# How do casual riders and annual members use Cyclistic bikes differently?

## — more details about this case study

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# **Scenario** A case study form Coursera


This was a fiction company Cyclistic, a bike-share company in Chicago. It had two types of users,

1. **Casual riders:** single-ride passes and full-day passes
2. **Annual members**: annual memberships, according to finance analysts they are **more profitable**

The marketing team had an insight:

"Cyclistic's future success depends on maximizing the number of annual memberships. There is a very good chance to **convert casual riders into members** because they are already aware of the Cyclistic program "

Before designing marketing strategies aimed at converting casual riders into annual members, they needed to know…

**"How do casual riders and annual members use Cyclistic bikes differently ?"**

# Materials From

https://divvy-tripdata.s3.amazonaws.com/index.html

# Tools I Used

| Prepare | Process | Analyze | Visualiztion |
| --- | --- | --- | --- |
| BigQuery (GCP) | Spreadsheet<br>BigQuery | BigQuery | Looker studio<br>Spreadsheet |

# Ask

1. How annual members and casual riders use our Cyclistic bikes differently?
2. Why would casual members upgrade to annual memberships?
3. How can Cyclistic use digital media to influence casual riders to become members?

# Prepare

1. Download the previous 12 months (2023/07 - 2024/06) of trip data
2. Browse the file and check the structure of data
3. Upload to **Google Cloud Platform**
4. Upload to BigQuery with **bq command** (combine 12 csv files into one table)

Approximately **5,700,000 data in total**, and each had **13 columns**, including

**STRING:**

**ride_id** (=unique to every single trip), **rideable_type** (=bike type), **started_station_name, start_station_id, end_station_name, end_station_id, member_casual** (=membership type)

**TIMESTAMP:**

**started_at, ended_at** (=the time when they started or ended their ride)

**FLOAT:**

**start_lat, start_lng, end_lat, end_lng** (=where they started or ended their ride)

# Process

1. Identify distinct value
2. Identify relation between columns
3. Check if there is a null value
4. Check if values are reasonable
5. Proxy null data

# Process - Identify distinct value

1. **ride_id** should be unique, **but there were 221 duplicates**
2. Check the difference of data between them:

| ride_id | rideable_type | started_at | ended_at | start_station_nai | start_station_id | end_station_nan | end_station_id | start_lat | start_lng | end_lat | enc |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 011C8EF97AB0 | classic_bike | 2024-05-31 19:45:38.037000 UTC | 2024-06-01 20:45:33.862000 UTC | Clifton Ave & Arr | TA1307000163 | | | 41.918216 | -87.656936 | | |
| 011C8EF97AB0 | classic_bike | 2024-05-31 19:45:38.000000 UTC | 2024-06-01 20:45:33.000000 UTC | Clifton Ave & Arr | TA1307000163 | | | 41.918216 | -87.656936 | | |
| 01406457A85B0 | electric_bike | 2024-05-31 23:54:59.000000 UTC | 2024-06-01 00:01:47.000000 UTC | | | Damen Ave & Cl | 13132 | 41.89 | -87.67 | 41.895769 | |
| 01406457A85B0 | electric_bike | 2024-05-31 23:54:59.194000 UTC | 2024-06-01 00:01:47.626000 UTC | | | Damen Ave & Cl | 13132 | 41.89 | -87.67 | 41.895769 | |
| 02606FBC7F85 | classic_bike | 2024-05-31 17:55:01.000000 UTC | 2024-06-01 18:54:53.000000 UTC | Pine Grove Ave | TA1307000150 | | | 41.94947274 | -87.64645278 | | |
| 02606FBC7F85 | classic_bike | 2024-05-31 17:55:01.635000 UTC | 2024-06-01 18:54:53.970000 UTC | Pine Grove Ave | TA1307000150 | | | 41.94947274 | -87.64645278 | | |
| 0354FD075633 | electric_bike | 2024-05-31 23:34:36.273000 UTC | 2024-06-01 00:14:29.238000 UTC | | | | | 41.97 | -87.66 | 41.96 | |
| 0354FD075633 | electric_bike | 2024-05-31 23:34:36.000000 UTC | 2024-06-01 00:14:29.000000 UTC | | | | | 41.97 | -87.66 | 41.96 | |
| 048C715F1DE0 | electric_bike | 2024-05-31 23:53:44.401000 UTC | 2024-06-01 00:12:26.776000 UTC | | | | | 41.89 | -87.66 | 41.89 | |
| 048C715F1DE0 | electric_bike | 2024-05-31 23:53:44.000000 UTC | 2024-06-01 00:12:26.000000 UTC | | | | | 41.89 | -87.66 | 41.89 | |
| 05D27072A33A | classic_bike | 2024-05-31 16:34:46.426000 UTC | 2024-06-01 04:12:45.545000 UTC | Dearborn St & E | 13045 | DuSable Lake S | TA1309000039 | 41.893992 | -87.629318 | 41.932588 | |

3. Data in most columns were the same, but slight different in **start_at** and **end_at**

**⇒ Exclude the duplicates**

# Process - Identify relation between columns

1. Was **station_id** associated with **station_name**?
   There were **multiple station_names** with **the same station_id**!

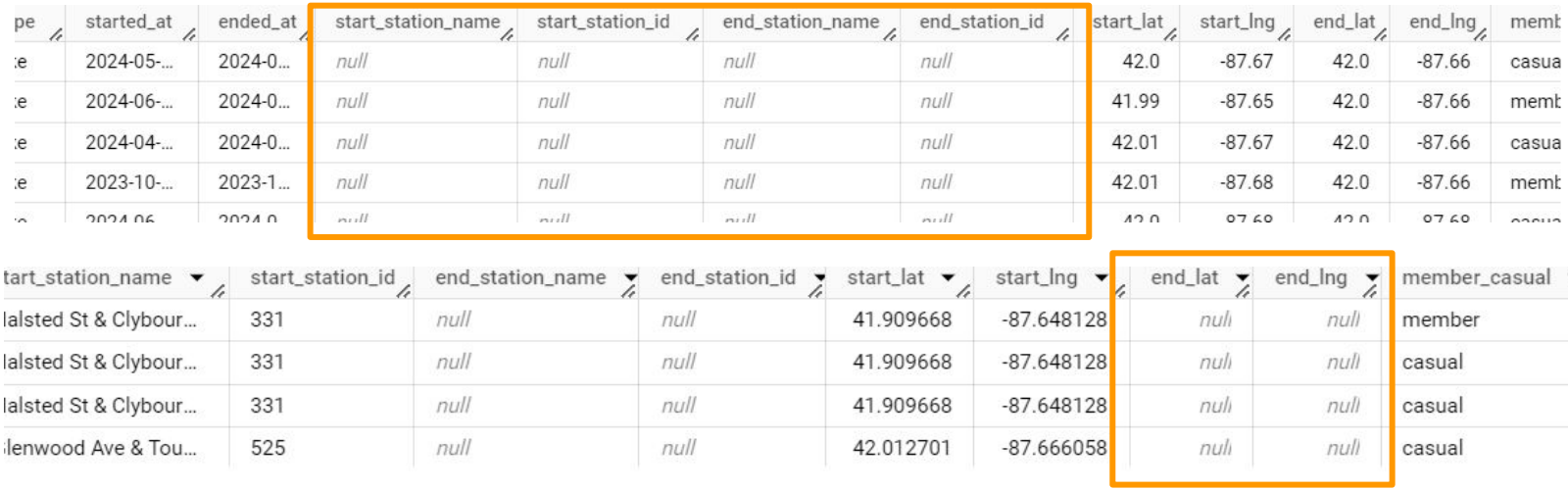
| end_station_id | end_station_name |
|---|---|
| TA1309000042 | Lincoln Ave & Melrose St |
| TA1309000042 | Lincoln Ave & Belmont Ave (Te... |
| TA1305000030 | Wells St & Randolph St |
| TA1305000030 | Clark St & Randolph St |
| KA1503000074 | Museum of Science and Industry |

2. Check the location (**lat & lng**) of these station, found their locations were close, I guessed they might change their names at different times

   ⇒ **Remain these names**

# Process - Check if there is null value

1. The value in any one or more columns of **_station_name, _station_id, end_lat** and **end_lng** of **1,460,033 data (about 25%) were null !**



| pe | started_at | ended_at | start_station_name | start_station_id | end_station_name | end_station_id | start_lat | start_lng | end_lat | end_lng | memb |
|---|---|---|---|---|---|---|---|---|---|---|---|
| :e | 2024-05-... | 2024-0... | null | null | null | null | 42.0 | -87.67 | 42.0 | -87.66 | casua |
| :e | 2024-06-... | 2024-0... | null | null | null | null | 41.99 | -87.65 | 42.0 | -87.66 | memb |
| :e | 2024-04-... | 2024-0... | null | null | null | null | 42.01 | -87.67 | 42.0 | -87.66 | casua |
| :e | 2023-10-... | 2023-1... | null | null | null | null | 42.01 | -87.68 | 42.0 | -87.66 | memb |

| tart_station_name | start_station_id | end_station_name | end_station_id | start_lat | start_lng | end_lat | end_lng | member_casual |
|---|---|---|---|---|---|---|---|---|
| lalsted St & Clybour... | 331 | null | null | 41.909668 | -87.648128 | null | null | member |
| lalsted St & Clybour... | 331 | null | null | 41.909668 | -87.648128 | null | null | casual |
| lalsted St & Clybour... | 331 | null | null | 41.909668 | -87.648128 | null | null | casual |
| lenwood Ave & Tou... | 525 | null | null | 42.012701 | -87.666058 | null | null | casual |

# Process - Check if there is null value

2. After drilling down, I found that
   a. The **start_lat** and **start_lng** of each trip **was always recorded.**
   b. If **sation_id**s were not recorded, the **latitude and longitude** of these locations **were less specific than recorded ones**. For me, these data were still reliable.

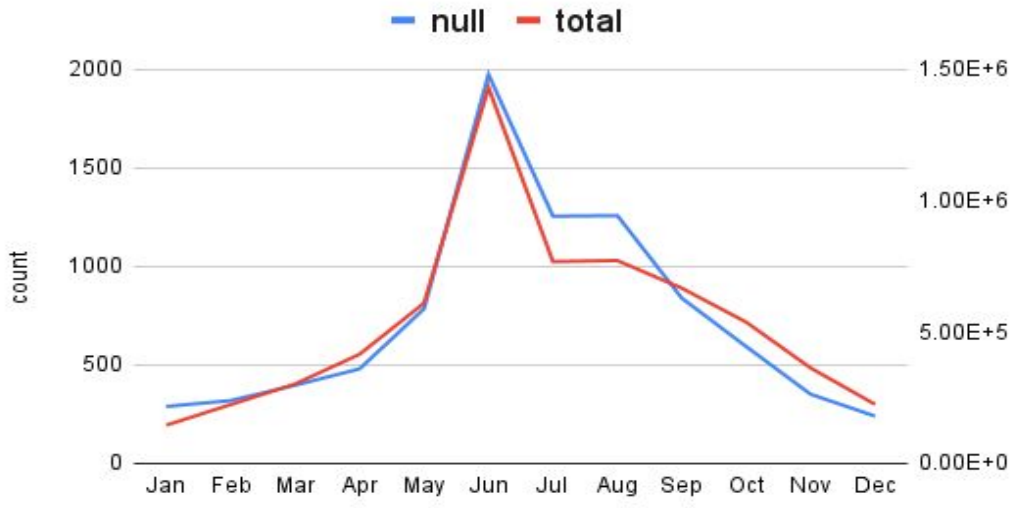
| end_station_name | end_station_id | st | st | end_lat | end_lng |
|---|---|---|---|---|---|
| University Library (NU) | 605 | | | 42.052939 | -87.673447 |
| *null* | *null* | | | 41.9 | -87.76 |

→specific
→rough

3. In my opinion, **the data without any location info might be not reliable.**

# Process - Check if there is null value

2. I checked whether there was any data that didn't record **station_id, lat or lng at the same time**, and there were **7,813 (about 0.1 %)**.
3. The distribution of these data throughout the year **was similar to** total data




⇒ It's fine to exclude them

# Process - Check if values are reasonable

- **end_lat** and **end_lng** of some data **were zero**!

| end_station_id | start_lat | start_lng | end_lat | end_lng |
|---|---|---|---|---|
| 653B | 41.893992 | -87.629318 | 0.0 | 0.0 |
| OH Charging Stx - Test | 41.796642 | -87.625923 | 0.0 | 0.0 |
| OH Charging Stx - Test | 41.86316583333... | -87.6798115 | 0.0 | 0.0 |

⇒ Replace them with the **average end_lat** and **end_lng (proxy the data)**

p.s. I also **filled the null data in end_lat and end_lng** in the same way.

# Process - Check if values are reasonable

- **started_at** should be earlier then **ended_at**, **but 434 data showed earlier ended_at than started_at !**

| ride_id | rideable_type | started_at | ended_at |
|---|---|---|---|
| 2BFB23CDC9A75AB0 | electric_bike | 2023-08-26 10:19:36 UTC | 2023-08-26 10:16:52 UTC |
| 7934DBD46A7BB934 | electric_bike | 2023-12-06 16:07:40 UTC | 2023-12-06 16:07:37 UTC |
| 64BF86DB62A97011 | electric_bike | 2023-07-22 10:05:44 UTC | 2023-07-22 10:05:41 UTC |
| 01A0D47F50989776 | electric_bike | 2023-09-10 15:22:55 UTC | 2023-09-10 15:22:52 UTC |

⇒ Given that they were only a **small proportion** of the total, **exclude these data**

# Analyze & Visualization

**How do casual riders and annual members use Cyclistic bikes differently ?**

1. In terms of rideable type
2. In terms of riding times
3. In terms of riding duration
4. In terms of which day of the week to ride
5. In terms of their destinations

# Analyze - create new columns

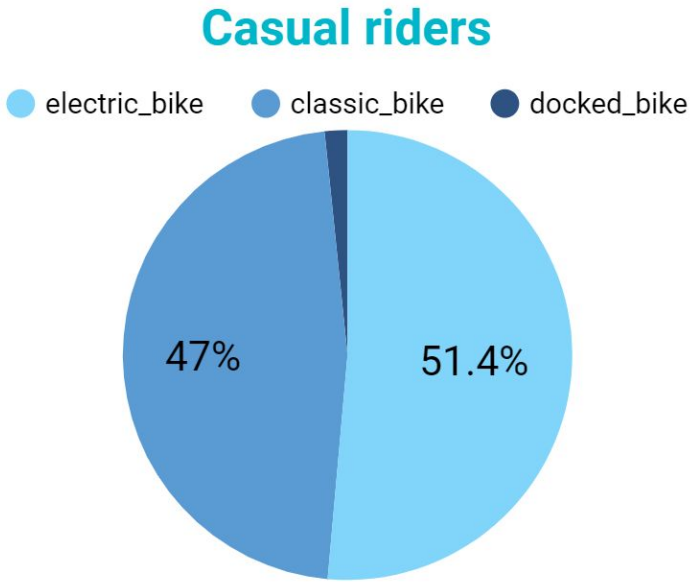
TIMESTAMP_DIFF(ended_at,started_at,MINUTE) AS **riding_duration** (minutes)

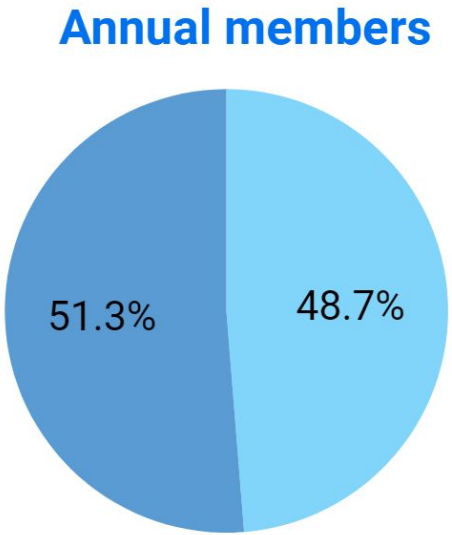
EXTRACT(DAYOFWEEK FROM started_at) AS **weekday** (1 for Sun, 2 for Mon, 3 for Tue….)

EXTRACT(MONTH FROM started_at) AS **month** (1 for Jun, 2 for Feb, 3 for Mar….)

EXTRACT(HOUR FROM started_at) AS **time_hour** (1 for Jun, 2 for Feb, 3 for Mar….)

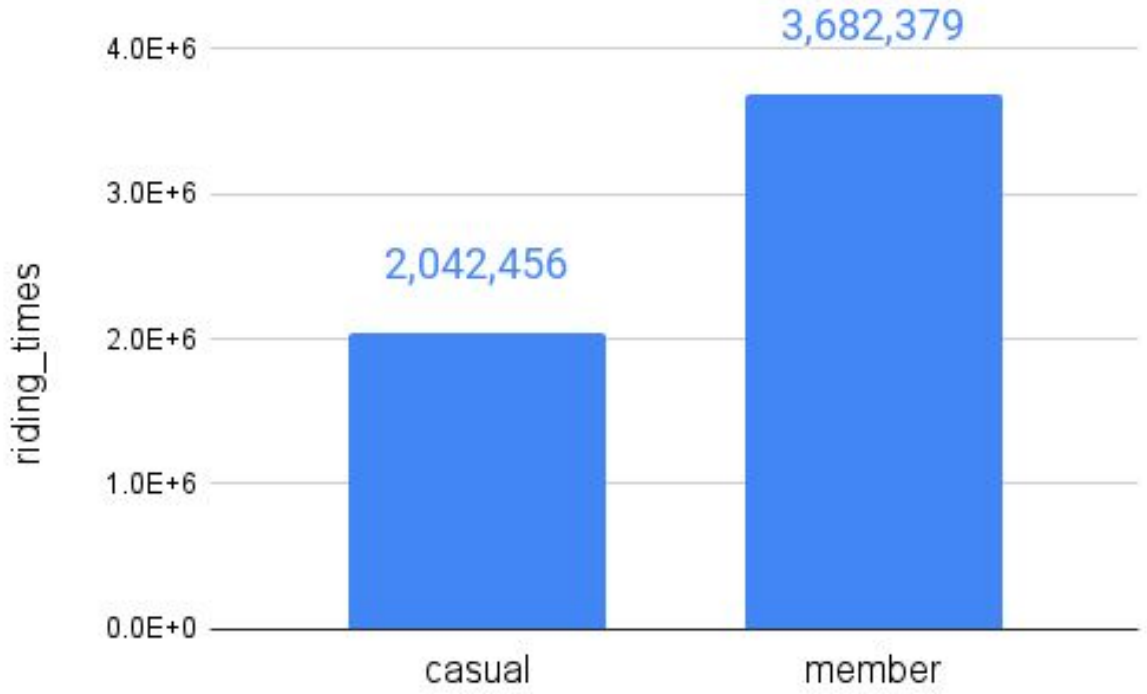
# Analyze - In terms of rideable type




No significant difference between annual members and casual riders.
Note that **no annual member used docked_bike** in the past year.

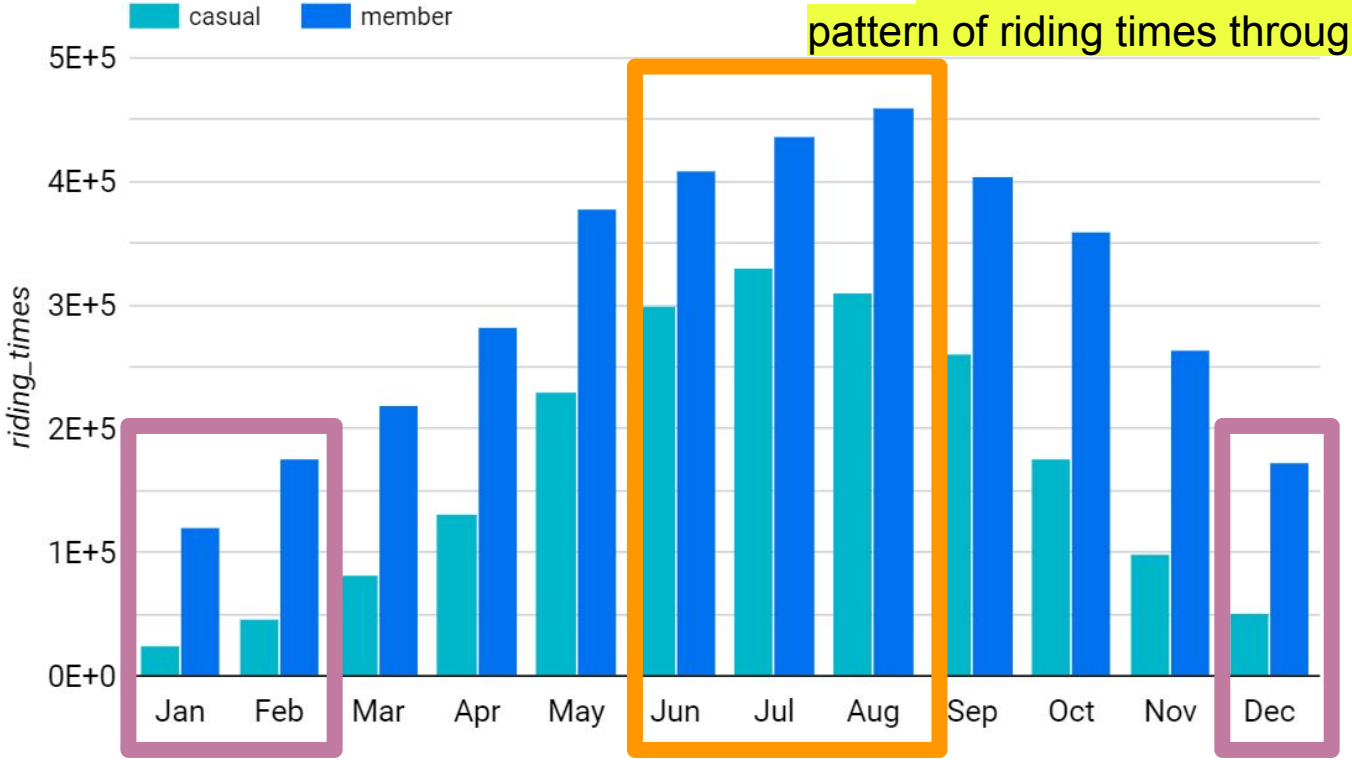
# Analyze - In terms of riding times




**Annual members** rode 1.8 times more than casual riders !

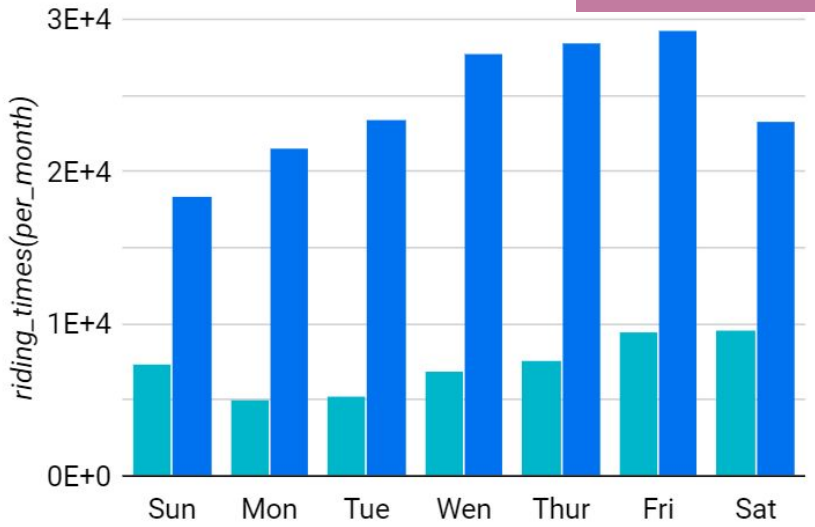
# Analyze - In terms of riding times

Both kinds of users shared the same pattern of riding times throughout the year.

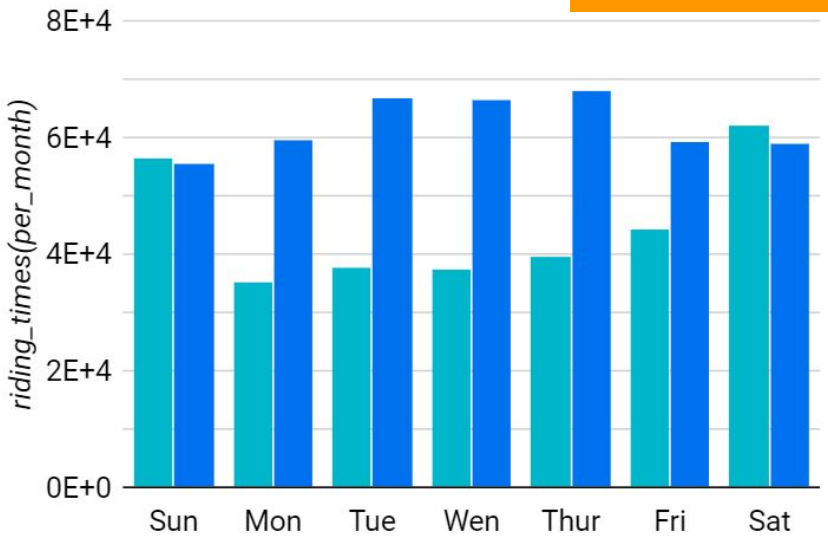


# Analyze - In terms of riding times (off & peak)

off season



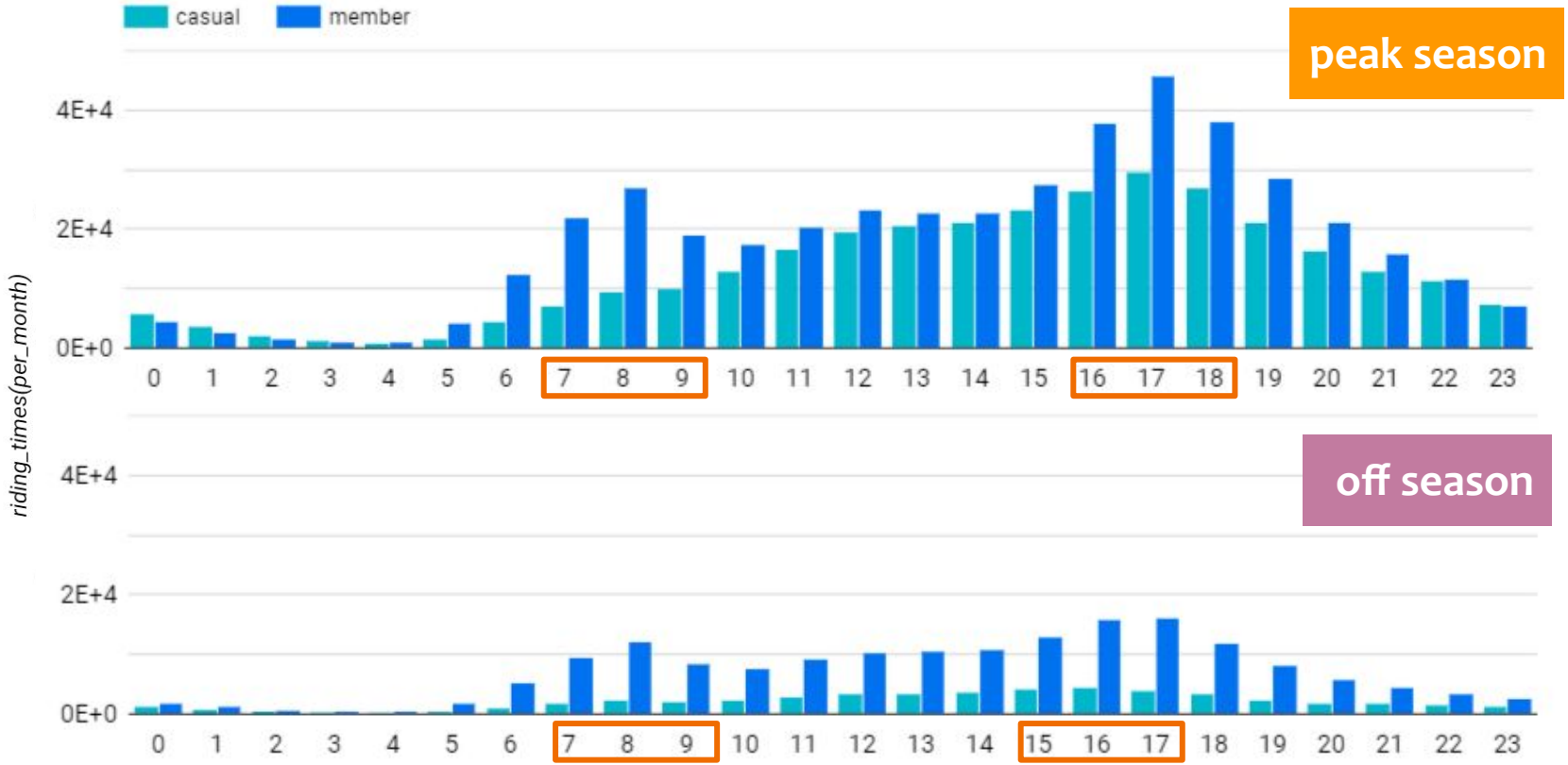

peak season



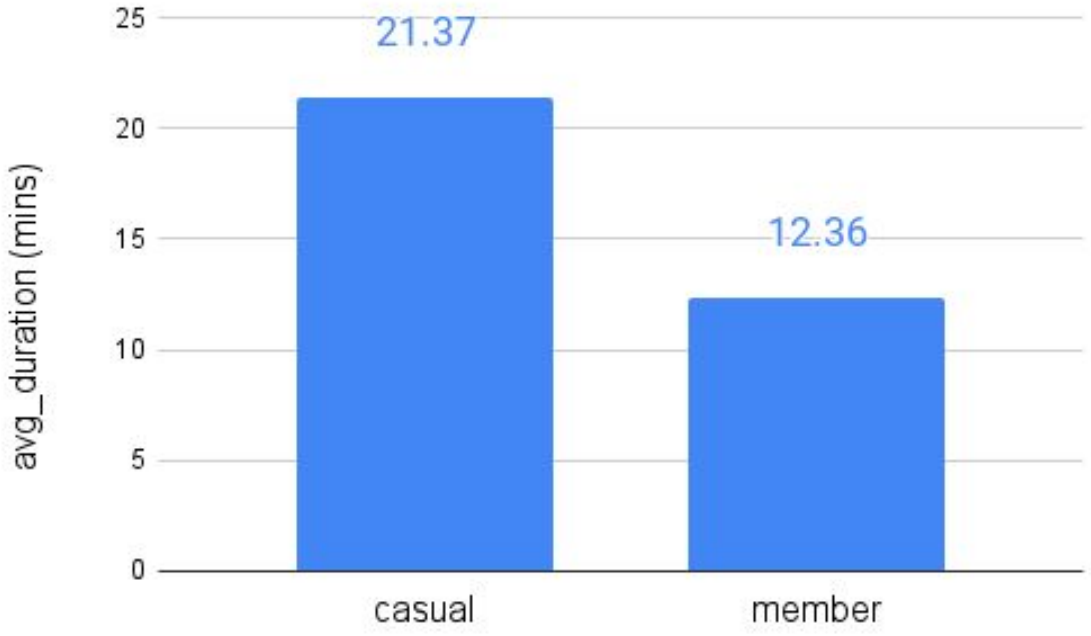

Casual riders used more often **on weekends in busy season**, while annual members prefered **weekdays** use **in both seansons**.

**Annual members** might ride Cyclistic for **commutation!**

# Analyze - In terms of riding times (off & peak)



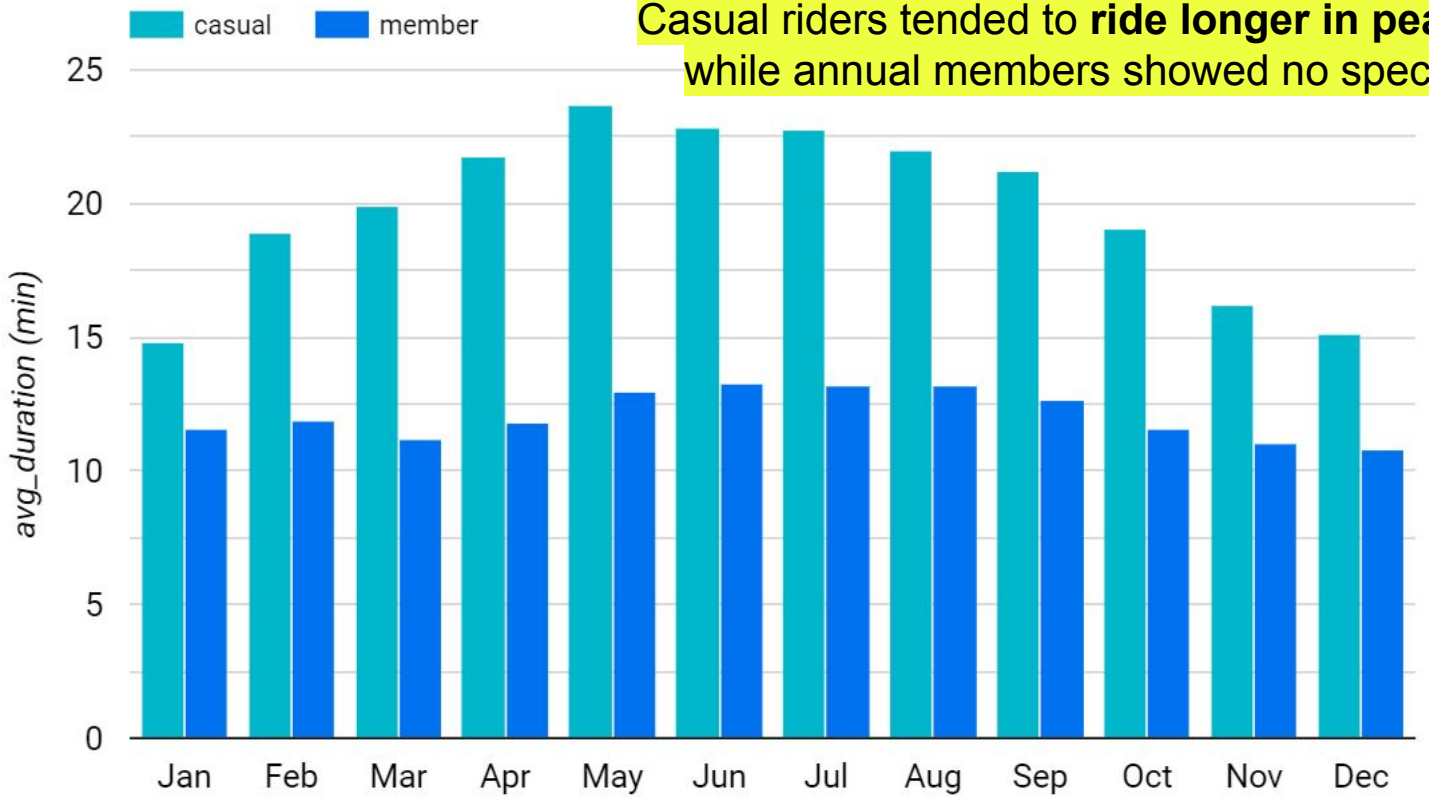
# Analyze - In terms of riding duration




**Casaul users** rode 1.73 times longer than annual memebers!

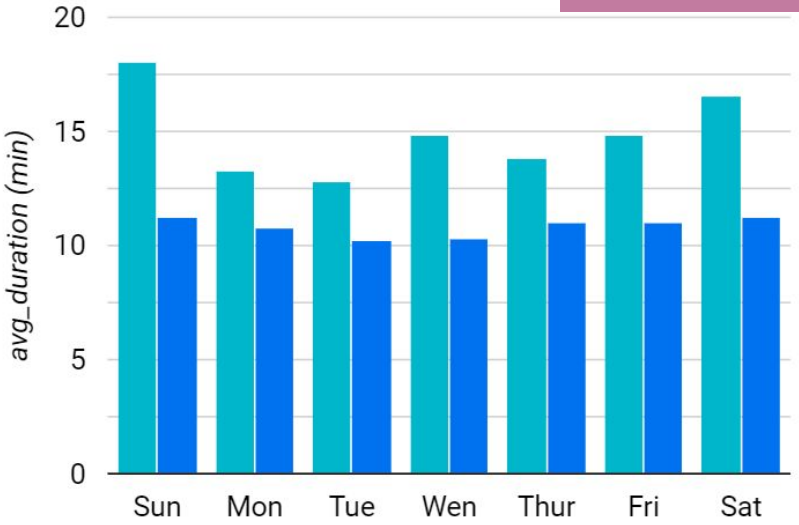
# Analyze - In terms of riding duration

Casual riders tended to **ride longer in peak season**, while annual members showed no specific pattern.

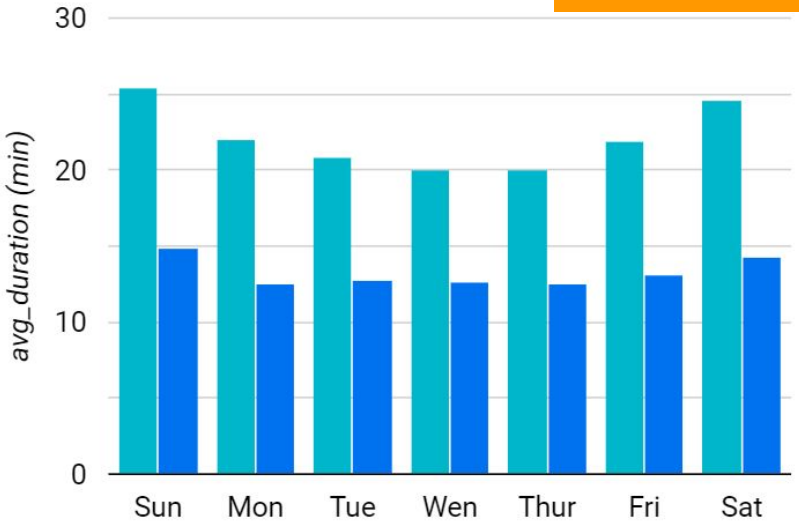


# Analyze - In terms of riding duration (off & peak)

off season




peak season

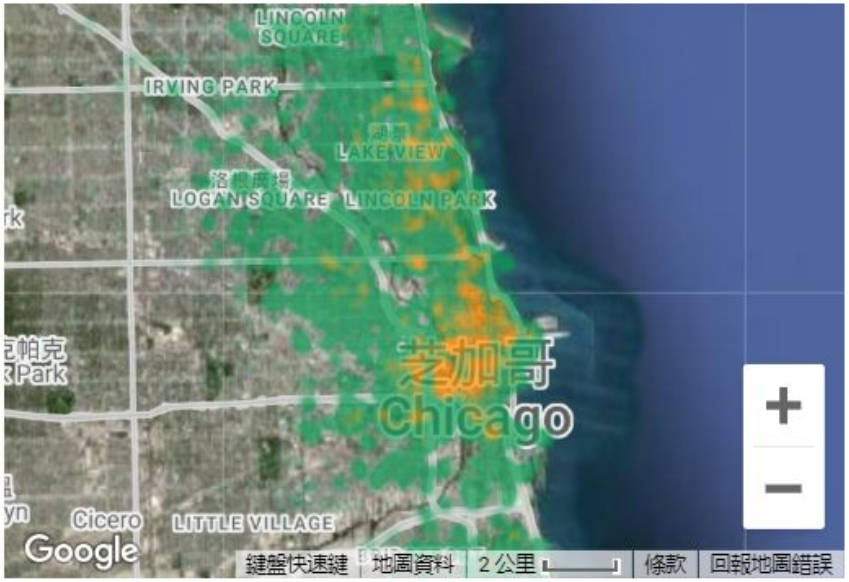



The patterns of riding duration **were similar** in off and busy season.
Casual riders tended to ride **longer on weekend**, while riding durations of annual members **were even throughout the week**

# Analyze - In terms of their destinations

(visit times)

## Annual members




riding_times 0 28,686

## Casual riders


riding_times 0 50,632

Casual riders' destinations were **concentrated in specific areas**, while annual members' destinations were **scattered throughout Chicago**.

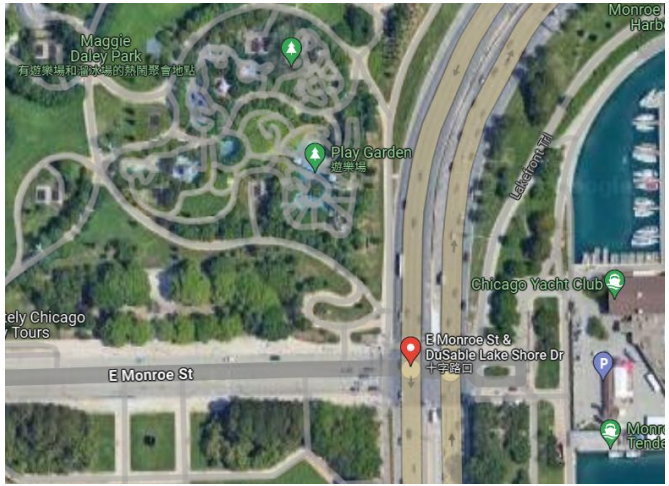
# Analyze - In terms of their destinations

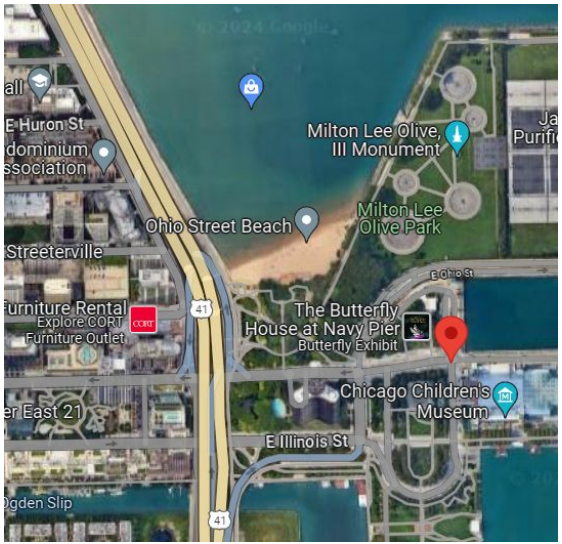
| end_station_name | end_station_id | member | casual | (visit times) |
|---|---|---|---|---|
| Streeter Dr & Grand Ave | 13022 | 14,080 | 50,635 | **64,715** |
| DuSable Lake Shore Dr & M... | 13300 | 11,282 | 29,726 | **41,008** |
| DuSable Lake Shore Dr & N... | LF-005 | 15,688 | 23,870 | **39,558** |
| Michigan Ave & Oak St | 13042 | 14,133 | 24,303 | **38,436** |
| Kingsbury St & Kinzie St | KA1503000043 | 26,846 | 8,080 | **34,926** |
| Clark St & Elm St | TA1307000039 | 24,765 | 10,012 | **34,777** |
| Clinton St & Washington Bl... | WL-012 | 28,686 | 6,077 | **34,763** |
| Wells St & Concord Ln | TA1308000050 | 21,148 | 11,074 | **32,222** |

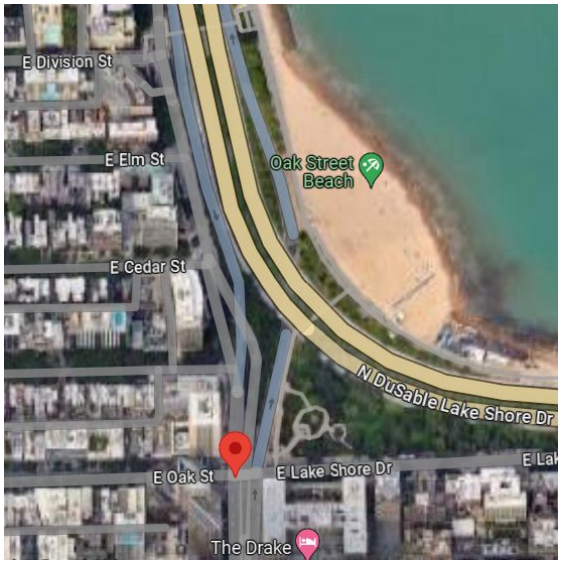
The most visited destinations of annual members and casual riders are different.

**So, Where were they?**

# Analyze - In terms of casual riders' destinations

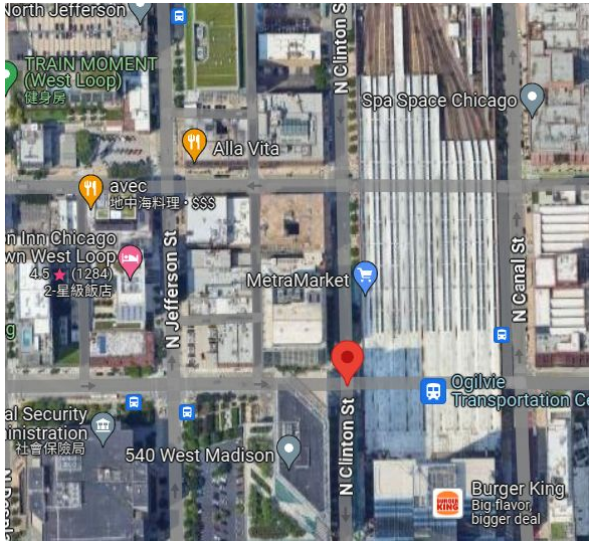


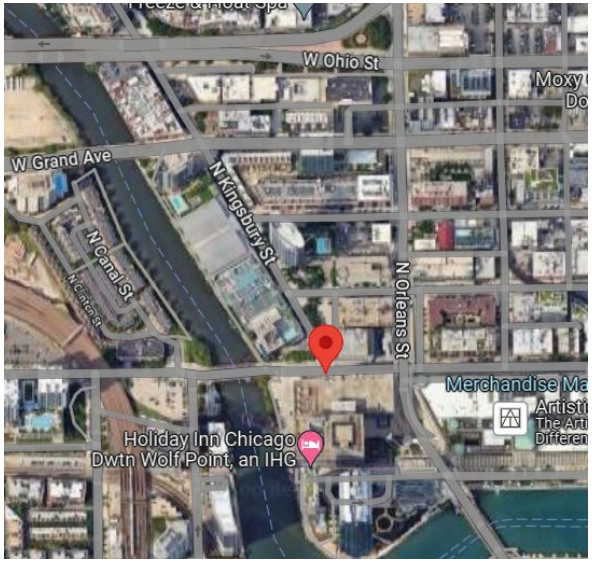



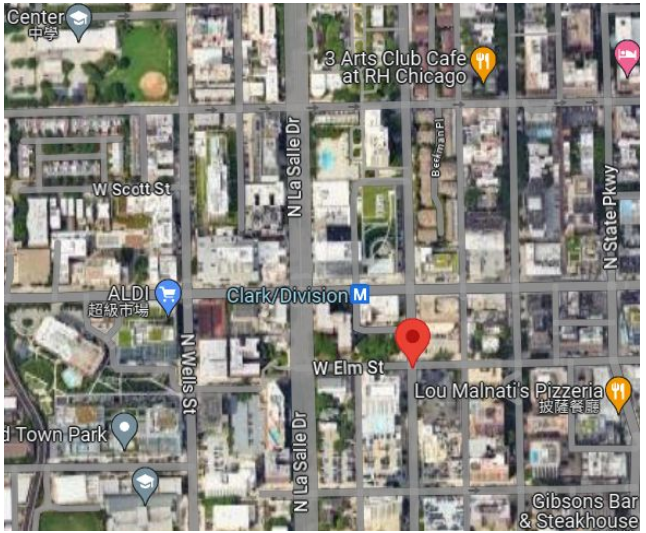




Casual riders tended to visit the **suburbans or beach**, while

# Analyze - In terms of annual members' destinations




Casual riders tended to visit the **suburbans or beach**, while annual members tended to go to **downtown area**.

# Conclusion

| | Casual Rider | Annual Member |
|---|---|---|
| **Number of times** | **Fewer** overall | **Higher** overall |
| **Duration** | Longer overall, **especially in summer** | Shorter overall, **evenly** in every month |
| **Prefer days of use (weekdays / weekends)** | Used more often and longer **on weekends, especially in summer** | Used more often **on weekdays** |
| **Destination** | Mostly **tourist area** | Mostly **downtown** |
| **Prefer rideable type** | No preference | |
| **Prerfer riding season (peak season)** | **Summer** (From June to August) | |

# Conclusion

| | Casual Rider | Annual Member |
|---|---|---|
| (peak season) | | **Summer** (From June to August) |

1. **Riding times were considerable** in both types of users, **annual members** especially. This showed high popularity of Cyclistic.
2. **Causual riders** tended to ride **longer**, while **annual members** contributed **more revenue** than casual rider, according to the finance analysts.
3. **Annual members** could **create more stable revenue** in terms of weekly usage, compared to casual riders.

⇒ **Turn casual riders to annual members** to gain more stable revenue!!

## But how?

# Conclusion

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| **Prefer rideable type** | No preference | |
| **Prerfer seasons (peak season)** | **Summer** (From June to August) | |

4. **Casual riders** tended to bike **on holidays or vacations**.
5. **Annual members** tended to bike **for regular use (commutation probably)**.

⇒ **Launch campaigns on holidays, encouraging the users commuting by bike.**

# Further things we can do…

1. **Comfirm the usage habit** of casual rider and annual member, for example by conducting a survey.
2. The survey should also include whether annual members have been casual riders and **why they chose to covert to annual**.
3. Develop marketing strategies after exploring **the type of digital media that Cyclistic users used**, including when to use and how often to use. (by a survey or data tracked by our app)
4. To set the "goal of successful marketing", it is important to figure out the **difference in fees between casual and annual membership** and how it influence the revenue.