Analysis report

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BUSINESS TASK

I must answer this question with my analysis to know what I can offer casual bike share users to make them want to become members of Cyclistic. How are annual members and casual riders different when it comes to using Cyclistic bikes?

DATA SOURCE

- Data was collected from: https://divvy-tripdata.s3.amazonaws.com/index.html
- Under this license: https://divvybikes.com/data-license-agreement

Install required packages for creating my enviroment en R:

- tidyverse for data import and wrangling
- dplyr for data manipulation
- ggplot for visualization
- lubridate for date functions

```r
library(tidyverse)  #helps wrangle data
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v dplyr     1.1.4     v readr     2.1.5
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   3.5.1     v tibble    3.2.1
## v lubridate 1.9.4     v tidyr     1.3.1
## v purrr     1.0.2
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to
```

```r
library(lubridate)  #helps wrangle date attributes
library(ggplot2)  #helps visualize data
library(dplyr) # helps Data Manipulation
```

DATA COLLECTION

```r
setwd("/Users/carme/Desktop/Datos_divvy/CSV") #sets your working directory to simplify calls to data...
# Upload Divvy datasets (csv files) here
jan <- read_csv("202401-divvy-tripdata.csv")
feb <- read_csv("202402-divvy-tripdata.csv")
mar <- read_csv("202403-divvy-tripdata.csv")
apr <- read_csv("202404-divvy-tripdata.csv")
may <- read_csv("202405-divvy-tripdata.csv")
jun <- read_csv("202406-divvy-tripdata.csv")
jul <- read_csv("202407-divvy-tripdata.csv")
aug <- read_csv("202408-divvy-tripdata.csv")
sep <- read_csv("202409-divvy-tripdata.csv")
oct <- read_csv("202410-divvy-tripdata.csv")
nov <- read_csv("202411-divvy-tripdata.csv")
dec <- read_csv("202412-divvy-tripdata.csv")
```

Stack individual data frames into one big data frame:

```r
all_trips <- bind_rows(jan, feb, mar, apr, may, jun, jul, aug, sep, oct, nov, dec)
```

Inspect the new table that has been created:

```r
colnames(all_trips)  #List of column names
```

```
##  [1] "ride_id"            "rideable_type"      "started_at"
##  [4] "ended_at"           "start_station_name" "start_station_id"
##  [7] "end_station_name"   "end_station_id"     "start_lat"
## [10] "start_lng"          "end_lat"            "end_lng"
## [13] "member_casual"
```

```r
nrow(all_trips)  #How many rows are in data frame?
```

```
## [1] 5860568
```

```r
dim(all_trips)  #Dimensions of the data frame?
```

```
## [1] 5860568      13
```

```r
head(all_trips)  #See the first 6 rows of data frame.  Also tail(all_trips)
```

```
## # A tibble: 6 x 13
##   ride_id          rideable_type started_at          ended_at
##   <chr>            <chr>         <dttm>              <dttm>
## 1 C1D650626C8C899A electric_bike 2024-01-12 15:30:27 2024-01-12 15:37:59
## 2 EECD38BDB25BFCB0 electric_bike 2024-01-08 15:45:46 2024-01-08 15:52:59
## 3 F4A9CE78061F17F7 electric_bike 2024-01-27 12:27:19 2024-01-27 12:35:19
## 4 0A0D9E15EE50B171 classic_bike  2024-01-29 16:26:17 2024-01-29 16:56:06
## 5 33FFC9805E3EFF9A classic_bike  2024-01-31 05:43:23 2024-01-31 06:09:35
## 6 C96080812CD285C5 classic_bike  2024-01-07 11:21:24 2024-01-07 11:30:03
## # i 9 more variables: start_station_name <chr>, start_station_id <chr>,
## #   end_station_name <chr>, end_station_id <chr>, start_lat <dbl>,
## #   start_lng <dbl>, end_lat <dbl>, end_lng <dbl>, member_casual <chr>
```

```r
str(all_trips)  #See list of columns and data types (numeric, character, etc)
```

```
## spc_tbl_ [5,860,568 x 13] (S3: spec_tbl_df/tbl_df/tbl/data.frame)
##  $ ride_id           : chr [1:5860568] "C1D650626C8C899A" "EECD38BDB25BFCB0" "F4A9CE7806
##  $ rideable_type     : chr [1:5860568] "electric_bike" "electric_bike" "electric_bike" "
##  $ started_at        : POSIXct[1:5860568], format: "2024-01-12 15:30:27" "2024-01-08 15
##  $ ended_at          : POSIXct[1:5860568], format: "2024-01-12 15:37:59" "2024-01-08 15
##  $ start_station_name: chr [1:5860568] "Wells St & Elm St" "Wells St & Elm St" "Wells St
##  $ start_station_id  : chr [1:5860568] "KA1504000135" "KA1504000135" "KA1504000135" "TA1
##  $ end_station_name  : chr [1:5860568] "Kingsbury St & Kinzie St" "Kingsbury St & Kinzie
##  $ end_station_id    : chr [1:5860568] "KA1503000043" "KA1503000043" "KA1503000043" "131
##  $ start_lat         : num [1:5860568] 41.9 41.9 41.9 41.9 41.9 ...
##  $ start_lng         : num [1:5860568] -87.6 -87.6 -87.6 -87.6 -87.7 ...
##  $ end_lat           : num [1:5860568] 41.9 41.9 41.9 41.9 41.9 ...
##  $ end_lng           : num [1:5860568] -87.6 -87.6 -87.6 -87.6 -87.6 ...
##  $ member_casual     : chr [1:5860568] "member" "member" "member" "member" ...
##  - attr(*, "spec")=
##   .. cols(
##   ..   ride_id = col_character(),
##   ..   rideable_type = col_character(),
##   ..   started_at = col_datetime(format = ""),
##   ..   ended_at = col_datetime(format = ""),
##   ..   start_station_name = col_character(),
##   ..   start_station_id = col_character(),
##   ..   end_station_name = col_character(),
##   ..   end_station_id = col_character(),
##   ..   start_lat = col_double(),
##   ..   start_lng = col_double(),
##   ..   end_lat = col_double(),
##   ..   end_lng = col_double(),
##   ..   member_casual = col_character()
##   .. )
##  - attr(*, "problems")=<externalptr>
```

```r
summary(all_trips)  #Statistical summary of data. Mainly for numerics
```

```
##    ride_id          rideable_type        started_at                    
##  Length:5860568     Length:5860568     Min.   :2024-01-01 00:00:39.00  
##  Class :character   Class :character   1st Qu.:2024-05-20 19:47:53.00  
##  Mode  :character   Mode  :character   Median :2024-07-22 20:36:16.27  
##                                        Mean   :2024-07-17 07:55:47.61  
##                                        3rd Qu.:2024-09-17 20:14:22.56  
##                                        Max.   :2024-12-31 23:56:49.84  
##                                                                        
##     ended_at                      start_station_name start_station_id  
##  Min.   :2024-01-01 00:04:20.00   Length:5860568     Length:5860568    
##  1st Qu.:2024-05-20 20:07:54.75   Class :character   Class :character  
##  Median :2024-07-22 20:53:59.16   Mode  :character   Mode  :character  
##  Mean   :2024-07-17 08:13:06.54                                        
##  3rd Qu.:2024-09-17 20:27:46.02                                        
##  Max.   :2024-12-31 23:59:55.70                                        
##
```

```
##  end_station_name   end_station_id       start_lat       start_lng
##  Length:5860568     Length:5860568     Min.   :41.64   Min.   :-87.91
##  Class :character   Class :character   1st Qu.:41.88   1st Qu.:-87.66
##  Mode  :character   Mode  :character   Median :41.90   Median :-87.64
##                                        Mean   :41.90   Mean   :-87.65
##                                        3rd Qu.:41.93   3rd Qu.:-87.63
##                                        Max.   :42.07   Max.   :-87.52
##
##     end_lat         end_lng        member_casual
##  Min.   :16.06   Min.   :-144.05   Length:5860568
##  1st Qu.:41.88   1st Qu.: -87.66   Class :character
##  Median :41.90   Median : -87.64   Mode  :character
##  Mean   :41.90   Mean   : -87.65
##  3rd Qu.:41.93   3rd Qu.: -87.63
##  Max.   :87.96   Max.   : 152.53
##  NA's   :7232    NA's   :7232
```

DATA WRANGLING

Remove fields with location coordinates because they are irrelevant:

```r
all_trips <- all_trips %>%
  select(-c(start_lat, start_lng, end_lat, end_lng))
```

Add columns that list the date, month, day, and year of each ride. This will allow us to aggregate ride data for each month, day, or year … before completing these operations we could only aggregate at the ride level:

```r
all_trips$date <- as.Date(all_trips$started_at) #The default format is yyyy-mm-dd
all_trips$month <- format(as.Date(all_trips$date), "%m")
all_trips$day <- format(as.Date(all_trips$date), "%d")
all_trips$year <- format(as.Date(all_trips$date), "%Y")
all_trips$day_of_week <- format(as.Date(all_trips$date), "%A")
```

Add a "ride_length" calculation to all_trips (in seconds):

```r
all_trips$ride_length <- difftime(all_trips$ended_at,all_trips$started_at)
```

Inspect the structure of the columns:

```r
str(all_trips)
```

```
## tibble [5,860,568 x 15] (S3: tbl_df/tbl/data.frame)
##  $ ride_id           : chr [1:5860568] "C1D650626C8C899A" "EECD38BDB25BFCB0" "F4A9CE7806
##  $ rideable_type     : chr [1:5860568] "electric_bike" "electric_bike" "electric_bike" "
##  $ started_at        : POSIXct[1:5860568], format: "2024-01-12 15:30:27" "2024-01-08 15:
##  $ ended_at          : POSIXct[1:5860568], format: "2024-01-12 15:37:59" "2024-01-08 15:
##  $ start_station_name: chr [1:5860568] "Wells St & Elm St" "Wells St & Elm St" "Wells St
##  $ start_station_id  : chr [1:5860568] "KA1504000135" "KA1504000135" "KA1504000135" "TA1
##  $ end_station_name  : chr [1:5860568] "Kingsbury St & Kinzie St" "Kingsbury St & Kinzie
##  $ end_station_id    : chr [1:5860568] "KA1503000043" "KA1503000043" "KA1503000043" "131
##  $ member_casual     : chr [1:5860568] "member" "member" "member" "member" ...
##  $ date              : Date[1:5860568], format: "2024-01-12" "2024-01-08" ...
##  $ month             : chr [1:5860568] "01" "01" "01" "01" ...
##  $ day               : chr [1:5860568] "12" "08" "27" "29" ...
##  $ year              : chr [1:5860568] "2024" "2024" "2024" "2024" ...
##  $ day_of_week       : chr [1:5860568] "viernes" "lunes" "sábado" "lunes" ...
##  $ ride_length       : 'difftime' num [1:5860568] 452 433 480 1789 ...
##   ..- attr(*, "units")= chr "secs"
```

Convert “ride_length” from Factor to numeric so we can run calculations on the data:

```r
is.factor(all_trips$ride_length)
```

```
## [1] FALSE
```

```r
all_trips$ride_length <- as.numeric(as.character(all_trips$ride_length))
is.numeric(all_trips$ride_length)
```

```
## [1] TRUE
```

Check that there are no duplicate rows:

```r
all_trips <- unique(all_trips)
```

We will delete “bad” data. The data frame includes a few hundred entries where the walk time was a negative value or less than 60 seconds. We will create a new version of the data frame (v2) since data is being removed:

```r
all_trips_v2 <- all_trips %>%
  filter(!is.na(ride_length) & ride_length >= 60)
```

Let’s make the month column more coherent:

```r
all_trips_v2 <- all_trips_v2 %>%
  mutate(month = recode(month,
                        "01" = "enero",
                        "02" = "febrero",
                        "03" = "marzo",
                        "04" = "abril",
                        "05" = "mayo",
                        "06" = "junio",
                        "07" = "julio",
                        "08" = "agosto",
                        "09" = "septiembre",
                        "10" = "octubre",
                        "11" = "noviembre",
                        "12" = "diciembre"))
```

DATA ANALYSIS

Descriptive analysis on ride_length (all figures in seconds):

```
summary(all_trips_v2$ride_length)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max. 
##    60.0   347.3   596.7  1062.3  1051.6 93596.0
```

We can see that the average duration of the trips is 1062.3 seconds, and that trips lasting less than 60 seconds were effectively eliminated.

Let's count the number of trips for each user:

```
all_trips_v2 %>%
  group_by(member_casual) %>%
  summarise(number_of_rides = n()) %>%
  print()
```

```
## # A tibble: 2 x 2
##   member_casual number_of_rides
##   <chr>                   <int>
## 1 casual                2086305
## 2 member                3642733
```

We can see that members take more trips than casual users.

Compare members and casual users:

```
aggregate(all_trips_v2$ride_length ~ all_trips_v2$member_casual, FUN = mean)
```

```
##   all_trips_v2$member_casual all_trips_v2$ride_length
## 1                     casual                1555.6221
## 2                     member                 779.8342
```

```
aggregate(all_trips_v2$ride_length ~ all_trips_v2$member_casual, FUN = median)
```

```
##   all_trips_v2$member_casual all_trips_v2$ride_length
## 1                     casual                   748.13
## 2                     member                   531.00
```

```
aggregate(all_trips_v2$ride_length ~ all_trips_v2$member_casual, FUN = max)
```

```
##   all_trips_v2$member_casual all_trips_v2$ride_length
## 1                     casual                    93596
## 2                     member                    93588
```

```
aggregate(all_trips_v2$ride_length ~ all_trips_v2$member_casual, FUN = min)
```

```
##   all_trips_v2$member_casual all_trips_v2$ride_length
## 1                     casual                       60
## 2                     member                       60
```

We can see that casuals spend twice as much time as members on their trips.

See the average travel time each day for members and casual users, but let's order the days of the week:

```
all_trips_v2$day_of_week <- ordered(all_trips_v2$day_of_week, levels=c("domingo", "lunes",
```

Now, let’s run the average ride time by each day for members vs casual users:

```
aggregate(all_trips_v2$ride_length ~ all_trips_v2$member_casual + all_trips_v2$day_of_week,
```

```
##    all_trips_v2$member_casual all_trips_v2$day_of_week all_trips_v2$ride_length
## 1                      casual                  domingo                1822.3651
## 2                      member                  domingo                 872.9023
## 3                      casual                    lunes                1489.0019
## 4                      member                    lunes                 744.5072
## 5                      casual                   martes                1326.5486
## 6                      member                   martes                 749.2442
## 7                      casual                miércoles                1376.3531
## 8                      member                miércoles                 759.9032
## 9                      casual                   jueves                1354.3948
## 10                     member                   jueves                 747.5375
## 11                     casual                  viernes                1517.2393
## 12                     member                  viernes                 758.6460
## 13                     casual                   sábado                1748.3825
## 14                     member                   sábado                 862.1790
```

Both users take longer trips on weekends, especially casual ones.

Analyze ridership data by type and weekday:

```
all_trips_v2 %>%
  mutate(weekday = wday(started_at, label = TRUE)) %>%
  group_by(member_casual, weekday) %>%
  summarise(number_of_rides = n(),average_duration = mean(ride_length)) %>%
  arrange(member_casual, weekday)
```

```
## ‘summarise()‘ has grouped output by ’member_casual’. You can override using the
## ‘.groups‘ argument.
```

```
## # A tibble: 14 x 4
## # Groups:   member_casual [2]
##    member_casual weekday number_of_rides average_duration
##    <chr>         <ord>             <int>            <dbl>
##  1 casual        "do\\."          358189            1822.
##  2 casual        "lu\\."          246546            1489.
##  3 casual        "ma\\."          226028            1327.
##  4 casual        "mi\\."          261441            1376.
##  5 casual        "ju\\."          257153            1354.
##  6 casual        "vi\\."          306227            1517.
##  7 casual        "sá\\."          430721            1748.
##  8 member        "do\\."          409150             873.
##  9 member        "lu\\."          525798             745.
## 10 member        "ma\\."          561056             749.
## 11 member        "mi\\."          599649             760.
## 12 member        "ju\\."          561059             748.
## 13 member        "vi\\."          516387             759.
## 14 member        "sá\\."          469634             862.
```

From this summary we can extract that members make more trips during the week, and casual members make more trips on weekends.

Let's see what happens with the number of trips and their duration monthly:

```
all_trips_v2 %>%
  group_by(member_casual, month) %>%
  summarise(
    number_of_rides = n(),
    average_duration = mean(ride_length, na.rm = TRUE)
  ) %>%
  mutate(
    month = factor(month, levels = c("enero", "febrero", "marzo", "abril", "mayo", "junio"
                                     "julio", "agosto", "septiembre", "octubre", "noviembr
  ) %>%
  arrange(member_casual, month)
```

```
## ‘summarise()‘ has grouped output by ’member_casual’. You can override using the
## ‘.groups‘ argument.
```

```
## # A tibble: 24 x 4
## # Groups:   member_casual [2]
##    member_casual month      number_of_rides average_duration
##    <chr>         <fct>                <int>            <dbl>
##  1 casual        enero                23773            1315.
##  2 casual        febrero              46245            1541.
##  3 casual        marzo                80617            1533.
##  4 casual        abril               128007            1606.
##  5 casual        mayo                223935            1736.
##  6 casual        junio               290953            1720.
##  7 casual        julio               310508            1730.
##  8 casual        agosto              308427            1597.
##  9 casual        septiembre          334863            1326.
## 10 casual        octubre             210743            1433.
## # i 14 more rows
```

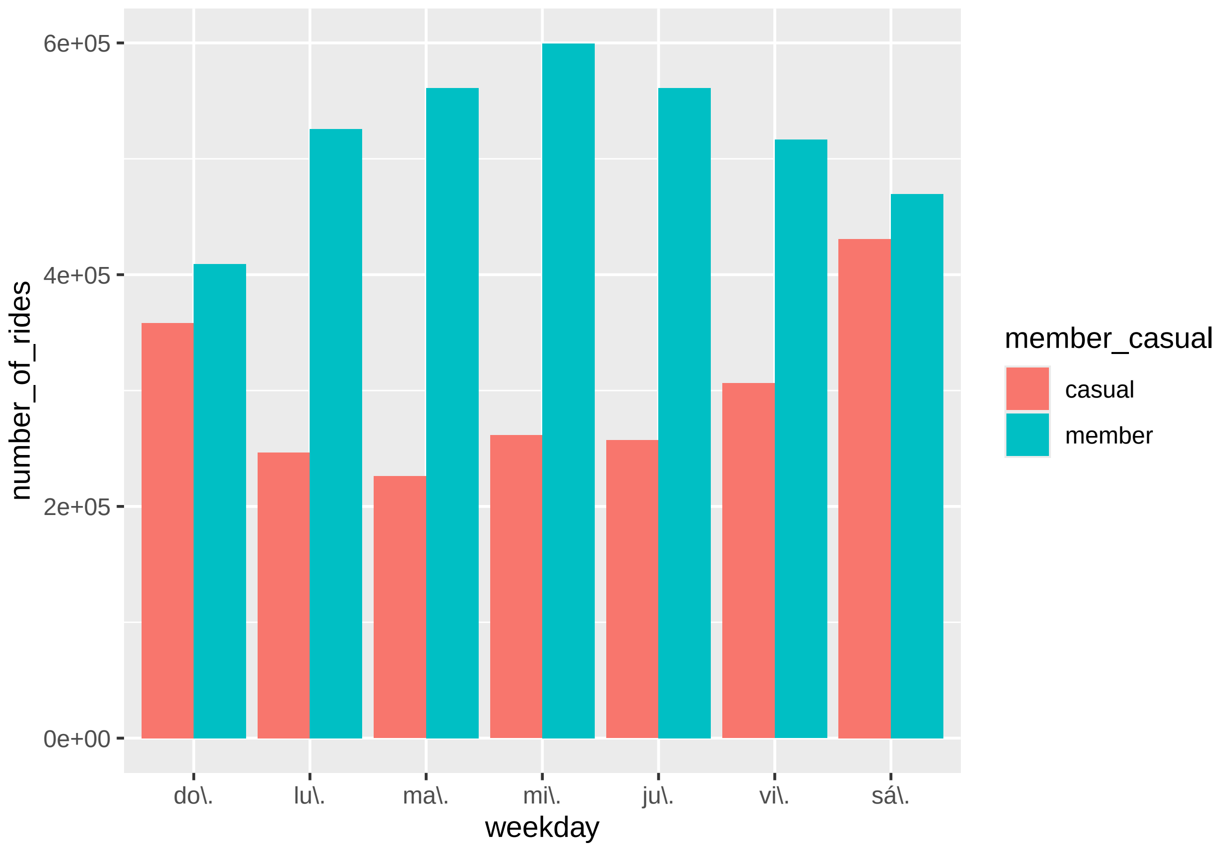
Members and casuals make more trips in summer and less in winter. Casual travelers also make shorter trips during the winter.

DATA VISUALIZATIONS

Let's visualize the number of rides by rider type:

```
all_trips_v2 %>%
  mutate(weekday = wday(started_at, label = TRUE)) %>%
  group_by(member_casual, weekday) %>%
  summarise(number_of_rides = n() ,average_duration = mean(ride_length)) %>%
  arrange(member_casual, weekday)  %>%
  ggplot(aes(x = weekday, y = number_of_rides, fill = member_casual)) +
  geom_col(position = "dodge")
```

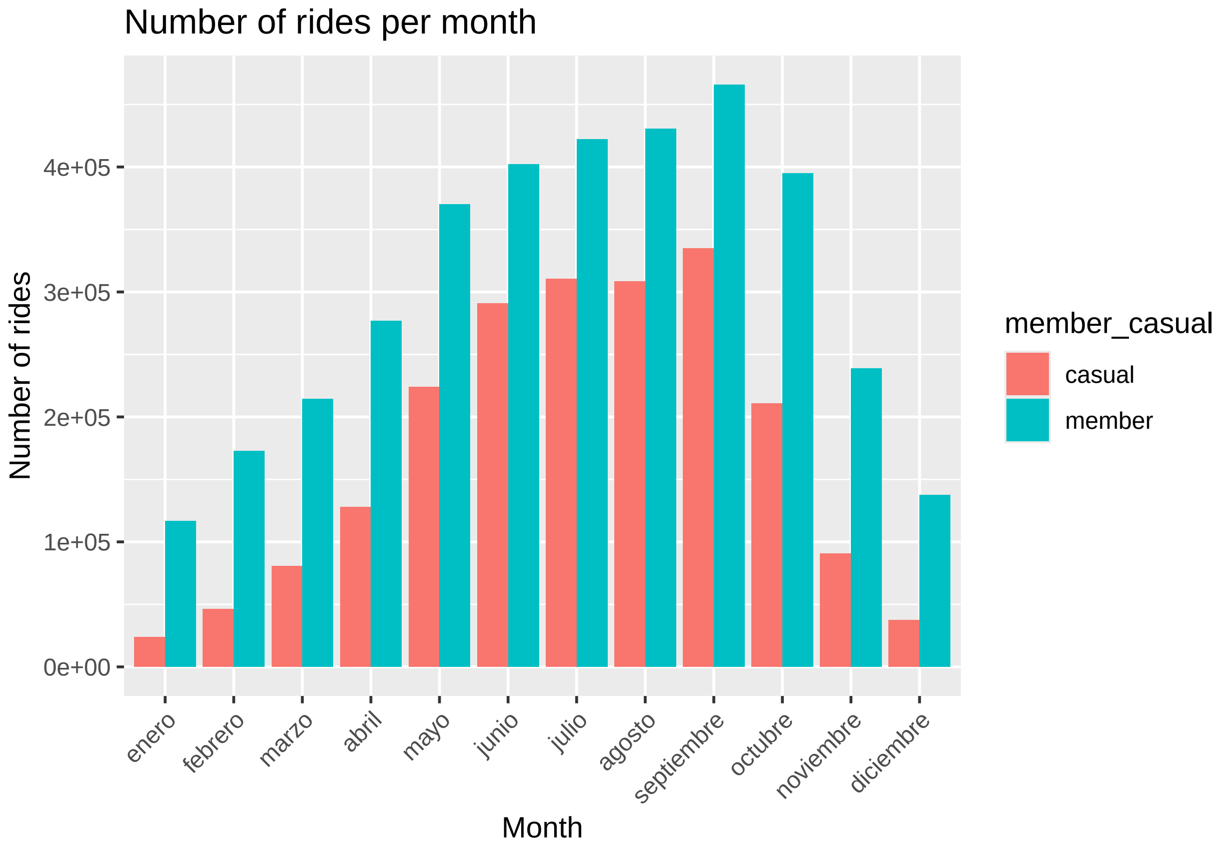
```
## ‘summarise()‘ has grouped output by ’member_casual’. You can override using the
## ‘.groups‘ argument.
```



We can see that members make more trips than casual users, and we can see that indeed members make fewer trips on weekends, and casual members make more trips on weekends.

```
all_trips_v2 %>%
  mutate(month = factor(month, levels = c("enero", "febrero", "marzo", "abril", "mayo", "j
  group_by(member_casual, month) %>%
  summarise(number_of_rides = n(),
            average_duration = mean(ride_length, na.rm = TRUE)) %>%
  arrange(member_casual, month) %>%
  ggplot(aes(x = month, y = number_of_rides, fill = member_casual)) +
  geom_col(position = "dodge") +
  labs(x = "Month", y = "Number of rides", title = "Number of rides per month") +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

```
## `summarise()` has grouped output by 'member_casual'. You can override using the
## `.groups` argument.
```



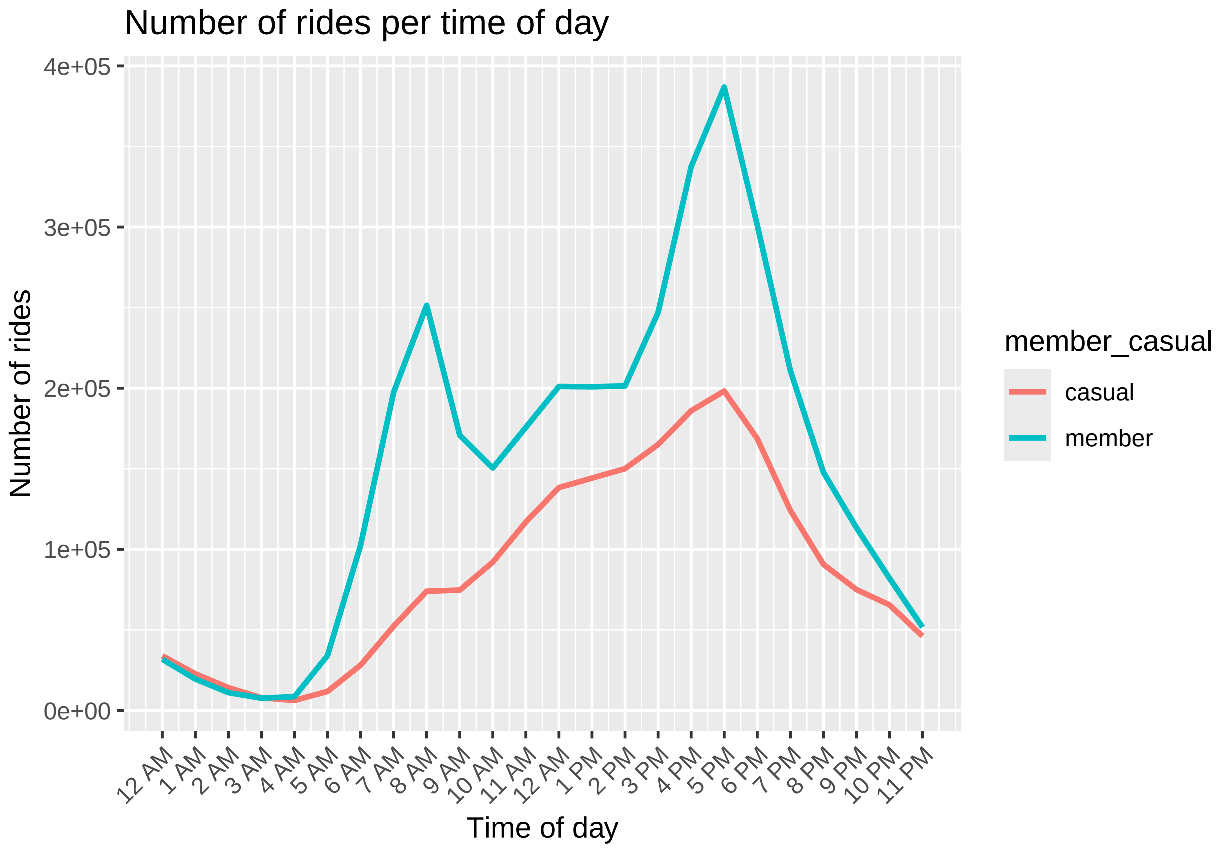
Here we can clearly see that both groups make more trips in summer and less trips in winter.

Let me show how the time of day affects the number of trips:

```
all_trips_v2 %>%
  mutate(hour_of_day = hour(started_at)) %>%
  group_by(member_casual, hour_of_day) %>%
  summarise(number_of_rides = n(),
            average_duration = mean(ride_length, na.rm = TRUE)) %>%
  arrange(member_casual, hour_of_day) %>%
  ggplot(aes(x = hour_of_day, y = number_of_rides, color = member_casual, group = member_ca
  geom_line(size = 1) +  # Cambia geom_col por geom_line
  scale_x_continuous(breaks = 0:23,
                     labels = function(x) {
                       hour_labels <- ifelse(x %% 12 == 0, "12 AM",
                                             ifelse(x < 12, paste0(x, " AM"),
                                                    paste0(x - 12, " PM")))
                       return(hour_labels)
                     }) +
  labs(x = "Time of day", y = "Number of rides", title = "Number of rides per time of day"
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

```
## `summarise()` has grouped output by 'member_casual'. You can override using the
## `.groups` argument.
```

```
## Warning: Using `size` aesthetic for lines was deprecated in ggplot2 3.4.0.
## i Please use `linewidth` instead.
## This warning is displayed once every 8 hours.
## Call ‘lifecycle::last_lifecycle_warnings()‘ to see where this warning was
## generated.
```

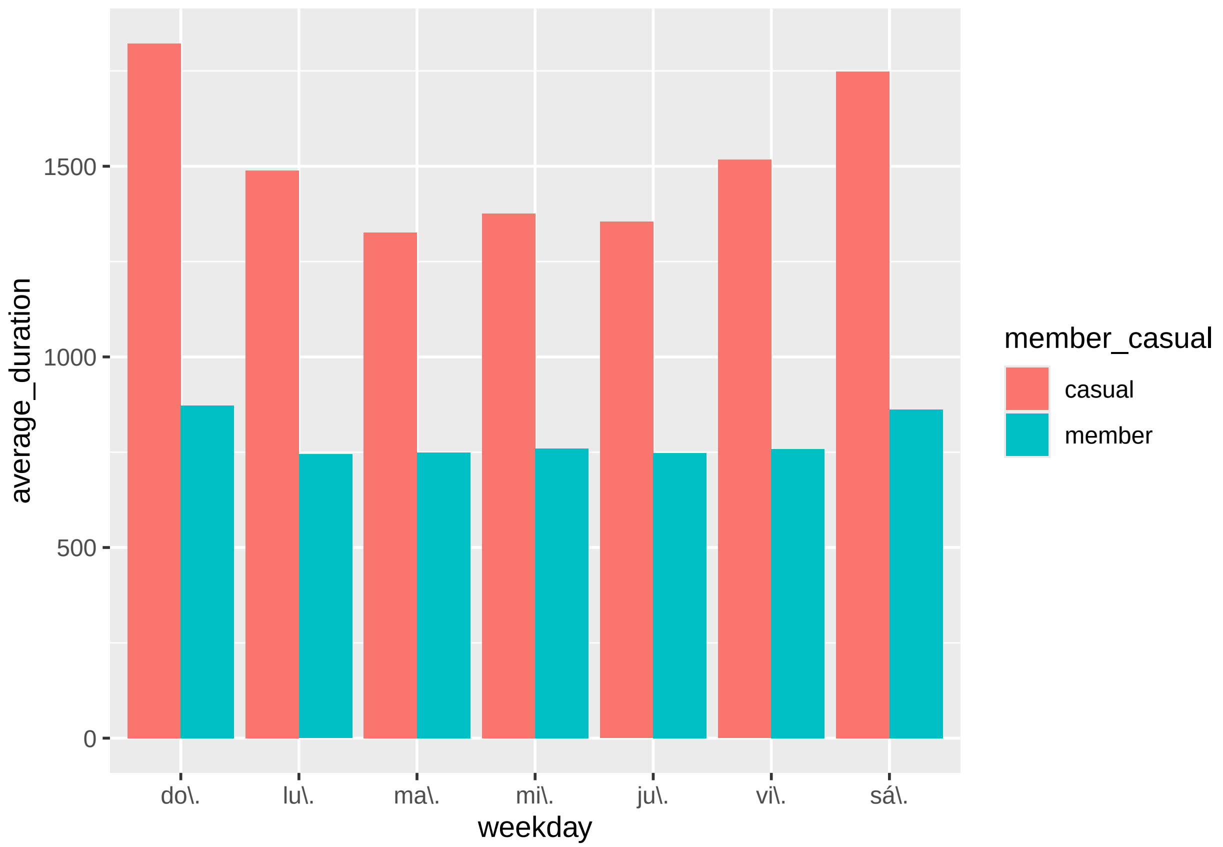


We can see that members take their bike more in the morning and afternoon, right at the time when businesses open and close, then they use the bike to go to or from work, the casual ones, for their part, concentrate their trips in the morning. afternoon, then they are probably students who take the bike in the afternoon as a leisure activity.

Let’s create a visualization for average duration:

```
all_trips_v2 %>%
  mutate(weekday = wday(started_at, label = TRUE)) %>%
  group_by(member_casual, weekday) %>%
  summarise(number_of_rides = n() ,average_duration = mean(ride_length)) %>%
  arrange(member_casual, weekday)  %>%
  ggplot(aes(x = weekday, y = average_duration, fill = member_casual)) +
  geom_col(position = "dodge")
```

```
## ‘summarise()‘ has grouped output by ’member_casual’. You can override using the
## ‘.groups‘ argument.
```

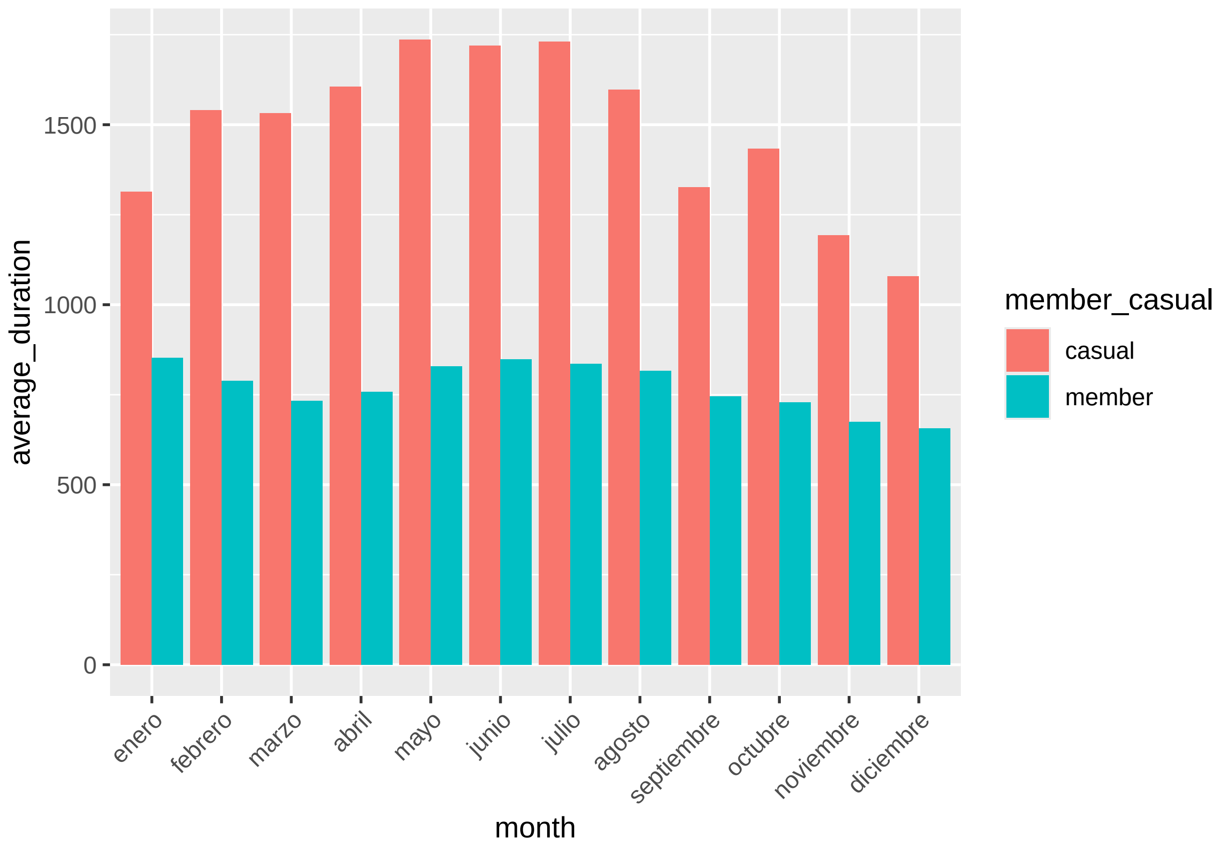


We can notice that both groups make longer trips on weekends, but the casual ones significantly increase the duration of the trip. Casual people take longer trips in general.

Let's see what happens monthly with the duration of the trips:

```
all_trips_v2 %>%
  mutate(month = factor(month, levels = c("enero", "febrero", "marzo", "abril", "mayo", "j
                                         "julio", "agosto", "septiembre", "octubre", "novi
  group_by(member_casual, month) %>%
  summarise(number_of_rides = n(),
            average_duration = mean(ride_length, na.rm = TRUE)) %>%
  arrange(member_casual, month) %>%
  ggplot(aes(x = month, y = average_duration, fill = member_casual)) +
  geom_col(position = "dodge") +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

```
## 'summarise()' has grouped output by 'member_casual'. You can override using the
## '.groups' argument.
```

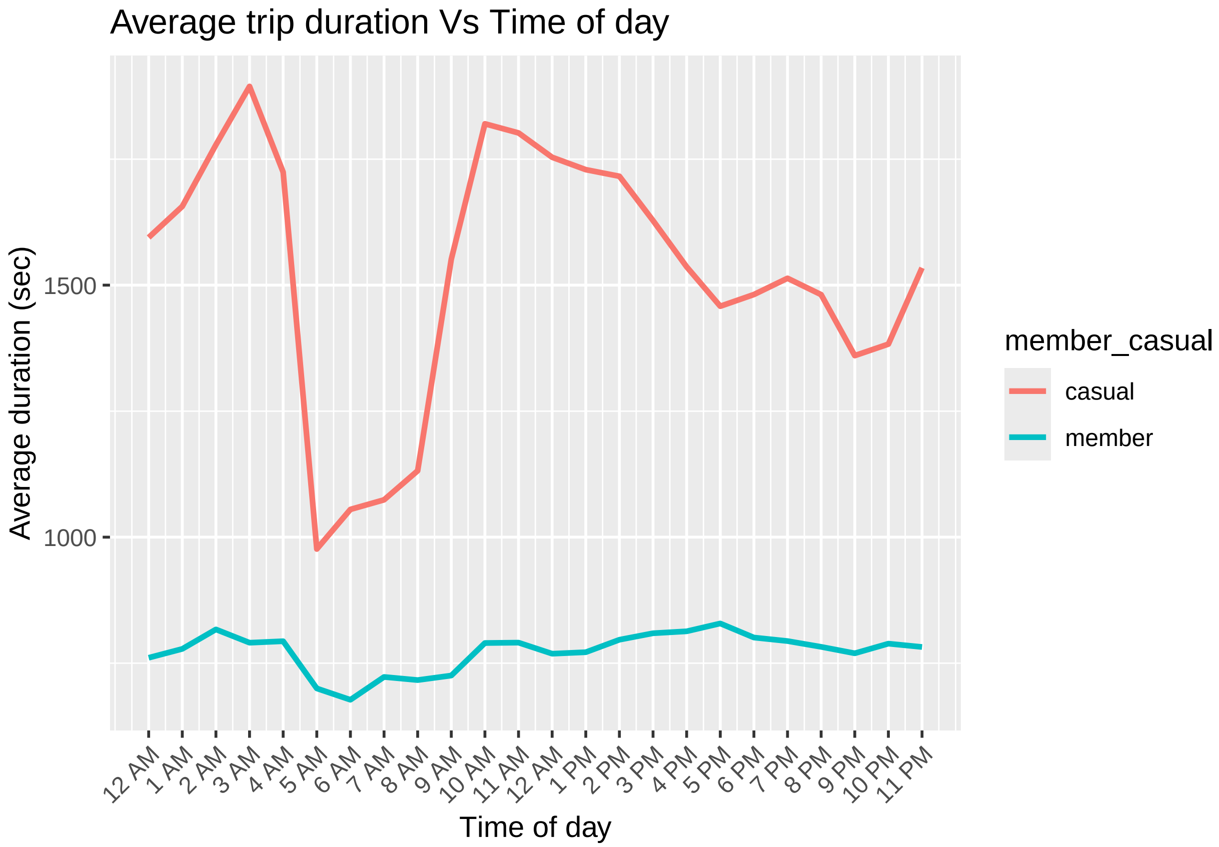


Annually, casuals continue to make longer trips but a little shorter in the winter months. Members take shorter trips overall, and trip lengths don't vary as much between seasons.

Let's see what happens with the time of day and the duration of the trip:

```
all_trips_v2 %>%
  mutate(hour_of_day = hour(started_at)) %>%
  group_by(member_casual, hour_of_day) %>%
  summarise(number_of_rides = n(),
            average_duration = mean(ride_length, na.rm = TRUE)) %>%
  arrange(member_casual, hour_of_day) %>%
  ggplot(aes(x = hour_of_day, y = average_duration, color = member_casual, group = member_
  geom_line(size = 1) +  # Cambio a gráfico de líneas
  scale_x_continuous(breaks = 0:23,
                     labels = function(x) {
                       hour_labels <- ifelse(x %% 12 == 0, "12 AM",
                                             ifelse(x < 12, paste0(x, " AM"),
                                                    paste0(x - 12, " PM")))
                       return(hour_labels)
                     }) +
  labs(x = "Time of day", y = "Average duration (sec)", title = "Average trip duration Vs '
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```

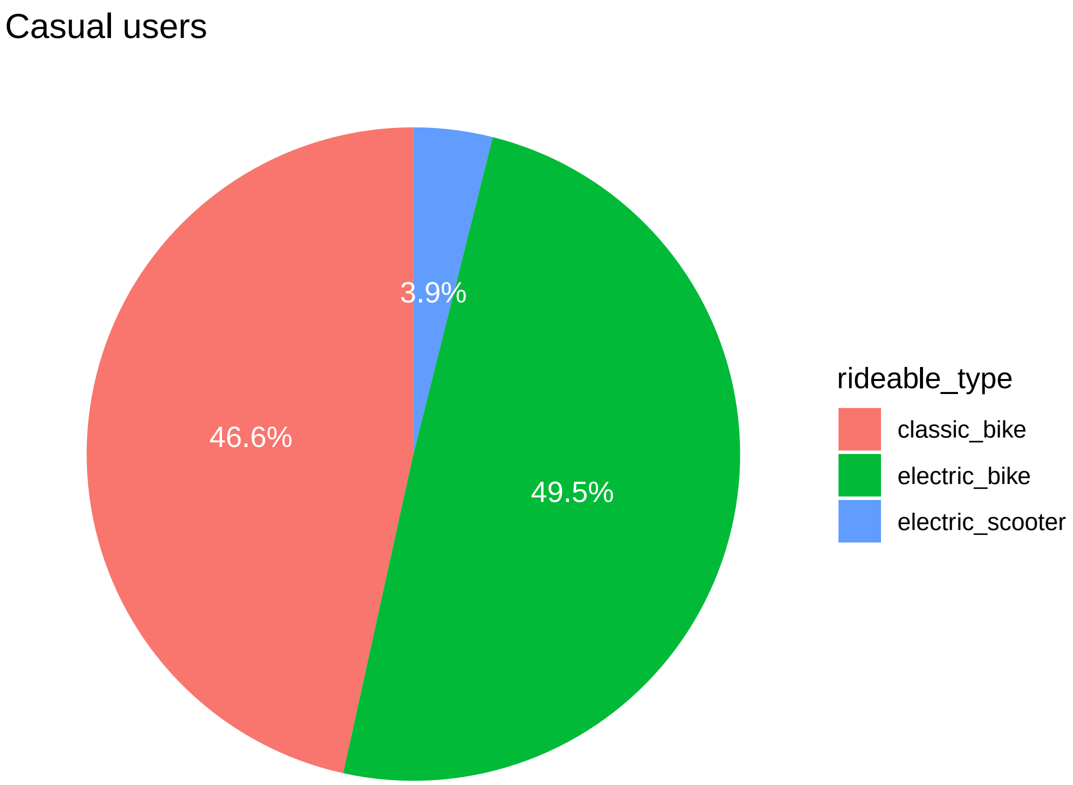
```
## 'summarise()' has grouped output by 'member_casual'. You can override using the
## '.groups' argument.
```



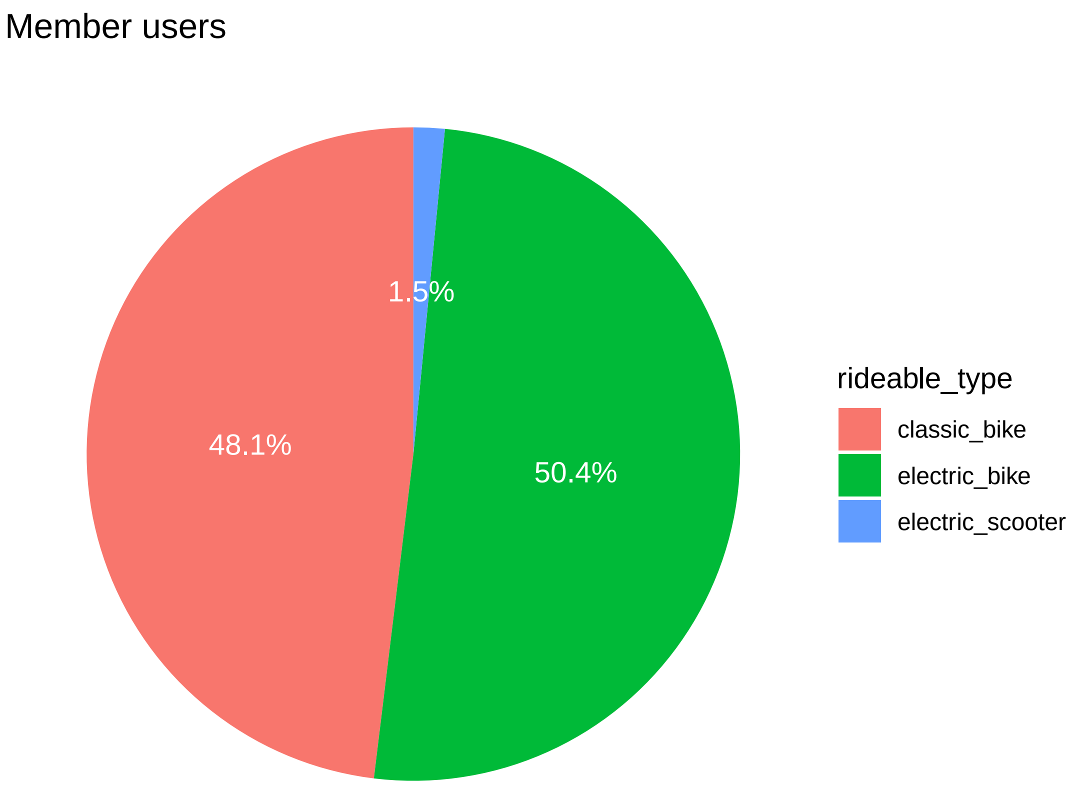
We can see that members make the same type of trip during the day as at night (some at night a little shorter), because the use they make is to go to work (whether day or night shift). Casual people do not make long trips at night, since their use of bikes is more recreational.

Let's try to visualize the type of bicycle used by each type of user:

```
all_trips_v2 %>%
  filter(member_casual == "casual") %>%
  count(rideable_type) %>%
  mutate(percentage = round(n / sum(n) * 100, 1)) %>%
  ggplot(aes(x = "", y = n, fill = rideable_type)) +
  geom_bar(stat = "identity", width = 1) +
  coord_polar(theta = "y") +
  labs(title = "Casual users") +  theme_void() +
  theme(axis.text.x = element_blank()) +
  geom_text(aes(label = paste0(percentage, "%")),
            position = position_stack(vjust = 0.5), color = "white")
```



```r
all_trips_v2 %>%
  filter(member_casual == "member") %>%
  count(rideable_type) %>%
  mutate(percentage = round(n / sum(n) * 100, 1)) %>%
  ggplot(aes(x = "", y = n, fill = rideable_type)) +
  geom_bar(stat = "identity", width = 1) +
  coord_polar(theta = "y") +
  labs(title = "Member users") +
  theme_void() +
  theme(axis.text.x = element_blank()) +
  geom_text(aes(label = paste0(percentage, "%")),
            position = position_stack(vjust = 0.5), color = "white")
```



Electric bikes are the favorites of both types of users, so it doesn't seem relevant to the case.

CONCLUSIONS

Casual users:

- They take fewer trips overall than members.
- They make more trips on weekends and during the summer, and tend to make more trips in the afternoon.
- They take longer trips in general, twice as long.
- Their trips are longer during the day, on weekends, and in the spring-summer seasons.
- This suggests recreational use of bicycles, probably students and retirees.

Member users:

- They make more trips in general than casual users.
- They make more trips during the week, in summer, and the times at which they make the most trips are 8AM and 6PM.
- They take shorter trips, approximately half as long as casual users.
- Their trips are almost always of the same duration, somewhat less overnight.
- They do not vary their duration significantly between the different seasons, but they make slightly longer trips on weekends.
- This suggests that they are users who use bikes to go to work, whether during the day shift or the night shift, which is why the times they make the most trips coincide with the opening and closing hours of businesses.

RECOMENDATIONS

- Offer a type of membership to casual users called ‘free time’ that allows them to use the bikes during the afternoon, from 4PM to 10PM for example, on weekends all day, and unlimited access during the day in the summer months.
- Create a marketing campaign focused on these benefits, clear messages about the hours and days that users can enjoy their membership, and how this will allow them to have a more flexible experience that fits their lives, across networks social events, advertising messages at bus stops (to raise awareness about the importance of the environment), and advertising messages near secondary schools, universities, and nursing homes.
- One of the key strategies for converting casual cyclists into annual Cyclistic members is to leverage the existing network of users. A referral system would incentivize current users to refer their friends and family to join the annual membership program. This marketing strategy can leverage the trust and personal relationships of current riders to attract new members. Every time a referral signs up for an annual membership, both the current user and the new member would receive a reward, such as a month of Free membership or a discount on future renewals. This type of incentive would motivate members to share the program with others.