Lyft Data Science Challenge - Ananya Garg & Sukanto Guha

Driver's lifetime value and **factors that affect a driver's lifetime value**

We believe that a driver's lifetime value is a function of the following:

1. How fast they accept trips
2. How accurately and quickly they are able to navigate to the pick-up point
3. How many days (since onboarding) do they drive for Lyft (Fig 1)
4. How many hours a day they drive for Lyft
5. How many prime-time rides do they take

Based on this, we derived a rating system for the drivers, and checked if higher rated drivers differentiated their behaviour from lower rated drivers. We then checked how drivers performed on the above metrics, and thus calculated the value of a driver to Lyft. 1 is the best rating and 3 is the worst. We got a strong positive correlation on 3 of the 5 metrics above. Here is the graph showing the same:

Fig 1: For metric 1, as the driver has a lower rating, the average time taken to accept the trip increased, thereby decreasing the value of a driver.

Fig 2: For metric 2, as rating for worse, the average time taken to reach the user increased, thereby decreasing the value of a driver. While it is possible that these maybe genuine cases of drivers unable to find their riders, we believe the trend line is significant enough to be correlated to the rating and not accidental.

Fig 3: As we see, our top rated drivers (line in purple) do not take just Prime-Time rides, and their frequency of prime time rides remains pretty much constant (around 200 prime time rides). This increases the value if the driver, as they care about their passengers over making extra bucks every ride.

Fig 1.Rating vs avg(accepted_at - requested_at)

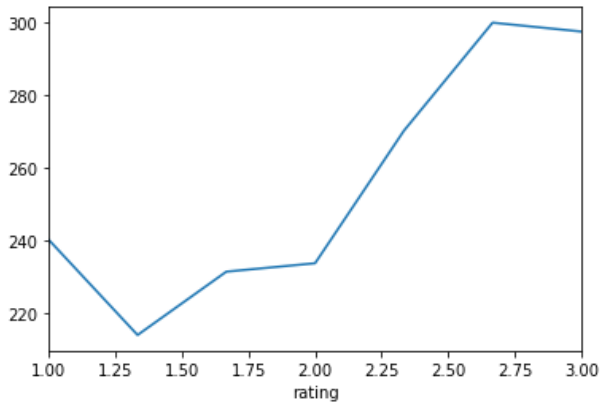


Fig 2. Rating vs avg(arrived_at - accepted_at)

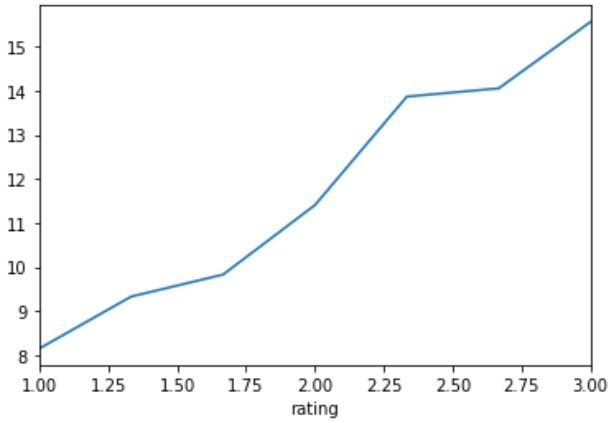
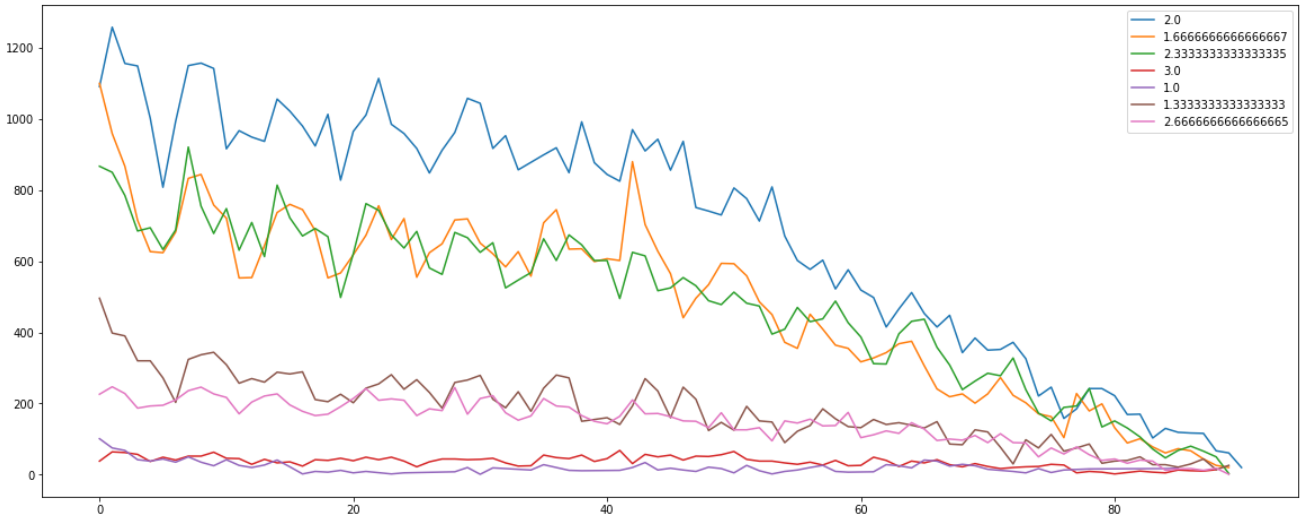
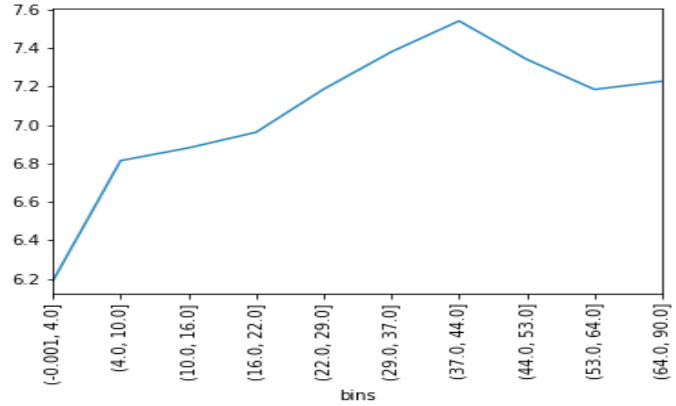


Fig 3: (Days since onboarding) vs (No of prime time rides taken per day), each line is for a rating

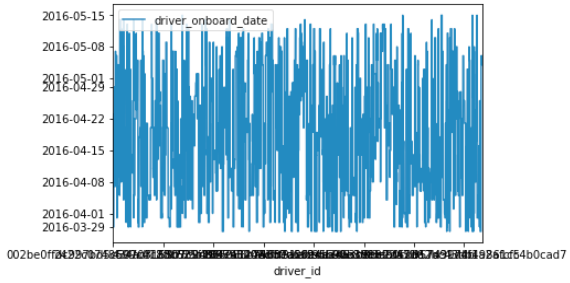


Average Projected Lifetime for a Driver

Y- axis - Average number of rides per day by a driver - just the count of rides.
X- axis - How many days a driver has driven on Lyft since onboarding.



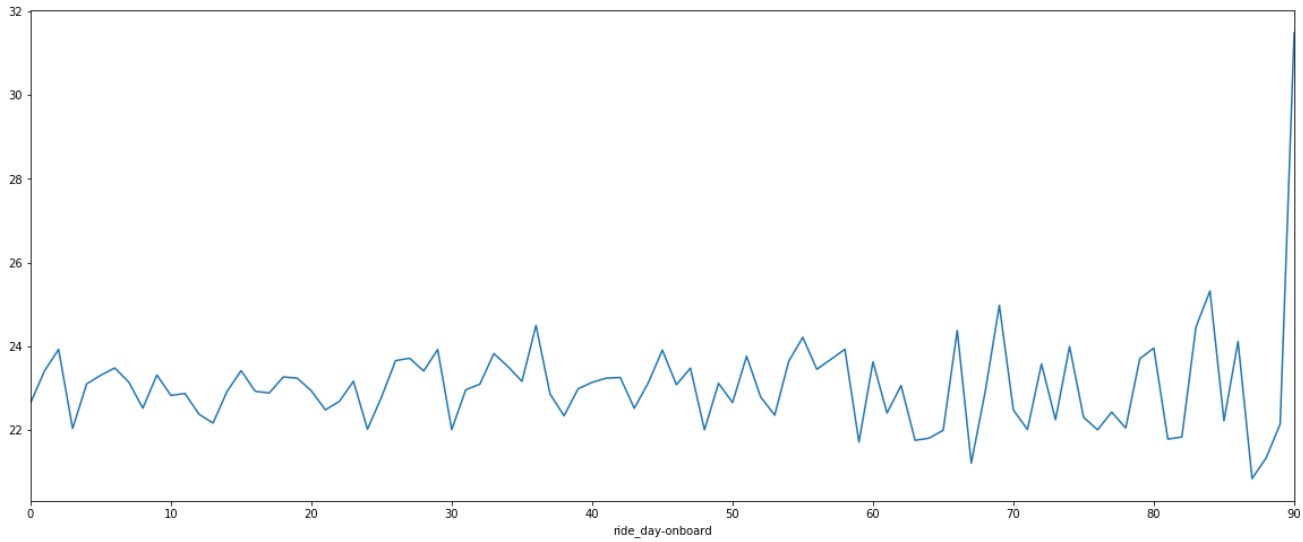
We use days from onboarding as a measure instead of the driver_onboard_date provided, as drivers are on boarded all throughout the 3 months as seen below.



We also deduced that on average, drivers peak with 7.5 rides about 35-40 days into using the app, after which it declines back down onto a steady state. We do notice they still average about 7.1 rides a day even after 90 days, which seems to indicate a reasonable retention on average.
We combine this with the following:
Mean ride time = 14.31 min
Median ride time - 12.11 min

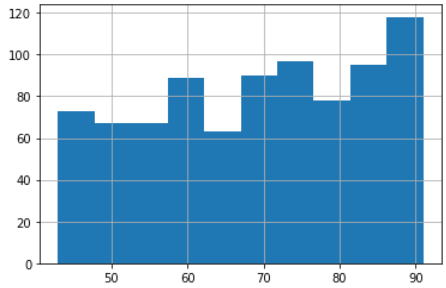
Drivers with all rides less than 15 min = short ride drivers
Fare for rides longer than 15 mins is $33.86
Fare for shorter rides it is $15.03.
Thus we can conclude that a driver with about 7.5 rides makes a mean $23.02 per ride, and daily wages of $100 a day. This average cost of ride stays pretty consistent as the days since onboarding increase, as we can see in the graph below:

Fig: (days since onboarding) vs avg(daily fare)



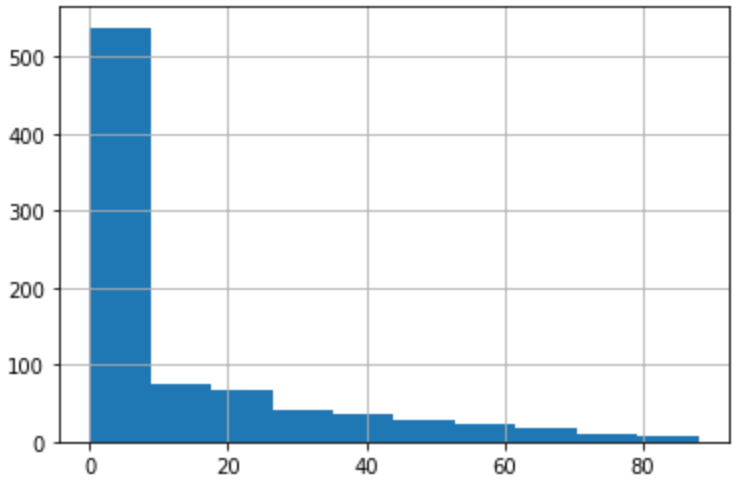
Given that drivers more or less earn a consistent amount on Lyft, we wonder what the churn is. We know that the last day in our data set is ‘2016-06-27 00:50:50’. The first day of onboarding is ‘2016-03-28 00:00:00'. First we plot how many days each driver had as their performance period

Fig: Histogram for the window of performance of a driver



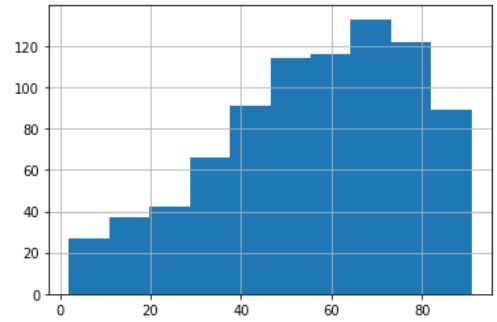
So we see that out of 837 drivers, about 500 had more than 50 days of performance. However, if we check the difference of their last ride from the last day of the data, we get a much more dismal figure:

Fig. Histogram of how many days before the last day, the drivers stopped driving



This graph above plots the day they last drove from the last date (‘‘2016-06-27 00:50:50’). We see that 500 of these drivers drove right up till the last day, thus showing us a good retention. What is shocking is how that number rapidly drops, and we have over 50 drivers who haven’t driven for 20 days, which is a good enough sign that they have left Lyft. We combine the data from these two graphs, to see that in a 90 day period, how many drivers are likely to drive for how many days:

Fig. Histogram of how many days a driver is likely to drive in a 90-day period



While we see that it peaks around 80 days, this graph actually shows a very dismal performance. It means that out of 90 days:

1. only about 87 drivers out of 837 are likely to drive for all 90 days (almost just 10%)
2. About 130-140 drivers will stop after 80 days, which means most drivers lost majority of their incentives to drive after a couple of months
3. 20/837 drivers don’t drive for even a single day, thus wasting the time, effort and money spent in the onboarding process

This shows us that effectively, 10% of the drivers onboarded are truly valuable to Lyft.

<u>Differences between Driver segments</u>

A) Full time vs part time on Lyft

The max a driver has driven is 31447 seconds = 8h 45 min of trips in a single day, and the mean is 1h 41 min daily. Let’s say that if a driver is driving more than 1.5 hours of driving time daily, then they are doing this as their primary occupation, as driving time of 2 hours excludes overheads such as pickup time, wait time, petrol-filling, etc. We believe that drivers who have Lyft as their primary occupation are more valuable, because they will be more willing to work odd hours, take arduous prime rides and short, not-very-profitable trips.

We see the following break-up in the histograms of the no. of hours driven on average:

Fig 1. Less than 2 hours per day

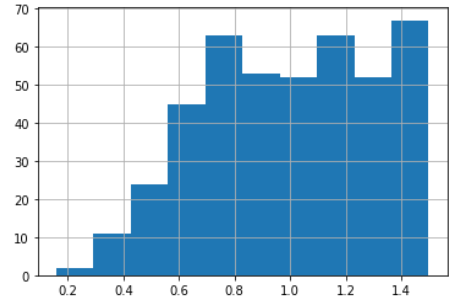
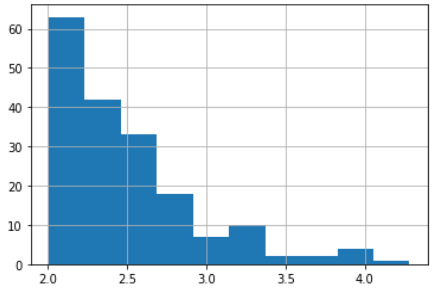
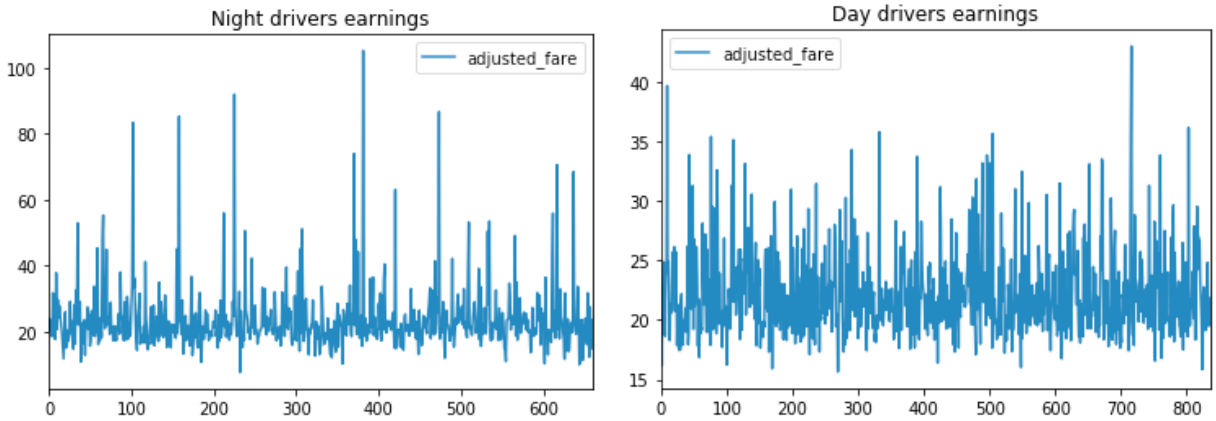


Fig 2. More than 2 hours per day



B) Day time vs night time drivers

Day Drivers = Primarily driving between 6 AM and 10 PM PDT.
Night drivers = Primarily driving between 10 PM and 6 am PDT.
The graphs below show the earnings for each driver in these phases.



We observe that night drivers earn more per trip, but they take fewer trips. However, the average(both mean and median) earning per trip consolidated over all drivers was the same for both day and night. Based on our metrics above, we feel drivers who drive all night are more valuable to Lyft as there are more prime times ride at night, while time to accept the trip remains the same, and the time to arrive after accepting the trip is 18 seconds lesser for the night drivers (247s vs 265s). This is a huge difference and most of it can be attributed to the lack of traffic. However, if earnings are the same, the night rides add more value to Lyft as the service experienced by customers is better.

Actionable Recommendations

A 100 drivers out of the 937 given in the dataset had been onboarded but did not use Lyft in the first 3 months. We strongly recommend that if drivers have not taken at least 10 rides in the first month, they should be contacted to find out what their issues are, as Lyft spent money to acquire them, so them not driving is a sunk cost.

In addition to our conclusions from the data above, we feel a Driver's Lifetime Value should also include the following parameters, which were not included in the data but nevertheless seem important to us:

1. Acquisition cost of the driver - how much is Lyft spending to acquire a driver? How much is the referral bonus? That data along with the number of hours they drive would present a more realistic picture of a driver's value - as a driver may be more valuable if they drive close to average hours but refer other drivers often!
2. Churn rate for drivers - How often, historically, do drivers stop using Lyft? What is the average time drivers drive on the app for? Since we had data for only 3 months, we witnessed the peak and gradual decline of drivers using the app.