UBER SUPPLY DEMAND GAP -DA/BA

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TOOL USED:

- EXCEL for cleaning the data and creating the dashboard.
- SQL insights for Visualization.
- EDA-PYHTON (Pandas, NumPy, Matplotlib)

PROJECT OVERVIEW:

- ANALYZE UBER RIDE REQUEST DATA TO DETECT SUPPLY-DEMAND ISSUES.
- DATASET: RIDE LOGS WITH TIMESTAMPS, PICKUP POINT, AND TRIP STATUS.
- TOOLS: EXCEL (DASHBOARDS AND PIVOT TABLES), SQL (INSIGHTS), PYTHON (PANDAS, NUMPY, MATPLOTLIB, SEABORN).

DATA EXTRACTION:

- Standard python libraries used are:
  - NumPy 1.19.2,
  - Pandas 1.2.3,
  - Matplotlib 3.3.4
  - Seaborn 0.11.1

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

- Loading the dataset from csv to pandas data frame.

```
uberdata = pd.read_csv("Uber Request Data.csv")
```

Request id	Pickup point	Driver id	Status	Request timestamp	Drop timestamp
619	Airport	1.0	Trip Completed	11/7/2016 11:51	11/7/2016 13:00
867	Airport	1.0	Trip Completed	11/7/2016 17:57	11/7/2016 18:47
1807	City	1.0	Trip Completed	12/7/2016 9:17	12/7/2016 9:58
2532	Airport	1.0	Trip Completed	12/7/2016 21:08	12/7/2016 22:03
3112	City	1.0	Trip Completed	13-07-2016 08:33:16	13-07-2016 09:25:47

- Checking different columns data types.

```
uberdata.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6745 entries, 0 to 6744
Data columns (total 6 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   Request id         6745 non-null   int64
 1   Pickup point       6745 non-null   object
 2   Driver id          4095 non-null   float64
 3   Status             6745 non-null   object
 4   Request timestamp  6745 non-null   object
 5   Drop timestamp     2831 non-null   object
dtypes: float64(1), int64(1), object(4)
memory usage: 316.3+ KB
```

DATA CLEANING:

- Checking Null column values:
  - 'Drop timestamp' has 58 percent of null values.
  - 'Driver ID' has 39 percent of null values.
  - These entries are the rides where trip was never assigned to a driver.

```
pd.DataFrame(round((100*(uberdata.isnull().sum()/len(uberdata.index))),2))
```

Request id	0.00
Pickup point	0.00
Driver id	39.29
Status	0.00
Request timestamp	0.00
Drop timestamp	58.03

- Correcting data types of datetime columns:
  - Converting format of 'Request timestamp' and 'Drop timestamp' columns to datetime object.

```
uberdata['Request timestamp'] = pd.to_datetime(uberdata['Request timestamp'])
uberdata['Drop timestamp'] = pd.to_datetime(uberdata['Drop timestamp'])
uberdata.head(10)
```

Request id	Request timestamp	Drop timestamp
619	2016-11-07 11:51:00	2016-11-07 13:00:00
867	2016-11-07 17:57:00	2016-11-07 18:47:00
1807	2016-12-07 09:17:00	2016-12-07 09:58:00

FEATURE ENGINEERING:

- Addition of new columns:
  - 'Request Hours': By extracting hours from 'Request Timestamp' object column.
  - 'Drop Hours': By extracting hours from 'Drop Timestamp' object column.

```
uberdata['Request Hours'] = uberdata['Request timestamp'].apply(lambda x:x.hour)
uberdata['Drop Hours'] = uberdata['Drop timestamp'].apply(lambda x: x.hour)
uberdata.head(5)
```

Request id	Request timestamp	Drop timestamp	Request Hours	Drop Hours
619	2016-11-07 11:51:00	2016-11-07 13:00:00	11	13.0
867	2016-11-07 17:57:00	2016-11-07 18:47:00	17	18.0
1807	2016-12-07 09:17:00	2016-12-07 09:58:00	9	9.0
2532	2016-12-07 21:08:00	2016-12-07 22:03:00	21	22.0
3112	2016-07-13 08:33:16	2016-07-13 09:25:47	8	9.0

- Dividing all requests into different time slots:

```
def determine_time_slot(x):
    if (x >=0 and x < 8):
        return "Early morning hours"      #12am-7am
    elif (x >= 8 and x < 12):
        return "Peak morning hours"       #8am-11am
    elif (x >= 12 and x < 17):
        return "Noon hours"               #12pm-4pm
    elif (x >= 17 and x < 21):
        return "Evening hours"            #5pm-8pm
    elif (x >= 21):
        return "Night hours"              #9pm onwards


uberdata['Request Time Slot'] = uberdata['Request Hours'].apply(determine_time_slot)
uberdata[['Request id','Pickup point','Request Time Slot']].head(5)
```

Request id	Pickup point	Request Time Slot
619	Airport	Peak morning hours
867	Airport	Evening hours
1807	City	Peak morning hours
2532	Airport	Night hours
3112	City	Peak morning hours

PLOTS AND OBSERVATIONS:

- Most problematic pickup point status wise:

```
sns.countplot(x="Status",hue="Pickup point",data = uberdata)
plt.title('Status vs Airport/City trips count')
plt.ylabel('Airport/City trip count')
```

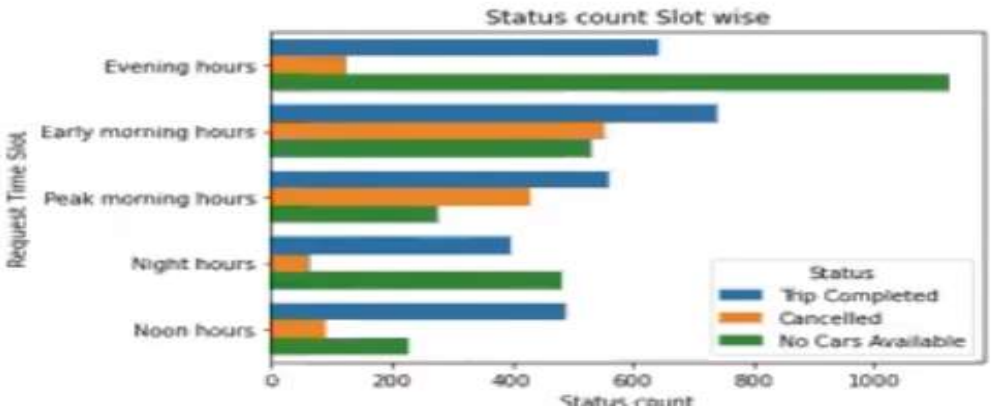
Table 1. Distribution of airport/City trips status wise

Status	Pickup Point	
	Airport	City
No Cars Available	1600-1700	900
Cancelled	175-200	1400-1500
Trip Completed	1300-1350	1500

- Most problematic time slots where rides were unsuccessful:

Table 1. Problematic time slots

Status	Request Time Slot	
	Evening	Early Morning
No Cars Available	1100-1200	500-600
Cancelled	100	550
Trip Completed	700	750-775



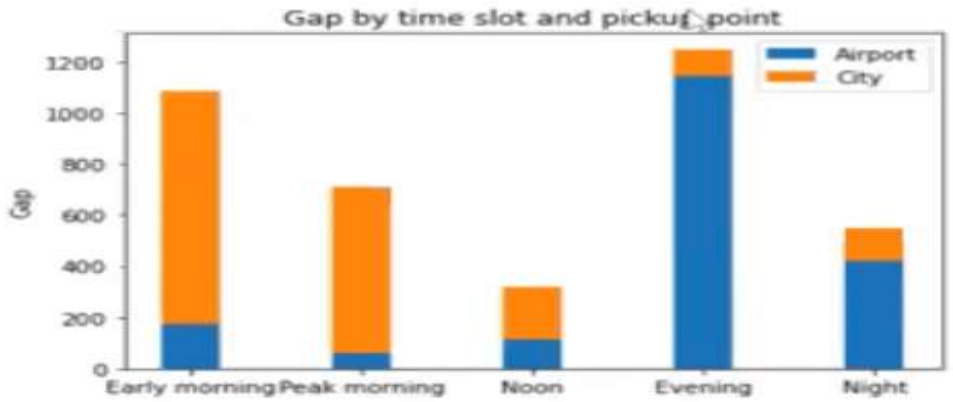
SUMMARY OF EDA INSIGHTS:

- Gap for airport pickup point is maximum in evening.

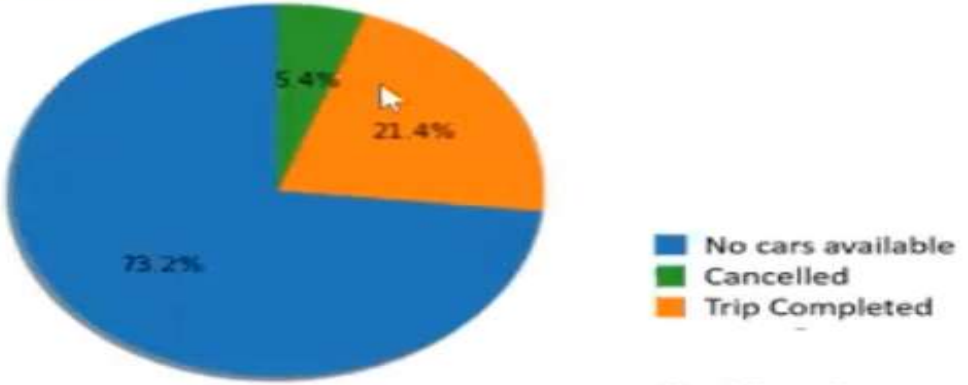
Request Time Slot	Demand_From_Airport	Supply_To_Airport	Gap_From_Airport
Evening	1457	312	1145

- Gap for city pickup point is maximum in early morning.

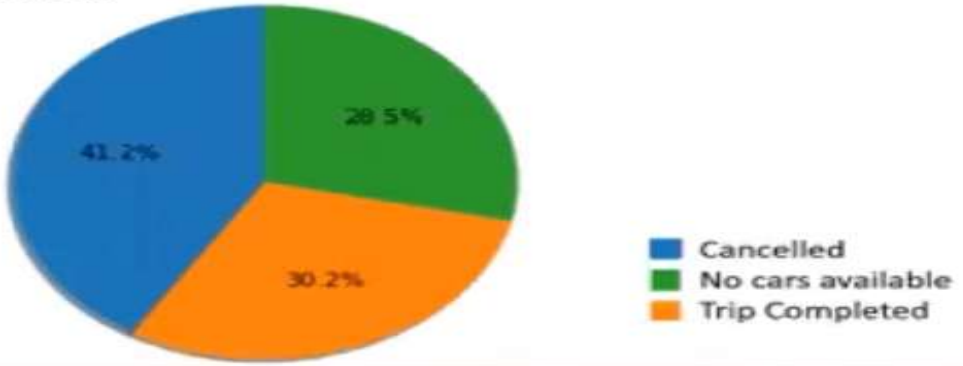
Request Time Slot	Demand_From_City	Supply_To_City	Gap_From_City
Early morning	1310	396	914



- For 73 % of total airport requests cars were not available.



- 41% of city requests were cancelled by the drivers.



SUMMARY OF SQL INSIGHTS:

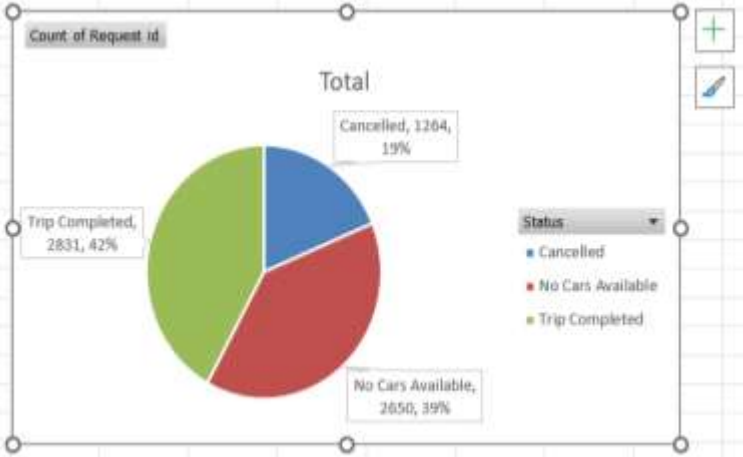
Uber_SQL_Insights.sql

C: > Users > hp > Desktop > Uber_SQL_Insights.sql

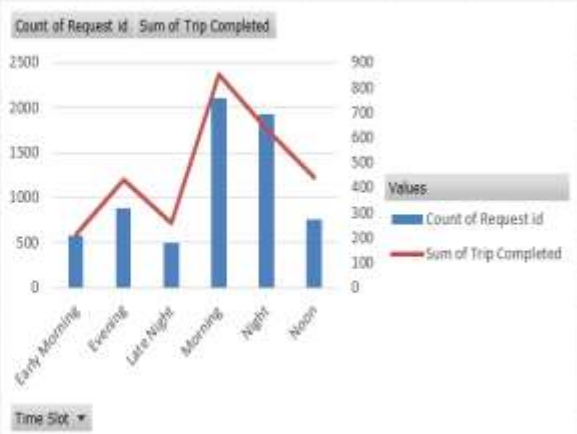
```sql
-- Total Requests by Pickup Point and Status
SELECT pickup_point, status, COUNT(*) AS total_requests
FROM uber_requests
GROUP BY pickup_point, status
ORDER BY pickup_point, total_requests DESC;

-- Hourly Demand Trend
SELECT
    HOUR(request_timestamp) AS hour_of_day,
    COUNT(*) AS total_requests
FROM uber_requests
GROUP BY hour_of_day
ORDER BY hour_of_day;

--  Requests with No Cars Available
SELECT COUNT(*) AS no_car_requests
FROM uber_requests
WHERE status = 'No Cars Available';

-- Supply vs Demand Per Hour
SELECT
    HOUR(request_timestamp) AS hour,
    COUNT(*) AS total_requests,
    SUM(CASE WHEN status = 'Trip Completed' THEN 1 ELSE 0 END) AS completed_trips,
    SUM(CASE WHEN status != 'Trip Completed' THEN 1 ELSE 0 END) AS unfulfilled_requests
FROM uber_requests
GROUP BY hour
ORDER BY hour;

-- Driver-wise Trip Completion Count
SELECT driver_id, COUNT(*) AS completed_trips
FROM uber_requests
WHERE status = 'Trip Completed'
GROUP BY driver_id
ORDER BY completed_trips DESC;

-- Cancellation Rates by Pickup Point
SELECT
    pickup_point,
    COUNT(*) AS total_requests,
    SUM(CASE WHEN status = 'Cancelled' THEN 1 ELSE 0 END) AS cancelled,
    ROUND(SUM(CASE WHEN status = 'Cancelled' THEN 1 ELSE 0 END) * 100.0 / COUNT(*), 2) AS cancel_rate_percent
FROM uber_requests
GROUP BY pickup_point;

-- Peak Hours for No Cars Available
SELECT
    HOUR(request_timestamp) AS hour,
    COUNT(*) AS no_car_count
FROM uber_requests
WHERE status = 'No Cars Available'
GROUP BY hour
ORDER BY no_car_count DESC
LIMIT 5;

```

SUMMARY OF EXCEL INSIGHTS:

Row Labels	Count of Request id
Cancelled	1264
No Cars Available	2650
Trip Completed	2831
Grand Total	**6745**



Row Labels	Count of Request id	Sum of Trip Completed	Gap
Early Morning	578	214	364
Evening	884	432	452
Late Night	498	257	241
Morning	2103	854	1249
Night	1924	633	1291
Noon	758	441	317
Grand Total	**6745**	**2831**	**3914**



Row Labels	Count of Request id
0	99
1	85
2	99
3	92
4	203
5	445
6	398
7	406
8	423
9	431
10	243
11	171
12	184
13	160
14	136
15	171
16	159
17	418
18	510
19	473
20	492
21	449
22	304
23	194
Grand Total	**6745**

SOLUTION FOR THE SUPPLY DEMAND GAP:

- For the trips in the early morning, drivers can be incentivized to make those trips.
  1. Uber can pay for the gas mileage of drivers to come back to the city without a rider.
  2. Uber can increase the demand at the airport to reduce idle time – by increased marketing and price cuts for the passengers.
  3. Uber can request a feedback from drivers to understand reasons behind ride cancellation.

- For the trips in evening, some of the ways are:
  1. Uber can also pay drivers to come without a passenger to the airport.
  2. Another innovative way can be to encourage passengers to pool the ride with others so that lesser number of cars can serve more passengers.

THANK YOU

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