✓ **Portfolio Project** | Bay Wheels User Analysis

INTRODUCTION: Here's what you need to know: Lyft purchased its bike share program from Ford (who owned GoBike) and needs a data analyst – that's you! – to help the marketing team use data-driven approaches in their new marketing efforts. You've been tasked by your manager to investigate the differences between Lyft users and Ford users. Lyft wants to increase memberships in its rideshare program and needs to determine how their users, both past and present, use their product.

HOW IT WORKS: Follow the prompts in the questions below to investigate your data. Post your answers in the provided boxes: the **yellow boxes** for the queries you write, **purple boxes** for visualizations and **blue boxes** for text-based answers. When you're done, export your document as a pdf file and submit it on the Milestone page – see instructions for creating a PDF at the end of the Milestone.

RESOURCES: If you need hints on the Milestone or are feeling stuck, there are multiple ways of getting help. Attend Drop-In Hours to work on these problems with your peers, or reach out to the HelpHub if you have questions. Good luck!

PROMPT: Congratulations are in order! You've been hired as an intern by Lyft, one of the largest ride-sharing transportation providers in the country. In your new role, you'll be working on the Lyft Bay Wheels product: their latest initiative that provides rental bikes all across San Francisco through the Lyft app.

SQL App: Here's that link to our specialized SQL app, where you'll write your SQL queries and interact with the data.

– Data Set **Description**

To begin, you'll query a total of 3 datasets. You'll start with the `lyft.baywheels` and `ford.gobike` datasets available in your schema. Later, you will join the sf.weather dataset.

The `lyft.baywheels` dataset reports information about rentals made on the Bay Wheels bike share system. Each row represents a single rental; we will be making use of the following fields in this project:

- **`started_date`** - Date for start of rental
- **`started_at`** - Timestamp for start of rental
- **`ended_at`** - Timestamp for end of rental
- **`start_station_name`** - For rentals that started from a bike dock, the name of the dock.
- **`end_station_name`** - For rentals that ended at a bike dock, the name of the dock.
- **`start_lat`**, **`start_lng`** - Latitude and longitude, respectively, of the start of the rental.
- **`end_lat`**, **`end_lng`** - Latitude and longitude, respectively, of the end of the rental.
- **`member_casual`** - String indicating whether the rental was made by a system "member", who has a monthly subscription with the bikeshare system, or by a "casual" user, who is making a one-time rental.

The `ford.gobike` dataset has information very similar to the `lyft.baywheels` table, but reports rides prior to Lyft's takeover of the bikeshare system. One major distinction between the two tables is different field names. The field names in the `ford.gobike` dataset will be explained through the course of the project tasks.

The `sf.weather` dataset contains daily weather statistics recorded at SF International Airport through 2020. We will be concerned with the following three features in this project:

- **`date`** - Date of weather recordings
- **`temperature_avg`** - Average temperature in Fahrenheit
- **`precipitation`** - Recorded precipitation in inches

– **Task 1:** Top User Engagement

These datasets are currently captured in your SQL database in separate tables, but your manager has told you that they are indeed the same data, just with different names.

Before you can start analyzing customer activity, you first need to combine the data needed from Ford and Lyft. While the datasets are currently captured in your SQL database in separate data tables, your manager has assured you that they are the same data, though with different variable names. Below is a table of equivalent columns between the two datasets, detailing which columns in the `lyft.baywheels` data set match which columns in the `ford.gobike` data table.

Lyft Bay Wheels	**Ford GoBike**
started_date	start_date
started_at	start_time
ended_at	end_time
start_station_name	start_station_name
end_station_name	end_station_name
start_lat	start_station_latitude
start_lng	start_station_longitude
end_lat	end_station_latitude
end_lng	end_station_longitude
member_casual	user_type

A. Write a query that filters the `ford.gobike` data to only include data from the year 2020. HINT: Use the `date_part` function in SQL!

```
SELECT
  *
FROM
  ford.gobike
WHERE
  DATE_PART ('year', start_date) = 2020
```

B. Write a query that unions the `ford.gobike` dataset and the `lyft.baywheels` dataset using the corresponding columns above. Make sure that you are still filtering to the year 2020 on the Ford data.

Note: You will want the Lyft data to be the first table in your query so that the column names from the Lyft dataset become the standard ones for the remainder of your analysis.

```
SELECT
  started_date,
  started_at,
  ended_at,
  start_station_name,
  end_station_name,
  start_lat,
  start_lng,
  end_lat,
  end_lng,
  member_casual
```

```
FROM
 lyft.baywheels
UNION
SELECT
  start_date,
  start_time,
  end_time,
  start_station_name,
  end_station_name,
  start_station_latitude,
  end_station_longitude,
  end_station_latitude,
  end_station_longitude,
  user_type
FROM
  ford.gobike
WHERE
  DATE_PART ('year', start_date) = 2020
```

After showing the result of the query to your manager, she tells you that she wants to know which data source is attributed to each row. She asks you to create a new column called `data_source` that has the value ‘Lyft’ if the data came from the Lyft dataset and the value ‘Ford’ if it came from the Ford dataset.

A colleague teaches you a simple method to do this. When writing your query, add an additional column after your select statement. Here is an example of this for the Lyft table:

```
SELECT
  *,
  'Lyft' AS data_source
FROM lyft_baywheels
```

Modify your query from part B to include the `data_source` column.

```
SELECT
  started_date,
  started_at,
  ended_at,
  start_station_name,
  end_station_name,
  start_lat,
  start_lng,
  end_lat,
  end_lng,
  member_casual,
  'Lyft' AS data_source
FROM
 lyft.baywheels
UNION
SELECT
  start_date,
  start_time,
  end_time,
  start_station_name,
  end_station_name,
  start_station_latitude,
  end_station_longitude,
  end_station_latitude,
  end_station_longitude,
  user_type,
  'Ford' AS data_source
FROM
  ford.gobike
WHERE
  DATE_PART ('year', start_date) = 2020
```

Great! Since you and other members on your team will be referencing the output of your query for deeper analysis, your manager asked the Engineering team to store it specially in your schema. **For the remainder of this project, you'll query** `project.ford_lyft_analysis`.

– **Task 2:** Preparing the Data and Creating New Features

Now that we have combined and joined our three data tables together, you'll need to create additional variables so that you can perform the analysis your manager is asking from you.

A. The member_casual column is supposed to indicate whether the rental was made by a system "member", who has a monthly subscription, or by a "casual" user, who is making a one-time rental. You notice that the member_casual column actually has *four* different values: 'member', 'Subscriber', 'casual', and 'Customer'. This is because Ford referred to its members as 'Subscribers' and its casual users as 'Customer' in its data.

Write a query that returns all the variables from `project.ford_lyft_analysis`, plus a new variable called "member_type", that contains **only values that match the Lyft classifications: 'member' or 'casual'**.

In other words, if member_casual is equal to 'Subscriber' your member_type field should be the string 'member' and if member_casual is equal to 'Customer', your member_type field should be the string 'casual'. Remember SQL is case sensitive!

```
SELECT
  *,
  CASE
    WHEN member_casual = 'Subscriber' THEN 'member'
    WHEN member_casual = 'Customer' THEN 'casual'
    ELSE member_casual
  END AS member_type
FROM
  project.ford_lyft_analysis
```

B. Almost there! After going over the table with your manager, she hypothesises that patterns are driven by changes in weather and wants you to incorporate weather data into your analysis.

You both decide San Francisco's average daily temperature and amount of precipitation are the best metrics to base your weather analysis on. These are located in the `temperature_avg` and `precipitation` columns, respectively, of the `sf.weather` table.

Modify your query from part A to join the table with the `sf_weather` data on the `started_date` field. From the `sf_weather` table, return the average daily temperature, and the amount of precipitation.

```
SELECT
  a.*,
  CASE
    WHEN member_casual = 'Subscriber' THEN 'member'
    WHEN member_casual = 'Customer' THEN 'casual'
    ELSE member_casual
  END AS member_type,
  b.temperature_avg,
  b.precipitation
FROM
  project.ford_lyft_analysis AS a
  INNER JOIN sf.weather AS b ON a.started_date = b.date
```

That's it! Now this query will result in almost 2 million records for the year 2020! Since SQLPad will only let you download 150,000 records in a .csv, the engineering team used some extra tools they have to download the result of your query. It's loaded for you in a Tableau Workbook, where you'll complete the rest of your project.

– **Task 3:** Visualizing and Analyzing Using Tableau

Phew! Now that you've gotten the query out of the way, you're ready to dive into investigating the differences between Lyft users and Ford users so that the marketing team at Lyft can make the best plan possible to help increase memberships in its rideshare program. The remaining Tasks will be completed in Tableau, and will focus on visualizing and analyzing your results. Click this link **to navigate to the workbook you'll use to complete the remainder of this Project.**

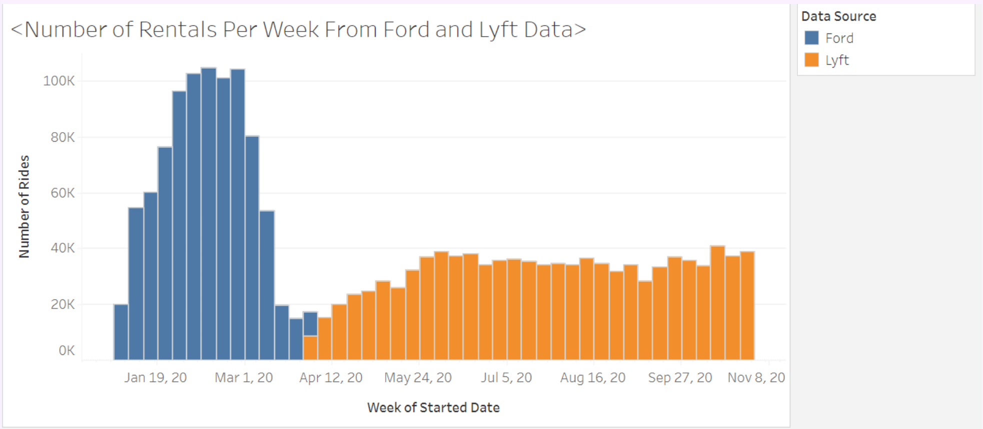
Once you've published your Tableau Workbook, paste the Share Link in the box below.

https://prod-useast-b.online.tableau.com/#/site/globaltech/workbooks/747755?:origin=card_share_link

Continue to post your answers in the provided boxes: purple boxes for your visualizations, and blue boxes for text-based answers.

A. On Sheet 1, start your exploration by plotting the number of rentals made each week. (Use the Started At field to determine each rental's week.) You should also add color to the chart so that you can clearly see when the Data Source changed over from Ford to Lyft.

Using your visualization, when did operations transfer over from Ford to Lyft? Are there any major differences in the volume of rentals before and after the transfer?



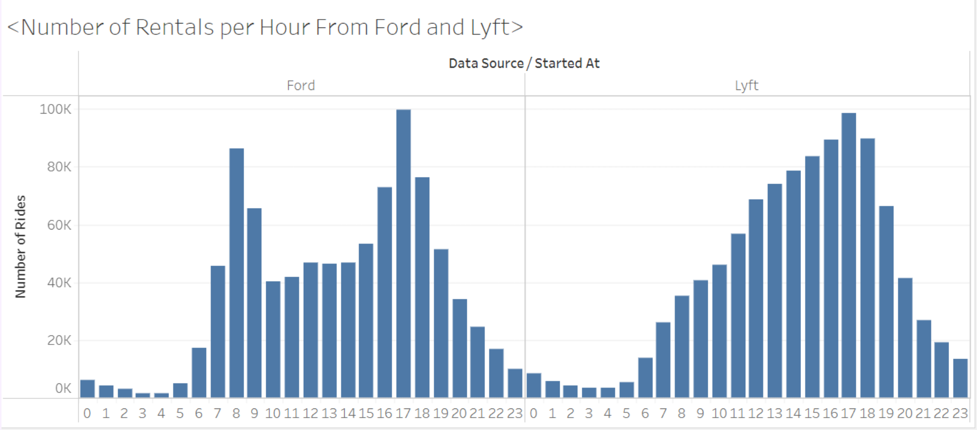
Ford transferred their bike company to Lyft in the week of March 29th, 2020. The visual shows that the number of bike rides decreases significantly after the transfer. It surprised me since the number of bike rides should increase after the transfer for Lyft to call their business decision a successful move. This one failed kind of badly then. As long as they make a profit I guess.

Afterthought: I just spoke with my cousin about the data and I realized another trend in this chart. Even though Ford's rides kind of peaked in the middle weeks, they fell off a whole lot as well before they finally made their decision of transferring to Lyft. That means the huge loss in rides (and profit) caused Ford to decide to give their biking company up. While Lyft on the other hand, even though they did not peak as much as Ford in terms of bike rides number, their ride volume is very consistent. This shows that Lyft handles the company way better than Ford did. One reason I can think of that would make Ford bike rides peak way higher than Lyft is that at the time Ford launched their biking service, the concept of renting bikes like that was very new and exciting. That's why many people are interested in their service, hence the huge but short-lived peak in the data.

B. Next, on Sheet 2, create a bar chart to depict the total number of rides during each hour of the day. No need to include this visualization in this report just yet! During which hours of the day are customers most likely to rent a bike?

At 17:00 (or 5 pm), customers are most likely to rent a bike, with a total of 198,402 rides at that hour. It does make sense since 5 pm is when people are most free (students and workers alike), and the weather is more likely to be nice too (personally speaking).

C. Let's break the hourly usage patterns down by data source. Using the **Data Source** field, modify your visualization from part B to create two side-by-side bar charts: one to illustrate the total number rides during each hour of the data for Ford GoBike data, and the other for Lyft Baywheels. Regarding popular hours of the day, what differences do you notice between Lyft users and Ford users?

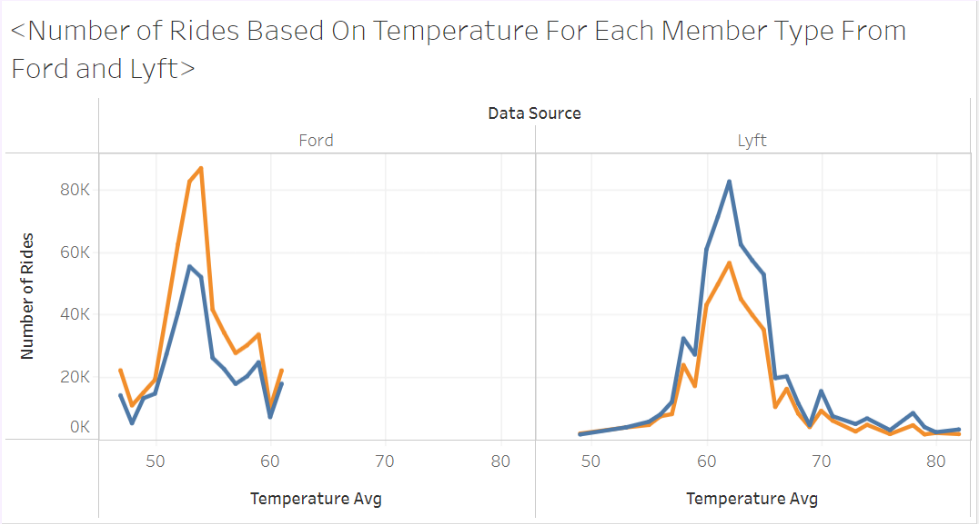


As for differences, I realized Ford data has two peaks, while Lyft data only peaks once. They both have their highest peak at around 5 pm, where Ford has 99,741 rides at the time and Lyft has

98,6616. They are both around 98–99 thousand-ish rides, very close to each other. However, unlike Lyft, Ford also peaks one more time around 8 am, at 86,155 rides. In comparison, at 8 am, only 35,208 Lyft users ride their bikes around this time, which is a significant difference. It seems like a lot of Ford users are going to work by bike at this time. Or it could also be that a lot of people used the Ford bike service for morning exercise. It is a theory of mine without anything backing it up but it might be because of geological differences between Ford and Lyft services that make the bike rides volume so different in the early hours.

D. On Sheet 3, create a line plot of the average temperature on the horizontal-axis and the number of rides taken on the vertical-axis. Plot one line for each Member Type. Finally, add **Data Source** to the column in order to compare Ford ridership with Lyft ridership. Note: you will have to convert the **Temperature Avg** feature into a Dimension first!

How does the temperature affect ridership? Which riders are more willing to use a bike on cold days, and which riders are more likely to ride on warmer days?


<Number of Rides Based On Temperature For Each Member Type From Ford and Lyft>

As for Ford bikers, they preferred riding bikes on colder days. Both members and casual riders ride their bikes the most when the temperature is around 54–55 degrees. While Lyft bikers preferred riding bikes on warmer days. Both member and casual riders take their bikes out when the temperature is 62 degrees. I also realized that Ford's members (86,655 rides) ride their bikes way more than Ford's casuals (55,292 rides) at the temperature where Ford bikers ride their bikes the most. In contrast, Lyft's members ride (56,408 rides) ride their bikes way less than Lyft's casuals (82,416 rides) at the most preferred-to-bike temperature. This trend shows the clearest at preferred-to-bike temperature but it is also relevant to the rest of the data. For Ford, more members ride their bikes overall regardless of the temperature, and for Lyft, it's the opposite. I also realized that Lyft bikers are also willing to bike in hotter weather, as the hottest temperature they are still willing to bike is 82 degrees. While Ford bikers cannot tolerate the heat so well since they have already stopped biking around 61 degrees. On the chilling side, both Ford and Lyft bikers can still ride their bikes in the 45s, so they are evenly matched on that front. That makes my previous theory about the geological differences between Lyft and Ford bikers more relevant as different places have different ranges of temperature and people who can tolerate them.

– **Task 4:** Communicating Results

Your manager wants you to share the visualizations you created in parts C and D of Task 4 with the marketing team for visibility. She asks you to email the visualizations to the team with a short paragraph explaining what insights can be drawn from it and any data-based marketing strategies you might recommend to increase ridership at Lyft Baywheels.

A. In a single paragraph, summarize what can be gleaned from your visualizations. In particular, are there differences between the datasets representing Ford and Lyft riders? How might Lyft market to customers in order to build upon the success of the Ford's GoBike program?

To summarize my points above, I can see the big differences between Ford and Lyft riders are the preferred time, biking temperature, and main member types. Ford riders not only preferred to bike around 5 pm just like Lyft riders, but they also bike early in the morning around 8 am. As for preferred biking temperature, even though both riders took their bikes out the most around 50–60 degrees, Lyft riders actually ride in hotter weather more than Ford riders. Finally, for the main member types, I realized that Ford's riders are mostly members, while Lyft's riders are mostly casuals. In order to not let Ford's GoBike program's success go to waste, my first recommendation is to focus on getting more members like Ford instead of just casual ones. Even though more casual riders are a good thing, members tend to use your service for a long period of time, which could be a more reliable income for the company. Reviewing old marketing strategies from Ford can be an excellent idea. We can also advertise Lyft's service to people who tend to exercise early in the morning. This is a possible task since Ford data proves that many riders bike early. Lyft can put on advertisements where there are big parks in the area. Lyft can also take Ford's GoBike program's geographical data and analyze them to expand its range of influence, providing services to Ford's ex-customers are the best way to build up whatever Ford left behind.

That's it! Submit your final project for evaluation, and go celebrate your achievement! You just completed a rich, complex data analysis project representing real-world level work. You've gained some impressive skills! Well done, and never stop learning 😀

– LevelUp

The dataset in your Tableau workbook is rich – there's much more that can be done with the data! Below you'll find three additional LevelUp tasks. Have fun exploring them!

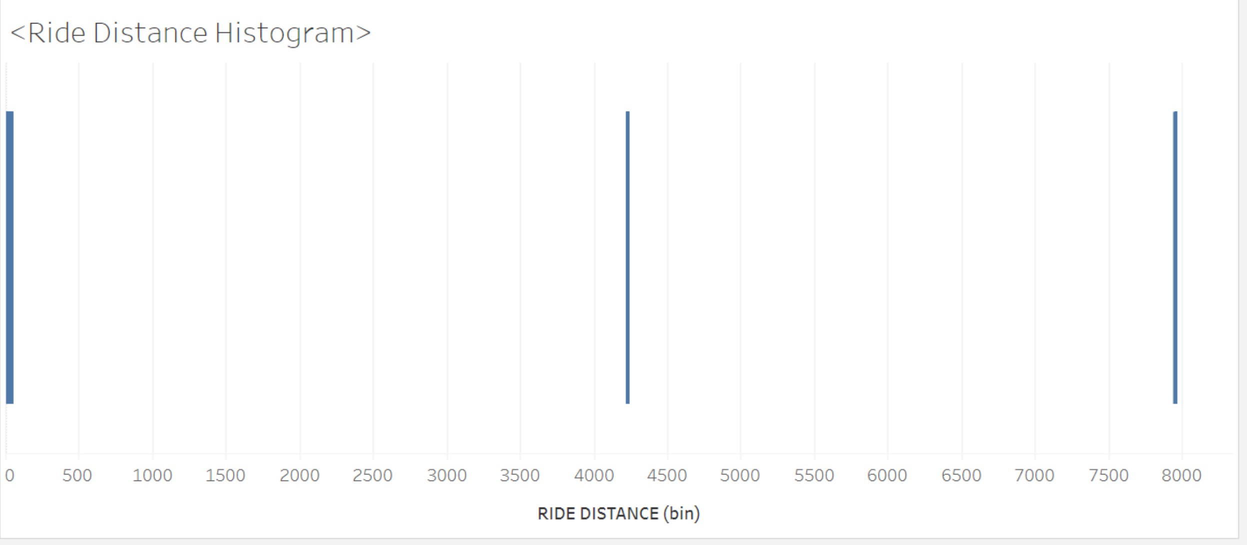
A. Your manager tells you that Lyft is interested in determining the distance riders travel between start and end points. Take a look in your Tableau notebook. You'll find a variable called RIDE DISTANCE that is the distance between the start and end points on a map.

   Note: this is not the same as the total distance traveled on the bike. For instance, if a ride began and ended at the same location, the distance would show up as a zero in the data regardless of how long the bike was rented for. Instead, it lets Lyft know the typical distance riders travel when they start and end their rides at different points. The formula used is the Haversine distance. It calculates the distance between two GPS coordinates, taking Earth's curvature into consideration.

   On Sheet 5, use this new calculated field to plot a histogram of the distance riders traveled. To make your visualization more useful, filter to values that are less than 7 miles and use a bin size of 0.1.

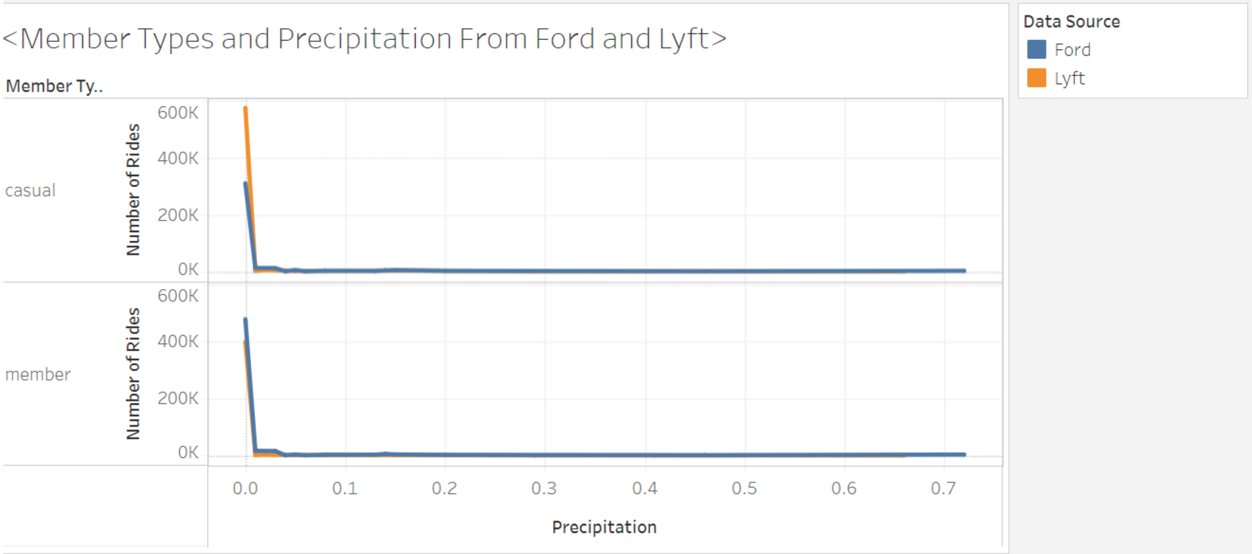
   Analyze the histogram: how far do the majority of the rides typically go?

The majority of the rides typically range from 37.6 units of distance to 41.4 units of distance.



B. While you were assigned the analysis against temperature, one of your colleagues looked at the other weather feature you joined into the data: precipitation. She has interpreted the data to say that there's no major differences between Member Types in terms of ridership due to the weather.

She's asked that you verify her work. Can you create a plot to illustrate how precipitation affects ridership? Compare between Ford and Lyft users and again between member and casual riders.



My colleague must be a very talented data scientist since her analysis is correct. Besides a slightly more notable difference between Ford and Lyft

casual riders around 0.0 precipitation, I would say that both Ford and Lyft members and casuals' ridership is very similar due to the weather.

C. One of your colleagues has looked at the rentals by temperature plot you created and the rentals by precipitation plot your colleague created. With the approaching colder season in San Francisco, they're afraid of a dropoff in the amount of casual riders on the system and want to suggest additional marketing efforts to increase casual rider engagement over the next few months.

   How much do you agree with, or disagree with your colleague's assessment? Are there aspects of the data that they haven't considered in their analysis that can be addressed with other plots you created? Is there information outside of the available data that would be useful to make a better judgment of where to put the marketing focus for the next winter season?

I agree and disagree with my second colleague. On one hand, the number of casual riders during the colder seasons did, in fact, decrease both from the temperature graph and the precipitation graph (as lower precipitation suggests higher temperature and vice versa). However, the number of member riders also decreases in the colder season as well. It does seem like people really hate riding bikes on cold days as a whole, not only casuals but members alike. We can use the total riding distance data from riders during the time to see how far they are willing to travel compared to hotter seasons, as maybe less number of rides does not mean less amount of traveling distance. Based on the distance, we can then market our service as good for covering long/short distances during the cold winter months to ensure people it is still good riding a bike around this time. Not the most viable strategy but at least that is an idea.

– Submission

Great work completing your Final Project!!!! To submit your completed project file, you will need to download / export this document as a PDF and then upload it to the Milestone submission page. You can find the option to download as a PDF from the File menu in the upper-left corner of the Google Doc interface.