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Part 1: Data Preparation

1.1 Data Import and Merge:

The initial step involved importing and merging the provided Excel tables for the two quarters into a single table. This was done to facilitate a cohesive analysis of the data from both quarters.

1.2 Display Format Setting:

To enhance readability, the display format was configured to avoid scientific notation, and numeric values were rounded to two decimal places. This ensures that the data is presented in a user-friendly format.

1.3 Data Cleaning:

1.3.1 Missing Values Check:

A thorough check for missing values was conducted to identify any gaps in the dataset. Strategies for handling missing data were implemented as needed.

1.3.2 Duplicate Rows Removal:

Duplicate rows were identified and removed to ensure the integrity of the dataset, preventing any redundancy in the analysis.

1.3.3 Data Type Adjustment:

The data types were adjusted to ensure consistency and accuracy in subsequent analyses. Trip data was converted to float64, start_time and end_time were modified to datetime64, and all other data were adjusted to object data type.

1.4 Column Order Adjustment:

To facilitate a clearer comparison of data across different tracking numbers, the order of the table columns was adjusted. This enhances the visual organization of the data for better analysis.

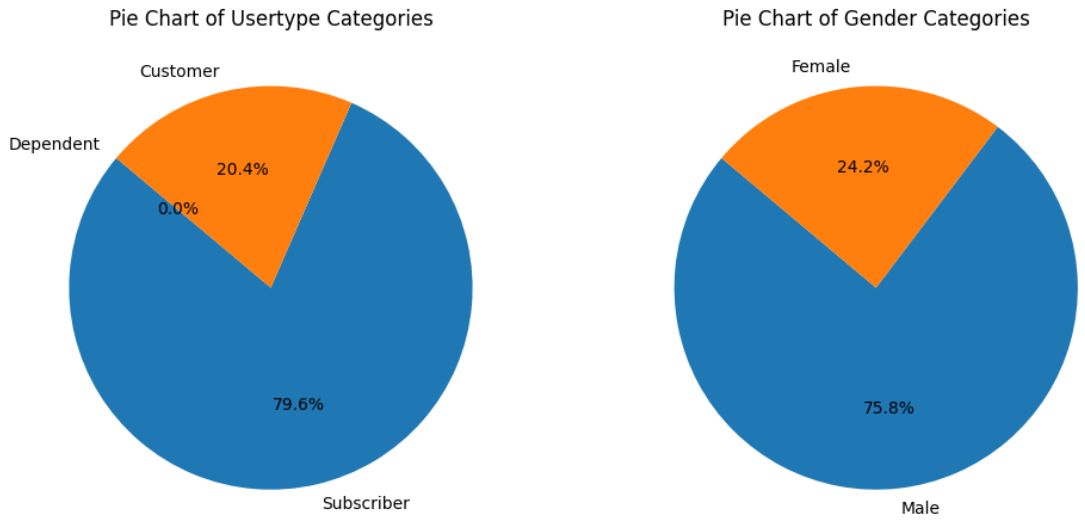
Part 2: Data Exploration and Analysis

2.1 User Type Analysis

Before delving into the analysis, it is crucial to note that a significant portion of customers lacks birth year and gender information. This may introduce biases in the conclusions compared to the actual scenario.

To compare the proportions of different user types and genders, two corresponding pie charts were created based on the data from Q1 and Q2. From this, the following conclusions can be drawn:

- The most prevalent user type is subscribers, followed by customers, while dependent users constitute a minimal proportion, nearly zero.
- Male users significantly outnumber female users, accounting for 75.8% and 24.2%, respectively. These insights can aid businesses in understanding current market trends and identifying potential growth opportunities within specific categories.



Next, an analysis of user behavior regarding order duration and riding distance was conducted, yielding the following conclusions:

- The majority of orders have durations concentrated within relatively short time intervals

(median of 11.17 minutes), suggesting users primarily engage in short-distance rides, such as commuting or occasional trips.

- There are a few orders with considerably longer durations, with the longest being 1438.97 minutes, possibly indicative of special usage scenarios like extended rentals.

- Riding distance also predominantly falls within short ranges (median of 1.52 kilometers), indicating users are primarily engaged in short-distance rides. There are instances of longer-distance rides, with the maximum riding distance being 27.32 kilometers, likely reflecting specific user needs such as long-distance commuting or leisure rides.

Analyzing the riding frequency across different age groups, the following conclusions were drawn:

- The age group between 20 and 30 years exhibits the highest riding frequency, potentially representing the primary user demographic. Initiatives like promotional activities, special discounts, or additional services can be considered to attract and retain this demographic.
- The age group between 60 and 70 years also shows relatively high riding frequency, suggesting an active segment of elderly users. To enhance satisfaction among this group, services tailored to the needs of seniors could be explored.
- The age group between 10 and 20 years has the longest average ride duration, at 28.83 minutes. This might indicate a preference for longer rides within this demographic, presenting an opportunity to offer more long-distance riding services and incentives. Other age groups show relatively shorter average ride durations, ranging from 11 to 12 minutes, indicating a preference for short-distance rides. Further optimization of services to improve ride efficiency can be considered based on this trend.

Based on the behavioral analysis charts for the three user types, the following conclusions can be drawn:

1.Customer:

- Longer average ride duration (31.23 minutes)
- Longer average ride distance (2.18 kilometers)

2.Dependent:

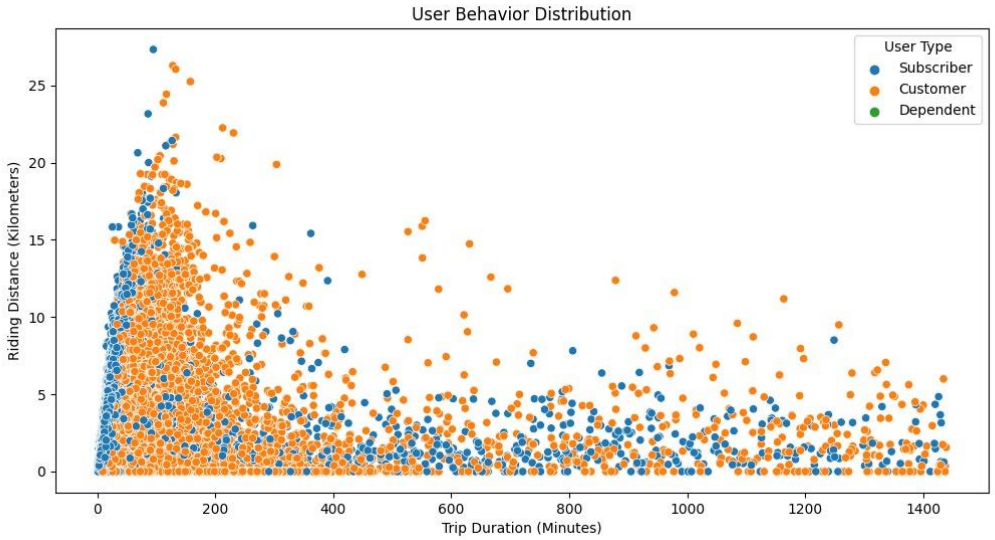
- Shortest average ride duration (7.57 minutes)

- Shortest average ride distance (0.31 kilometers)

3.Subscriber:

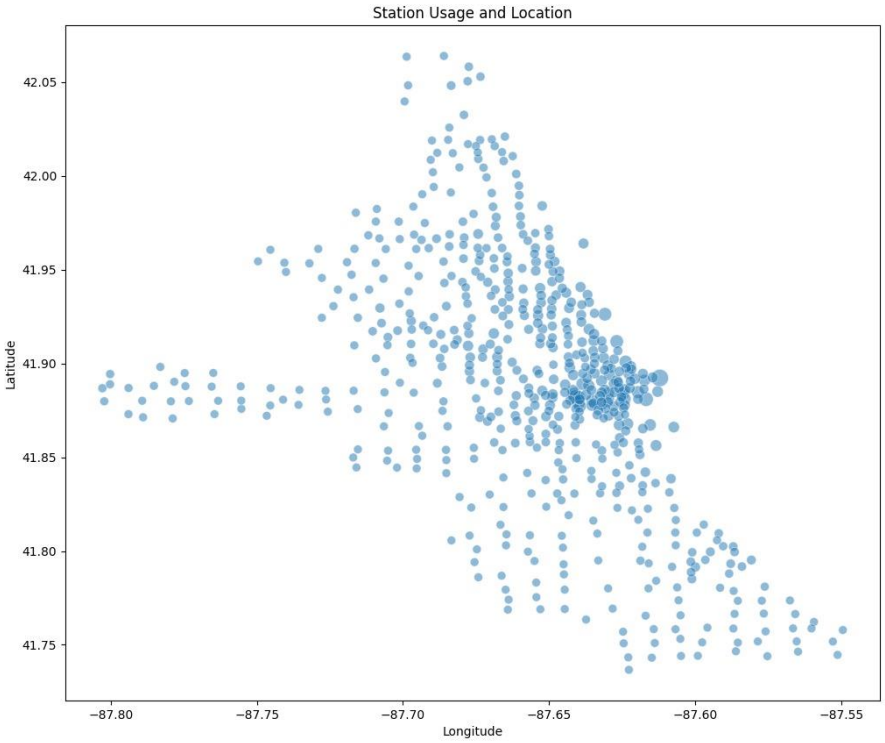
- Moderate average ride duration (11.66 minutes)
- Moderate average ride distance (1.91 kilometers)

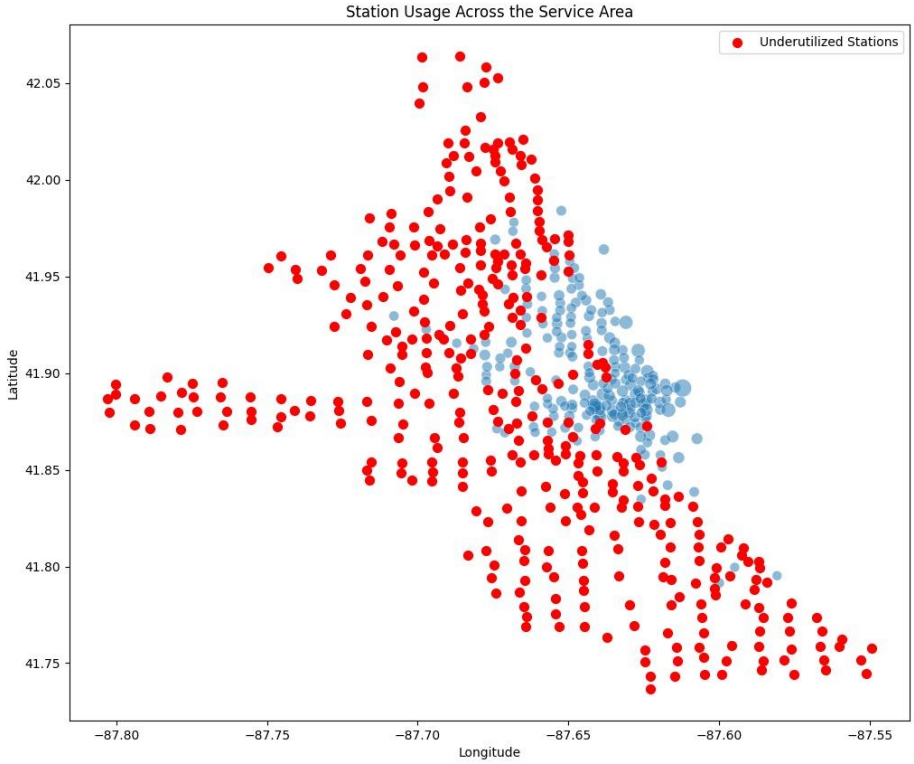
This comprehensive analysis provides valuable insights into user demographics, behaviors, and preferences, allowing businesses to tailor their services, promotions, and incentives to meet the diverse needs of their user base.



2.2Geographical Analysis

Based on the geographical distribution map of station usage and location, it is evident that there are bike stations marked in red scattered across a wide area. Bike stations with higher usage are concentrated in specific regions, while stations with lower usage are dispersed, indicating a reasonably rational distribution of bike stations.


Station Usage and Location
Latitude
Longitude
42.05
42.00
41.95
41.90
41.85
41.80
41.75
−87.80
−87.75
−87.70
−87.65
−87.60
−87.55


Station Usage Across the Service Area
Underutilized Stations
Latitude
Longitude
42.05
42.00
41.95
41.90
41.85
41.80
41.75
−87.80
−87.75
−87.70
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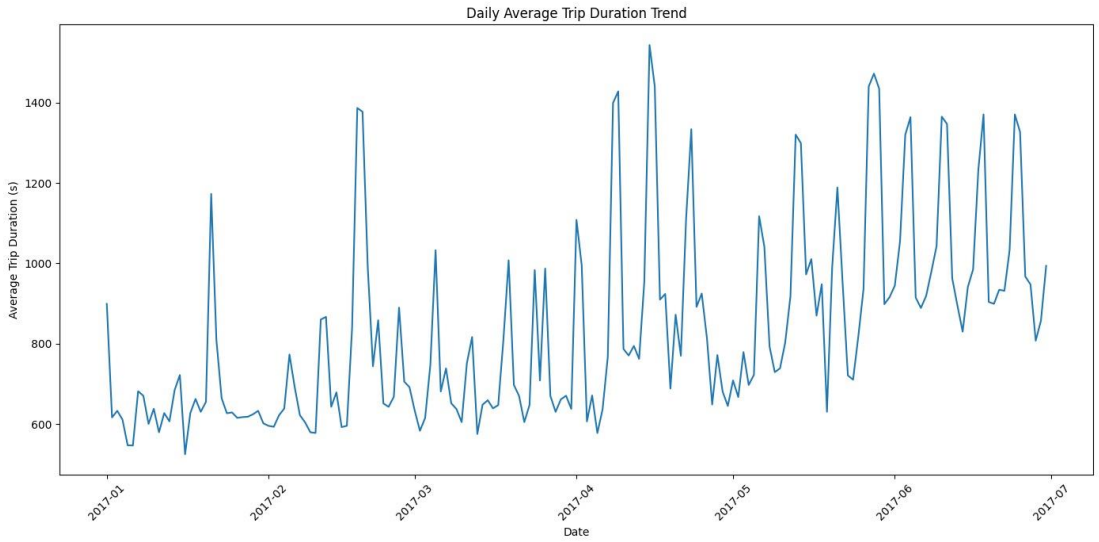
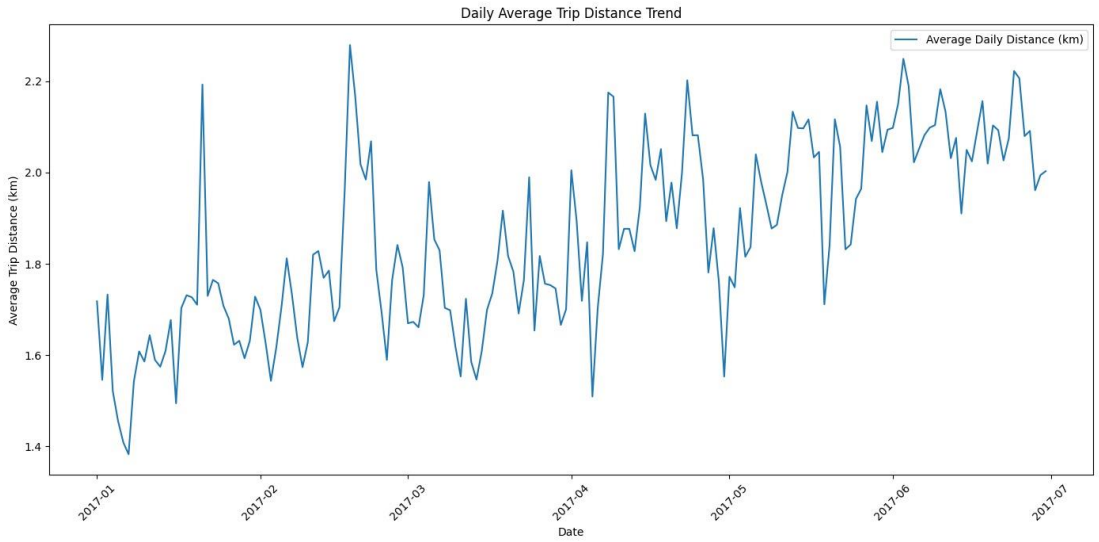
−87.60
−87.55

2.3 **Market Trend Analysis**

Monitoring the changes in order duration and riding distance is essential for understanding market trends and adjusting strategies accordingly.





From the two charts, it is evident that in the second quarter of 2017, both order duration and riding distance increased compared to the first quarter. The overall trend for average trip duration and daily average trip distance shows a fluctuating upward trajectory.

Users in the second quarter appear more inclined to engage in longer and more distant rides. This shift could be attributed to seasonal factors, improved weather conditions, or the impact of promotional activities. The variation in order duration between quarters may be related to seasonal factors, with the second quarter typically experiencing warmer weather.

Part 3: Crtical thinking based on your findings in Part 2

User Type Analysis

The proportion of subscribers is 79.6%, significantly higher than customers and dependents, indicating that there is still potential for one-fifth of users to become subscribers. The company can introduce discounted promotions for daily, monthly, and annual subscriptions targeting females to increase the proportion of female users.

Given that the majority of orders are concentrated in short time periods and distances, further optimization of short-distance riding services is recommended. Providing more parking points, streamlining the rental process, and ensuring a better experience for users during quick short-distance travels can be achieved. Flexible billing methods for short rides and additional discounts for longer rides can be implemented to cater to diverse user needs.

Differential promotional activities for various age groups can enhance riding frequency. The age group between 20 and 30 years has the highest riding frequency, suggesting potential for converting more users into annual subscribers by offering discounts on subscription plans. Notably, the age group between 60 and 70 years also exhibits relatively high riding frequency, warranting service optimizations to meet the needs of elderly users.

Tailoring marketing promotions based on the riding preferences of different user types, coupled with differentiated pricing strategies, can cater to the diverse needs of the user base.

- For Customers:

Customers may prefer longer rides, prompting the introduction of membership plans or packages tailored for longer rides to encourage more frequent use.

- For Dependents:

Dependents may prioritize short and convenient rides. Introducing short-distance riding packages or incentives can attract and retain these users.

- For Subscribers:

Subscribers, maintaining moderate levels in duration and distance, may prioritize overall value. Offering flexible billing options can make it easier for them to adapt to different riding needs.

Geographic Analysis

A reduction in bike deployment to red-marked stations is advisable. The map indicates that red-marked bike stations are spread across a wide area, suggesting a potential decrease in bike stations in that region. Red-marked bike stations can be segmented by area, reducing human resource costs, such as maintenance. Additionally, designing bike transportation routes to move bikes from less-used stations to more active ones can increase bike utilization, thereby enhancing user satisfaction. These measures collectively contribute to cost reduction for the company. For blue-marked stations, considering the opposite measures (increased bike deployment, additional stations, and increased maintenance cost investment) can boost bike utilization and user satisfaction.

Market Trend Analysis

In response to the observed trend, the company can further promote longer and more distant rides. For instance, introducing discounts or packages specifically for long-duration and long-distance rentals can enhance the appeal of extended rides. Seasonal market promotions and campaigns can be implemented to capitalize on seasonal changes, emphasizing the advantages of cycling during warmer months to attract more users.

The overall increase in order duration may indicate increased user engagement and investment, signifying a willingness to spend more time experiencing shared riding services. Encouraging more frequent service use can be achieved through initiatives such as membership plans, point systems, or special events to enhance user loyalty. The increased demand for longer rides suggests a heightened focus on user experience and service quality. Therefore, increasing bike deployment and regular maintenance frequency should be prioritized to enhance user satisfaction and increase user retention.