Bolt Campaign Analyst Take Home Test

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Objective:

- To analyse Demand and Supply Pattern from the given data.
- To identify the critical time periods
- To Calculate the gap between Supply and Demand volume.
- To estimate required Online Hours for better Coverage.
- To calculate the minimum guaranteed amount to be paid to riders in crucial periods.

Given Demand and Supply Data:

Demand:

- **Date** – date and hour
- **People saw 0 cars (unique)** – number of users who did not see a car
- **People saw +1 cars (unique)** – number of users who saw at least a car
- **Coverage Ratio (%)** – proportion of users who saw at least a car

Supply:

- **Date** – date and hour
- **Active riders** – number of active riders (any level of activity) available
- **Online (h)** – total supply hours available
- **Has booking (h)** – total hours when riders had a client booking (any state)
- **Waiting for booking (h)** – total hours which riders spent waiting for booking
- **Hours per active rider** – average number of hours each rider was online
- **Rides per online hour** (RPH) – average finished trips per online hour
- **Finished Rides** – number of finished trip

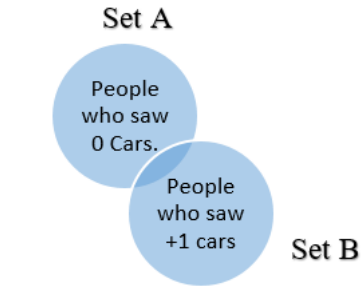
	Date	Active drivers	Online (h)	Has booking (h)	Waiting for booking (h)	Hours per active driver	Rides per online hour	Finished Rides	People saw 0 cars (unique)	People saw +1 cars (unique)	Coverage Ratio (%)
0	2016-12-18 23	52	18	6	11	0.3	0.67	12.0	9	32	78
1	2016-12-18 22	59	20	11	9	0.3	1.40	28.0	29	64	69
2	2016-12-18 21	72	25	7	18	0.3	0.64	16.0	5	39	89
3	2016-12-18 20	86	29	7	23	0.3	0.52	15.0	13	48	79
4	2016-12-18 19	82	31	14	17	0.4	1.16	36.0	12	77	87

Observations:

- The ideal total demand of customers is all the people looking for a ride. This means all the people who didn't see any car and all the people who could see at least one car.
- Active riders include all the riders. This include the riders currently on their ride, have a booking, and riders looking for a booking. In order to calculate the supply, we need, we need to find the estimate of riders waiting for booking.

Demand Estimation:

- According to the given data, people who saw a car which later disappeared, is counted in both columns of given demand data. This means there is no exact way to calculate the exact number of people who were looking for a ride.
- However, considering the sum of both the values, we can estimate the total supply.



$A \cap B \neq 0$

$AUB \neq A+B$

$AUB > A+B$

The idea behind this approach is, the sum of both these values will give us a number higher than required. This value will cover our exact demand.

Therefore, Estimated demand=

(People who saw 0 cars) + (People who saw +1 cars)

Supply Estimation:

To calculate our supply, we need to find out the riders who were waiting for booking per hour.

Estimated Supply =

Active riders – [(Finished Rides) +
((Has Booking) /
(Hours per active rider))]

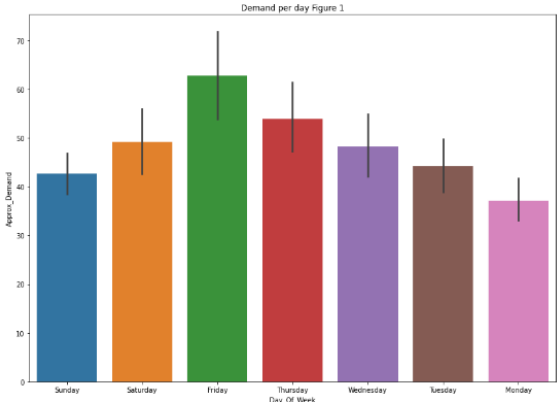
This value will exclude all the riders who were able to complete their ride and all the riders who had bookings.

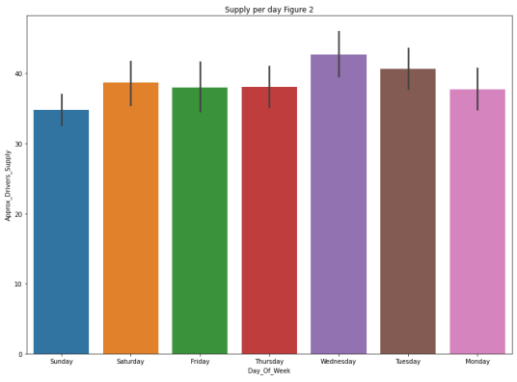
Demand vs Supply Analysis:

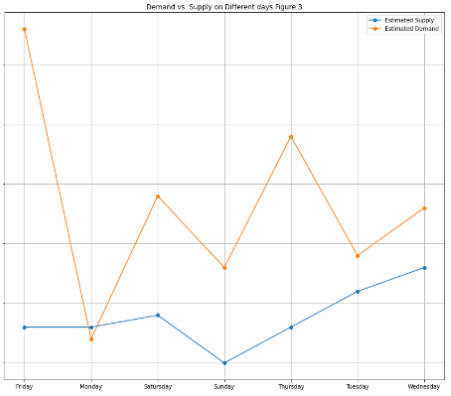
The following section shows the variation in Demand vs Supply with respect to: Hours, Days and Timeslots.

A) Demand vs Supply with respect to Weekdays.

- It can be seen from fig 1 in figure below, Demand varies a lot over weekdays, with maximum demand on Fridays followed by Thursday. The lowest demand is observed on Sunday
- Unlike Demand, the supply doesn't show a lot of variation with almost similar values over all days, which can be seen from fig 2.
- Maximum gap between Demand and Supply can be seen on Thursday. (fig 3)

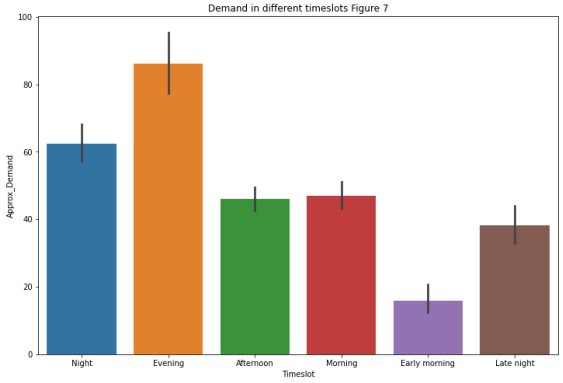


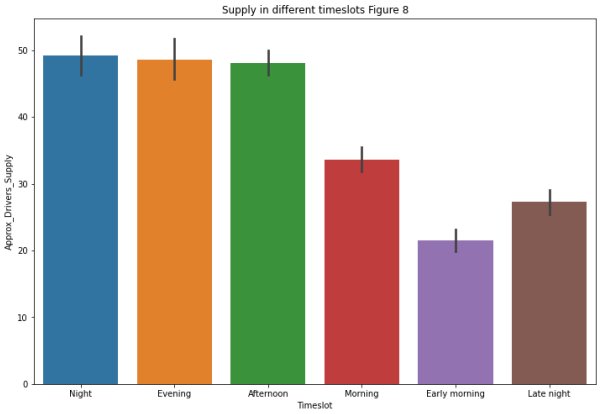


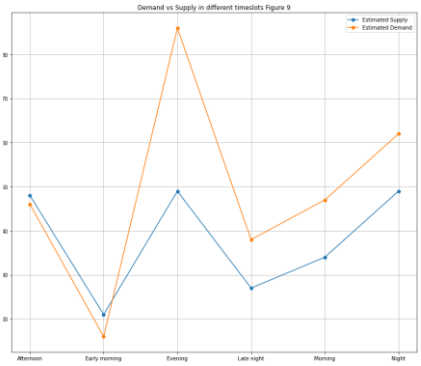


B) Demand vs Supply with respect to Timeslots.

- It can be seen from fig 7 in figure below, Demand varies a lot over timeslots, with maximum demand in Evenings (After office hours) followed by Mornings and Afternoon. The lowest demand is observed in Early morning periods.
- The supply also shares a similar trend similar values with maximum values in Evenings and Nights. The lowest supply can be seen in early mornings. (Fig 8 2)
- The crucial hours can be easily seen from the high values of demand in the Evenings (Fig 9).

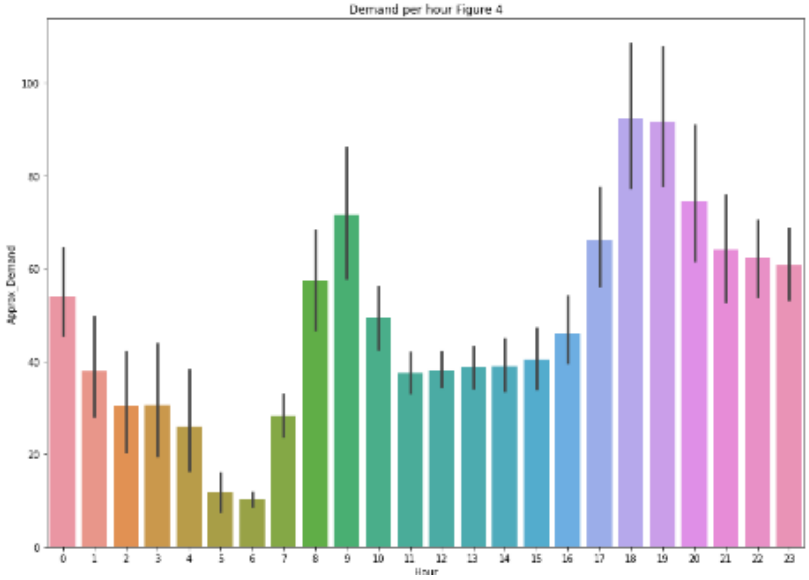




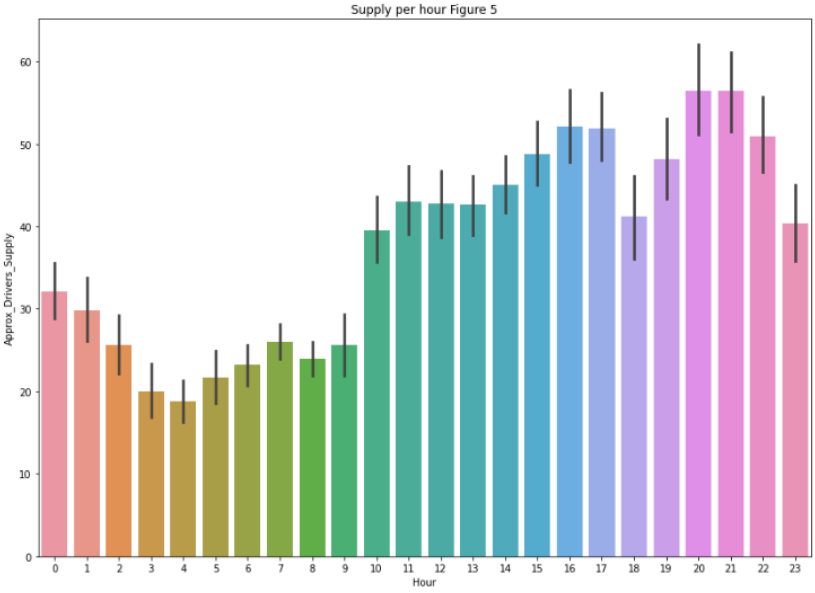


C) Demand vs Supply with respect to Hours.

- From the fig 4, it can be clearly seen that crucial hours are from 0800-1000 in the morning and 1800-2000 in the evening.
- The maximum peak for demand per hour is from 1900-2000 hours.

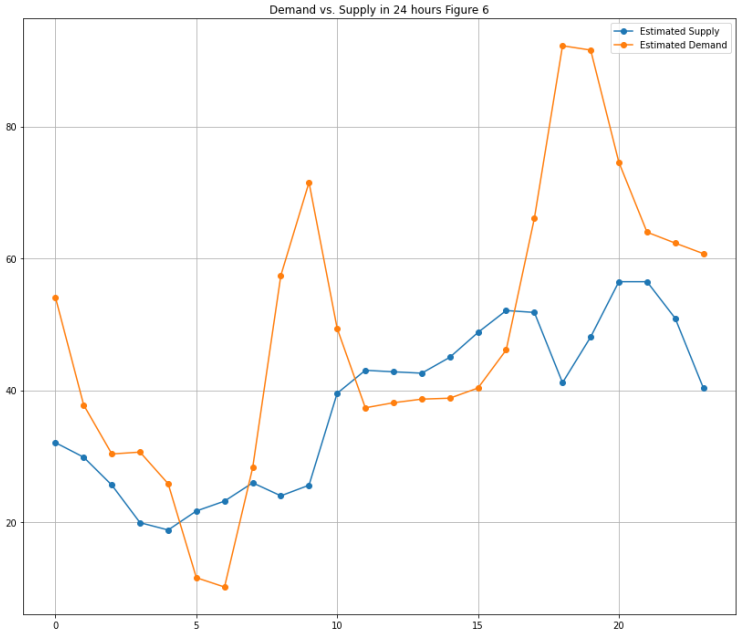


- From the supply fig 5, a similar trend can be seen. The supply per hour slowly increases from morning (0800 hours) till evenings (2022).
- The highest supply can be easily seen between 1900-2100.



- The figure 6 clearly shows the Demand and supply gap per hours for the given period.

- There is a huge gap between Supply and Demand in morning hours and evening hours (from 0800-1000 and 1800-2020).



Observation:

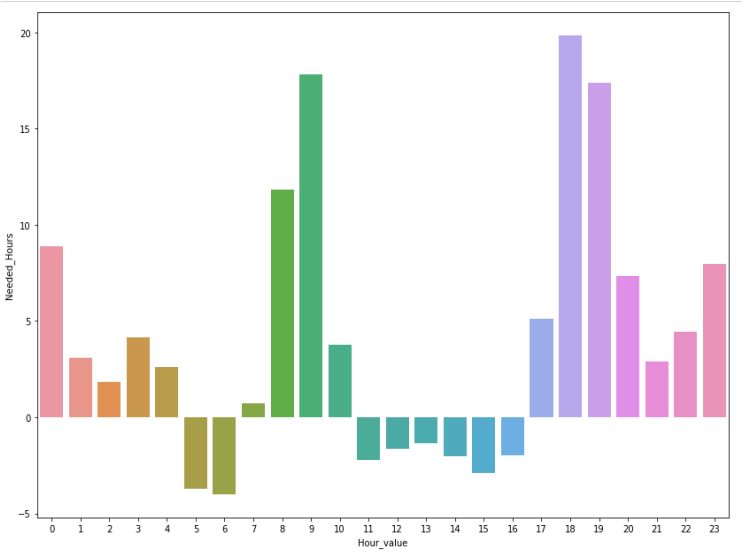
- Crucial period (When demand is High): The crucial hours per day with heavy demand are between **0800-1000** and **1800-2000**. The days with most demand are **Thursdays and Fridays.**
- Travelling hours when most people are going to their work and after office hours are the most crucial. Similarly, Fridays are also very important day per week, as people usually travel back home for weekends.

Online hours Required:

- To calculate the online hours required for better coverage, we need to calculate the Gap between Demand and supply.
    - **Gap (per hour) = Demand (Per hour)- Supply (Per hour).**
    - The negative values in Gap can be ignored as it will only denote supply was more than required and coverage was already 100%.

The Online hours can be estimated by:

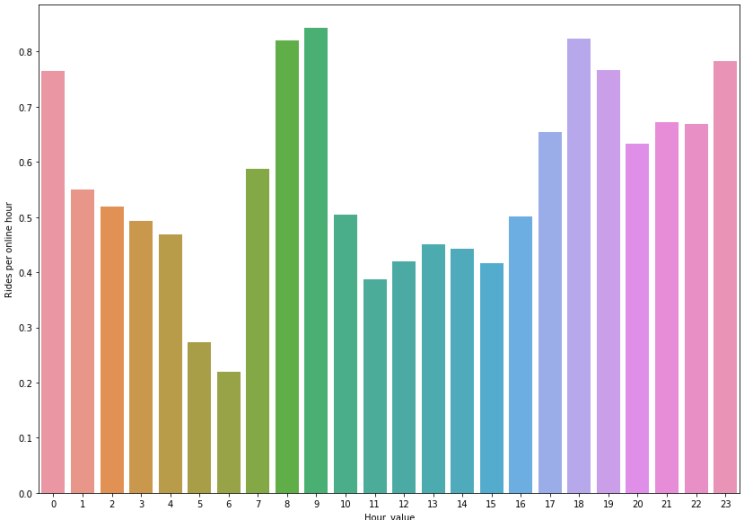
- **Online Hours Needed = Gap * Hour per active rider.**
- This value will give us extra hours needed per hour per day.
- Fig shows the value of extra hour needed for a better coverage.



Observation:

- The crucial time periods (0800-1000 and 1800-2000) need the most extra online hours (**approximately 18 hours in the mornings and 20 hours in the evenings**.)
- The negative value shows how many extra hours we have. This can also be interpreted as we have extra riders than needed we require.

Minimum guaranteed Amount to be paid to riders:



In order to estimate how much amount should be guaranteed to the riders we need to see how many rides are completed per rider in the given hour. The fig shows the variation in rides per hour with hours.

Assumption:

For both morning and evening crucial period, the approximate completed rides per hour = 0.8. (From the figure shown.)

A ride costs 10 euros, and a rider makes 8 euros (80%) per ride, Bolt makes 2 euros (20%)

The minimum amount Bolt can guarantee can be divided into three cases.

a) 75% of average amount what a rider makes (i.e. 8 euros) = 6 without changing the price of rides for the customer.
b) 50% of average amount what a rider makes (i.e. 8 euros) = 6 without changing the price of rides for the customer
c) Average amount a rider makes for a ride (i.e. 8 euros) by increasing the price of ride for peak hours to 120%.

Case a:

If a customer completes a ride of worth 5 euros, he will be getting 80% (4 euros) from the ride and the rest of the 2 euros will be paid by Bolt. The total amount the company will have to. pay will be one euro.

Case b:

If a customer completes a ride of worth 5 euros, he will be getting 80% (4 euros) from the ride and company will not have to pay the rest amount of money. This will generate one euro for a ride worth of 5 euros for the company.

Since the average value of a ride is 10 euros, it is very unlikely that a ride in the peak hour will amount to less than the average value.

Case c:

For the same case, the same ride will cost 6 euros. The rider will earn 4.8 euros from the ride and company will pay the rest 3.2 euros. The total amount that bolt will have to pay would be 2 euros. This case will attract the most amount of supply, which will guarantee a higher coverage. However, the price is more for peak hours, the customers might look for other alternatives.

(Refer to the attached Jupyter Notebook for more details)