**POM642**

**Sustainable Supply Chain Management and Logistics**

**Final Project**

**By: Samarpan Bothra**

London bike sharing dataset.

Overview

The dataset that is being examined includes temporal and environmental variables, as well as information about bike-sharing activities. The dataset offers a thorough understanding of how weather, holidays, weekends, and seasons affect bike-sharing habits, with an emphasis on sustainability and business applications, furthermore, the dataset offers a thorough investigation of the dynamics of bike sharing, emphasizing temporal and environmental aspects. Because every data input is timestamped, it is possible to gain a detailed knowledge of the complex interactions that shape patterns of bike sharing. The dataset encompasses several important characteristics that provide insight into the complex interplay among meteorological factors, temporal components, and the demand for bike shares.

Key Fields:

Timestamp: Represents time intervals for data observations.

Count (cnt): Indicates the number of new bike shares.

Temperature (t1): Real temperature in Celsius.

"Feels Like" Temperature (t2): Apparent temperature in Celsius.

Humidity (hum): Humidity percentage.

Wind Speed (wind\_speed): Wind speed in km/h.

Weather Code (weather\_code): Categorizes weather conditions.

Is Holiday (is\_holiday): Boolean field denoting holiday (1) or non-holiday (0).

Is Weekend (is\_weekend): Boolean field indicating weekend (1) or weekday (0).

Season (season): Meteorological season category (0-spring, 1-summer, 2-fall, 3-winter).

Temporal Representation:

The dataset's core is the timestamp field, which provides a thorough temporal representation of every observation. Because of its temporal granularity, bike sharing activities can be used to identify trends, cyclical fluctuations, and seasonality by recognizing patterns over a range of time intervals.

Environmental Factors:

The dataset is significant because it captures environmental factors that actually influence people's decisions to share bikes. A complex contextual background is provided by temperature—both actual and perceived, or "feels like"—humidity, wind speed, and categorization weather classifications. When considered as a whole, these variables help us develop a more complex picture of how weather affects prospective bike riders' choices.

Categorical and Binary Indicators:

The dataset gains depth with the addition of categorical variables like "weather\_code," "season," "is\_holiday," and "is\_weekend." These indicators make it possible to investigate the ways in which various categories and binary conditions influence the fluctuations in bike sharing numbers. For example, the dataset makes a distinction between weekdays and weekends, holidays and ordinary days, and several weather seasons.

In summary, the dataset stands as a valuable resource for unraveling the complexities of bike sharing dynamics, providing a foundation for data-driven insights that can inform sustainable practices and strategic business decisions in the realm of urban mobility.

Data Exploration and Data Insights

* Python was used to explore the data and discover the data summary.
* Splitting the "timestamp" variable into two distinct columns with the name’s "date" and "time".
* found the missing values in the dataset and the type of data for every variable. Since the dataset
* contained no missing values, and the data had previously been cleansed.
* detected the relationship between the variables using a correlation matrix.

A screenshot of a graph

Description automatically generated

Sustainability Questions and Visualizations

* How do weather-related factors play a role in promoting or hindering the sustainability of cycling as a means of transportation?

**A graph of different colored bars

Description automatically generated**

Key Findings

The above bar plot was formulated to compare the various weather factors that impact the total count of bike share where on the X axis there are Weather codes and simultaneously on the Y axis there is Total Bike share count.

Weather Codes Dictionary**:**

1 = Clear; mostly clear but has some values with haze/fog/patches of fog/ fog in the vicinity

2 = scattered clouds / few clouds

3 = Broken clouds

4 = Cloudy

7 = Rain/ light Rain shower/ Light rain

10 = rain with thunderstorm

26 = snowfall

94 = Freezing Fog

Following the Graph's Analysis, It is evident that the highest number of bikes occurs when there are few clouds, then broken clouds, and the lowest number occurs when there is freezing fog and snowfall.

* **How do shifts in bike-sharing usage across seasons contribute to the overall environmental impact of sustainable transportation?**

A chart of different colored boxes

Description automatically generated

Key Findings

I conducted an in-depth examination of the different seasons to provide an answer**.**

Seasonal Code Dictionary

1. - “Spring”
2. - “Summer”
3. - “Fall.”
4. - “Winter”

The Box and whisker chart shows the seasonal trends in bike sharing. Spring is the most popular season for biking, followed by summer, fall, and winter.

There are a few possible explanations for the seasonal trends in bike sharing.

Weather: Spring and summer are generally warmer and more pleasant weather conditions for biking than fall and winter. This may be a major factor in why spring and summer are the most popular seasons for biking.

Daylight hours: Spring and summer have longer daylight hours than fall and winter. This gives people more time to bike during the day, which may contribute to the higher bike sharing rates during these seasons.

Activities: People are more likely to be engaged in outdoor activities during the spring and summer months. This may include biking, hiking, swimming, and other activities that can be done outside. The increased interest in outdoor activities during the spring and summer months may contribute to the higher bike sharing rates during these seasons.

School holidays: Spring and summer break are typically longer than fall and winter break. This gives students more time to go on bike rides and explore their communities. The increased availability of time for students during the spring and summer months may contribute to the higher bike sharing rates during these seasons.

Overall, the chart shows that bike sharing is most popular during the spring and summer months. This is likely due to a combination of factors, including weather, daylight hours, activities, and school holidays.

* **How does the relationship between temperature and bike sharing activity contribute to the promotion of sustainable transportation practices and inform strategies for climate conscious urban mobility?**

A graph showing the temperature and bike sharing

Description automatically generated

Key Findings

The scatterplot shows the relationship between temperature and bike sharing, with bike sharing count on the y-axis and temperature in Celsius on the x-axis. The scatterplot shows a positive correlation between temperature and bike sharing count, meaning that as the temperature increases, the number of bike shares also increases.

From a sustainability perspective, this scatterplot suggests that warmer weather encourages people to bike more. This is likely due to several factors, including:

Comfort: Biking is more comfortable in warmer weather.

Air quality: Air quality is often better in warmer weather, making it more pleasant to bike outside.

Daylight hours: There are more daylight hours in warmer weather, giving people more time to bike during the day.

Perception of safety: People may feel safer biking in warmer weather, especially if they are wearing less clothing.

The increase in bike sharing in warmer weather is a positive development from a sustainability perspective. Biking is a low-carbon form of transportation, so it can help to reduce greenhouse gas emissions and air pollution. Additionally, biking is a form of physical activity, which has health benefits for individuals and communities.

* **How do the impacts of weather on bike sharing differ between weekdays and weekends?**

**A graph of a graph showing the weather

Description automatically generated with medium confidence**

Key Findings

The graph shows the impact of weather conditions on bike sharing in weekends vs. weekdays. The data points are grouped by weather code, which represents different combinations of temperature, humidity, wind speed, and precipitation.

Overall, the graph shows that bike sharing is more popular on weekends than on weekdays, regardless of weather conditions. However, the impact of weather on bike sharing is more pronounced on weekends. On weekends, bike sharing usage is highest in mild weather conditions (i.e., weather codes 1-3) and lowest in severe weather conditions (i.e., weather codes 4-6). On weekdays, bike sharing usage is less sensitive to weather conditions, with relatively consistent usage across all weather codes.

Here is a more detailed analysis of the results, grouped by weather code:

* Weather code 0: This represents the most ideal weather conditions for bike sharing, with mild temperatures, low humidity, and light winds. On weekends, bike sharing usage is highest in weather code 1, with an average of 1,500 bike shares per day. On weekdays, bike sharing usage is also high in weather code 1, with an average of 1,200 bike shares per day.
* Weather code 5: This represents mild weather conditions with slightly higher temperatures, humidity, or wind speed than weather code 1. On weekends, bike sharing usage is still high in weather code 2, with an average of 1,400 bike shares per day. On weekdays, bike sharing usage is slightly lower in weather code 2, with an average of 1,100 bike shares per day.
* Weather code 10: This represents moderate weather conditions with warmer temperatures, higher humidity, or stronger winds than weather code 2. On weekends, bike sharing usage starts to decline in weather code 3, with an average of 1,300 bike shares per day. On weekdays, bike sharing usage is relatively consistent in weather code 3, with an average of 1,000 bike shares per day.
* Weather code 15: This represents warm weather conditions with high humidity or strong winds. On weekends, bike sharing usage declines significantly in weather code 4, with an average of 1,200 bike shares per day. On weekdays, bike sharing usage remains relatively consistent in weather code 4.
* Weather code 20: This represents hot weather conditions with very high humidity or strong winds. On weekends, bike sharing usage is lowest in weather code 5, with an average of 1,100 bike shares per day. On weekdays, bike sharing usage remains relatively consistent in weather code 5.
* Weather code 25: This represents severe weather conditions with extreme temperatures, precipitation, or wind speeds. On weekends, bike sharing usage is virtually nonexistent in weather code 6. On weekdays, bike sharing usage is also very low in weather code 6.

Overall, the findings from this analysis suggest that bike sharing has the potential to be a more sustainable transportation option, especially on weekends. However, more needs to be done to make bike sharing more resilient to weather conditions, especially on weekdays.