Explore_bikeshare_data

August 6, 2024

0.0.1 Explore Bike Share Data

For this project, your goal is to ask and answer three questions about the available bikeshare data from Washington, Chicago, and New York. This notebook can be submitted directly through the workspace when you are confident in your results.

You will be graded against the project Rubric by a mentor after you have submitted. To get you started, you can use the template below, but feel free to be creative in your solutions!

Caricamento Librerie

[218]:
```
library(lubridate)
library(dplyr)
library(ggplot2)
```

Caricamento CSV Carico i csv nei rispettivi dataframe

[97]:
```
ny = read.csv('new-york-city.csv')
wash = read.csv('washington.csv')
chi = read.csv('chicago.csv')
```

Analisi Dati e Schema Effettuo un'analisi preliminare dei 3 dataset di partenza utilizzando la funzione summary.

New York

[8]:
```
summary(ny)
```

```
       X            Start.Time          End.Time         Trip.Duration
 Min.   :     33   Length:300000      Length:300000      Min.   :     61.0
 1st Qu.:1707416   Class :character   Class :character   1st Qu.:    368.0
 Median :3405756   Mode  :character   Mode  :character   Median :    609.0
 Mean   :3407026                                        Mean   :    899.7
 3rd Qu.:5108762                                        3rd Qu.:   1054.0
 Max.   :6816152                                        Max.   :2155775.0

 Start.Station      End.Station         User.Type           Gender
 Length:300000      Length:300000      Length:300000      Length:300000
 Class :character   Class :character   Class :character   Class :character
 Mode  :character   Mode  :character   Mode  :character   Mode  :character
```

```
  Birth.Year
Min.   :1885
1st Qu.:1970
Median :1981
Mean   :1978
3rd Qu.:1988
Max.   :2001
NA's   :28220
```

Washington

[9]:
```
summary(wash)
```

```
      X            Start.Time          End.Time         Trip.Duration
Min.   :      7   Length:300000      Length:300000      Min.   :     60.0
1st Qu.: 436394   Class :character   Class :character   1st Qu.:    410.6
Median : 875064   Mode  :character   Mode  :character   Median :    706.5
Mean   : 875404                                        Mean   :   1237.3
3rd Qu.:1313148                                        3rd Qu.:   1229.4
Max.   :1751446                                        Max.   :1235662.2
Start.Station      End.Station         User.Type
Length:300000      Length:300000      Length:300000
Class :character   Class :character   Class :character
Mode  :character   Mode  :character   Mode  :character
```

Chicago

[10]:
```
summary(chi)
```

```
      X            Start.Time          End.Time         Trip.Duration
Min.   :      4   Length:300000      Length:300000      Min.   :   60.0
1st Qu.: 387137   Class :character   Class :character   1st Qu.:  393.0
Median : 777104   Mode  :character   Mode  :character   Median :  670.0
Mean   : 776346                                        Mean   :  936.2
3rd Qu.:1164065                                        3rd Qu.: 1125.0
Max.   :1551500                                        Max.   :86224.0

Start.Station      End.Station         User.Type           Gender
Length:300000      Length:300000      Length:300000      Length:300000
Class :character   Class :character   Class :character   Class :character
Mode  :character   Mode  :character   Mode  :character   Mode  :character
```

```
  Birth.Year
 Min.   :1899
 1st Qu.:1975
 Median :1984
 Mean   :1981
 3rd Qu.:1989
 Max.   :2016
 NA's   :61019
```

Da questa analisi si evincono i seguenti punti: - New York: La variabile Birth.Year ha 28,220 valori mancanti. - Chicago: La variabile Birth.Year ha 61,019 valori mancanti, che rappresentano una percentuale significativa del totale. - Washington: Mancano completamente le informazioni su Gender e Birth.Year, limitando l'analisi ai soli dati sui viaggi e alle stazioni.

Data Cleaning e costruzione del dataset finale Di seguito il codice che userò per mergiare i 3 dataframe uniformando ed omologando i campi per ottenere un dataset finale, comprensivo di tutte le informazioni essenziali.

New York cleaning and standardizzation

[150]:
```r
names(ny)[names(ny) == "X"] <- "Trip.id"
ny$Birth.Year <- as.integer(ny$Birth.Year)
ny$City <- rep('New York', times = nrow(ny))
ny$Start.Time <- ymd_hms(ny$Start.Time)
ny$End.Time <- ymd_hms(ny$End.Time)
ny$Gender <- case_when(
    is.null(ny$Gender)  ~ NA,
    ny$Gender == '' ~ NA,
    TRUE ~ ny$Gender
)
ny$Birth.Year <- case_when(
    is.null(ny$Birth.Year)  ~ NA,
    TRUE ~ ny$Birth.Year
)
```

Washington cleaning and standardizzation

[151]:
```r
names(wash)[names(wash) == "X"] <- "Trip.id"
wash$Trip.Duration <- as.integer(wash$Trip.Duration)
wash$Gender <- as.character(rep(NA, times = nrow(wash)))
wash$Birth.Year <- as.integer(rep(NA, times = nrow(wash)))
wash$City <- rep('Washington', times = nrow(wash))
wash$Start.Time <- ymd_hms(wash$Start.Time)
wash$End.Time <- ymd_hms(wash$End.Time)
```

Chicago cleaning and standardizzation

[148]:
```
names(chi)[names(chi) == "X"] <- "Trip.id"
chi$Birth.Year <- as.integer(chi$Birth.Year)
chi$City <- rep('Chicago', times = nrow(chi))
chi$Start.Time <- ymd_hms(chi$Start.Time)
chi$End.Time <- ymd_hms(chi$End.Time)
chi$Gender <- case_when(
    is.null(chi$Gender)  ~ NA,
    chi$Gender == '' ~ NA,
    TRUE ~ chi$Gender
)
chi$Birth.Year <- case_when(
    is.null(chi$Birth.Year)  ~ NA,
    TRUE ~ chi$Birth.Year
)
```

[182]:
```
final_ds <- data.frame()
final_ds <- rbind(ny,wash,chi)
summary(final_ds)
```

```
   Trip.id          Start.Time
Min.   :      4   Min.   :2017-01-01 00:07:57.00
1st Qu.: 551291   1st Qu.:2017-03-10 07:18:00.00
Median :1102220   Median :2017-04-28 07:06:29.50
Mean   :1686259   Mean   :2017-04-20 13:55:05.85
3rd Qu.:1742392   3rd Qu.:2017-06-03 01:16:15.75
Max.   :6816152   Max.   :2017-06-30 23:59:01.00
                  NA's   :8
   End.Time                      Trip.Duration     Start.Station
Min.   :2017-01-01 00:14:00.00   Min.   :     60   Length:900000
1st Qu.:2017-03-10 07:30:00.00   1st Qu.:    389   Class :character
Median :2017-04-28 07:15:36.00   Median :    660   Mode  :character
Mean   :2017-04-20 14:09:57.41   Mean   :   1024
3rd Qu.:2017-06-03 01:22:04.75   3rd Qu.:   1135
Max.   :2017-07-08 14:30:26.00   Max.   :2155775
NA's   :10
End.Station         User.Type           Gender            Birth.Year
Length:900000      Length:900000      Length:900000      Min.   :1885
Class :character   Class :character   Class :character   1st Qu.:1970
Mode  :character   Mode  :character   Mode  :character   Median :1981
                                                         Mean   :1978
                                                         3rd Qu.:1988
                                                         Max.   :2001
                                                         NA's   :356440
    City
Length:900000
Class :character
```

```
Mode   :character
```

0.0.2 Question 1

Dividendo per fasce orarie di 3 ore la giornata, qual'è la fascia in cui vi sono più viaggi?

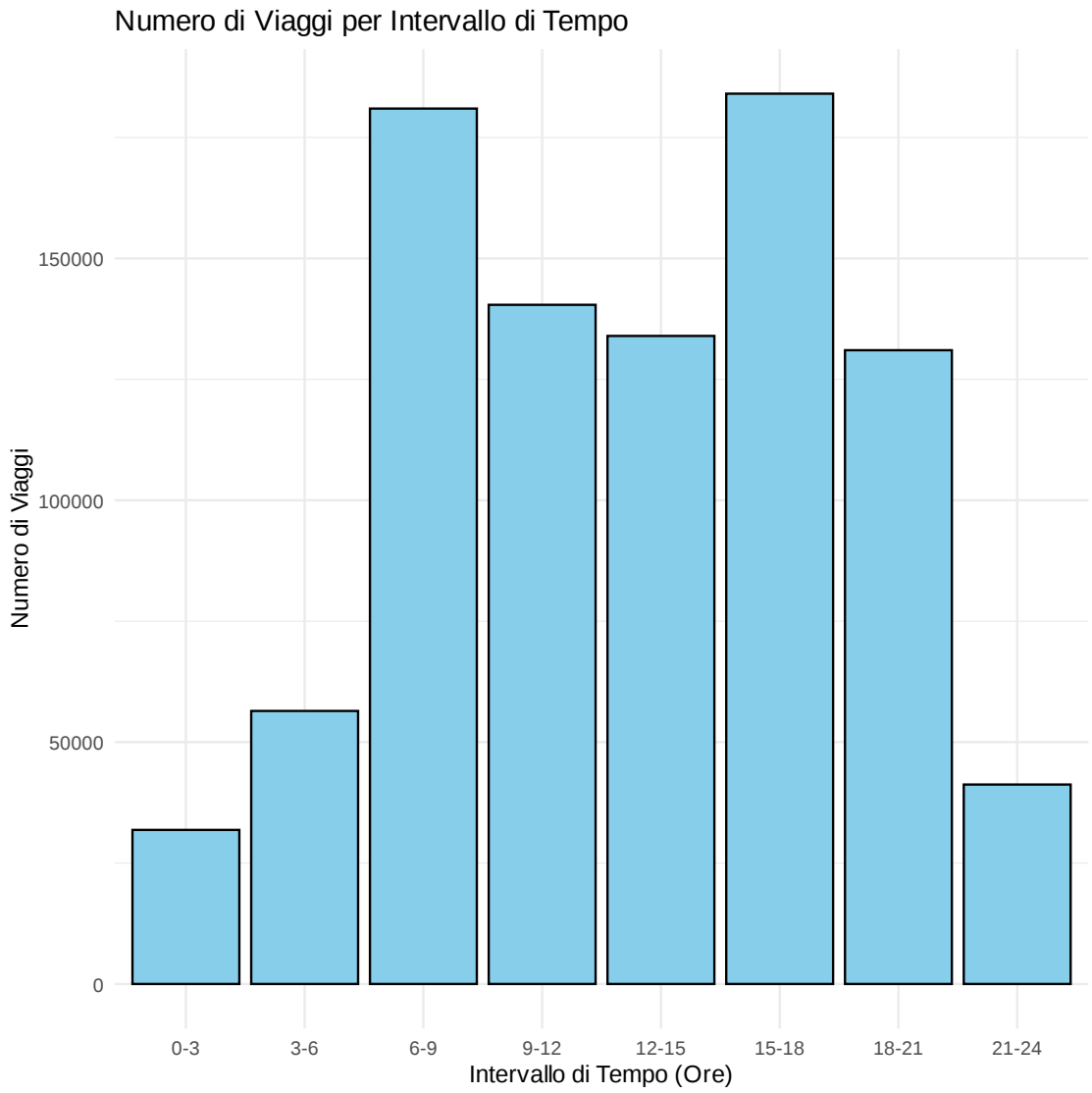
[212]:
```r
# Filtrare le righe valide
q1_ds <- final_ds %>%
  filter(!is.na(Start.Time))

# Creare una nuova colonna con intervalli di ore usando cut()
q1_ds$Start.Range.Hour <- cut(hour(q1_ds$Start.Time),
                              breaks = c(-1, 3, 6, 9, 12, 15, 18, 21, 24),
                              labels = c("0-3", "3-6", "6-9", "9-12", "12-15",␣
 ↪"15-18", "18-21", "21-24"),
                              right = FALSE)

# Rimuovere eventuali valori NA nella colonna Start.Range.Hour
q1_ds <- q1_ds %>% filter(!is.na(Start.Range.Hour))

# Selezionare solo le colonne necessarie
q1_ds <- q1_ds %>% select(Trip.id, Start.Range.Hour)
```

[207]:
```r
q1_ds_group <- q1_ds %>%
  group_by(Start.Range.Hour) %>%
  summarize(Trips.Cnt = n()) %>%
  arrange( Start.Range.Hour)
print(q1_ds_group)
```

```
# A tibble: 8 × 2
  Start.Range.Hour Trips.Cnt
  <fct>                <int>
1 0-3                  31853
2 3-6                  56443
3 6-9                 180982
4 9-12                140415
5 12-15               133977
6 15-18               184066
7 18-21               131028
8 21-24                41228
```

[208]:
```r
# Creare il grafico a colonne
ggplot(q1_ds_group, aes(x = Start.Range.Hour, y = Trips.Cnt)) +
  geom_col(fill = "skyblue", color = "black") +
```

```
labs(
  title = "Numero di Viaggi per Intervallo di Tempo",
  x = "Intervallo di Tempo (Ore)",
  y = "Numero di Viaggi"
) +
theme_minimal()
```



Le due fasce orario che presentano picchi nei giorni feriali sono: - 6 AM alle 9 AM: 180982 trips. - 15 AM alle 18 AM: 184066 trips. La forma a "M" di questo grafico è comune in ambito automotive in quanto quelle due fasce orarie indicano gli spostamenti legati ad impegni lavorativi.

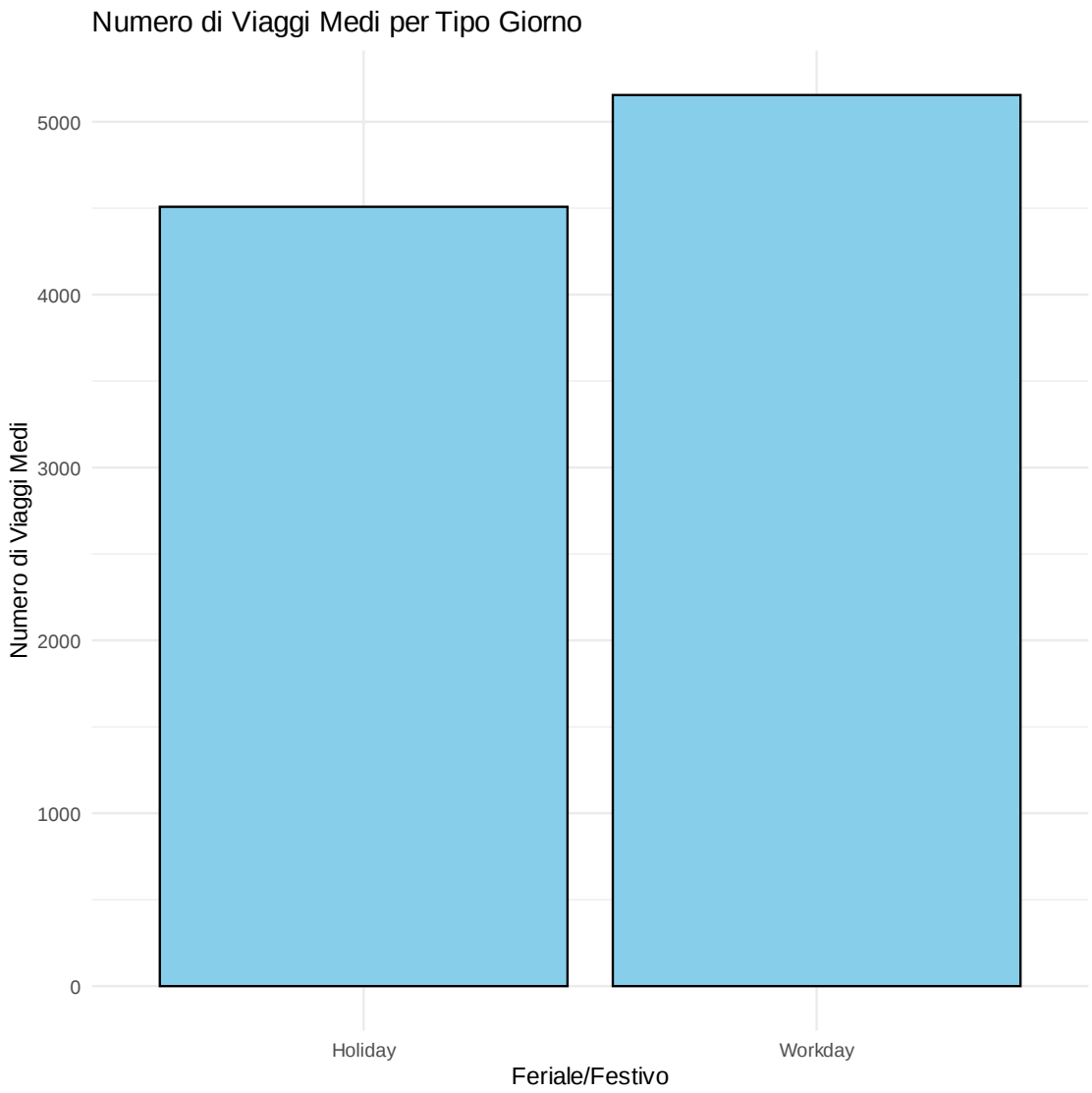
0.0.3 Question 2

Il volume di viaggi varia in media se il giorno è feriale o festivo?

[209]:
```
# Creo la colonna Start.Range.Hour per categorizzare ogni trip
q2_ds <- data.frame()
q2_ds <- rbind(q2_ds,final_ds %>% select(Trip.id,Start.Time))
q2_ds$Start.Date <- floor_date(q2_ds$Start.Time, unit="day")
q2_ds$Day.Type <- ifelse(wday(q2_ds$Start.Time) %in% c(1, 7), 'Holiday',␣
 ↪'Workday')
q2_ds <- q2_ds %>% select(Trip.id,Start.Date,Day.Type)
```

[210]:
```
q2_ds_group <- q2_ds %>%
  group_by(Start.Date, Day.Type) %>%
  summarize(Trips.Cnt = n(), .groups = "drop_last")  %>%
  group_by(Day.Type) %>%
  summarize(Trips.Daily.Mean = mean(Trips.Cnt))
```

[157]:
```
ggplot(q2_ds_group, aes(x = Day.Type, y = Trips.Daily.Mean)) +
  geom_col(fill = "skyblue", color = "black") +
  labs(
    title = "Numero di Viaggi Medi per Tipo Giorno",
    x = "Feriale/Festivo",
    y = "Numero di Viaggi Medi"
  ) +
  theme_minimal()
```



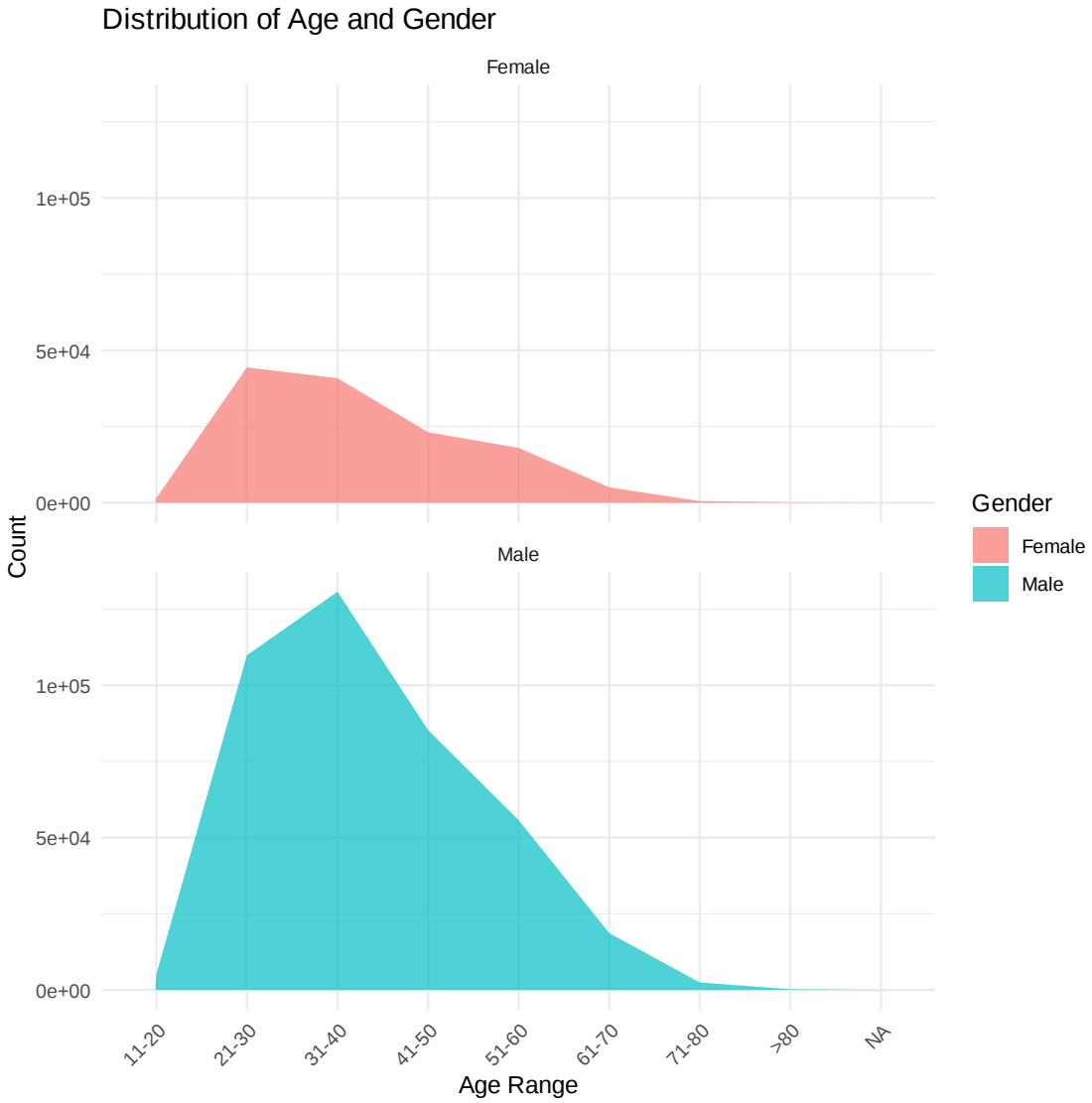
Come si evince dal grafico, il volume medio di viaggi per singolo giorno varia se il suddetto è feriale o festi. Nei giorni Festivi le persone tendono a compiere meno viaggi rispetto ai giorni feriali.

0.0.4 Question 3

Il target di driver diviso per fascia d'età e sesso sui dati disponibili dove si incentra?

[211]:
```
q3_ds <- final_ds %>% filter(!is.na(Gender) & !is.na(Birth.Year))
q3_ds$Age <- year(q3_ds$Start.Time) - q3_ds$Birth.Year

q3_ds$Age_Range <- cut(q3_ds$Age,
                       breaks = c(-Inf, 10, 20, 30, 40, 50, 60, 70, 80, Inf),
                       labels = c("0-10", "11-20", "21-30", "31-40", "41-50",␣
 ↪"51-60", "61-70", "71-80", ">80"))
```

```r
distribution <- q3_ds %>%
  group_by(Age_Range, Gender) %>%
  summarise(Count = n(), .groups = 'drop')

ggplot(distribution, aes(x = Age_Range, y = Count, fill = Gender, group =␣
 ↪Gender)) +
  geom_area(position = "stack", alpha = 0.7) +
  facet_wrap(~ Gender, ncol = 1) +
  labs(title = "Distribution of Age and Gender",
       x = "Age Range",
       y = "Count") +
  theme_minimal() +
  theme(axis.text.x = element_text(angle = 45, hjust = 1))
```



I grafici mostrano che il target principale dei nostri utenti sono i Maschi di età compresa fra i 31 e i 40 anni.

0.1 Finishing Up

Congratulations! You have reached the end of the Explore Bikeshare Data Project. You should be very proud of all you have accomplished!

Tip: Once you are satisfied with your work here, check over your report to make sure that it is satisfies all the areas of the rubric.

0.2 Directions to Submit

Before you submit your project, you need to create a .html or .pdf version of this notebook in the workspace here. To do that, run the code cell below. If it worked correctly, you should get a return code of 0, and you should see the generated .html file in the workspace directory (click on the orange Jupyter icon in the upper left).

Alternatively, you can download this report as .html via the **File** > **Download as** submenu, and then manually upload it into the workspace directory by clicking on the orange Jupyter icon in the upper left, then using the Upload button.

Once you've done this, you can submit your project by clicking on the "Submit Project" button in the lower right here. This will create and submit a zip file with this .ipynb doc and the .html or .pdf version you created. Congratulations!

[84]:
```
system('python -m nbconvert --to pdf Explore_bikeshare_data.ipynb')
```