

# **Cyclistic Bike-Share: An Analysis of Rider Behavior**

## **A Report on How Annual Members and Casual Riders Use Cyclistic Bikes Differently**

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### **1. The Business Task: Converting Casual Riders into Annual Members**

The primary goal of this analysis is to understand the key differences in how annual members and casual riders use the Cyclistic bike-share service. The director of marketing, Lily Moreno, has identified that maximizing annual memberships is crucial for the company's future growth. By identifying distinct usage patterns, the marketing team can develop targeted strategies to effectively convert casual riders into more profitable annual members. This report will present data-driven findings to inform this new marketing initiative.

The Business Task can be accessed in this link:

<https://github.com/Burhanudin26/Google-Data-Analytics/tree/main/Case%201>

### **2. Data Sources: Historical Trip Information**

To address the business task, this analysis utilizes Cyclistic's historical bike trip data from the last 12 months. This public dataset, provided by Motivate International Inc., contains detailed trip information but anonymizes personally identifiable information to protect rider privacy.

The key data points used include:

- Trip start and end times
- Trip start and end station names
- Rider type (casual or member)

The data is considered reliable and comprehensive for identifying broad usage trends between the two rider groups. Please refer to the dataset link provided:

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

The datasets used are Divvy\_Trips\_2019\_Q1 and Divvy\_Trips\_2020\_Q1. Fig 1. displays data from Divvy\_Trips\_2019\_Q1, and Fig 2. displays data from Divvy\_Trips\_2020\_Q1.

trip_id	start_time	end_time	bikeid	tripduration	from_station_id	from_station_name	to_station_id	to_station_name	usertype	gender	birthyear
21742443	2019-01-01 00:0	2019-01-01 00:1	2167	390	199	Wabash Ave & C	84	Millwaukee Ave & S	Subscriber	Male	1989
21742444	2019-01-01 00:0	2019-01-01 00:1	4386	441	44	State St & Rand	624	Dearborn St & V	Subscriber	Female	1990
21742445	2019-01-01 00:1	2019-01-01 00:2	1524	829	15	Racine Ave & 18	644	Western Ave & F	Subscriber	Female	1994
21742446	2019-01-01 00:1	2019-01-01 00:4	252	1,783.00	123	California Ave &	176	Clark St & Elm S	Subscriber	Male	1993
21742447	2019-01-01 00:1	2019-01-01 00:2	1170	364	173	Mies van der Ro	35	Streeter Dr & Gr	Subscriber	Male	1994
21742448	2019-01-01 00:1	2019-01-01 00:1	2437	216	98	LaSalle St & Wa	49	Dearborn St & M	Subscriber	Female	1983
21742449	2019-01-01 00:1	2019-01-01 00:1	2708	177	98	LaSalle St & Wa	49	Dearborn St & M	Subscriber	Male	1984
21742450	2019-01-01 00:1	2019-01-01 00:2	2796	100	211	St. Clair St & Eri	142	McClurg Ct & Eri	Subscriber	Male	1990
21742451	2019-01-01 00:1	2019-01-01 00:4	6205	1,727.00	150	Fort Dearborn D	148	State St & 33rd	Subscriber	Male	1995
21742452	2019-01-01 00:1	2019-01-01 00:2	3939	336	268	Lake Shore Dr &	141	Clark St & Lincol	Subscriber	Male	1996
21742453	2019-01-01 00:2	2019-01-01 00:3	6243	886	299	Halsted St & Ro	295	Broadway & Arg	Subscriber	Male	1994
21742454	2019-01-01 00:2	2019-01-01 00:3	6300	653	204	Prairie Ave & Ge	420	Ellis Ave & 55th	Subscriber	Female	1994
21742455	2019-01-01 00:2	2019-01-01 00:3	3029	601	90	Millennium Park	255	Indiana Ave & R	Subscriber	Male	1986
21742456	2019-01-01 00:2	2019-01-01 00:3	84	562	90	Millennium Park	255	Indiana Ave & R	Customer	Female	1990
21742457	2019-01-01 00:2	2019-01-01 00:3	5019	906	289	Wells St & Cono	324	Stockton Dr & W	Subscriber	Female	1990
21742458	2019-01-01 00:2	2019-01-01 00:3	5526	892	289	Wells St & Cono	324	Stockton Dr & W	Subscriber	Female	1989
21742459	2019-01-01 00:2	2019-01-01 00:3	3373	407	152	Lincoln Ave & Di	166	Ashland Ave & V	Subscriber	Male	1967
21742460	2019-01-01 00:2	2019-01-01 00:4	5777	1,356.00	268	Lake Shore Dr &	319	Greenview Ave &	Customer	Female	1990
21742461	2019-01-01 00:2	2019-01-01 00:2	3940	102	35	Streeter Dr & Gr	35	Streeter Dr & Gr	Subscriber	Male	1985
21742463	2019-01-01 00:2	2019-01-01 01:0	3914	2,333.00	35	Streeter Dr & Gr	39	Wabash Ave & A	Customer		
21742464	2019-01-01 00:2	2019-01-01 00:4	140	960	47	State St & Kinzie	111	Sedgwick St & H	Subscriber	Male	1957

Fig 1. Dataset of Divvy\_Trips\_2019\_Q1

ride_id	rideable_type	started_at	ended_at	start_station_name	start_station_id	end_station_name	end_station_id	start_lat	start_lng	end_lat	end_lng	member_c
EACB19130B0C	docked_bike	2020-01-21 20:0	2020-01-21 20:1	Western Ave & L	239	Clark St & Lelan	326	41.9665	-87.6884	41.9671	-87.6674	member
8FED874C809D	docked_bike	2020-01-30 14:2	2020-01-30 14:2	Clark St & Montr	234	Southport Ave &	318	41.9616	-87.666	41.9542	-87.6644	member
789F3C21E472f	docked_bike	2020-01-09 19:2	2020-01-09 19:3	Broadway & Bel	296	Wilton Ave & Be	117	41.9401	-87.6455	41.9402	-87.653	member
C9A388DAC6Ae	docked_bike	2020-01-06 16:1	2020-01-06 16:2	Clark St & Rand	51	Fairbanks Ct & C	24	41.8846	-87.6319	41.8918	-87.6206	member
943BC3CBECCI	docked_bike	2020-01-30 08:3	2020-01-30 08:4	Clinton St & Lak	66	Wells St & Hubb	212	41.8856	-87.6418	41.8899	-87.6343	member
6D9C8A693816f	docked_bike	2020-01-10 12:3	2020-01-10 12:3	Wells St & Hubb	212	Desplaines St &	96	41.8899	-87.6343	41.8846	-87.6446	member
31EB9B8F406D	docked_bike	2020-01-10 13:0	2020-01-10 13:1	Desplaines St &	96	Wells St & Hubb	212	41.8846	-87.6446	41.8899	-87.6343	member
A2B24E3FC9C97	docked_bike	2020-01-10 07:2	2020-01-10 07:2	Desplaines St &	96	Wells St & Hubb	212	41.8846	-87.6446	41.8899	-87.6343	member
5E3F01E14417f	docked_bike	2020-01-31 16:3	2020-01-31 16:4	Wells St & Hubb	212	Desplaines St &	96	41.8899	-87.6343	41.8846	-87.6446	member
19DC57F7E314f	docked_bike	2020-01-31 09:3	2020-01-31 09:4	Clark St & Lake	38	Orleans St & Me	100	41.886	-87.6309	41.8882	-87.6364	member
863920DD9FD	docked_bike	2020-01-07 22:4	2020-01-07 22:5	Wilton Ave & Bel	117	Clark St & Newp	632	41.9402	-87.653	41.9445	-87.6547	member
9E74E3BB4FFA	docked_bike	2020-01-08 16:0	2020-01-08 16:0	LaSalle St & Illin	181	Clinton St & Was	91	41.8908	-87.6317	41.8834	-87.6412	member
3B8BD2E2F29B6	docked_bike	2020-01-08 09:3	2020-01-08 09:4	Clinton St & Was	91	LaSalle St & Illin	181	41.8834	-87.6412	41.8908	-87.6317	member
0F8517F8D212f	docked_bike	2020-01-23 09:3	2020-01-23 09:4	Clinton St & Was	181	LaSalle St & Illin	181	41.8834	-87.6412	41.8908	-87.6317	member
15A91638FAECf	docked_bike	2020-01-28 20:5	2020-01-28 21:0	California Ave &	123	Marshfield Ave &	58	41.9227	-87.6972	41.916	-87.6689	member
E45104F1ED75f	docked_bike	2020-01-07 17:0	2020-01-07 17:4	Franklin St & Ja	36	Lincoln Ave & Di	152	41.8777	-87.6353	41.9322	-87.6586	member
219541294624C	docked_bike	2020-01-07 08:3	2020-01-07 09:1	Wilton Ave & Div	13	Franklin St & Ja	36	41.9324	-87.6527	41.8777	-87.6353	member
013862D47804E	docked_bike	2020-01-06 17:1	2020-01-06 17:4	Franklin St & Ja	36	Lincoln Ave & Di	152	41.8777	-87.6353	41.9322	-87.6586	member
00678BB4A843f	docked_bike	2020-01-06 08:4	2020-01-06 09:2	Lincoln Ave & Di	152	Franklin St & Ja	36	41.9322	-87.6586	41.8777	-87.6353	member
A854F81611B5f	docked_bike	2020-01-19 12:0	2020-01-19 12:1	Kingsbury St & H	133	Clark St & Chica	337	41.8892	-87.6385	41.8968	-87.6309	member
3479141FF24AC	docked_bike	2020-01-16 17:1	2020-01-16 17:4	Lake Shore Dr &	76	Michigan Ave &	43	41.881	-87.6167	41.884	-87.6247	casual

Fig 2. Dataset of Divvy\_Trips\_2020\_Q1

### 3. Data Preparation: Cleaning and Transformation

To ensure the data was accurate and ready for analysis, a thorough cleaning and transformation process was undertaken. The following steps were performed:

- Data Organization:** The 12 individual monthly .csv files were downloaded, unzipped, and organized into a single project folder to maintain a clear file structure.
- Data Combination:** Using a spreadsheet application, the data from all 12 files was combined into one comprehensive master worksheet to enable a full-year analysis.
- Creation of New Columns:** To facilitate the analysis, two new columns were created in the master worksheet:

- **ride\_length**: This column was calculated by subtracting the **started\_at** time from the **ended\_at** time for each trip. The result was formatted as HH:MM:SS to represent the total trip duration.
- **day\_of\_week**: This column was added to determine the day of the week each ride started. This was calculated using the **WEEKDAY** function, with Sunday represented as 1 and Saturday as 7.

4. **Data Cleaning and Verification**: The combined dataset was checked for errors and inconsistencies. All trips with a ride length of zero or a negative value were identified and removed from the dataset to ensure the accuracy and integrity of subsequent analysis.

The results after the dataset was cleaned are as follows in Fig 3. for the dataset of Divvy\_Trips\_2019\_Q1 and Fig 4. for the dataset of Divvy\_Trips\_2020\_Q1.

	C	D	E	F	G	H	I	J	K	L	M	N
	time	bikeid	tripduration	from_station_id	from_station_name	to_station_id	to_station_name	usertype	gender	birthyear	ride_length	day_of_week
1	2019-01-01 00:11:07	2167	390	199	Wabash Ave & C	84	Milwaukee Ave & S	Subscriber	Male	1989	00:06:30	3
2	2019-01-01 00:15:34	4386	441	44	State St & Rand	624	Dearborn St & V	Subscriber	Female	1990	00:07:21	3
3	2019-01-01 00:27:12	1524	829	15	Racine Ave & 18	644	Western Ave & F	Subscriber	Female	1994	00:13:49	3
4	2019-01-01 00:43:28	252	1,783.00	123	California Ave &	176	Clark St & Elm S	Subscriber	Male	1993	00:29:43	3
5	2019-01-01 00:20:56	1170	364	173	Mies van der Ro	35	Streeter Dr & Gr	Subscriber	Male	1994	00:06:04	3
6	2019-01-01 00:19:09	2437	216	98	LaSalle St & Wa	49	Dearborn St & M	Subscriber	Female	1983	00:03:36	3
7	2019-01-01 00:19:03	2708	177	98	LaSalle St & Wa	49	Dearborn St & M	Subscriber	Male	1984	00:02:57	3
8	2019-01-01 00:20:21	2796	100	211	St. Clair St & Er	142	McClurg Ct & Er	Subscriber	Male	1990	00:01:40	3
9	2019-01-01 00:47:30	6205	1,727.00	150	Fort Dearborn D	148	State St & 33rd	Subscriber	Male	1995	00:28:47	3
10	2019-01-01 00:24:54	3939	336	268	Lake Shore Dr &	141	Clark St & Lincol	Subscriber	Male	1996	00:05:36	3
11	2019-01-01 00:35:20	6243	886	299	Halsted St & Ro	295	Broadway & Arg	Subscriber	Male	1994	00:14:46	3
12	2019-01-01 00:32:45	6300	653	204	Prairie Ave & Ga	420	Ellis Ave & 55th	Subscriber	Female	1994	00:10:53	3
13	2019-01-01 00:33:05	3029	601	90	Millennium Park	255	Indiana Ave & R	Subscriber	Male	1986	00:10:01	3
14	2019-01-01 00:33:05	84	562	90	Millennium Park	255	Indiana Ave & R	Customer	Female	1990	00:09:22	3
15	2019-01-01 00:39:00	5019	906	289	Wells St & Cono	324	Stockton Dr & W	Subscriber	Female	1989	00:15:06	3
16	2019-01-01 00:39:00	5526	892	289	Wells St & Cono	324	Stockton Dr & W	Subscriber	Female	1989	00:14:52	3
17	2019-01-01 00:31:00	3373	407	152	Lincoln Ave & Di	166	Ashland Ave & V	Subscriber	Male	1967	00:06:47	3
18	2019-01-01 00:47:03	5777	1,356.00	268	Lake Shore Dr &	319	Greenview Ave & I	Customer	Female	1990	00:22:36	3
19	2019-01-01 00:27:10	3940	102	35	Streeter Dr & Gr	35	Streeter Dr & Gr	Subscriber	Male	1985	00:01:42	3
20	2019-01-01 01:08:12	3914	2,333.00	35	Streeter Dr & Gr	39	Wabash Ave & A	Customer			00:38:53	3
21	2019-01-01 00:45:21	140	960	47	State St & Kinzie	111	Sedgwick St & H	Subscriber	Male	1957	00:16:00	3

Fig 4. Cleaned Dataset of Divvy\_Trips\_2019\_Q1

	C	D	E	F	G	H	I	J	K	L	M	N	O
	start_at	ended_at	start_station_name	start_station_id	end_station_name	end_station_id	start_lat	start_lng	end_lat	end_lng	member_casual	ride_length	day_of_week
1	01-21 20:0	2020-01-21 20:1	Western Ave & L	239	Clark St & Lelan	326	41.9665	-87.6884	41.9671	-87.6674	member	00:07:31	3
2	01-30 14:2	2020-01-30 14:2	Clark St & Montr	234	Southport Ave &	318	41.9616	-87.666	41.9542	-87.6644	member	00:03:43	5
3	01-09 19:2	2020-01-09 19:3	Broadway & Bel	296	Wilton Ave & Bel	117	41.9401	-87.6455	41.9402	-87.653	member	00:02:51	5
4	01-06 16:1	2020-01-06 16:2	Clark St & Rand	51	Fairbanks Ct & C	24	41.8846	-87.6319	41.8918	-87.6206	member	00:08:49	2
5	01-30 08:3	2020-01-30 08:4	Clinton St & Lak	66	Wells St & Hubb	212	41.8856	-87.6418	41.8899	-87.6343	member	00:05:32	5
6	01-10 12:3	2020-01-10 12:3	Wells St & Hubb	212	Desplaines St &	96	41.8899	-87.6343	41.8846	-87.6446	member	00:04:49	6
7	01-10 13:0	2020-01-10 13:1	Desplaines St &	96	Wells St & Hubb	212	41.8846	-87.6446	41.8899	-87.6343	member	00:04:49	6
8	01-10 07:2	2020-01-10 07:2	Desplaines St &	96	Wells St & Hubb	212	41.8846	-87.6446	41.8899	-87.6343	member	00:04:57	6
9	01-31 16:3	2020-01-31 16:4	Wells St & Hubb	212	Desplaines St &	96	41.8899	-87.6343	41.8846	-87.6446	member	00:04:55	6
10	01-31 09:3	2020-01-31 09:4	Clark St & Lake	38	Orleans St & Me	100	41.886	-87.6309	41.8882	-87.6364	member	00:03:23	6
11	01-07 22:4	2020-01-07 22:5	Wilton Ave & Bel	117	Clark St & Newp	632	41.9402	-87.653	41.9445	-87.6547	member	00:03:16	3
12	01-08 16:0	2020-01-08 16:0	LaSalle St & Illin	181	Clinton St & Was	91	41.8908	-87.6317	41.8834	-87.6412	member	00:06:20	4
13	01-08 09:3	2020-01-08 09:4	Clinton St & Was	91	LaSalle St & Illin	181	41.8834	-87.6412	41.8908	-87.6317	member	00:08:49	4
14	01-23 09:3	2020-01-23 09:4	Clinton St & Was	91	LaSalle St & Illin	181	41.8834	-87.6412	41.8908	-87.6317	member	00:07:45	5
15	01-28 20:5	2020-01-28 21:0	California Ave &	123	Marshfield Ave &	58	41.9227	-87.6972	41.916	-87.6689	member	00:16:40	3
16	01-07 17:0	2020-01-07 17:4	Franklin St & Jac	36	Lincoln Ave & Di	152	41.8777	-87.6353	41.9322	-87.6586	member	00:35:47	3
17	01-07 08:3	2020-01-07 09:1	Wilton Ave & Div	13	Franklin St & Jac	36	41.9324	-87.6527	41.8777	-87.6353	member	00:32:45	3
18	01-06 17:1	2020-01-06 17:4	Franklin St & Jac	36	Lincoln Ave & Di	152	41.8777	-87.6353	41.9322	-87.6586	member	00:32:07	2
19	01-06 08:4	2020-01-06 09:2	Lincoln Ave & Di	152	Franklin St & Jac	36	41.9322	-87.6586	41.8777	-87.6353	member	00:36:57	2
20	01-19 12:0	2020-01-19 12:1	Kingsbury St & H	133	Clark St & Chica	337	41.8892	-87.6385	41.8968	-87.6309	member	00:06:08	1
21	01-16 17:1	2020-01-16 17:4	Lake Shore Dr &	76	Michigan Ave &	43	41.881	-87.6167	41.884	-87.6247	casual	00:30:01	5

Fig 4. Cleaned Dataset of Divvy\_Trips\_2020\_Q1

## 4. Summary of Analysis

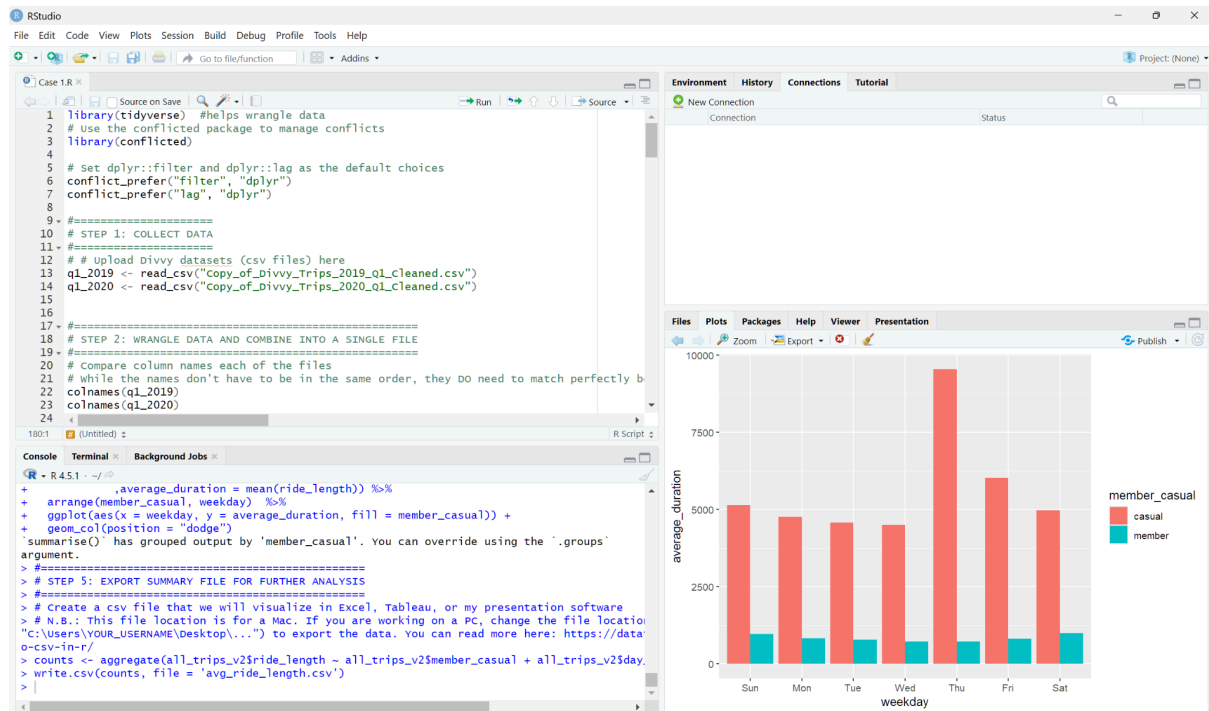


Fig 5. Analysis was performed using RStudio

The analysis was performed using R to uncover the core differences between member and casual rider behavior. The following steps were taken:

1. **Data Import and Consolidation:** The relevant datasets were imported into R. The columns were made consistent across the different files, and the data was merged into a single, comprehensive dataframe.
2. **Data Cleaning and Preparation:** Additional data cleanup and preparation steps were performed within R to ensure the dataset was ready for analysis. This included the `ride_length` and `day_of_week` calculations mentioned in the previous section.
3. **Descriptive Analysis:** A descriptive analysis was conducted on the prepared dataframe. This involved calculating summary statistics (e.g., mean, median, max) for ride lengths and analyzing ride counts by rider type and day of the week to identify key trends, patterns, and relationships.
4. **Data Export:** A summary file of the key findings was exported for further use in visualization and reporting.

## 5. Key Findings and Supporting Visualizations

The analysis revealed distinct patterns that differentiate how casual riders and annual members use Cyclistic bikes. The following visualizations were created in R to tell a clear and compelling story with the data. The process involved:

1. **Ideation:** Sketching initial concepts on paper to determine the most effective ways to visualize the key comparisons between rider types.

2. **Creation in R:** Using libraries such as `ggplot2` to build polished visualizations (e.g., bar charts for average ride length, line charts for usage over time). Aesthetic principles like color, size, and shape were used to draw attention to the most important insights.
3. **Refinement:** Adding clear headlines, subtitles, and labels to ensure each chart is easily understood. The final visualizations were refined to ensure a high level of quality and detail, suitable for presentation to the executive team.

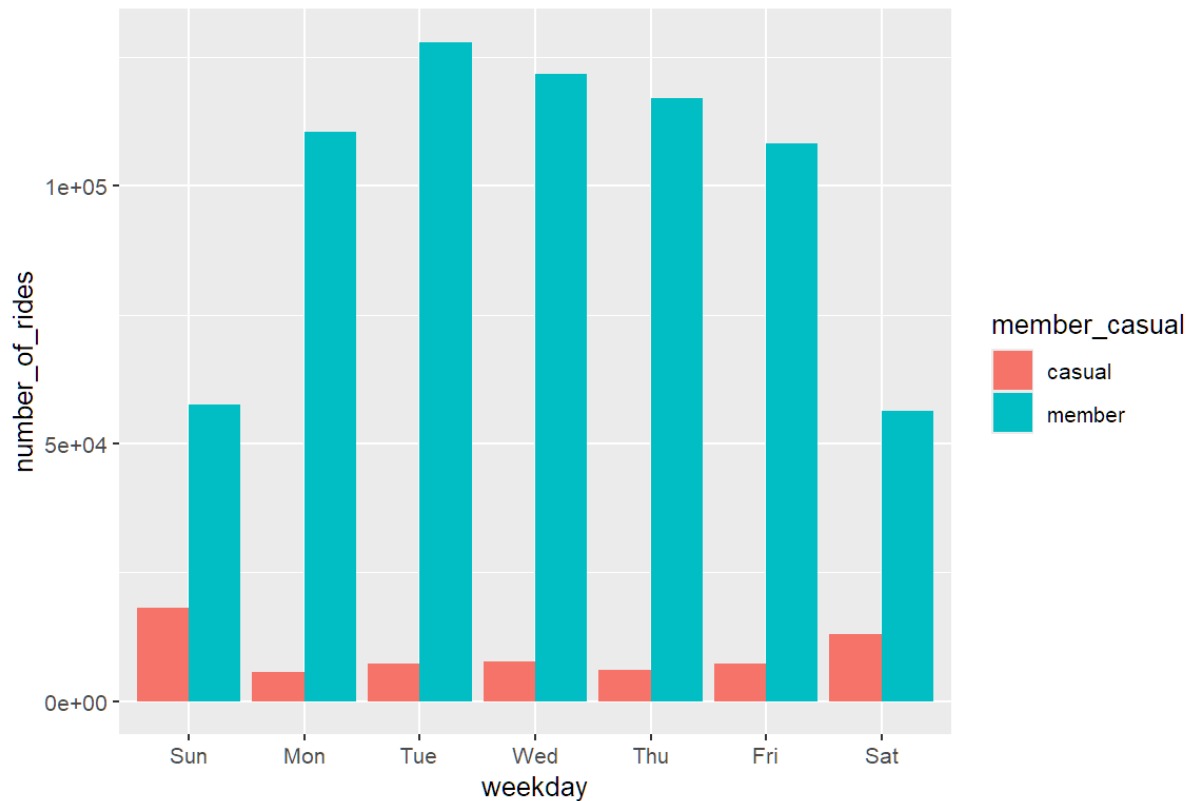


Fig 6. Chart Number of Rider

**Based on Fig 6. we can know that** Annual members demonstrate consistent usage throughout the Monday-Friday work week, with clear peaks during morning and evening commute hours. In contrast, casual rider usage surges dramatically over the weekend.

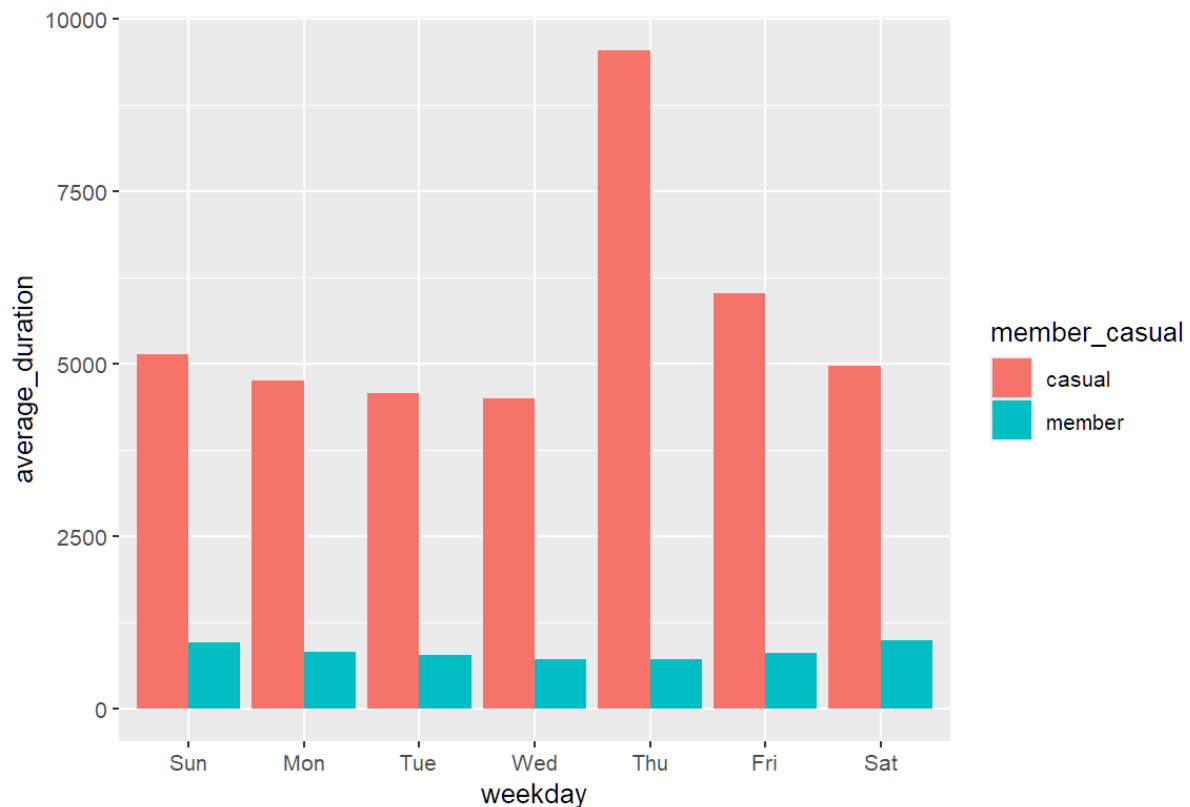


Fig 7. Chart Average Duration of Riding

**Based on Fig 7. we can know that** Casual riders, on average, take significantly longer rides than annual members. This suggests a primary use case centered around leisure, exploration, or one-off trips.

## 6. Top Recommendations to Drive Conversions

Based on the findings, the following three recommendations are proposed to strategically convert casual riders into annual members:

- **Recommendation 1: Introduce a "Weekend Pass" or "Leisure Membership".**
  - **Rationale:** Since casual riders are most active on weekends and take longer trips, a membership tier tailored to this behavior could be highly appealing. This could offer benefits like unlimited weekend rides or discounted rates for longer durations.
- **Recommendation 2: Launch a Marketing Campaign Focused on the "Cost of Commuting".**
  - **Rationale:** For casual riders who use the service on weekdays, a targeted campaign can illustrate the cost savings of an annual membership for frequent, short trips. Messaging like, "Riding to work more than twice a week? A membership pays for itself!" could be effective.
- **Recommendation 3: Implement a "First Ride Free" or "Ride-Again" Discount for New Users.**
  - **Rationale:** To capture casual riders who may be tourists or infrequent users, offer an immediate incentive to use the service again. A follow-up email after their first ride with a discount on a day-pass or a special offer on an annual membership could encourage repeat business and eventual conversion.

