Proposal for CitiBike Angel Mapper that Optimizes Routes for Longer Distances and Feature to Plan Ahead

To **CitiBike** 2022 November 16
Director of Analytics

One of CitiBike's goals is to provide efficiency[1] in their service. CitiBike's main challenge has been rebalancing the bikes in 'hotspot' locations during peak hours. The bike angel initiative by CitiBike was first established in 2021, to solve the rebalancing problem. This initiative has proven to be 80% cheaper than using alternatives such as bike trains and motor vehicles to "rebalance" CitiBike's bikes across NYC (Mestel, 2022).

The current Bike Angel routes are optimized for trip chaining (Lyft 2022). These are shorter distance trips with drop-off points that are walking distance from stations with pick-up points. However, not all Bike Angels are able to plan ahead for longer distance trips in efforts to rebalance rides. To encounter this challenge, we propose a feature called "CitiBike Angel Mapper" which will provide angels with rebalancing routes that are longer distances based on historical data. We will be working with the analytics and research and design team to develop this new feature with the goal of answering the research question; Relative to the current number of bikes available at peak hours and hotspots, will Citibike Angel Mapper increase the number of bikes available, improve customer satisfaction and operating costs and revenue?

Rationale

The "CitiBike Angel Mapper" will provide Angel riders with historical information on the usage trends of CitiBike riders so they can plan their rides in advance and evenly distribute our inventory of bikes around the city. The platform will leverage historical data from the "CitiBike trip data" dataset to predict CitiBike user movements by day of the week and time of day to visualize "hotspots", peak times when bikes are required at specific locations. The hotspots will vary by size depending on the number of people in that area, with larger circles symbolizing

[1] CitiBike Mission: It's fun, efficient and affordable – not to mention healthy and good for the environment.

higher traffic. The tool will also display the density of empty CitiBike docks, so Angel riders can also use this information to move bikes to these docks and be rewarded for that trip.

Cost Analysis

Implementing these proposed changes of "Citi Bike Angel Mappers" will require an initial investment of $175,000. This proposal highlights the related benefits once the costs outlined are integrated towards addressing operational challenges related to imbalance. The team will incur expenses in various stages of the development phase, as outlined below in Table 1.

Table 1:

Phase:	Tasks Undertaken:	Projected Expenses
Planning Stage	Characterized by analysis of the Bike Angels program. Identification of the benefits of the program.	$250 - Funds required by the group implementing this proposal.
Analysis Phase	Examination of Bike Angels to identify underlying issues. An analysis of the app's efficacy to identify its relevance and effectiveness in addressing the operational imbalance.	$450 - Funds required by the group implementing this proposal.
Assessment Phase/Rationale	The application of the proposed changes. Its efficacy and relevance during different times of the day.	$75,000 - R&D costs
Employees (team members)	6 team members	$100,000 - Wages and equipment

By increasing the supply of bikes in high demand locations during rush hours, CitiBike will be able to generate additional revenue and utilize bike inventory better. On average, there are about 70,000 rides per day in the city of New York (according to CitiBike's monthly operating reports). We estimate that by optimizing rebalancing and providing bike angles with data regarding hot spots ahead of time, daily rides can increase up to 3% per day meaning 2,100 additional daily rides on average. Considering a ride using a regular bike costs $3.99, we estimate a $251,370 increase in monthly revenue (not taking into account additional income from electric bikes) in comparison to a $175,000 initial investment.

Assessment

The project can be measured on a weekly, monthly, and quarterly basis. The performance of the project can be measured by three metrics. First is the participation of the bike angels. Record the number of the bikes that are returned by bike angels on a daily, weekly, and monthly basis. Do more bike angels get involved? Second is the user satisfaction. Do people feel it is easier to find a bike during the rush hour, and are there empty docks at the destination for return? Last is the costs of operations and revenue. Does the bike angle program help to reduce the bike-rebalancing cost? As the usage of bike stations has been maximized, has the revenue increased?

Conclusion

The project will indubitably lead to a more efficient utilization of our rebalancing personnel (bike angels), better usage of the company resources, and will certainly better our user experience all together.

References

Mestel, S. (2022, October 21). For Citi Bike's 'Angels,' riding in NYC can be a rewarding relationship. Bloomberg.com. Retrieved October 28, 2022, from https://www.bloomberg.com/news/articles/2022-10-21/for-citi-bike-s-angels-riding-in-nyc-can-be-a-rewarding-relationship

CitiBike. (2022). About Citi Bike: Company, history, motivate. Citi Bike NYC. Retrieved November 16, 2022, from https://ride.citibikenyc.com/about

Lyft. (2022). Bike angels. Bike Angels. Retrieved November 16, 2022, from https://www.lyft.com/bikes/bay-wheels/bike-angels