



Bike Share

WHITE PAPER PRESENTATION

Group 6

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Introduction

•What is Bike Sharing System?



Executive Summary

“The health crisis due to Covid-19 has had a significant impact on shared mobility and more particularly on the use of shared bikes. However, stay-at-home orders and limited business operations in countries across the world have resulted in a decrease in demand for bike-sharing services. Although COVID-19 can spread from human to human, public transport tends to contain many people in one shared space, which implies people probably change their attitudes and behaviors toward public transport. As people reassess ground transportation options in the face of the COVID-19 pandemic, many are choosing isolated modes such as driving or biking over public transportation or ridesharing”

(Bike Sharing Market Size, Analysis, Statistics, Report 2021–2027, 2012)

What is Capital Bikeshare?

A convenient fun way for bike-sharing, Capital Bikeshare is affordable, convenient, and equitable to everyone in the Washington, DC area, including Downtown Bethesda! There is a network of over 600 stations spread across multiple locations in the region spread across Washington DC with over 5000 bikes.

The generation of real-time data makes bike-share systems one of the most important and interesting subjects for a study on a real-time basis.

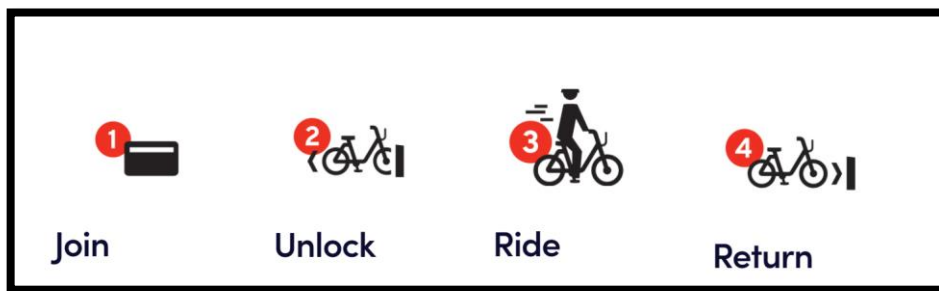
Technologies like GPS monitoring, Bike locking, online payments systems, and data collection on a website to mobile.

After getting access to data mined from users' smartphones various predictive statistical models are designed. Factors like the season, weather pattern, hour, day, weekday, weekend, proximity to the nearest bike stand, and the number of users at a particular time of a day are studied to depict variously.

The suggested statistical models are combined with an operative bike reassignment model to assess the cost-effectiveness of generating speedy bike redistribution tours to improve system service quality. The study will also look at adaptations of the proposed technique to the relationship between dependent variables operated by permanent installations or ready zones and assess their response to changing requirement cases.

Apart from the fascinating real-world applications of bike-sharing systems, the features of the data created by these systems make them appealing for research. In contrast to other modes of transportation such as bus or subway, the time of the trip, as well as the departure and arrival positions, are all recorded explicitly in these systems. This feature transforms the bike-sharing system into a virtual sensor network that can be used to monitor city movement. As a result, it is envisaged that the most significant occurrences in the city will be discovered through the monitoring of this data.

Objective



- Capital Bikeshare service is looking to study the data collected over the time frame of 2 years 2011 and 2012
- The goal of the study is to explore the environmental and seasonal settings of the rental service.
- Along with the above goal another point of investigation is to explore the data and share important insights with real-time data obtained

Research questions Explored in the project

Understanding the Environmental Constraints

- The effects and relation of weather conditions with respect to Bike usage in the region.
- The effects of temperature, wind speed, and Humidity on the usage of Bikes in the Washington region.

Study of Usage Trends

- Exploring the bike renting service usage on Hourly, Monthly, Weekly, and over the time frame of 2 years.
- Understanding the Registered vs Casual Service users

Further, we want to explore the data set with regards to the User count, Registered and Casual users to explore patterns and see if the overall usage is more on the weekend or the weekday. Additionally, we would like to see if the casual users and registered users are likely to use the cycling season-wise. We explore these questions in the next segment of the report.

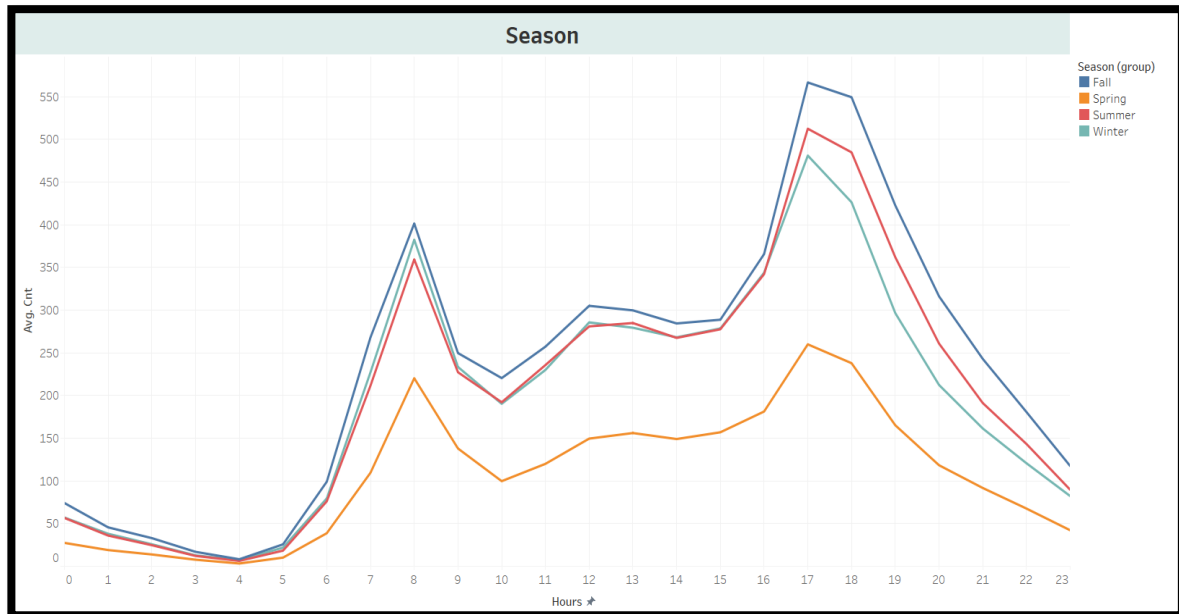
The timing and the season-wise usage have been explored to tell a story about the usage of varied users in the city of Washington DC.

User Count

Casual Users vs Registered Customer	
Casual	620,017
Registered	2,672,662
Total Number of Users	3,292,679

- From the above fig the total number of casual and registered users in the data are 620,017 and 2,672,662 for the years 2011 and 2012 respectively.

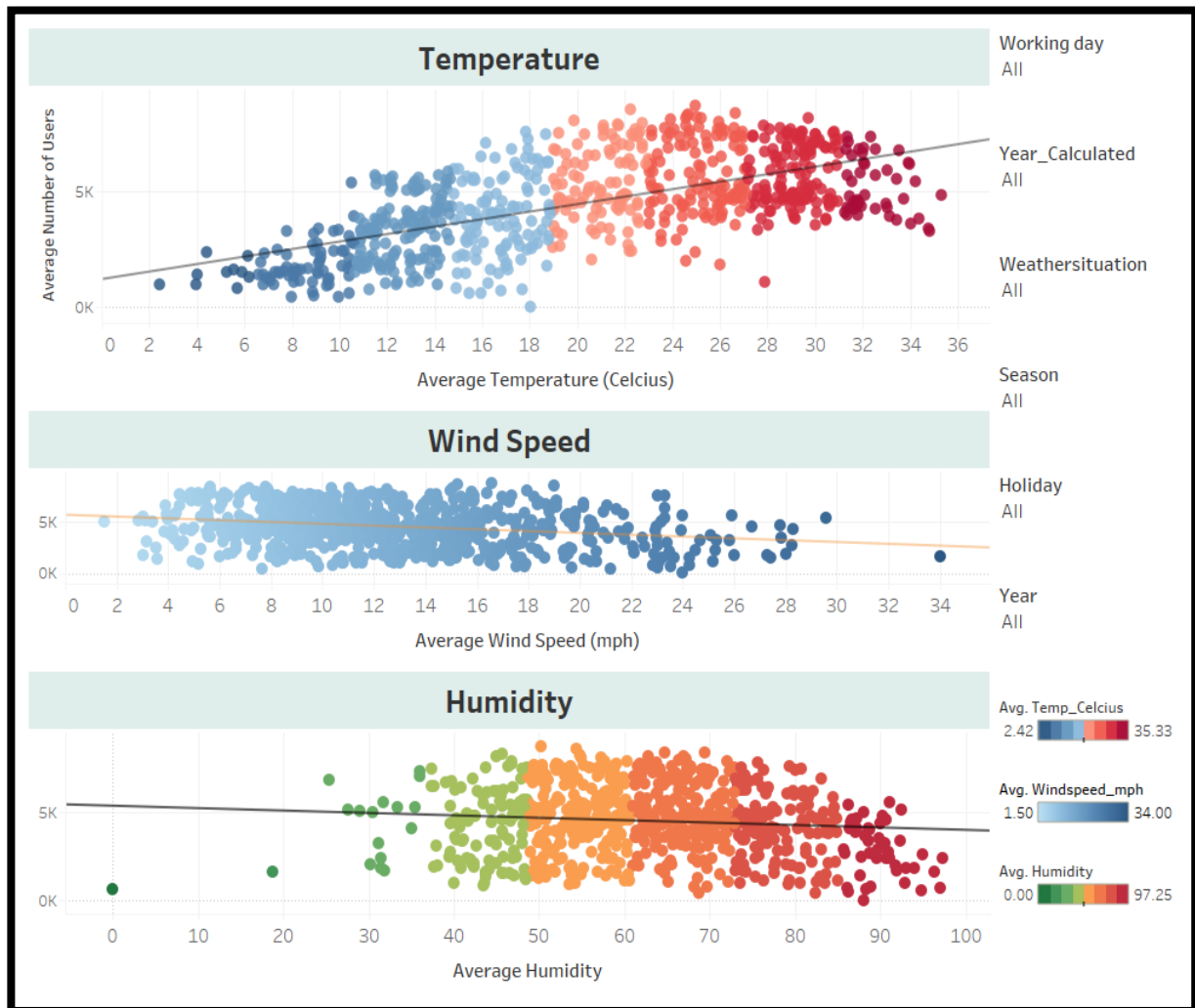
Variation of hourly count on a season for users



The line chart was used as it allows us to show the variation of Average user count based on season and further segregated based on hours.

- As per the research questions we mentioned, the above line graph depicts the hourly variation of users based on the seasons.
- As we can see the highest number of users are in the fall season, which is represented by the blue line. Whereas the spring season shows the lowest count of users.
- The graph also demonstrates the peak timing patterns of the users, we can see the peaks are in the morning from 7 am to 9 am and evening from 4 pm to 9 pm respectively.

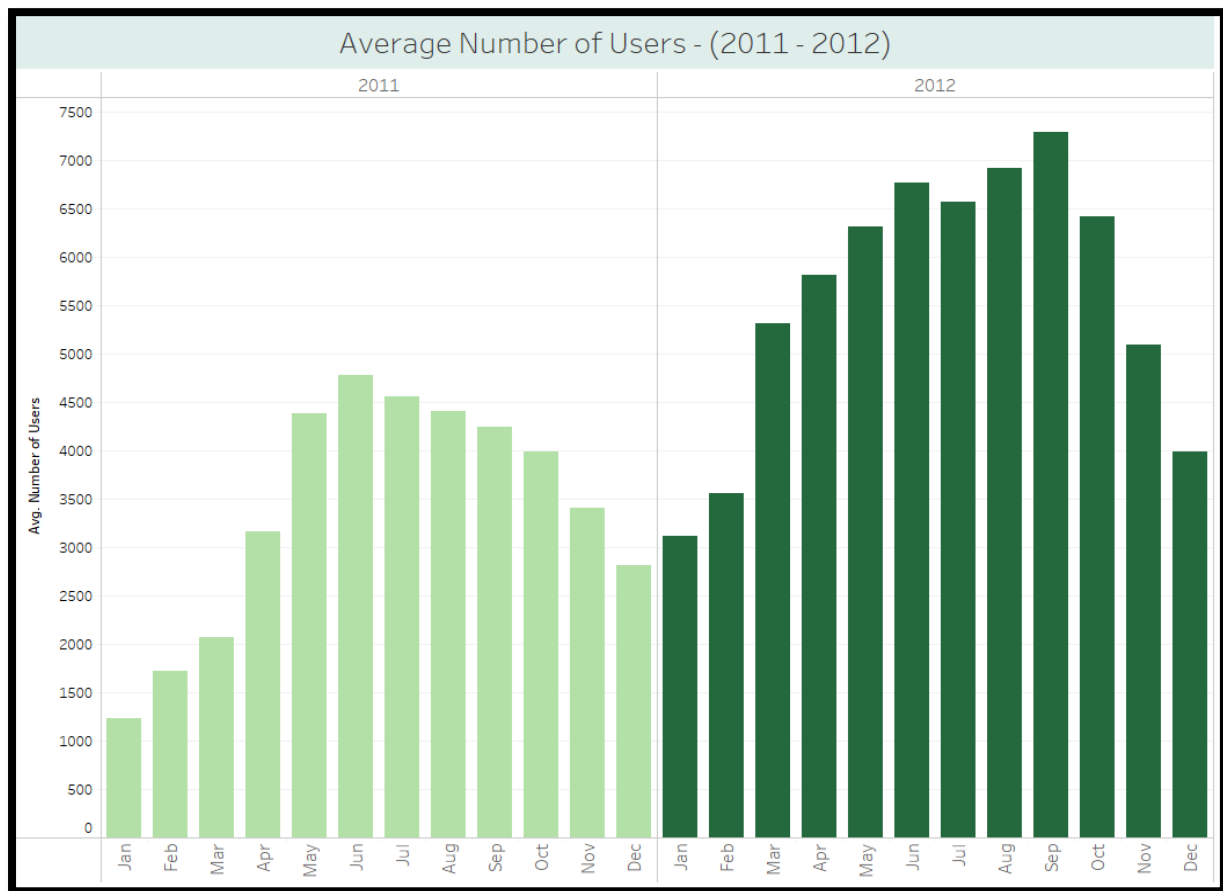
Variation of Bike rental count with Temperature, Windspeed, and Humidity



The scatter plot was used as it allows us to show the proper Average user count based on parameters like Temperature, Windspeed and Humidity

- The above graph demonstrates the variation of ridership based on three parameters – Temperature, Windspeed, and Humidity.
- The first graph shows the relation between the Average number of users vs Temperature, we can see with the increase in temperature the average number of users also increases. Hence, we can conclude riders prefer high temperatures over low or pleasant temperatures.
- The second and the third graph shows the relation between wind speed vs the Average number of user and humidity vs the Average number of users, the average number of users decreases with an increase in these parameters.
- As a result, we may conclude that favourable weather factors contribute to an increase in the number of bikes hired each day.

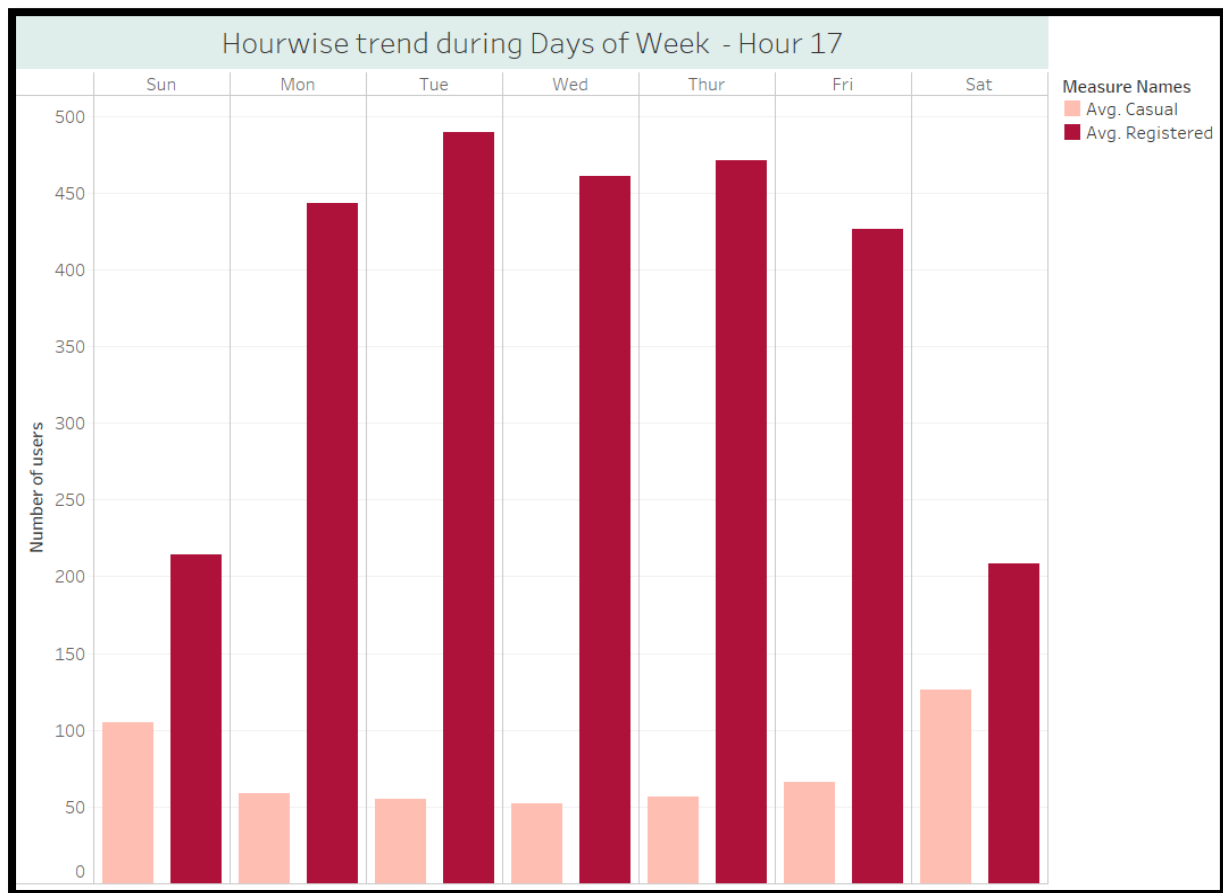
Average Bike rental Sharing based on Months and Year.



The Bar chart was used as it allows us to show the proper Average user count based on years and further segregated based on months.

- From the above chart we can observe the distribution of average users on monthly basis for the years 2011 and 2012.
- The light green and dark green shades represent the growth from light shade to dark shade and the progression of the year.
- As per the available data there was a 1.1% increase in user count (Casual and Registered) from the year 2011 to 2012.
- The rise in the use of service is observed from the months January to June for the year 2011 and from January to September for the year 2012.
- The highest Average usage of the service was observed in the months of June and September for the years 2011 and 2012 respectively.

Bike rental Sharing is based on the Type of User over the Weekdays and Hours of the day.



The Bar chart was used as it allows us to show the proper Average user count based on the type of the users over the Weekday and further segregated based on Hours.

- In this bar graph we were trying to look at the change in the number of users and the user types on different days of the week divided by the hours of the day.
- Also, as we observe the changing trend in the bar graph you will also notice that during the working hours of the working days the bar graphs of the registered users remain approximately constant.
- The height of bar graphs for casual users on Saturday and Sunday is relatively higher as compared to that on the working days.
- The Registered users are observed to be most active during the general working hours which is from 8 AM to 6 PM or 8 to 18 on the hour's slider.
- The Peak usage of the service around the week is observed at 8 AM and 5 PM on all the days of the week.
- For example, at 2 pm the number of users on working days (Monday - Friday) is around 13000 on an average and on the other hand as you will hover at the bars for Saturday and Sunday the number of registered users is around 24000 which are much higher as compared to the number of registered users during working days.

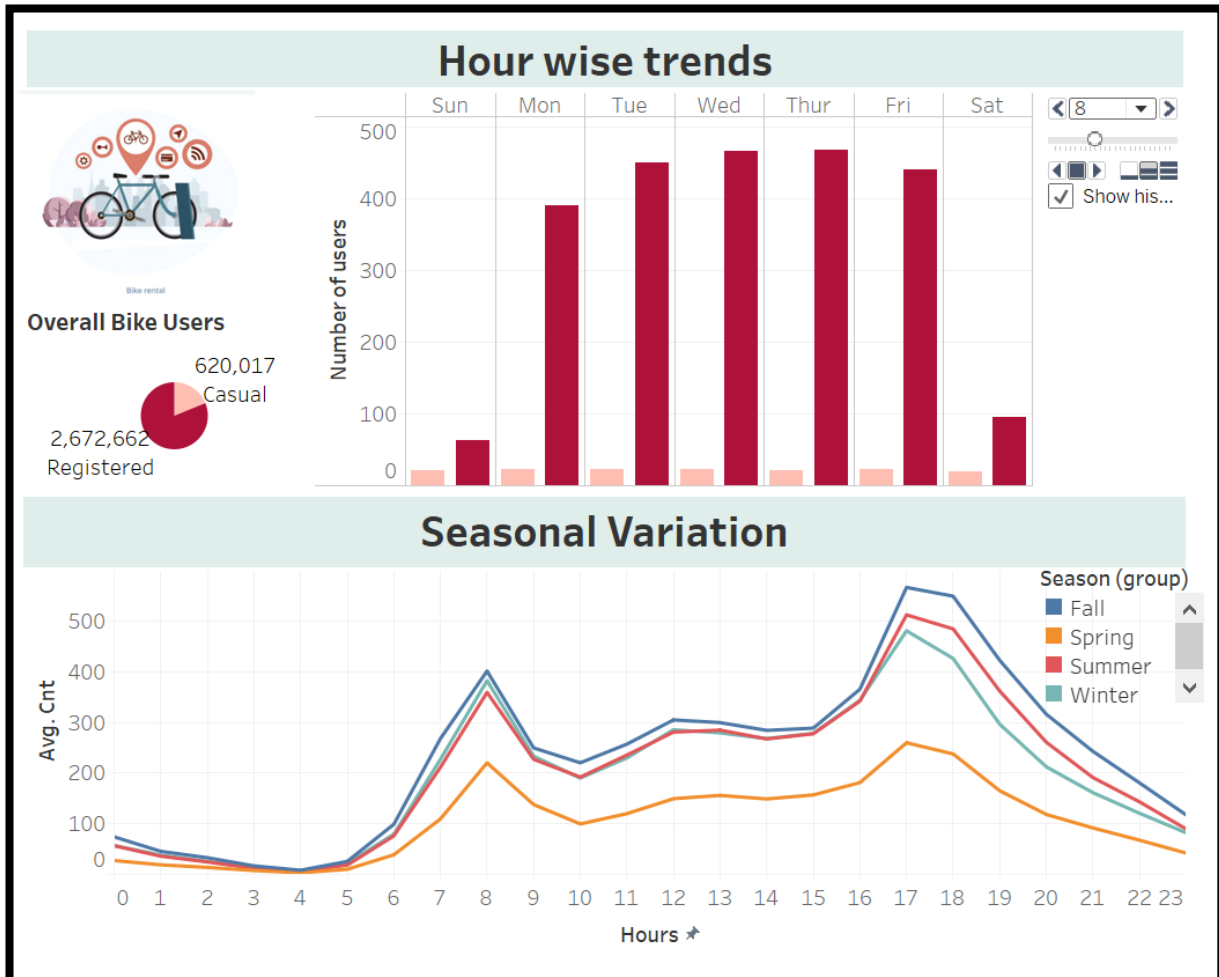
DASHBOARD 1: VARIATIONS IN NUMBERS OF USERS CONSIDERING DIFFERENT PARAMETERS



Variation in the number of users

- The dashboards show the variation of users depending on different parameters like Temperature, wind speed, and Humidity
- As we move from the top left, we can see the count of casual and register users for the years 2011 and 2012.
- There are single value filters(sliders) named, – working day, season, and holiday changing these filters we can see their effects on the dashboard
- The top right corner shows the legends which help to identify the chart series.
- We can observe the overall pattern of riders depending on the temperature, it shows the average user count increases with an increase in temperature, whereas for wind speed and humidity the average user count decreases with an increase in these parameters. By hovering on the scatter plot we get the Date, year, the parameter details and the average number of users.
- The Bar plot shows the average number of users for the years 2011 and 2012 according to the months.
 - We can see the users have increased for the year 2012. Hovering on the bar plot we can get the average number of casual and registered users.

DASHBOARD 2: HOURWISE TREND IN DAYS OF WEEK AND DIFFERENT SEASONS



- On the top left there is one pie chart that shows the overall count of casual users and registered customers.
- As we move towards the right there is one group bar chart that shows the average count of casual users and registered customers.
- The height of the bars is determined by the count of users in that specific hour
- On the top right there is one 'pages' shelf which helps us to put the grouped bar graph into the motion. The height of the bar keeps changing as the hour of the day changes.
- There were some major observations which we made as a group that was the pattern of registered users on the weekdays and on the weekends. In working hours of working days that is morning 9-5, there were fewer users and more on the weekends
- Now, as we see the below line graph, we can see that there are 4 different lines that represent 4 different season and their trends.
- As we will hover towards the data points in the line graph, we can also see one pie chart in the tooltip which we created as a sheet and inserted that sheet in our tooltip of the line graph
- The importance of inserting a pie chart was to look at the hourly and season wise distribution of casual users and the registered customer

CONCLUSION:

- Though we were able to find many patterns considering the weather, real-time data about the movement of the casual users, registered users, and overall Bike users
- Additionally, we wanted more business questions to be answered- like knowing the location (To & From) of the dock station.
- Real-time GIS data would help to get access to the longitudinal and latitude points, and we can explore the route which is used the most and place the docks accordingly for revenue generation and ease of access for the bikers.
- Furthermore, categorization using age can help us to understand which population is using the cycles most frequently
- Peak time of usage was morning 7-9 and evening 4-6
- The users preferred to bike more during summers and Fall versus the Winter and Spring Seasons
- There was a 1.1% increase in user count (Casual and Registered) between the years 2011 and 2012

References:

- 1) *Capital Bikeshare*. (2021, October 19). BikeArlington.
<https://www.bikearlington.com/capitalbikeshare/>
- 2) *Capital Bikeshare / Bethesda Transportation Solutions*. (n.d.). Capital Bikeshare. Retrieved March 30, 2022, from <https://www.bethesdatransit.org/bethesda/capital-bikeshare>
- 3) *Bike Sharing Market Size, Analysis, Statistics, Report 2021–2027*. (2012). Allied Market Research. <https://www.alliedmarketresearch.com/bike-sharing-market-A11309>