Time and Duration Distributions in Urban Bike Ride Data

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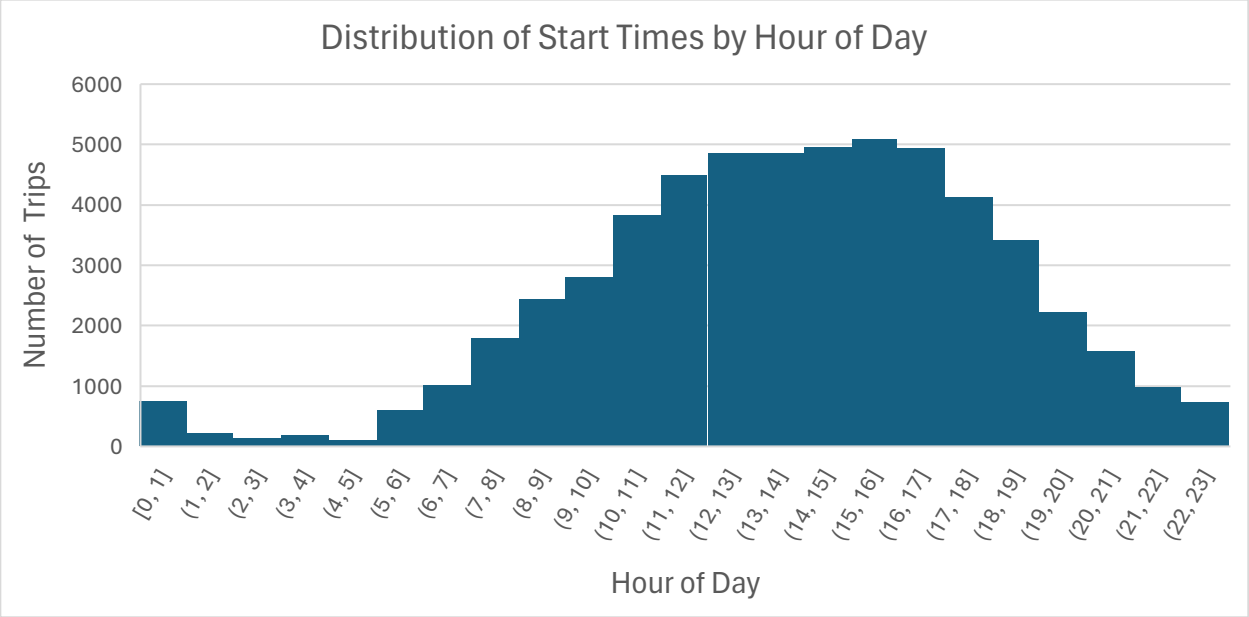
The dataset documents urban bike ride activity. The average ride duration was 42.81 minutes, with a standard deviation of 129.56 minutes, and trip lengths ranged from 1 minute to 1,440 minutes. Averages offer a point of reference; however, they hide behavioral information which can be more easily understood through a visual analysis. The figures below reveal non-normal distributions, long-tailed data, and distinct usage patterns that averages fail to capture. Temporal segmentation between weekday and weekend rides will also clarify how ride behavior shifts under different conditions.

As shown in Figure 1, start times concentrate heavily in the late afternoon which corresponds with people being off work for the afternoon. The data forms a left-skewed distribution and peaks around 17:00 (5:00pm) and tapering off after 20:00 (8:00pm). Very few rides occur before 08:00 (8:00am), and activity levels remain relatively low during early morning hours. While the average start time falls within the afternoon window, it masks the intensity of peak-hour behavior, especially between 16:00 and 18:00, were usage spikes most sharply.

Figure 1

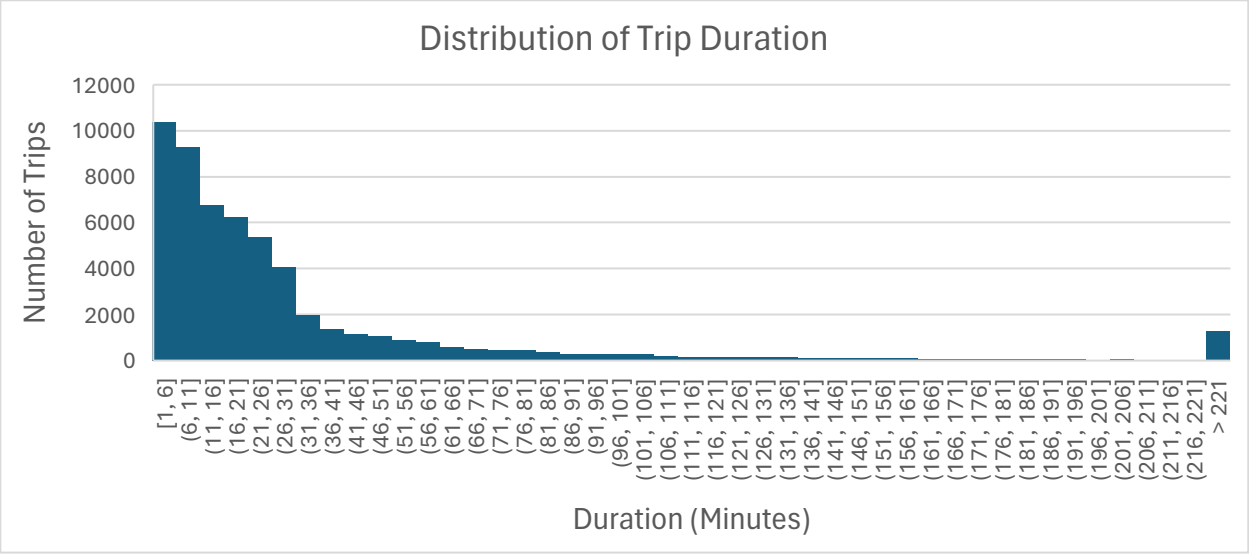
Distribution of Start Times by Hour of Day



Note. Ride start times follow a unimodal, left-skewed distribution. Peak usage occurs at 17:00, with most rides beginning between 14:00 and 18:00. The distribution extends toward the early morning hours, where trip frequency is significantly lower. Late evening trips are low, though still higher than early morning.

Figure 2

Distribution of Trip Duration



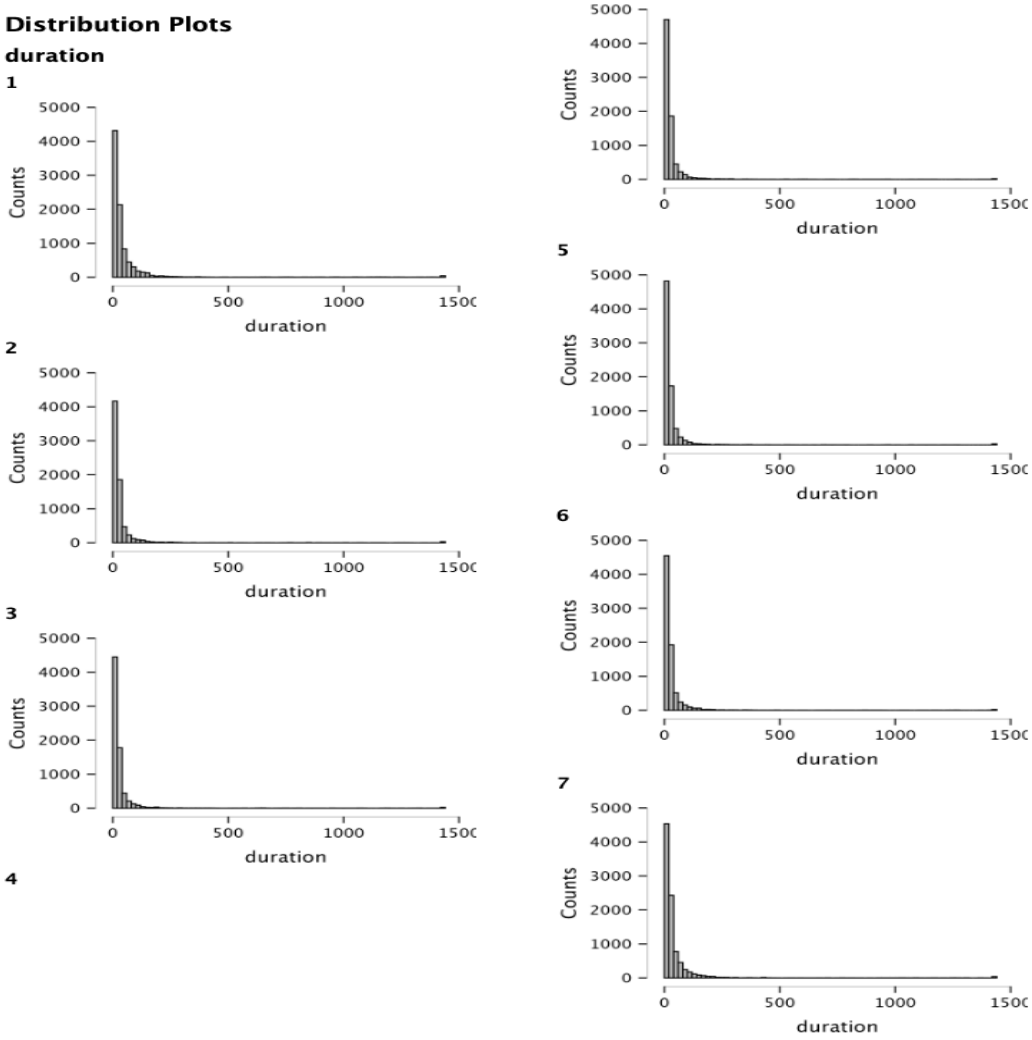
Note. Trip durations are heavily right-skewed, with the highest concentration occurring between 5 and 15 minutes. Frequency drops rapidly after 30 minutes, and a long tail extends to the maximum duration of 1,440 minutes. Outlier rides over 221 minutes significantly inflate the average.

Ride duration follows a strongly right-skewed distribution, as shown in Figure 2, with most trips concentrated between 5 and 15 minutes. This may indicate practical commutes, such as a trip to the store, work, or errand, rather than a trip for leisure. The frequency of trips drops steeply after that point, and a long tail of increasingly rare, high-duration rides stretches toward the extreme upper limit of 1,440 minutes. Although the mean duration is 42.81 minutes, this

average is heavily inflated by a small number of exceptionally long trips. The histogram in Figure 2 shows a steep early decline and a near-flat distribution beyond 60 minutes which indicates that most users complete relatively short trips. The last bin captures hundreds of outlier rides lasting over 221 minutes which further distorts measures of central tendency. These extreme values disproportionately affect both the mean and standard deviation which make them poor reflections of typical rider behavior.

Figure 3

Distribution of Trip Duration by Day of Week



Note. Each panel displays a right-skewed distribution of trip durations. Saturday and Sunday show broader tails, suggesting more frequent long-duration leisure trips. Weekday distributions cluster more tightly near the lower duration range which reflect shorter, utilitarian use.

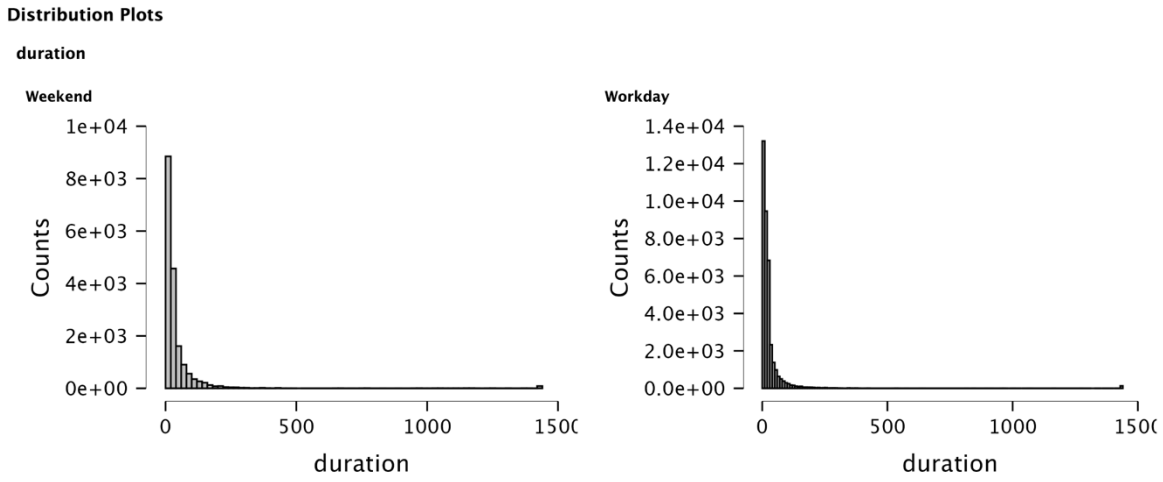
Disaggregating ride durations by day of the week shows a consistent distributional structure across all seven days. Each shows a strong right skew, with most rides lasting fewer than 30 minutes and a steep decline in frequency as duration increases. However, Figure 3 shows subtle but meaningful variation in the tail density and distribution spread that suggests behavioral shifts tied to day-of-week context.

Saturday (Day 1) and Sunday (Day 7) exhibit the heaviest tails. This suggests that longer rides are more common during weekends. These extended trips stretch past the 500-minute mark and contribute to a higher degree of variance. This behavior aligns with flexible, leisure-oriented usage on non-working days. Monday through Friday (Days 6 to 2), however, show sharper drop-offs and tighter clustering near the lower end of the distribution. These weekday distributions indicate a stronger focus on short, practical trips which are more consistent with commuting or task-based travel.

Although the mean duration is 42.81 minutes, daily visualizations show that most rides occur well below that point, and that the presence and frequency of long-duration outliers vary significantly by day. The observed distributions are non-normal across all categories and do not align with any theoretical bell-shaped pattern.

Figure 4

Distribution of Ride Duration by Day Type (Weekend vs. Workday)



Note. Both distributions are heavily right-skewed. Workday trips cluster more tightly under 30 minutes, while weekend rides display a longer right tail with more frequent long-duration trips, reflecting leisure-based use.

Figure 4 compares ride duration distributions between weekends and workdays. Both histograms display heavy right skew, with short trips dominating across all days. However, the weekend distribution exhibits a heavier tail which shows that longer rides occur more frequently during non-workdays. The counts of rides lasting more than 60 minutes increase on weekends, pushing the tail further toward the dataset's maximum duration of 1,440 minutes.

The workday distribution shows tighter behavioral consistency. Most trips cluster under 30 minutes, and the frequency of rides tapers off more quickly. This pattern suggests that weekday usage prioritizes short, task-based travel. The weekend tail likely reflects flexible, recreational use where riders spend more time on the bike without time-bound obligations.

This segmentation confirms that averages do not adequately represent rider behavior. Although the dataset’s mean duration is 42.81 minutes, most weekday rides fall well below that figure. Weekend outliers raise the average and increase the variance. Neither distribution fits a normal curve: both are skewed, asymmetric, and dominated by short trips and infrequent

extremes. Distributional visualizations, not means, offer the clearest view of how trip patterns differ between weekdays and weekends.

The figures show that while the average duration and start time provide a numerical benchmark, they obscure the actual structure of rider behavior. Each figure confirms that the distributions are heavily skewed, with most rides occurring within short, concentrated windows; either temporally in the afternoon or behaviorally under 30 minutes. Weekday rides tend to follow utilitarian patterns, while weekends introduce more flexibility and longer durations, which can be seen in heavier tails. These differences show that rider behavior is context dependent.

References

JASP Team. (2024). *JASP (Version 0.19.3) [Computer software]*. https://jasp-stats.org/