Cyclistic Case Study 2021 All Trips

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This analysis is for Cyclistic Case Study for Google Data Analytics Course. This is an analysis for the year of 2021.

STEP ONE: INSTALL REQUIRED PACKAGES AND IMPORT DATA

Install the required packages. **Tidyverse** package to import and wrangling the data and **ggplot2** package for visualization of the data. **Lubridate** package for date parsing and **anytime** package for the datetime conversion.

- install.packages("tidyverse")
- install.packages("ggplot2")
- install.packages("lubridate")
- install.packages("anytime")

```
library(tidyverse)
library(lubridate)
library(data.table)
library(ggplot2)
library(anytime)
```

Import data from local drive.

```
Jan21 <- read_csv("202101-divvy-tripdata.csv")
Feb21 <- read_csv("202102-divvy-tripdata.csv")
Mar21 <- read_csv("202103-divvy-tripdata.csv")
Apr21 <- read_csv("202104-divvy-tripdata.csv")
May21 <- read_csv("202105-divvy-tripdata.csv")
Jun21 <- read_csv("202106-divvy-tripdata.csv")
Jul21 <- read_csv("202107-divvy-tripdata.csv")
Aug21 <- read_csv("202108-divvy-tripdata.csv")
Sep21 <- read_csv("202109-divvy-tripdata.csv")
Oct21 <- read_csv("202110-divvy-tripdata.csv")
Nov21 <- read_csv("202111-divvy-tripdata.csv")
Dec21 <- read_csv("202112-divvy-tripdata.csv")
```

STEP TWO: EXAMINE THE DATA

Examine the dataframe for an overview of the data. Review column names, **colnames()**. Then, we need to combine all data one dataframe. Then we examine dataframes to find dimensions, **dim()**, the first, **head()**, and the last, **tail()**, six rows in the dataframe, the summary, **summary()**, statistics on the columns of the dataframe, and review the data type structure of columns, **str()**. (To reduce cuttler I have removed colnames output from Feb21-Dec21, because all tables have the same column names.

```
colnames(Jan21)
```

```
##  [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"
```

```
colnames(Feb21)
colnames(Mar21)
colnames(Apr21)
colnames(May21)
colnames(Jun21)
colnames(Jul21)
colnames(Aug21)
colnames(Sep21)
colnames(Oct21)
colnames(Nov21)
colnames(Dec21)
```

Since all column names are the same. We can combine the data into one dataframe.

```
all_trips <- bind_rows(Jan21, Feb21, Mar21, Apr21, May21, Jun21, Jul21,
Aug21, Sep21, Oct21, Nov21, Dec21)
```

```
View(all_trips)
```

```
nrow(all_trips)
```

```
## [1] 5595063
```

```
dim(all_trips)
```

```
## [1] 5595063      13
```

```
head(all_trips)
```

```
## # A tibble: 6 × 13
##   ride_id          ridea…¹ start…² ended…³ start…⁴ start…⁵ end_s…⁶ end_s…⁷ start…⁸
##   <chr>            <chr>   <chr>   <chr>   <chr>   <chr>   <chr>   <chr>   <dbl>
## 1 E19E6F1B8D4C4… electr… 1/23/2… 1/23/2… Califo… 17660   <NA>    <NA>     41.9
## 2 DC88F20C2C55F… electr… 1/27/2… 1/27/2… Califo… 17660   <NA>    <NA>     41.9
## 3 EC45C94683FE3… electr… 1/21/2… 1/21/2… Califo… 17660   <NA>    <NA>     41.9
## 4 4FA453A75AE37… electr… 1/7/20… 1/7/20… Califo… 17660   <NA>    <NA>     41.9
## 5 BE5E8EB4E7263… electr… 1/23/2… 1/23/2… Califo… 17660   <NA>    <NA>     41.9
## 6 5D8969F88C773… electr… 1/9/20… 1/9/20… Califo… 17660   <NA>    <NA>     41.9
## # … with 4 more variables: start_lng <dbl>, end_lat <dbl>, end_lng <dbl>,
## #   member_casual <chr>, and abbreviated variable names ¹rideable_type,
## #   ²started_at, ³ended_at, ⁴start_station_name, ⁵start_station_id,
## #   ⁶end_station_name, ⁷end_station_id, ⁸start_lat
```

```
tail(all_trips)
```

```
## # A tibble: 6 × 13
##   ride_id          ridea…¹ start…² ended…³ start…⁴ start…⁵ end_s…⁶ end_s…⁷ start…⁸
##   <chr>            <chr>   <chr>   <chr>   <chr>   <chr>   <chr>   <chr>   <dbl>
## 1 92BBAB97D1683… electr… 12/24/… 12/24/… Canal … 13341   <NA>    <NA>     41.9
## 2 847431F3D5353… electr… 12/12/… 12/12/… Canal … 13341   <NA>    <NA>     41.9
## 3 CF407BBC3B9FA… electr… 12/6/2… 12/6/2… Canal … 13341   Kingsb… KA1503…  41.9
## 4 60BB69EBF5440… electr… 12/2/2… 12/2/2… Canal … 13341   Dearbo… TA1305…  41.9
## 5 C414F654A2863… electr… 12/13/… 12/13/… Lawnda… 362     <NA>    <NA>     41.9
```

```
## 6 37AC57E34B2E7… classi… 12/13/… 12/13/… Michig… TA1309… Dearbo… TA1305…
41.9
## # … with 4 more variables: start_lng <dbl>, end_lat <dbl>, end_lng <dbl>,
## #   member_casual <chr>, and abbreviated variable names ¹rideable_type,
## #   ²started_at, ³ended_at, ⁴start_station_name, ⁵start_station_id,
## #   ⁶end_station_name, ⁷end_station_id, ⁸start_lat
```

```
summary(all_trips)
```

```
##    ride_id          rideable_type       started_at          ended_at
##  Length:5595063     Length:5595063     Length:5595063     Length:5595063
##  Class :character   Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##  start_station_name start_station_id   end_station_name   end_station_id
##  Length:5595063     Length:5595063     Length:5595063     Length:5595063
##  Class :character   Class :character   Class :character   Class :character
##  Mode  :character   Mode  :character   Mode  :character   Mode  :character
##
##    start_lat       start_lng         end_lat         end_lng
##  Min.   :41.64   Min.   :-87.84   Min.   :41.39   Min.   :-88.97
##  1st Qu.:41.88   1st Qu.:-87.66   1st Qu.:41.88   1st Qu.:-87.66
##  Median :41.90   Median :-87.64   Median :41.90   Median :-87.64
##  Mean   :41.90   Mean   :-87.65   Mean   :41.90   Mean   :-87.65
##  3rd Qu.:41.93   3rd Qu.:-87.63   3rd Qu.:41.93   3rd Qu.:-87.63
##  Max.   :42.07   Max.   :-87.52   Max.   :42.17   Max.   :-87.49
##                                   NA's   :4771    NA's   :4771
##  member_casual
##  Length:5595063
##  Class :character
##  Mode  :character
##
```

```
str(all_trips)
```

```
## spc_tbl_ [5,595,063 × 13] (S3: spec_tbl_df/tbl_df/tbl/data.frame)
```

```
##  $ ride_id           : chr [1:5595063] "E19E6F1B8D4C42ED"
"DC88F20C2C55F27F" "EC45C94683FE3F27" "4FA453A75AE377DB" ...
##  $ rideable_type     : chr [1:5595063] "electric_bike" "electric_bike"
"electric_bike" "electric_bike" ...
##  $ started_at        : chr [1:5595063] "1/23/2021 16:14" "1/27/2021 18:43"
"1/21/2021 22:35" "1/7/2021 13:31" ...
##  $ ended_at          : chr [1:5595063] "1/23/2021 16:24" "1/27/2021 18:47"
"1/21/2021 22:37" "1/7/2021 13:42" ...
##  $ start_station_name: chr [1:5595063] "California Ave & Cortez St"
"California Ave & Cortez St" "California Ave & Cortez St" "California Ave &
Cortez St" ...
##  $ start_station_id  : chr [1:5595063] "17660" "17660" "17660" "17660" ...
##  $ end_station_name  : chr [1:5595063] NA NA NA NA ...
##  $ end_station_id    : chr [1:5595063] NA NA NA NA ...
##  $ start_lat         : num [1:5595063] 41.9 41.9 41.9 41.9 41.9 ...
##  $ start_lng         : num [1:5595063] -87.7 -87.7 -87.7 -87.7 -87.7 ...
##  $ end_lat           : num [1:5595063] 41.9 41.9 41.9 41.9 41.9 ...
##  $ end_lng           : num [1:5595063] -87.7 -87.7 -87.7 -87.7 -87.7 ...
##  $ member_casual     : chr [1:5595063] "member" "member" "member" "member"
...
##  - attr(*, "spec")=
##   .. cols(
##   ..   ride_id = col_character(),
##   ..   rideable_type = col_character(),
##   ..   started_at = col_character(),
##   ..   ended_at = col_character(),
##   ..   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>
```

Columns *started_at* and *ended_at* need to be converted from character data type to date data type. **Str()** syntax confirms changes.

```
all_trips$started_at <- mdy_hm(all_trips$started_at)

all_trips$ended_at <- mdy_hm(all_trips$ended_at)

str(all_trips)
```

```
## spc_tbl_ [5,595,063 × 13] (S3: spec_tbl_df/tbl_df/tbl/data.frame)

##  $ ride_id           : chr [1:5595063] "E19E6F1B8D4C42ED"
"DC88F20C2C55F27F" "EC45C94683FE3F27" "4FA453A75AE377DB" ...

##  $ rideable_type     : chr [1:5595063] "electric_bike" "electric_bike"
"electric_bike" "electric_bike" ...

##  $ started_at        : POSIXct[1:5595063], format: "2021-01-23 16:14:00"
"2021-01-27 18:43:00" ...

##  $ ended_at          : POSIXct[1:5595063], format: "2021-01-23 16:24:00"
"2021-01-27 18:47:00" ...

##  $ start_station_name: chr [1:5595063] "California Ave & Cortez St"
"California Ave & Cortez St" "California Ave & Cortez St" "California Ave &
Cortez St" ...

##  $ start_station_id  : chr [1:5595063] "17660" "17660" "17660" "17660" ...

##  $ end_station_name  : chr [1:5595063] NA NA NA NA ...

##  $ end_station_id    : chr [1:5595063] NA NA NA NA ...

##  $ start_lat         : num [1:5595063] 41.9 41.9 41.9 41.9 41.9 ...

##  $ start_lng         : num [1:5595063] -87.7 -87.7 -87.7 -87.7 -87.7 ...

##  $ end_lat           : num [1:5595063] 41.9 41.9 41.9 41.9 41.9 ...

##  $ end_lng           : num [1:5595063] -87.7 -87.7 -87.7 -87.7 -87.7 ...

##  $ member_casual     : chr [1:5595063] "member" "member" "member" "member"
...

##  - attr(*, "spec")=

##   .. cols(

##   ..   ride_id = col_character(),

##   ..   rideable_type = col_character(),

##   ..   started_at = col_character(),

##   ..   ended_at = col_character(),

##   ..   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>
```

Create new columns as for *date*, *month*, *day*, *year*, *day_of_week*, and *ride_length* in seconds.

```
all_trips$date <- as.Date(all_trips$started_at)
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")
all_trips$ride_length <- difftime(all_trips$ended_at,all_trips$started_at)
```

Convert *ride_length* column to numeric in order to run calculations on the data. First, check to see if the data type is numeric, and then convert if needed.

```
is.numeric(all_trips$ride_length)
## [1] FALSE
```

Recheck *ride_length* data type.

```
all_trips$ride_length <- as.numeric(as.character(all_trips$ride_length))
is.numeric(all_trips$ride_length)
## [1] TRUE
```

STEP THREE: CLEAN DATA

na.omit() will remove all NA from the dataframe.

```
all_trips <- na.omit(all_trips)
```

Remove rows with the *ride_id* column character length is not 16. This will remove all the scientific ride ids that we noticed while examining the data.

```
all_trips <- subset(all_trips, nchar(as.character(ride_id)) == 16)
```

Remove rows with the *ride_length* less than 1 minute.

```
all_trips <- subset (all_trips, ride_length > "1")
```

STEP FOUR: ANALYZE DATA

Analyze the dataframe by find the **mean**, **median**, **max** (maximum), and **min** (minimum) of *ride_length*.

```
mean(all_trips$ride_length)
```
```
## [1] 1318.707
```

```
median(all_trips$ride_length)
```
```
## [1] 720
```

```
max(all_trips$ride_length)
```
```
## [1] 3356640
```

```
min(all_trips$ride_length)
```
```
## [1] 60
```

Run a statistical summary of the *ride_length*.

```
summary(all_trips$ride_length)
```
```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
##      60     420     720    1319    1320 3356640
```

Compare the members and casual users

```
aggregate(all_trips$ride_length ~ all_trips$member_casual, FUN = mean)
```
```
##   all_trips$member_casual all_trips$ride_length
## 1                  casual             1961.3398
## 2                  member              798.4492
```
```
aggregate(all_trips$ride_length ~ all_trips$member_casual, FUN = median)
```
```
##   all_trips$member_casual all_trips$ride_length
## 1                  casual                  1020
## 2                  member                   600
```
```
aggregate(all_trips$ride_length ~ all_trips$member_casual, FUN = max)
```
```
##   all_trips$member_casual all_trips$ride_length
## 1                  casual               3356640
## 2                  member                 89700
```
```
aggregate(all_trips$ride_length ~ all_trips$member_casual, FUN = min)
```
```
##   all_trips$member_casual all_trips$ride_length
## 1                  casual                    60
```

```
## 2                  member                    60
```

Aggregate the average ride length by each day of the week for members and users.

```
aggregate(all_trips$ride_length ~ all_trips$member_casual +
all_trips$day_of_week, FUN = mean)
```

```
##    all_trips$member_casual all_trips$day_of_week all_trips$ride_length
## 1                  casual                 Friday             1865.4044
## 2                  member                 Friday              774.7142
## 3                  casual                 Monday             1969.3185
## 4                  member                 Monday              770.6198
## 5                  casual               Saturday             2103.7133
## 6                  member               Saturday              898.2403
## 7                  casual                 Sunday             2268.3352
## 8                  member                 Sunday              921.2654
## 9                  casual               Thursday             1690.0091
## 10                 member               Thursday              747.7804
## 11                 casual                Tuesday             1737.8340
## 12                 member                Tuesday              749.7625
## 13                 casual              Wednesday             1705.6794
## 14                 member              Wednesday              754.1646
```

Sort the days of the week in order.

```
all_trips$day_of_week <- ordered(all_trips$day_of_week, levels=c("Sunday",
"Monday", "Tuesday", "Wednesday", "Thursday", "Friday", "Saturday"))
```

Assign the aggregate the average ride length by each day of the week for members and users to x.

```
x <- aggregate(all_trips$ride_length ~ all_trips$member_casual +
all_trips$day_of_week, FUN = mean)


head(x)
```

```
##   all_trips$member_casual all_trips$day_of_week all_trips$ride_length
## 1                  casual                 Sunday             2268.3352
## 2                  member                 Sunday              921.2654
## 3                  casual                 Monday             1969.3185
## 4                  member                 Monday              770.6198
## 5                  casual                Tuesday             1737.8340
## 6                  member                Tuesday              749.7625
```

Find the average ride length of member riders and casual riders per day and assign it to y.

```
y <- all_trips %>%
  mutate(weekday = wday(started_at)) %>%
  group_by(member_casual, weekday) %>%
  summarise(number_of_rides = n(),
            average_duration = mean(ride_length), .groups = 'drop') %>%
  arrange(member_casual, weekday)


head(y)
```

```
## # A tibble: 6 × 4
##   member_casual weekday number_of_rides average_duration
##   <chr>           <int>           <int>            <dbl>
## 1 casual              1          401470            2268.
## 2 casual              2          227603            1969.
## 3 casual              3          213707            1738.
## 4 casual              4          216912            1706.
## 5 casual              5          222919            1690.
## 6 casual              6          288411            1865.
```

Analyze the dataframe to find the frequency of member riders, casual riders, classic bikes, docked bikes, and electric bikes.

```
table(all_trips$member_casual)
```

```
##
##  casual  member
## 2036760 2515844
```

```
table(all_trips$rideable_type)
```

```
##
##  classic_bike   docked_bike electric_bike
##       3216339        310815       1025450
```

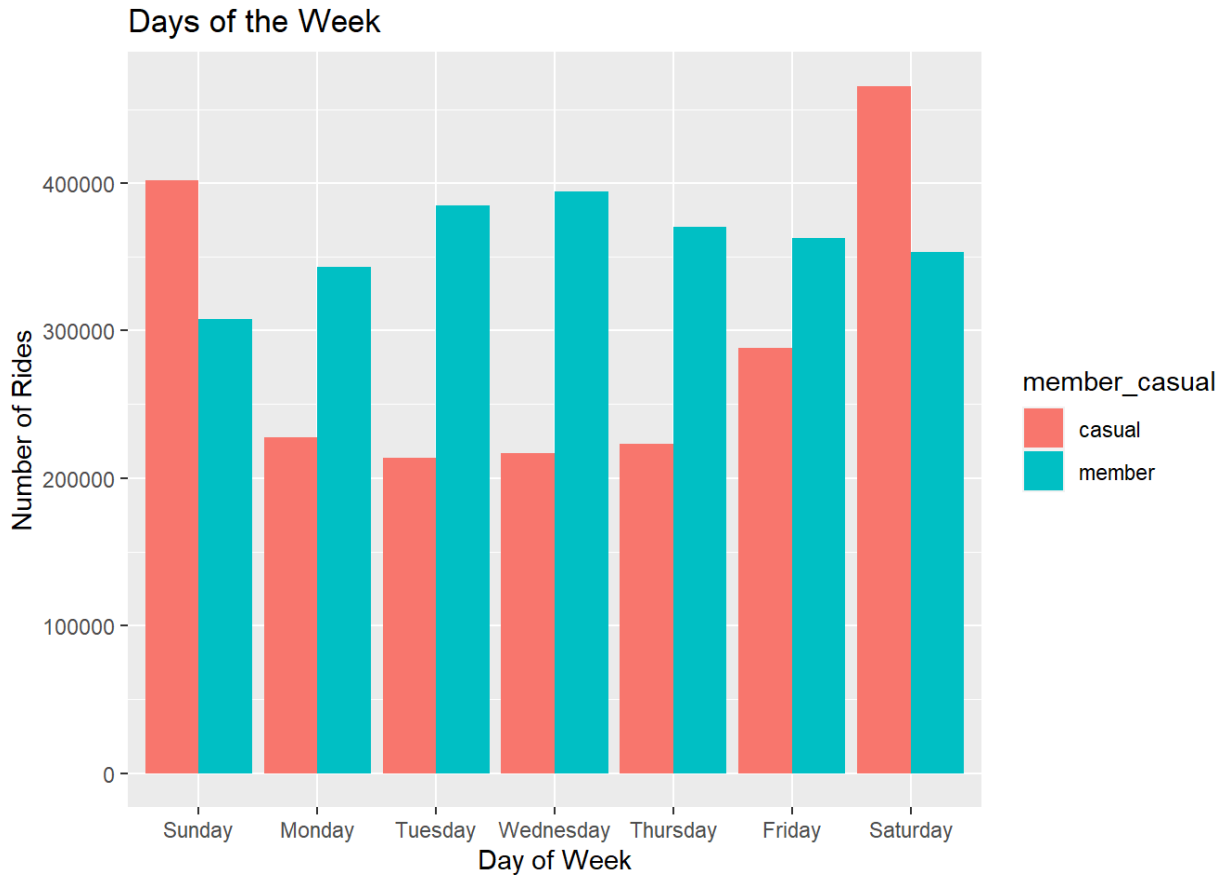
STEP FIVE: VISUALIZATION

Display full digits instead of scientific number.

```
options(scipen=999)
```

Plot the number of rides by user type during the week.

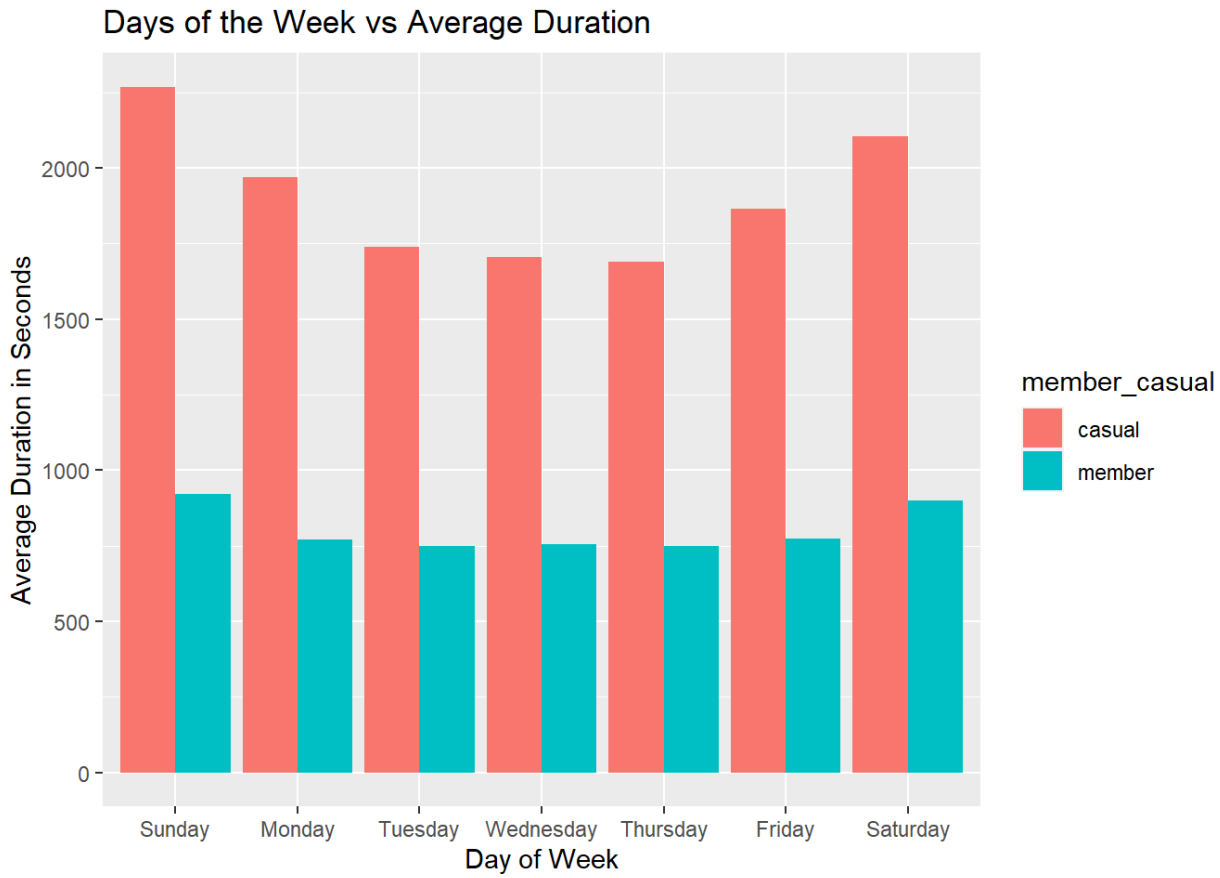
```
all_trips %>%
  mutate(day_of_week) %>%
  group_by(member_casual,day_of_week) %>%
  summarise(number_of_rides = n(), average_duration = mean(ride_length),
.groups = 'drop') %>%
  arrange(member_casual, day_of_week)  %>%
  ggplot(aes(x = day_of_week, y = number_of_rides, fill = member_casual)) +
  geom_col(position = "dodge")+
labs(x = "Day of Week",
     y= "Number of Rides",
     title= "Days of the Week")
```



Plot the duration of the ride by user type during the week.

```
all_trips %>%
  mutate(day_of_week) %>%
  group_by(member_casual, day_of_week) %>%
```

```
  summarise(number_of_rides = n(), average_duration = mean(ride_length),
.groups = 'drop') %>%
  arrange(member_casual, day_of_week)  %>%
  ggplot(aes(x = day_of_week, y = average_duration, fill = member_casual)) +
  geom_col(position = "dodge") +
  labs(x = "Day of Week",
       y= "Average Duration in Seconds",
       title= "Days of the Week vs Average Duration")
```



Create new dataframe for plots for weekday trends vs weekend trends.

```
mc<- as.data.frame(table(all_trips$day_of_week,all_trips$member_casual))
```

Rename columns

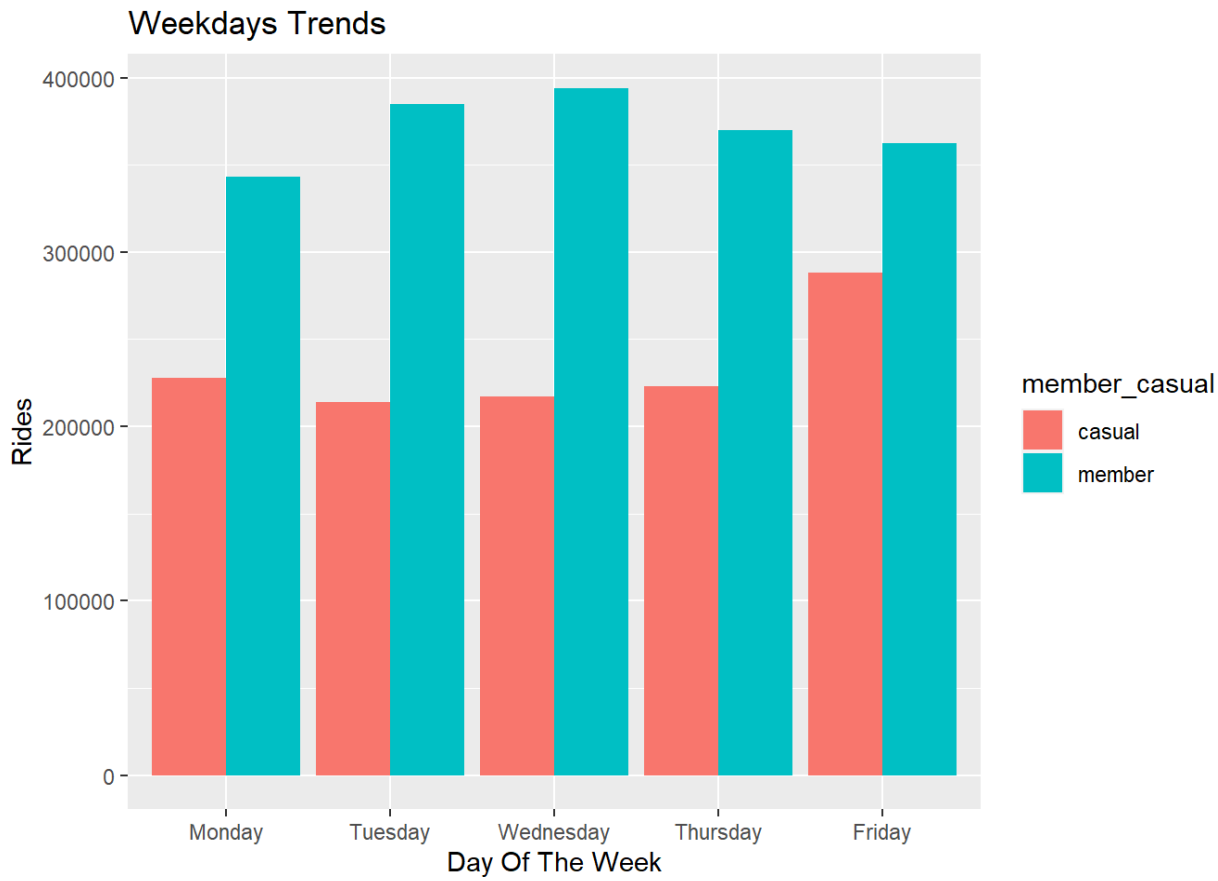
```
mc<-rename(mc, day_of_week = Var1, member_casual = Var2)
head(mc)
```

```
##   day_of_week member_casual   Freq
## 1      Sunday        casual 401470
```

```
## 2      Monday        casual 227603
## 3     Tuesday        casual 213707
## 4   Wednesday        casual 216912
## 5    Thursday        casual 222919
## 6      Friday        casual 288411
```

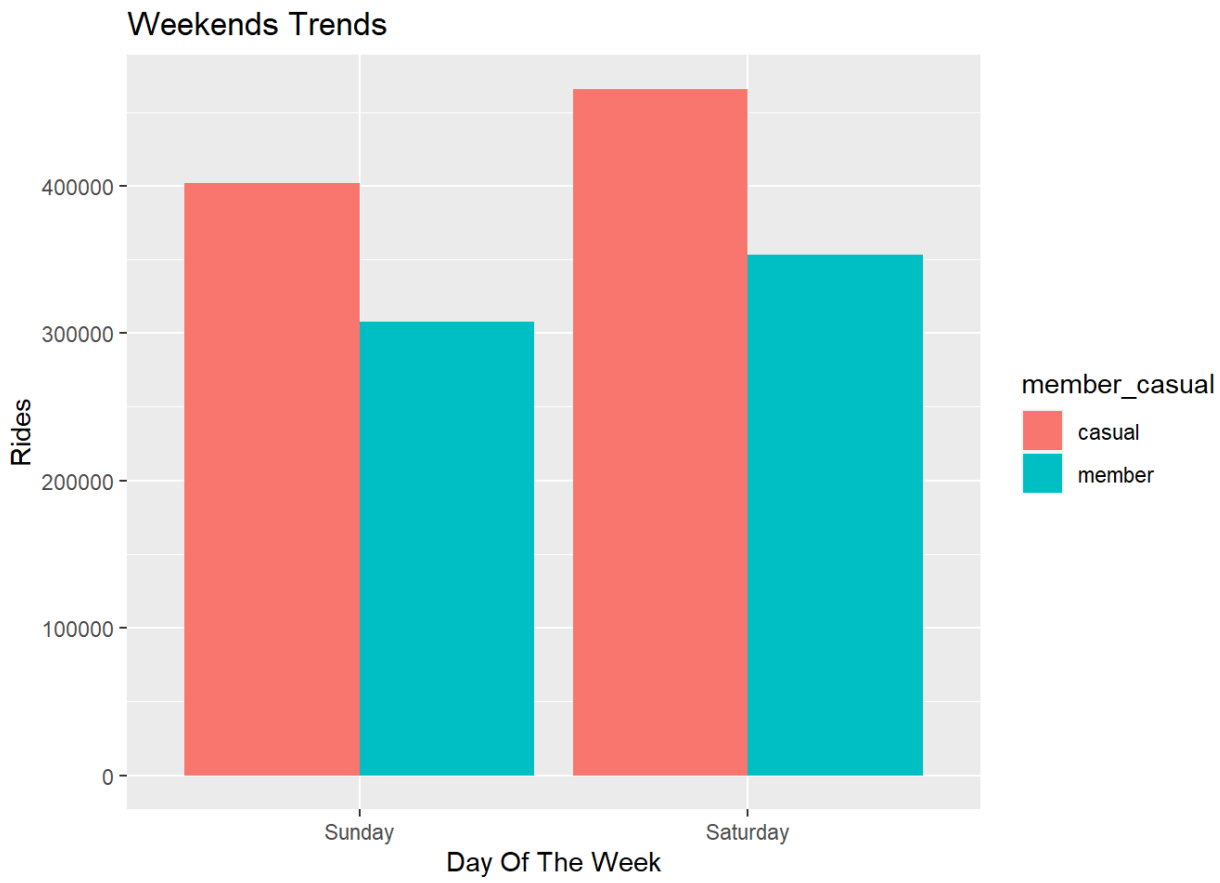
Weekday trends (Monday through Friday).

```
mc %>%
  filter(day_of_week == "Monday" |
           day_of_week == "Tuesday" |
           day_of_week == "Wednesday" |
           day_of_week == "Thursday" |
           day_of_week == "Friday") %>%
  ggplot(aes(x = day_of_week, y = Freq, fill = member_casual))+
  geom_bar(stat = "identity" , position = "dodge") +
  labs(title = "Weekdays Trends",
       x= "Day Of The Week",
       y = "Rides")
```



Weekend trends (Sunday and Saturday).

```
mc %>%
  filter(day_of_week == "Sunday" |
           day_of_week == "Saturday") %>%
  ggplot(aes(x = day_of_week, y = Freq, fill = member_casual))+
  geom_bar(stat = "identity", position = "dodge") +
  labs(title = "Weekends Trends",
       x= "Day Of The Week",
       y = "Rides")
```



Create dataframe for member and casual riders vs ride type

```
rt<- as.data.frame(table(all_trips$rideable_type,all_trips$member_casual))
```

Rename columns.

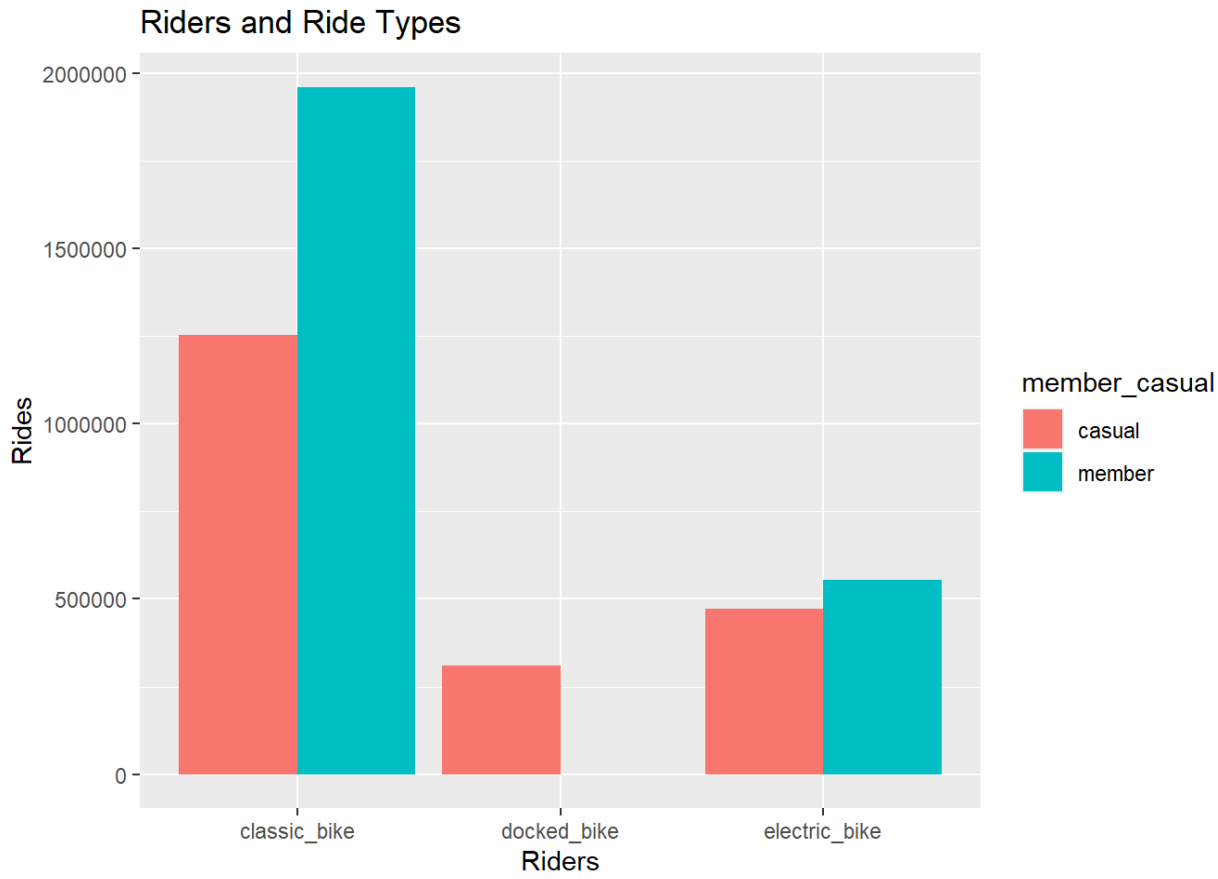
```
rt<-rename(rt, rideable_type = Var1, member_casual = Var2)
head(rt)
```

```
##   rideable_type member_casual    Freq
## 1  classic_bike        casual 1254201
## 2   docked_bike        casual  310814
## 3 electric_bike        casual  471745
## 4  classic_bike        member 1962138
## 5   docked_bike        member       1
## 6 electric_bike        member  553705
```

Plot for bike user vs bike type.

```
rt %>%
  filter(member_casual == "member" |
```

```
          member_casual == "casual") %>%
  ggplot(aes(x = rideable_type, y = Freq, fill = member_casual))+
  geom_bar(stat = "identity", position = "dodge") +
  labs(title = "Riders and Ride Types",
       x= "Riders",
       y = "Rides")
```



STEP SIX: EXPORT ANALYZED DATA

Save the analyzed data as a new file.

fwrite(all_trips, “all_trips.csv”)