

# Explore Bike Share Data

## Versions & Library used this project

1. R version - 4.4.0
2. ggplot2 3.5.2 (visualization)
3. dplyr 2.5.0 (data manipulation)
4. lubridate 1.9.4 (dates & times manipulation)
  - OS: Windows 11
  - IDE: RStudio

## Install Libraries

```
library(ggplot2)

## Warning: package 'ggplot2' was built under R version 4.4.3
library(dplyr)

## Warning: package 'dplyr' was built under R version 4.4.3
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
library(lubridate)

## Warning: package 'lubridate' was built under R version 4.4.3
##
## Attaching package: 'lubridate'

## The following objects are masked from 'package:base':
##
##     date, intersect, setdiff, union
```

## Load Data and process to single data set

```
# Load all csv files in data frame (df)
df_chicago <- read.csv("chicago.csv")
df_newyork <- read.csv("new-york-city.csv")
df_washington <- read.csv("washington.csv")
```

```

# Add column to df for city name to group by in charts
# we use function so we can use for each of the 3 files or more if they are added
process_city <- function(df, city) {
  df %>% mutate(
    City.Name = city
  )
}

# Load into new df with city name
df_chicago <- process_city(df_chicago, "Chicago")
df_newyork <- process_city(df_newyork, "New York City")
df_washington <- process_city(df_washington, "Washington")

# Make 1 dataset with all 3 cities so we can compare in same chart or filter this down
combined_df <- bind_rows(df_chicago, df_newyork, df_washington)

```

## Question 1:

What is the most common month of usage across each of the cities

```

# Objective: Display all cities and months into bar charts to compare against each other
# Find most common month fo a data frame
# Having function lets you use single city or multi-city data frame
find_most_common_month <- function(df) {
  df %>% mutate(
    month = month(Start.Time, label = TRUE, abbr = TRUE), # mutate to just month
    city = City.Name
  ) %>%
    count(city, month) # count city by month
}

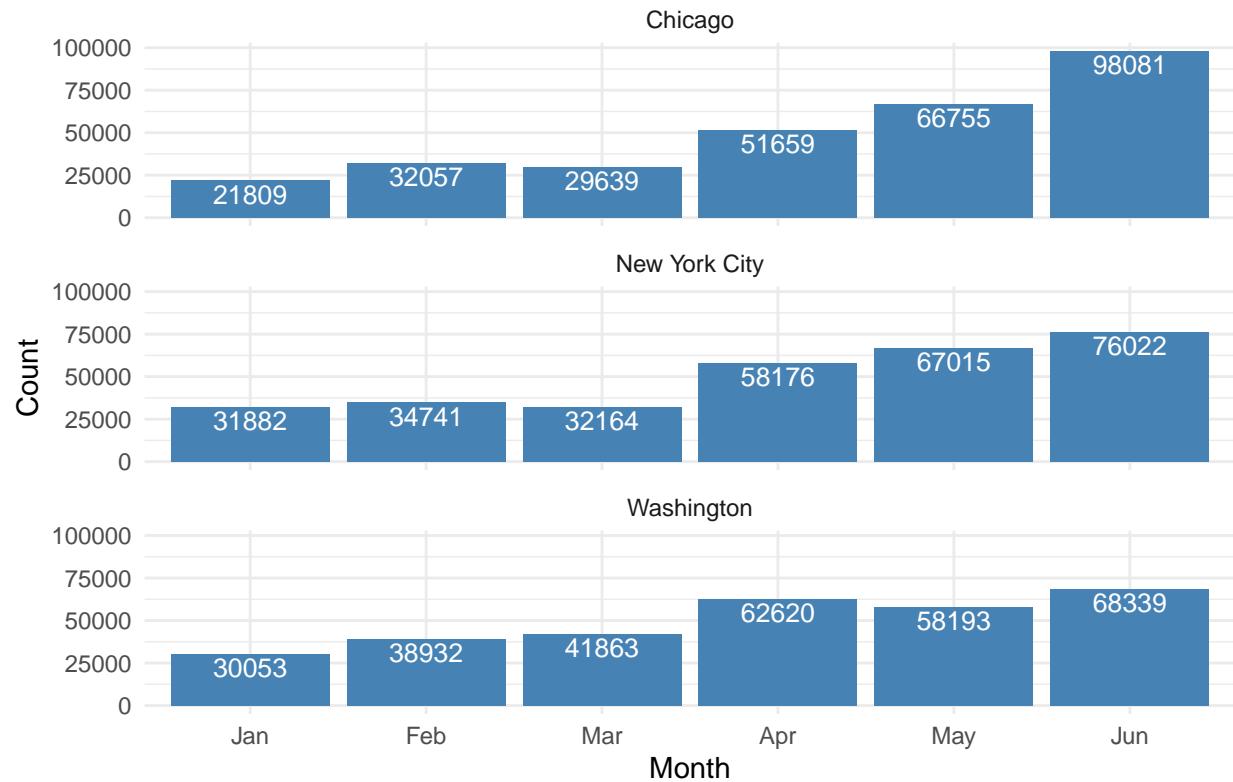
# Make df for most common month so if I want to change plot I don't redue transformation
most_common_month_df <- find_most_common_month(combined_df)

# Plot all 3 cities in different bar charts for easier comparison among each other
# Doing this in case the months for each city is different

ggplot(most_common_month_df, aes(x = month, y = n)) +
  geom_col(fill = "steelblue") +
  geom_text( # add data label to each bar to show exact number
    aes(label = n),
    position = position_dodge(width = 0.8), # dodge overlaps
    vjust = 1.2, # Adjust label into bar
    color = "white", # Label color
    size = 3.5 # Size of label
  ) +
  facet_wrap(~ city, ncol = 1) + # Use facet_wrap to make bar chart for each city
  labs(title = "Most Common Months by City", x = "Month", y = "Count") +
  theme_minimal() + # Removes gray from chart and leaves white background
  theme(
    plot.title = element_text(hjust = 0.5) # Set title to middle
  )

```

## Most Common Months by City



# Summary ## I grouped the trips by city and by month, using a sum for total number of trips each month calculated. Using bar charts I showed 1 bar chart for each of the cities, with the x-axis being the month and y-axis showing the count per month. Across the 3 cities June had the highest usage for bikes, making it the most common month to take a bike out around town. Chicago had the largest increase from month to month usage being from May - June. New York City had very similar pattern as Chicago with steady increase from January - June. Washington had a steady increase across the months until May, when they dipped from April and then climbing back up in June around 5000 more in June with May being less than April. With these cities all being in the northern part of the United States we can see that the usage is very seasonal with summer being a high usage since the weather is a lot nicer in these locations than winter and spring seasons

## Question 2

Find what these bikes are mainly used for, either for work commuters or fun to bike around. Let's assume they are mainly used for work, peak would be 7-9AM and 4-6PM the time average American commutes to work. I would like to find the number of rides each month that start during ON-PEAK times and compare the OFF-PEAK usage.

```
# Objective: Define the peak windows in a new column and set to ON-PEAK and OFF-PEAK depending on start
#           show a line graph for each city by month that has 2 lines for ON-PEAK and OFF-PEAK. Display
#           separate graphs using facet_wrap to dig into each city. Doing this will not only show us if
#           our bikes are possibly more used during these times we can assume the user is commuting
# Background of why I am curious about this. I work in the power industry and we control during peak times
```

```

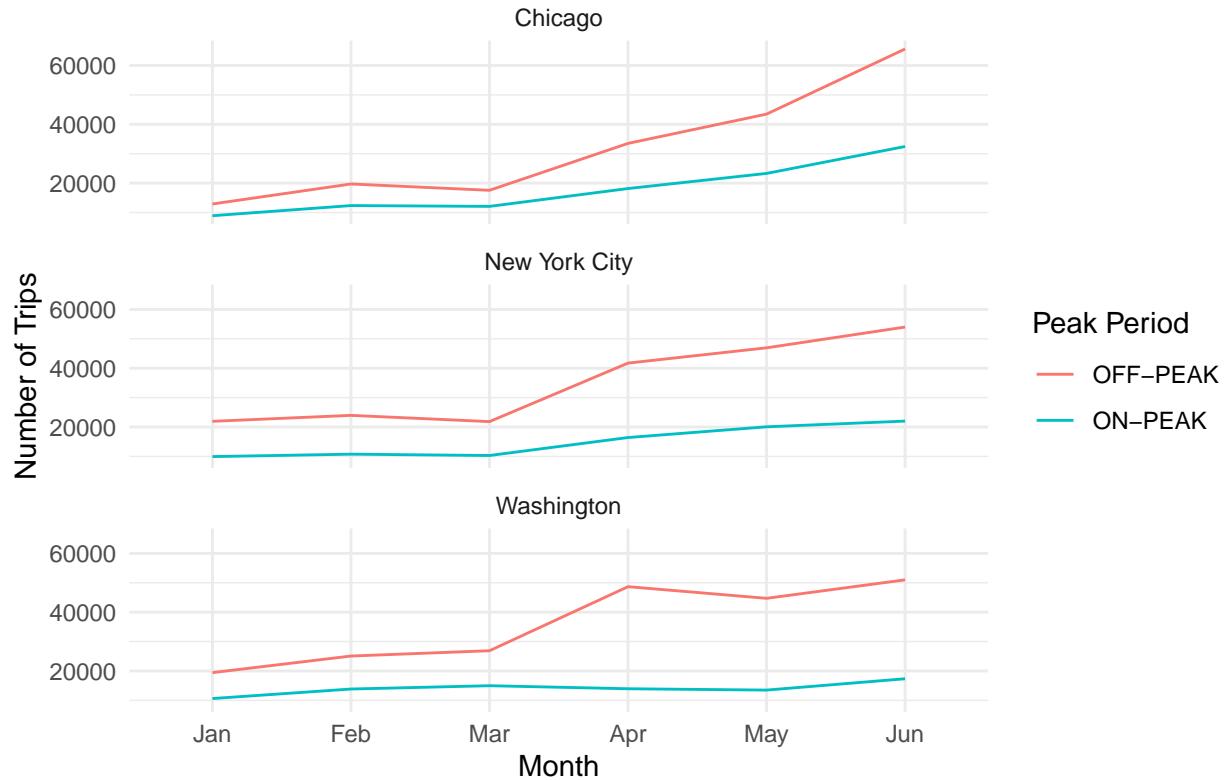
# we have found to be the peak usage of residents consuming power. Our peaks are 6-9AM and 5-8PM each day

combined_peak_df <- combined_df %>%
  mutate(
    start_hour = hour(Start.Time), # Get hour of start commute, do this once so we don't repeat in
    month = month(Start.Time, label = TRUE, abbr = TRUE), # mutate to just month
    peak_period = case_when(
      start_hour >= 7 & start_hour < 9 ~ "ON-PEAK", # Morning peak
      start_hour >= 16 & start_hour < 18 ~ "ON-PEAK", # Evening peak
      TRUE ~ "OFF-PEAK" # Off Peak
    )
  ) %>%
  count(City.Name, month, peak_period)

ggplot(combined_peak_df, aes(x = month, y = n, color = peak_period, group = peak_period)) +
  geom_line() + # Line Chart
  facet_wrap(~ City.Name, ncol = 1) + # make chart for each city
  labs(
    title = "Daily Bikeshare Trips by Peak Period (6-9AM & 4-6PM)",
    x = "Month",
    y = "Number of Trips",
    color = "Peak Period"
  ) +
  theme_minimal() +
  theme (
    plot.title = element_text(hjust = 0.5) # Set title in middle of chart
  )

```

## Daily Bikeshare Trips by Peak Period (6–9AM & 4–6PM)



# Summary ## To determine whether the bikes are used for commuting or leisure we defined what would be compute hours as ON-PEAK (7-9 AM & 4-6 PM) and OFF-PEAK periods which would occur outside the 4 hours. I then calculated the sum of usage for each city by month showing 2 lines for ON-PEAK and OFF-PEAK. Across all cities and months the OFF-PEAK is consistently higher than the ON-PEAK. During the month of June the OFF-PEAK is roughly double the amount of usage the ON-PEAK usage. Seeing this we can determine that the bikes are not dominated by individuals commuting to work. We could dive deeper into by grabbing the user home address where they start and where they end up each day. Then by checking if the user commutes multiple times a day and if the start and stop destinations match the other of previous trip.

### Question 3:

What is the minimum, median, and maximum ride duration for each of the city by month.

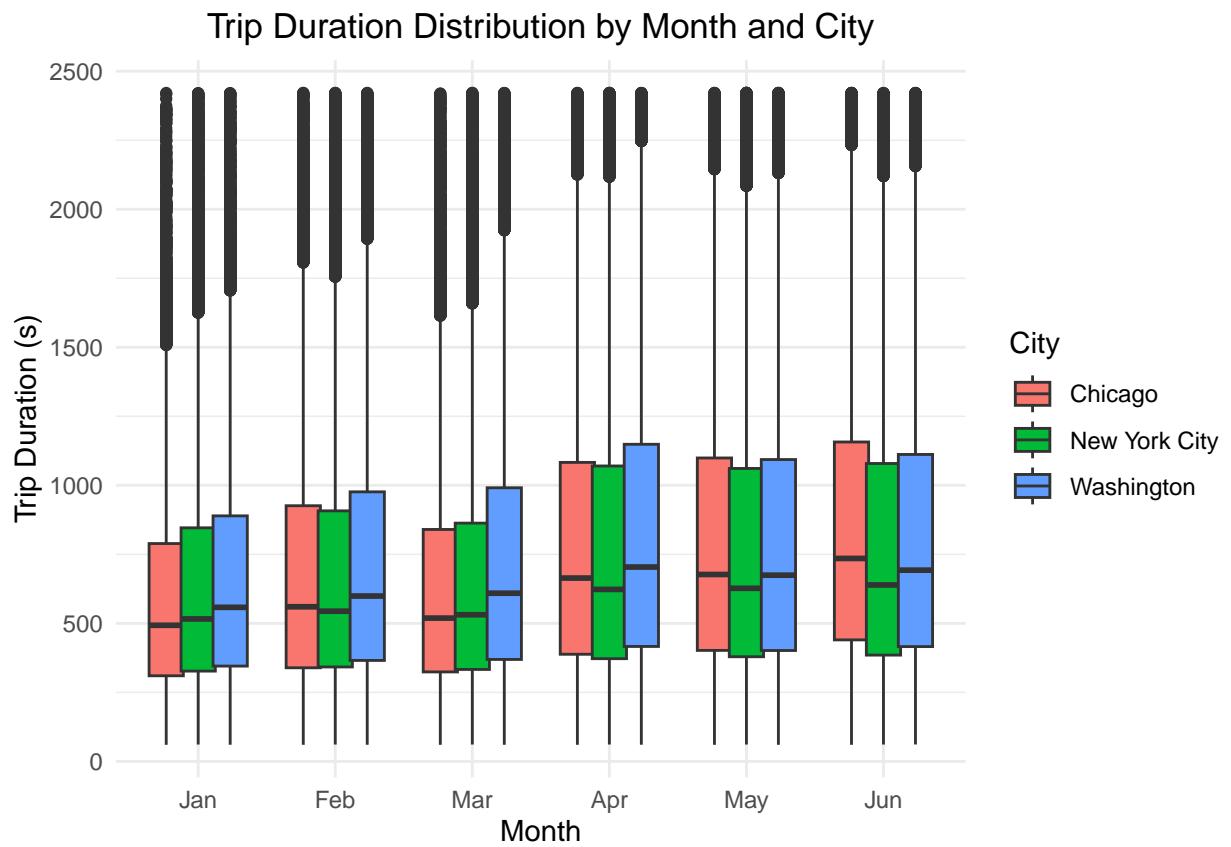
```
# Objective: Create a chart that has 3 box-and-whisker for each month. Each box-and-whisker will represent
# a city that the rides are accruing.
```

```
box_and_whisker_df <- combined_df %>%
  mutate(
    month = month(Start.Time, label = TRUE, abbr = TRUE),
    City.Name = City.Name
  ) %>%
  # I created it but each month as extreme outlier and I would like to get rid of it
  # trim anything above 95%
  filter(Trip.Duration <= quantile(Trip.Duration, 0.95, na.rm = TRUE))
```

```

ggplot(box_and_whisker_df, aes(x = month, y = Trip.Duration, fill = City.Name)) + # Color by city
  geom_boxplot(position = position_dodge(width = 0.7)) + # Dodge for any overlap
  labs(
    title = "Trip Duration Distribution by Month and City",
    x = "Month",
    y = "Trip Duration (s)",
    fill = "City" # Define legend
  ) +
  theme_minimal() +
  theme(
    plot.title = element_text(hjust = 0.5) # Adjust chart title to middle of chart
  )

```



# Summary ## I analyzed the distribution of trip duration for each city by month using a box-and-whisker plot, which shows the minimum, first quartile, median, third quartile, and maximum ride durations in seconds. After making one chart which showed major distortion due to a few rides I decided to only include the 95th percentile of durations to improve the visualization.