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Capital BikeShare Seasonal Analysis

Introduction

Capital BikeShare provides an eco-friendly transportation system for residents and tourists to navigate the city. Members can rent bicycles and return it from one station to another, promoting a sustainable mode of transportation. A study was conducted on bike rental data in relation to seasonal variables.

Objective

- Analyze Seasonal Trends: Investigate how weather conditions affect rental patterns.
- Enhance Seasonal Performance: Develop strategies based on seasonal demand.
- Efficiency during Low Demand: Identify opportunities for operational efficiency.

Seasonal Rental Analysis

Capital Bikeshare recorded the highest total rental in the summer season at $2.39 million and a daily rental average at $546.26 (Figure 1). The winter season recorded the lowest total rental at $1.10 million and a daily rental average at $254.42. Further insight on seasonal trends is warranted, as data on climate and weather conditions could highly influence customer behavior. To capitalize on peak seasons, Capital Bikeshare can optimize their operations during their low demand period. Some examples include adjusting inventory and expanding their bike lots.

Management and Operations

The winter season can be an opportunity to optimize management and operations by collecting valuable data and implementing strategic initiatives. With low biking activity in the winter, Capital BikeShare can limit staff, such as customer service representatives and bike maintenance teams, and create seasonal contractor opportunities to expand bike stations. Capital BikeShare could explore partnerships with local businesses to offer winter maintenance services, further optimizing operations. Furthermore, analyzing repair data from winter conditions can inform the development of more durable and weather-resistant bike models for improved year-round performance. Another important factor for station maintenance includes documenting the repair needs during the winter due to harsh conditions. This data can help with planning preventive measures.

Weather Rental Analysis

Temperature

Temperature and rentals show a significant positive correlation (R = 0.44) with a P-value below 1%, emphasizing its statistical significance (Table 1 & Table 2). Based on this, some other variables to consider in relation to rental are dewpoint (R = 0.23) and humidity (R = -0.30) (Table

3). Dewpoint shows a weak positive correlation, while humidity shows a slightly stronger, but negative, correlation. These weather conditions can influence rental decisions. Capital Bikeshare can use an algorithm to send promotions during unfavorable weather conditions and strategically place bikes near tunnels or underground pathways to keep customers active in harsh weather. This may result in a boost for winter services and enhance overall customer satisfaction. More data is needed on the feasibility of installing convenient pathways for customers.

The temperature-rental relationship fluctuates throughout the year: it is strongest in July and weakest in December (Figure 2). During analysis, it was predicted that this was due to more data collected in the peak seasons, where a higher sample size would lead to more significant results. However, the total number of data collected was similarly distributed over the months, invalidating the prediction (Table 4). Outside of the summer and spring seasons, the weather's severity could be less predictable for consumers and may explain the weak correlation between temperature and rental. To capitalize on reliable information collected in the summer, Capital BikeShare should accelerate their marketing efforts during this period by offering targeted promotions and incentives. Conducting a comprehensive year-round study on member activity, demographics, and promotion effectiveness can provide valuable insights to sustain success beyond the summer months.

Climate

Bike rentals are at their lowest when rain is forecasted. The rental revenue in light rain conditions totalled $0.30M, while heavy rain conditions totalled even lower at $0.17M (Figure 3). This highlights that there is a clear trend of reduced demand in service with the presence of rain. Understandably, bike rentals thrive in fair and cloudy conditions, where riders are more inclined to take advantage of favorable weather. For a future study, data on the trip time and time of day could be helpful in determining how long members spend in the different weather conditions. To enhance the recreational aspect of bike rentals and encourage more extended rides, a subscription service that tracks average ride times could be implemented. For casual riders, boosting extended membership trials during the winter compared to summer registration promotions can attract more casual members to upgrade their membership service.

Next Steps

These goals can guide Capital BikeShare in collecting data to improve services and operations:

- Location Optimization: Strategically place bikes near sheltered areas to encourage usage in adverse weather.
- Membership Tracking: Monitor year-round member activity and demographics to identify and retain loyal customers.
- Seasonal Promotions: Offer enticing winter membership trials and promotions to attract casual riders based on season demand.
- Customer Feedback: Collect quantifiable feedback from members year-round to make improvements in services.