

UBER DEMAND-SUPPLY GAP

Case Study Submission

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Data Gathering and Understanding

Business Understanding & Objective:

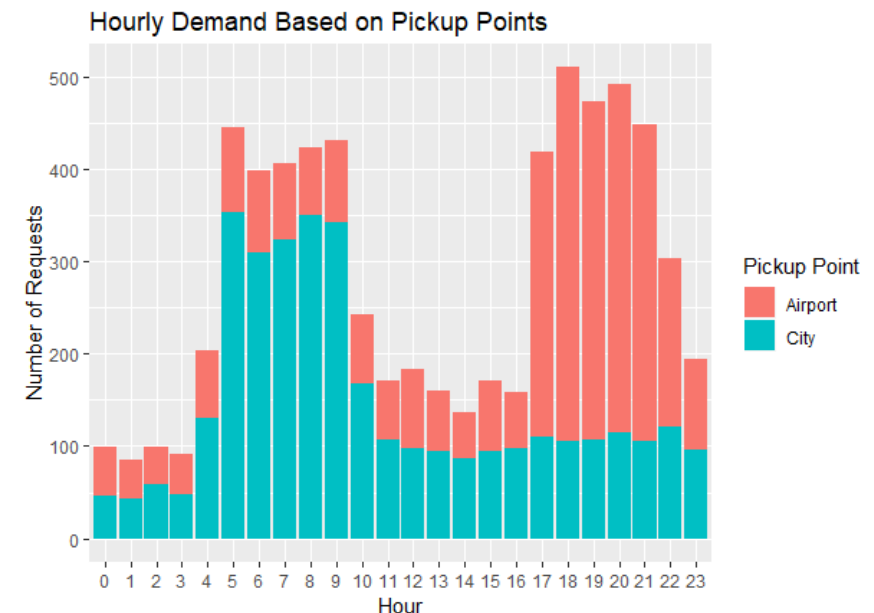
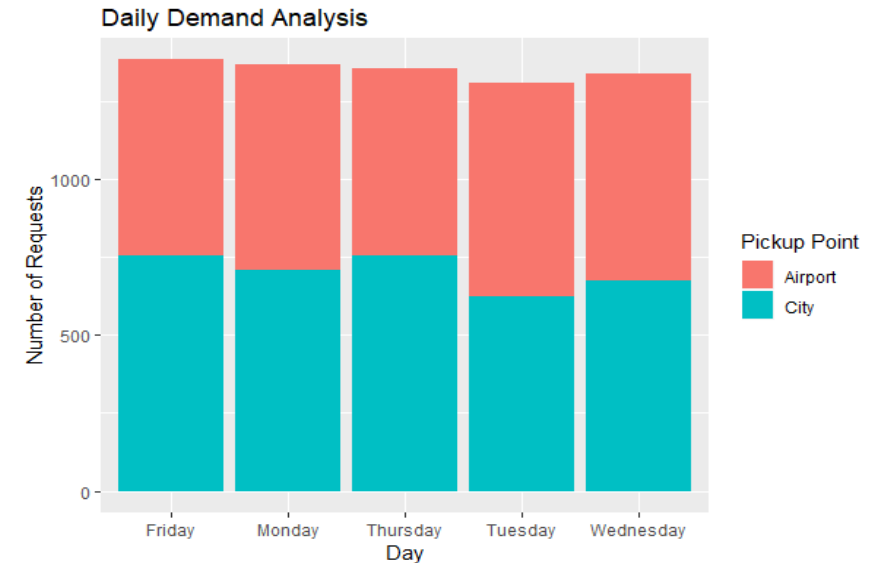
For a taxi aggregator like Uber, during demand cycle, the supply shortages caused either by driver induced request cancellations or non-availability of cars leads to loss of potential revenue. Considering inputs from the csv data provided in the problem statement, it was identified that there are issues with customers securing trips to and from the airport. This case study is focused towards the analysis of demand and supply levels for airport trips (either city to airport or vice-versa). From the results of the analysis, we must identify problem statement, possible root cause and suggest recommendations which can help fix the demand supply gap for Uber.

Data Understanding:

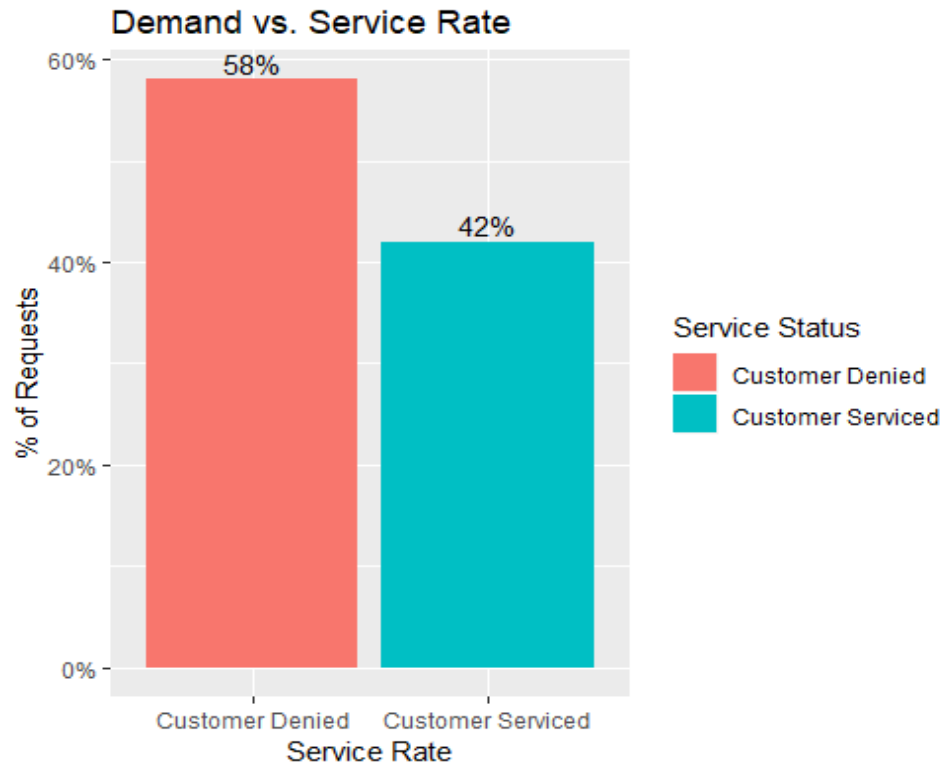
The dataset provided by Uber (Uber Request Data.csv) contains the following six attributes:

1. Request ID: A unique token representing a customer request.
2. Pickup point: Customer pickup point with two levels based on customer's location (City-represents customers to be picked up at the city and dropped to the airport; Airport-represents customers to be picked up from the airport and dropped to the city).
3. Driver ID: Unique identification number of a driver.
4. Status: It represents the customer request status and may take up one of three possible values; trip completed, cancelled or no cars available.
5. Request Timestamp: Contains date and time information at which the request was registered.
6. Drop Timestamp: Contains date and time information at which the trip was completed.

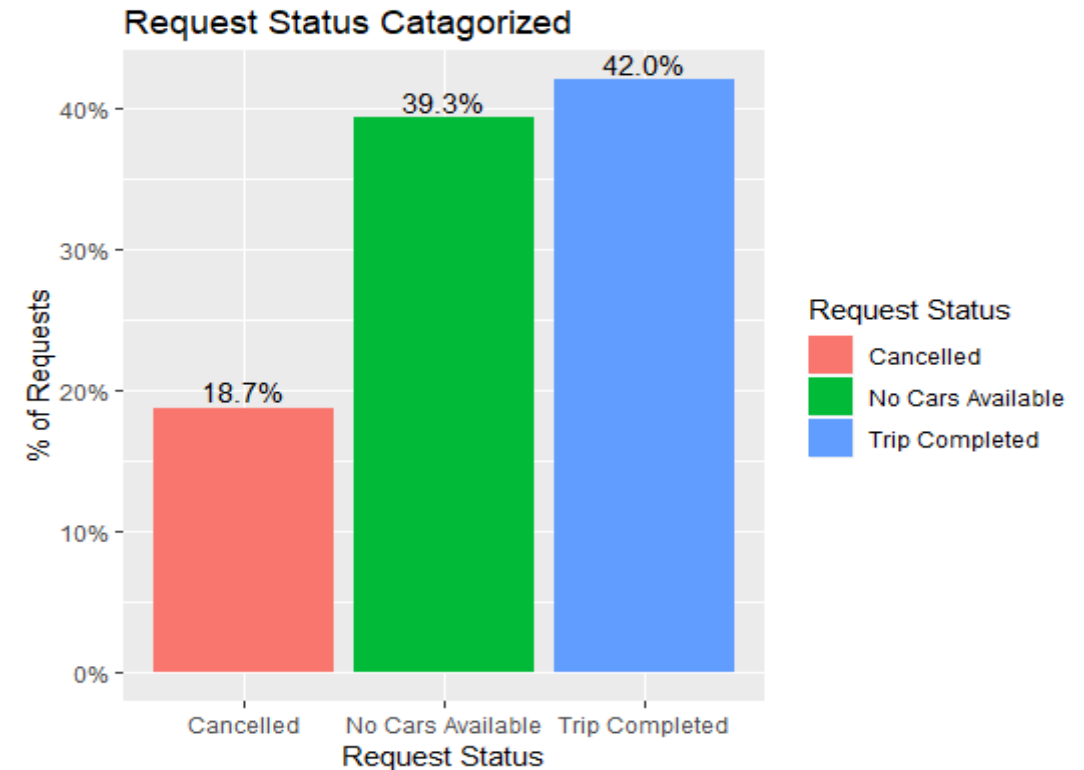
- Daily Demand Variation: There is minimal variation in the number of requests generated with respect to the days of the week. Therefore each day can be viewed as a cycle and there are five cycles of data in our dataset.
- Driver Idle Time Calculation: As this dataset contains information only with respect to trips made to and from the airport, and the discrepancy with respect to registering information for certain trips [For example for numerous Driver ID's the city to airport is registered on the 11th and the subsequent trip is again registered as city to airport on 12th]. Considering the scope of our analysis, driver idle time at the airport is not considered to maintain sanctity of the analysis.
- Demand Definition: Demand is defined as the total number of requests received within a given period.
- Supply Definition: Supply refers to the total number of requests for which the trip status is completed.
- Gap Definition: This refers to the number of requests for which there were no cars available or designated driver has cancelled the requests. As an expression it can be defined as Net Demand- Net Supply.
- Request Hour: For the scope of our analysis, we can group the request time stamps into 24 distinct groups (0-23 hours) relating to when the request was initiated by the customer. For example, any request generated between 10:00:01 to 10:59:59 will be assigned the request hour attribute 10. This will facilitate hourly analysis.
- Time Slots: Based upon the hourly demand pattern through the days, time slots have been grouped into 4 categories. For the analysis; 5am to 10am-Morning Peak(5hr) , 10am to 5pm- Day Time(7hr), 5pm to 10pm- Evening Peak(5hr) and 10pm to 5am-Night Time(7hr).
- Trip Times: The average trip times for city to airport with respect to request hours has minimal variation and an average of 52 minutes, similarly airport to city is 52 minutes, therefore trip times are not taken into analysis for problem diagnosis.



Initial Analysis and Overall Service Performance

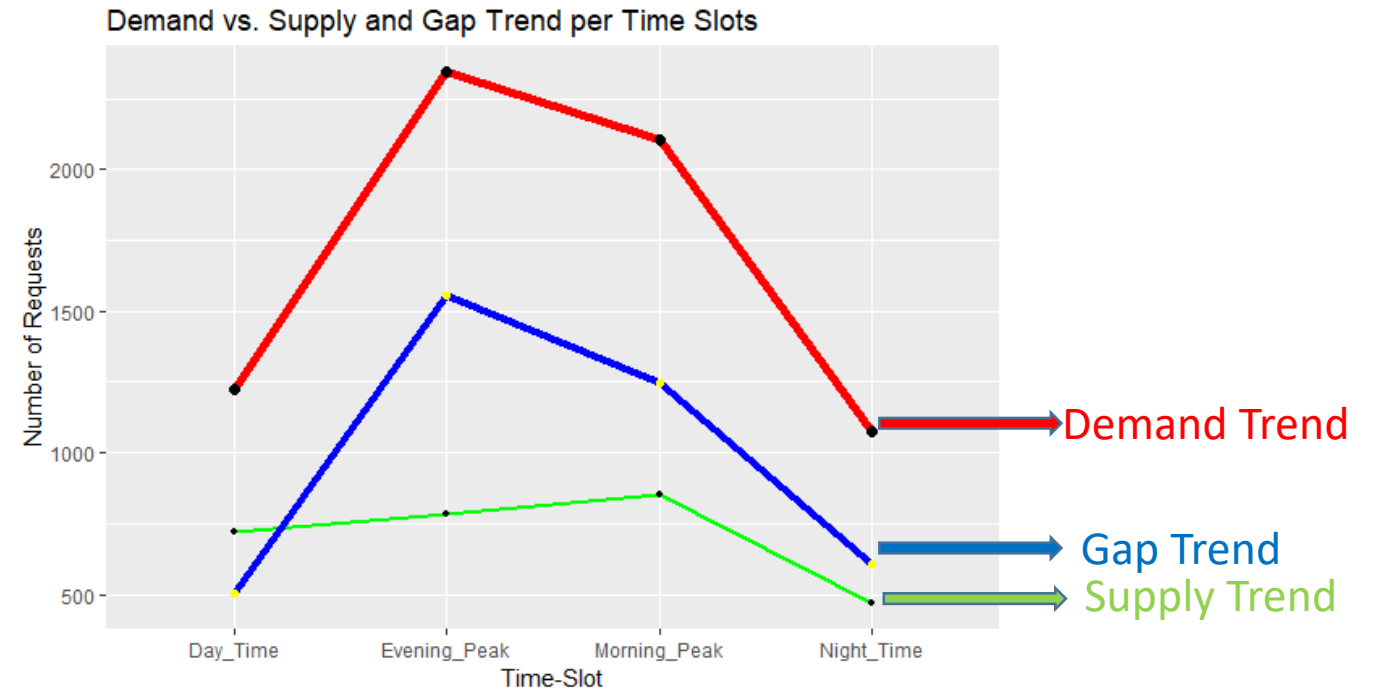
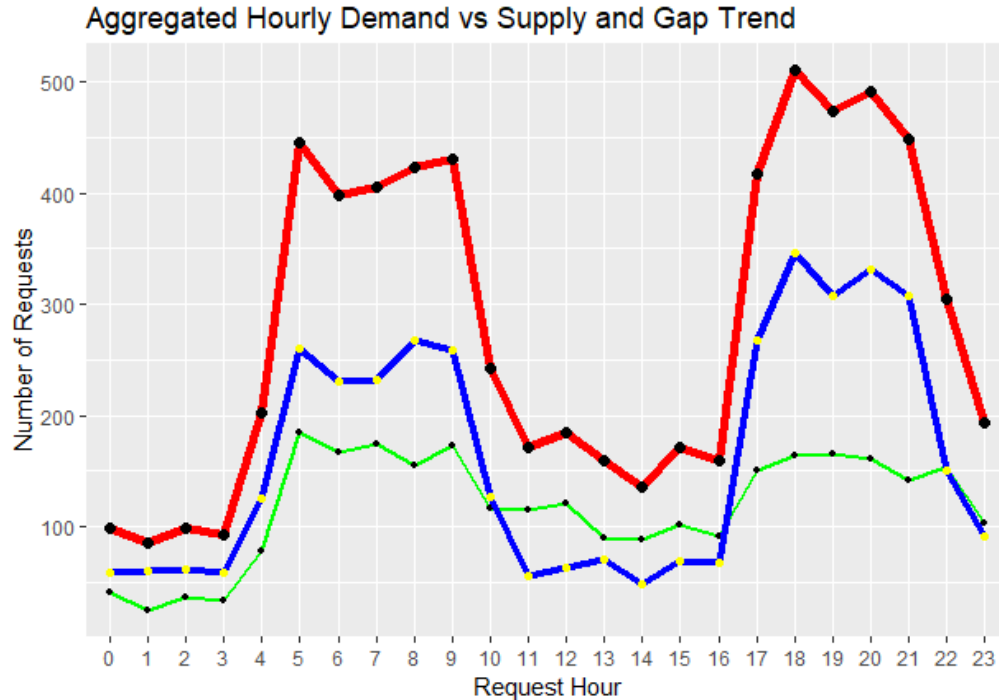


The above graph depicts the percentage of overall demand services (42%) vs the clients denied of service (58%). This shows the potential problem (higher services denial) which can negatively affect Uber's revenue and may potentially hit Top line and bottom line.



The above graph depicts the Overall request status (in %). It shows the breakdown of the **58% of denied requests**, of which, 39.3% corresponds to no cars available at the time of customer request and 18.7% corresponds to requests that were cancelled by the driver.

Demand Vs Supply Gap Trend Identification



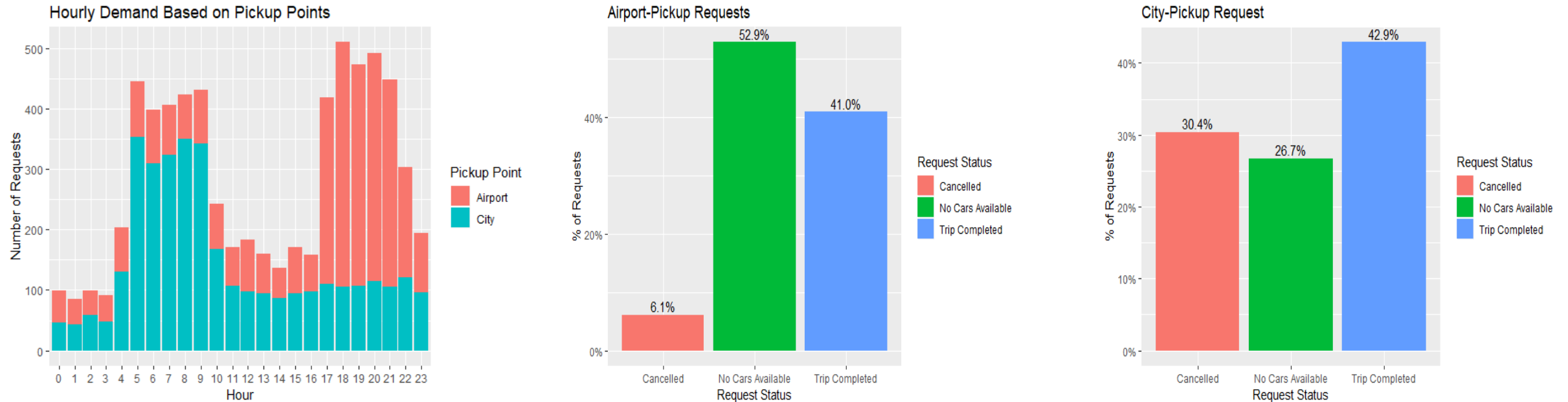
The above graphs depict the gap between demand and supply is highest at:

- Evening Peak
- Morning Peak

We need to further assess the reasons for this gap. Lets look at the reasons for this demand vs supply gap based upon pick up locations and time slot analysis.

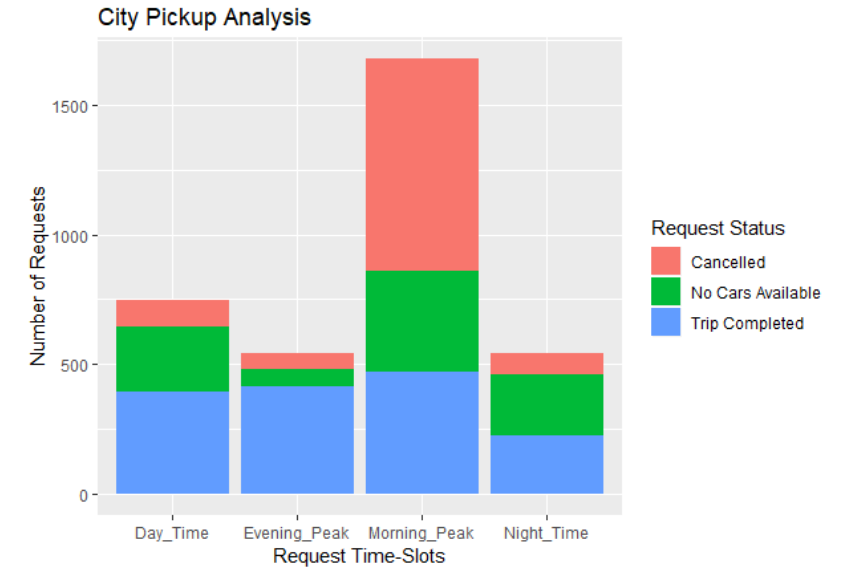
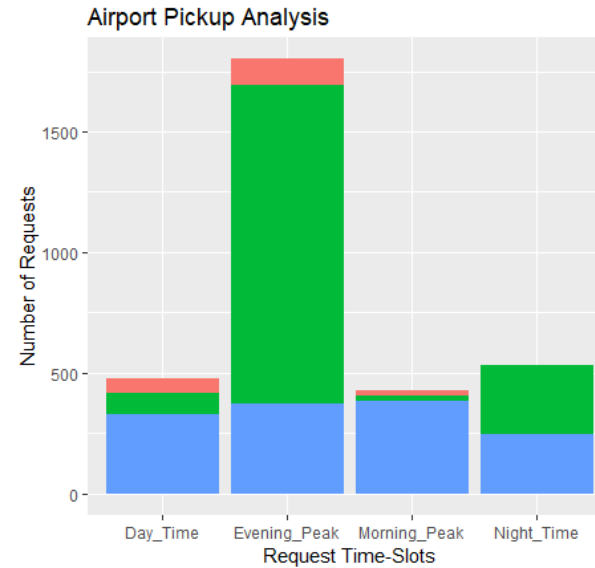
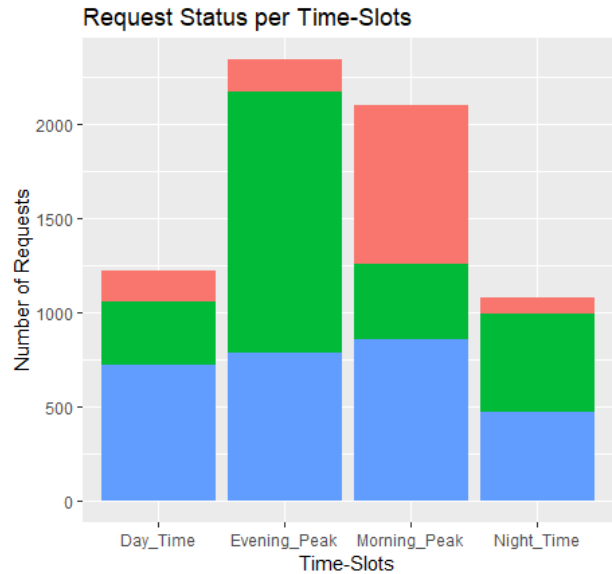
Request	Time_Slot	Total_Demand	Total_Supply	Supply_gap
1	Evening_Peak	2342	784	1558
2	Morning_Peak	2103	854	1249
3	Day_Time	1224	722	502
4	Night_Time	1076	471	605

Request Analysis based on Pick-Up Points



The above graphs analyze airport vs City pickups requests. From the analysis, we observe that:

- **City Demand is higher during morning hours and airport demand is higher during evening hours.**
- Airport vs city pick up requests completed are **41% vs 43%** respectively.
- Airport vs city denied requests are **59% vs 57%** respectively.
- Major contributor for denied requests at airport is **“No Cars Available” (~53%)**
- Major contributor for denied requests at city is **“Cancelled” requests by the drivers (~30%)**



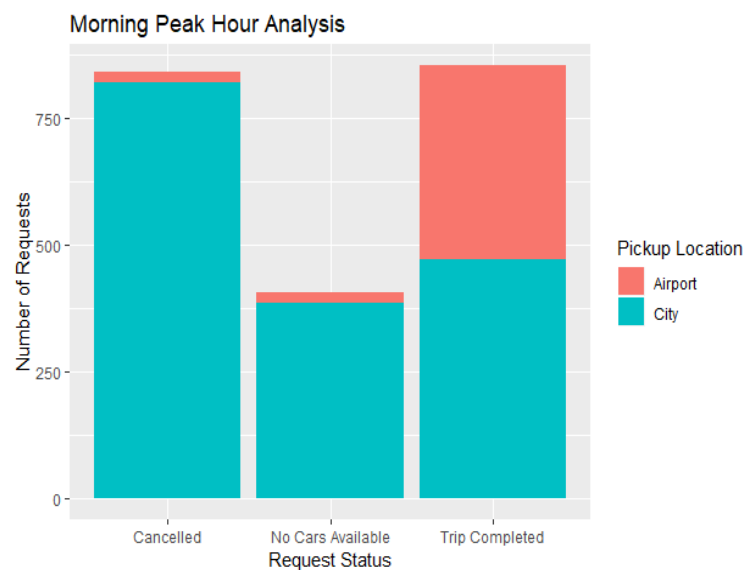
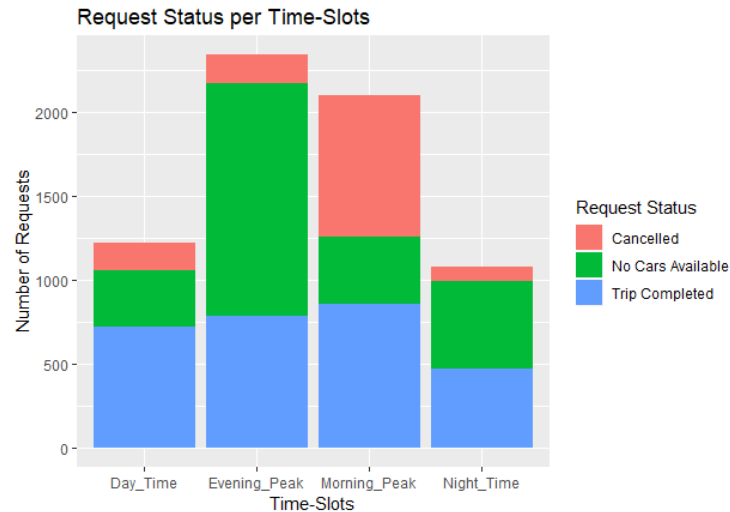
Based upon the analysis on hourly time slots, it is observed that

- The demand from the **airport** is **highest during evening peak hours**.
- The demand from the **city** is **highest during Morning Peak hours**.
- For airport demand during evening peak times, there are No Cars available.
- For City demand during morning peak times, majority of the requests are cancelled.

Problem Identification: (Combining all the analysis above and previous analysis)

- Request cancellation by drivers during Morning Peak hour for city pickups.
- No cars available at airport during Evening Peak hours.

Problem #1: Request cancellation by drivers during Morning Peak hour



- Morning Peak hour Cancellation issue by location: **City (97.3%) vs Airport(2.7%)**
- Morning Peak hour demand vs supply:

Morning Peak Hour Demand vs Supply from City	
Total Requests (Demand)	1677
Total Trips Completed (Supply)	472
Demand vs Supply Gap	1205

- **From the analysis, Cancellations during morning peak hour are more severe from City**

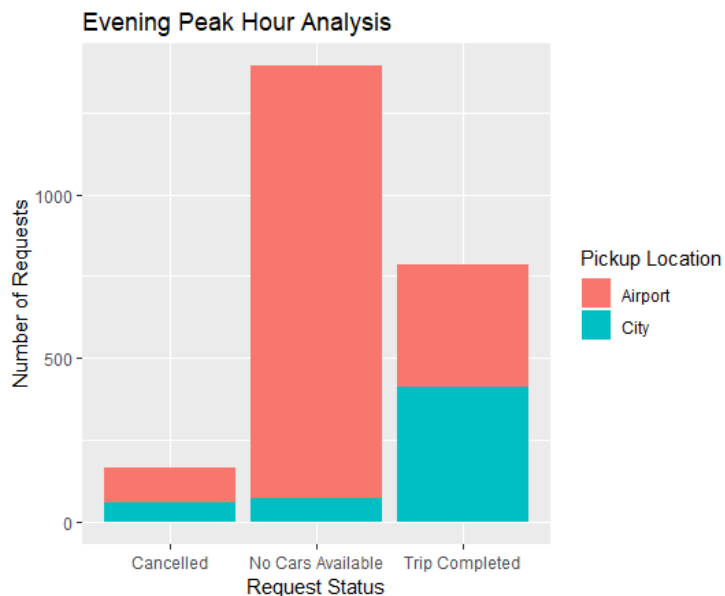
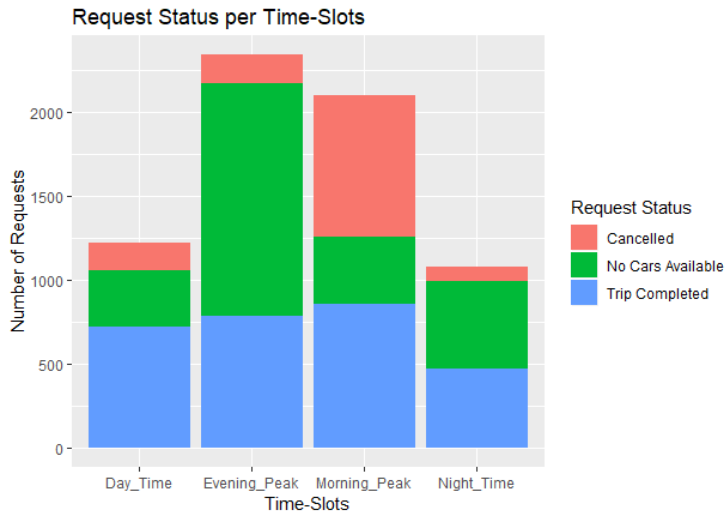
Hypothesis and Reason:

- For a driver who makes a trip from the city to the airport has to inadvertently wait for a longer duration to receive a return trip request. Consequently this will lead to increase in driver idle time, which could have been utilized for other trips if he chose not to accept a city to airport request during morning hours. In some cases the driver might have to return back to the city without a customer, therefore incurring a loss and waste of fuel. This might be the reason contributing to the high number of city-airport requests cancelled by the driver contributing to the large supply and demand gap.

Recommendations to Uber:

- Increasing the profit margin for drivers making trips from the city to the airport during Morning Peak Hours thereby encouraging the driver to take up more city-airport trips during this time slot.
- Surge pricing, by increasing the rate charged to the customer we can increase the revenue generated instead of changing the profit margin with normal prices. The benefit of the surge charge can be passed on to the drivers making this trip.
- Maintaining transparency with respect to the surge charging of customers during Morning Peak Hours.

Problem #2: No cars available at airport during Evening Peak Hours



- Evening Peak hour Car non-availability by location: **City (5.1%) vs Airport(94.9%)**
- Evening Peak hour demand vs supply:

Evening Peak Hour Demand vs Supply from Airport	
Total Requests (Demand)	1800
Total Trips Completed (Supply)	373
Demand vs Supply Gap	1427

- From the analysis, during evening peak hours, service denial at airports are more due to No Cars available than City requests.

Hypothesis and Reason:

- There is a possibility of more incoming flights during evening hours. This may be due to the high number of international flights landing during the late evening to night time. Therefore, there is significant reduction in natural supply of taxi's to the airport during the late evening rush hour. This imbalance leads to a surge in the demand for cars from customers desiring to leave the airport. The increased demand and insufficient supply contributes to the significant supply-demand gap at the airport during evening peak hours.

Recommendations to Uber:

- Introduce variable price slabs for Cab pooling for customers leaving the airport during the Evening peak Hour. This will improve the number of customers serviced through fewer supply of taxis.
- Surge Charge the customer for late evening trips from the airport. Additional perks for driver to encourage more drivers to initiate a trip toward the airport prior/during the evening peak hour and wait to pick up the airport clients.
- Maintaining transparency with respect to the surge charging of customers during Evening peak hour.

Thank You!