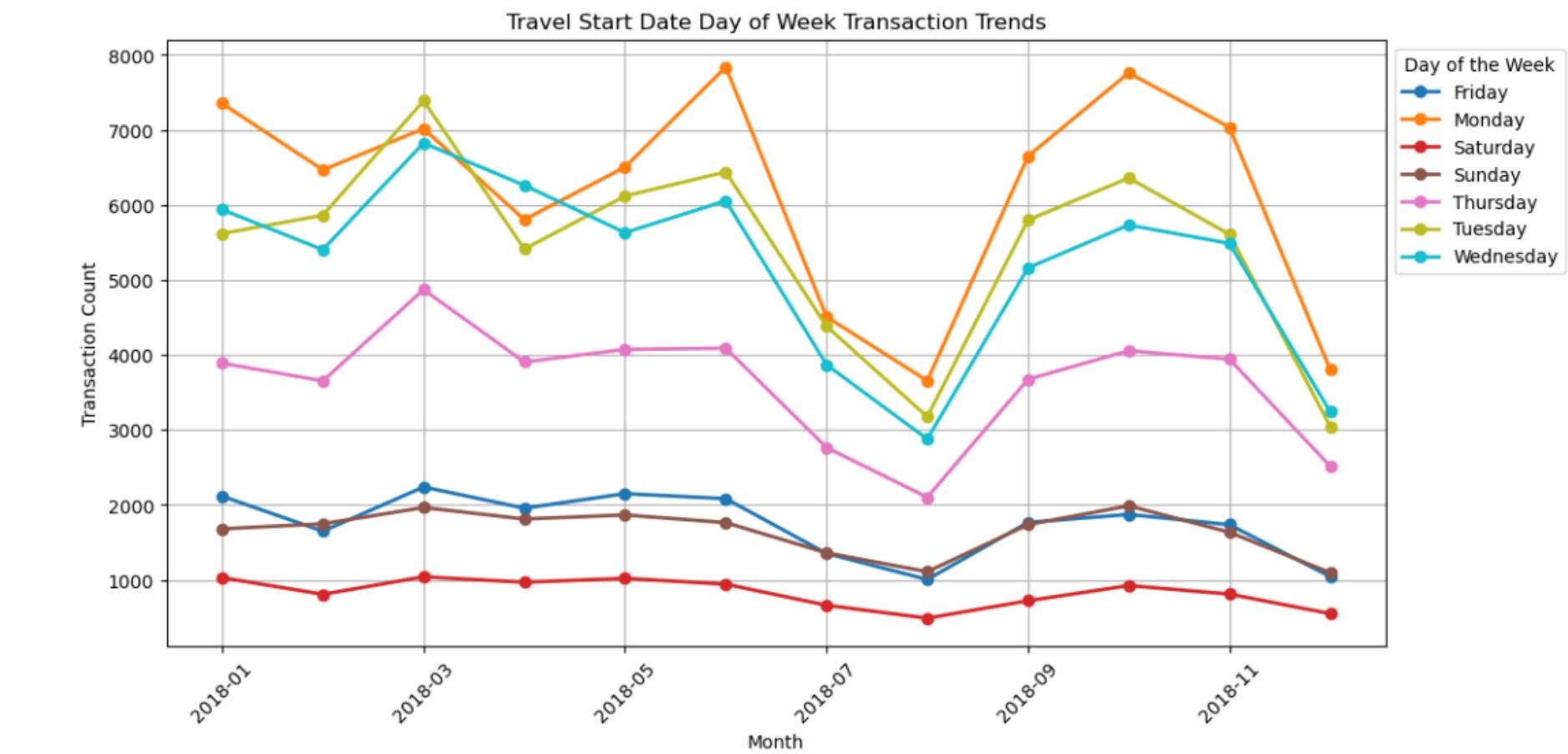
# Travel Start Date vs Day of Week and Holidays

## INSIGHTS

- Travel start date peak on Monday and Tuesday
- Lowest start date on Saturdays and Sundays
- Holidays drive higher booking amounts, especially during events like Fourth of July, Labor Day and Thanksgiving.
- Equal weights between Air and Hotel on weekdays

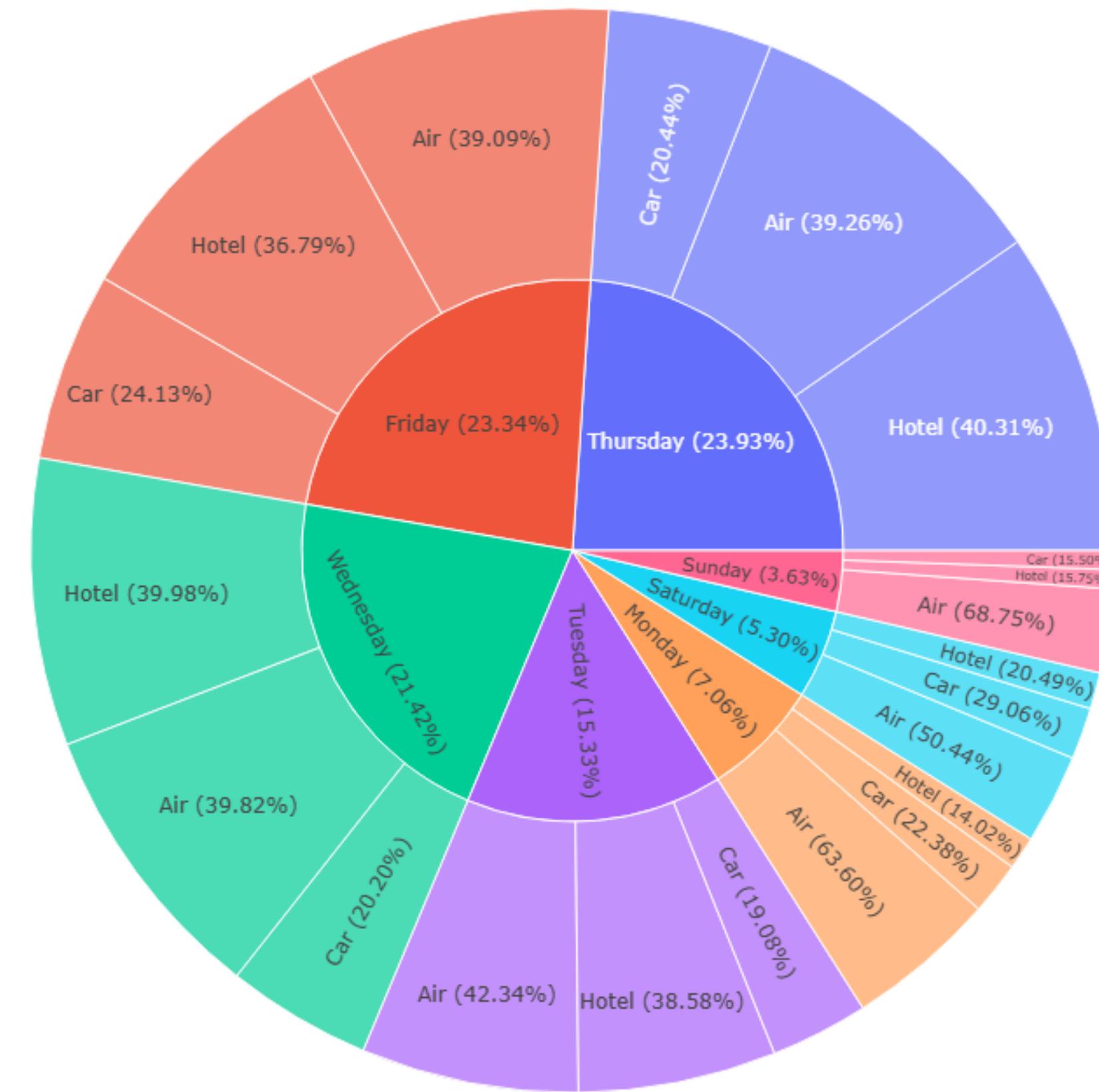
## RECOMMENDATION

1. Optimize prices for travel dates on Monday and Tuesday
2. Optimize marketing campaigns for travel start dates July 4, Labor Day and Thanksgiving



# Travel End Date vs Day of Week and Holidays

Sunburst Chart of Transactions by Travel Start Date Day of Week and Product Type



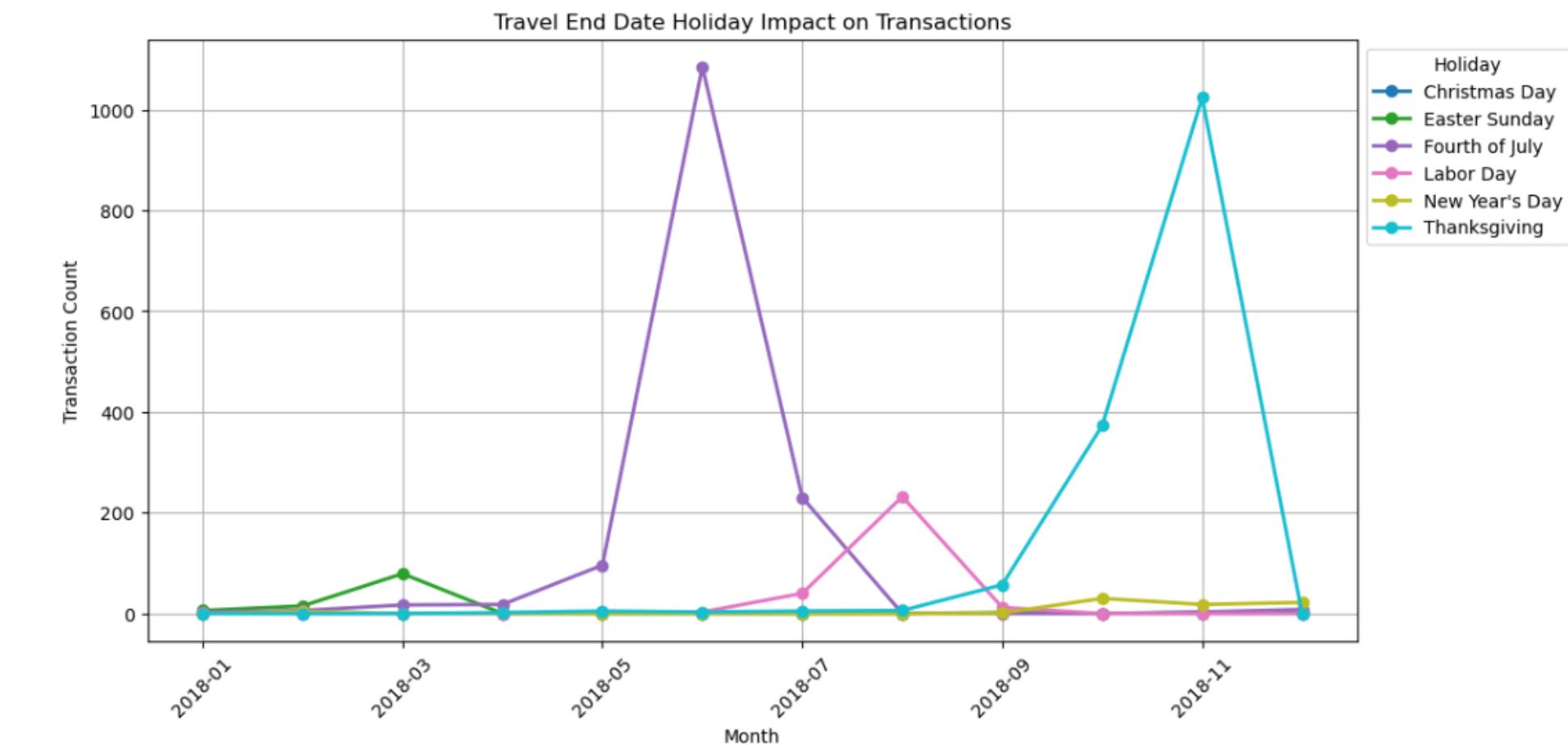
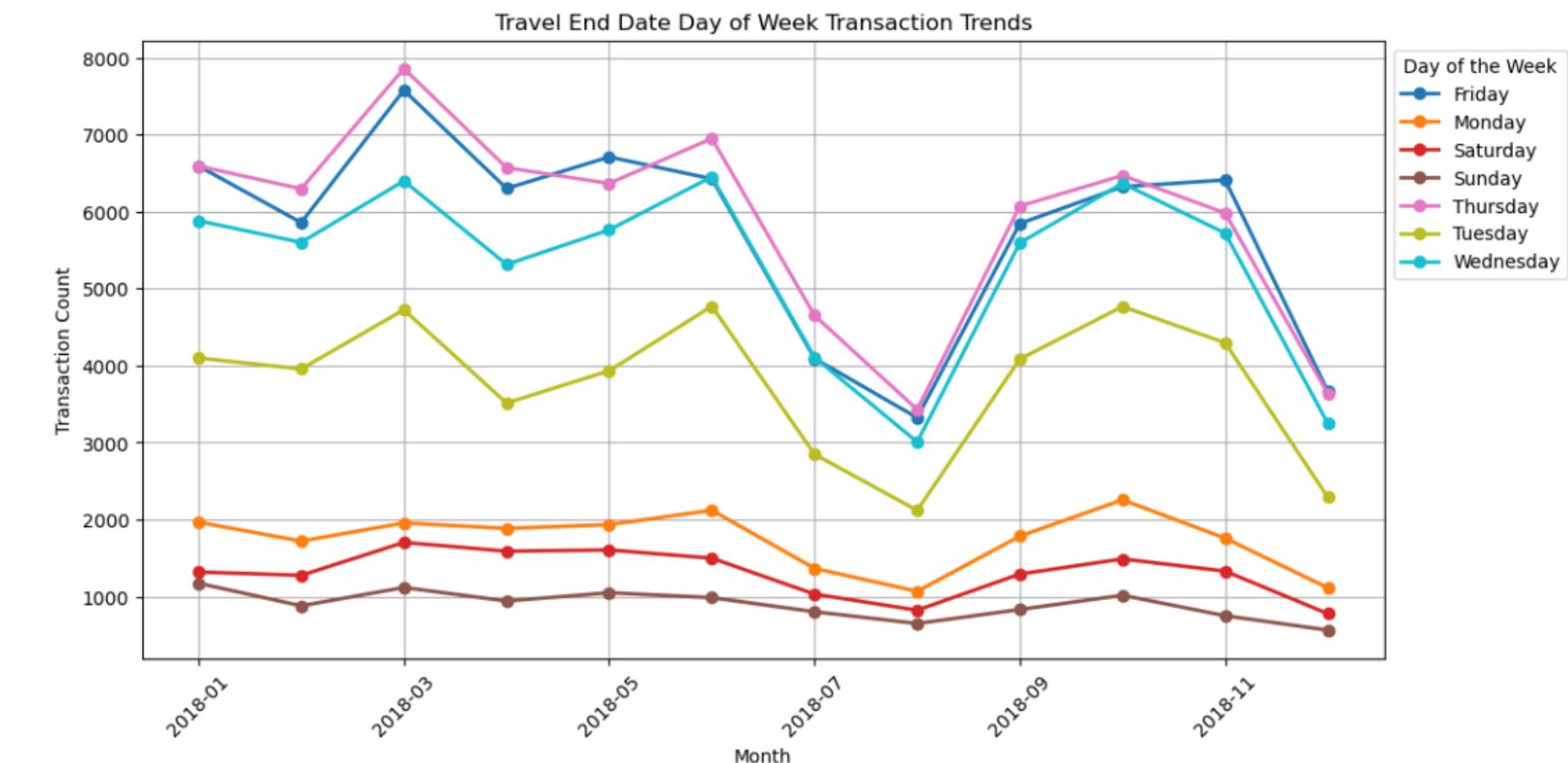
# Travel End Date vs Day of Week and Holidays

## INSIGHTS

- Travel end peak on Thursday and Friday
- Lowest end date occur on Saturdays and Sundays
- Holidays travel July 4 and Thanksgiving
- Equal weights between Air and Hotel on weekdays

## RECOMMENDATION

1. Optimize prices for travel dates on Monday and Tuesday
2. Optimize marketing campaigns for travel start dates July 4, and Thanksgiving



# Statistical Analysis

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Data is processed in Python

# Relationship Between Online Purchase and Booking Type?

## GOAL: CHI-SQUARED TEST

You use a Chi-square test for hypothesis tests about whether your data is as expected. The basic idea behind the test is to compare the observed values in your data to the expected values that you would see if the null hypothesis is true.

## INSIGHTS

- P-value = 0.06
- This means there is no strong statistical evidence of a significant relationship between Online Purchase (Platform) and Booking Type.

		Cancel	Exchange	Partial Refund	Purchase	\
BOOKING_TYPE_NAME	PLATFORM	Refund	Reserve	Void		
		11112.596165	6767.168636	1802.559521	148713.551168	
PLATFROM	Desktop	2832.403835	1724.831364	459.440479	37904.448832	
	Mobile					

{'Chi-Squared Statistic': 12.025490645147013,  
 'P-Value': 0.06140254944755101,  
 'Degrees of Freedom': 6,  
 'Expected Frequencies': BOOKING\_TYPE\_NAME \ PLATFROM  
 Desktop 11112.596165 6767.168636 1802.559521 148713.551168  
 Mobile 2832.403835 1724.831364 459.440479 37904.448832  
 BOOKING\_TYPE\_NAME \ PLATFROM  
 Desktop 9772.231392 57231.663244 709.229874  
 Mobile 2490.768608 14587.336756 180.770126 }

## RECOMMENDATION

1. Segment Further: Try analyzing the data separately for Desktop and Mobile users to check if there are any differences within subgroups
2. Increase Sample Size: Gather more data might reveal a stronger pattern.
3. Explore Other Metrics: Consider looking at conversion rates, or seasonal trends for more insights.

# Further Analysis

## If More Time Was Available

- **Develop an Interactive Dashboard:** Enable deeper analysis of individual customer behavior and trends

- **Customer Segmentation via K-Means Clustering:** Identify distinct customer groups to personalize strategies

## Additional Data Required for Further Insights

### **1. Marketing Campaign Performance:**

- Ad spend, ROI, and conversion effectiveness

### **2. Customer Feedback & Surveys:**

- Understand reasons for cancellations or churn

### **3. Competitor Pricing & Promotions:**

- Benchmarking to assess market positioning

### **4. Session Data for Conversion Funnel Analysis:**

- Identify drop-off points in the booking process





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**THANK YOU**

**-Shivank Garg**