

Opportunities in Short Term Bicycle Rental in London

Anuj Suhag, 17th Nov 2023

Data Exploration Report

Introduction to data:

Usage data from 30 Dec '20 to 18 June '23 curated by TfL;
cleaned and merged to have a uniform schema that contains :

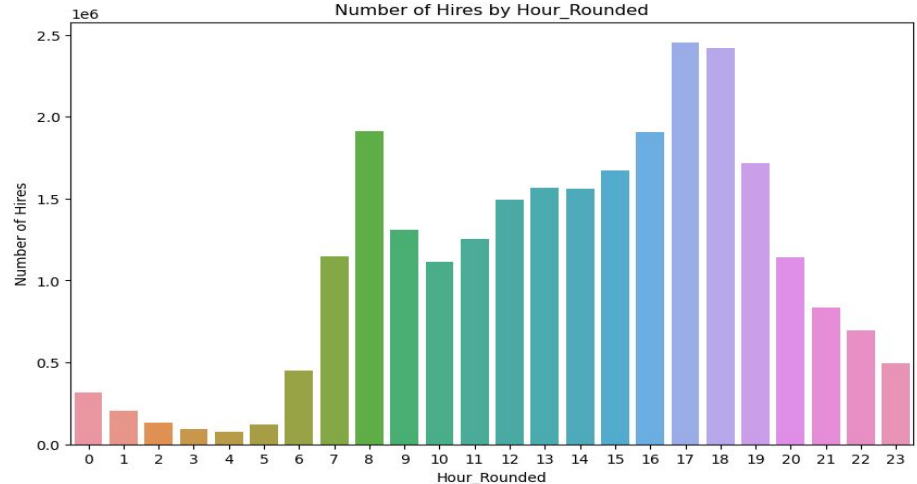
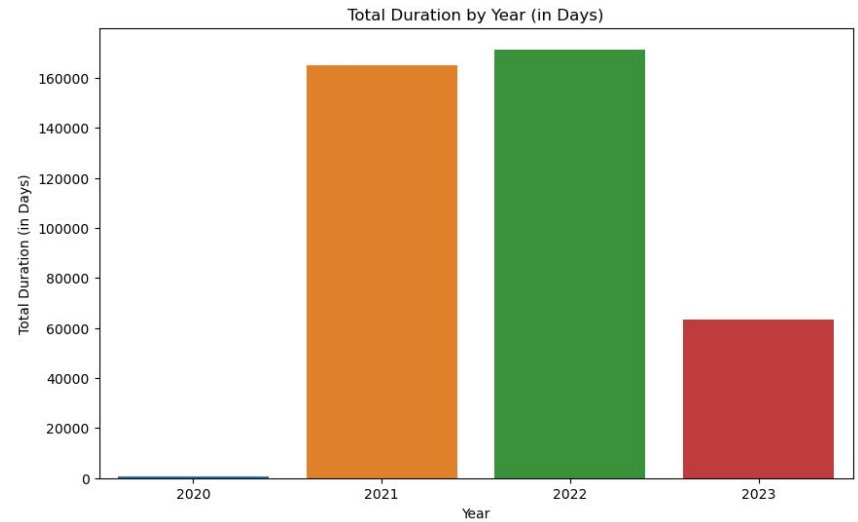
- Start & End - time and station,
- Duration - in sec
- Seasons - engineered
- Day type - engineered
- Time of day categories - engineered

Inference from data:

Rental duration summary statistics:

- Mean duration = 22 min
- Median = 12 min
- Right skew in data
- Mean duration increasing annually

Peak rental during morning and event rush hours



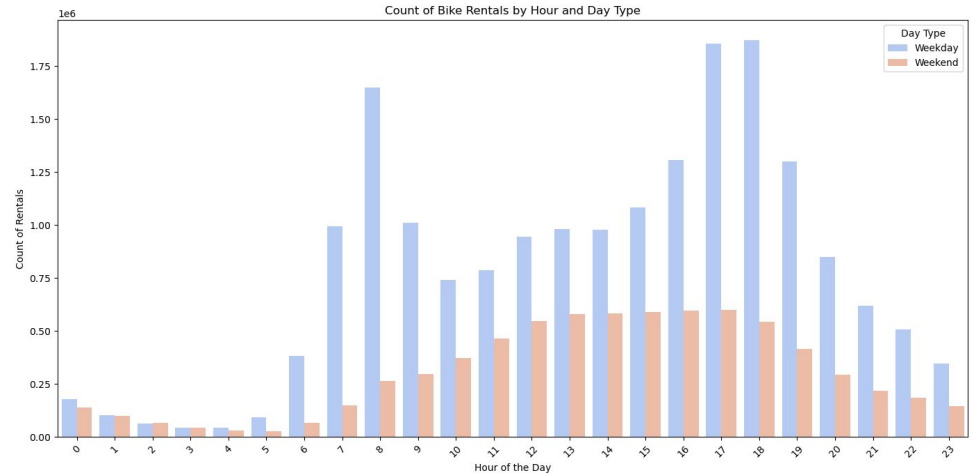
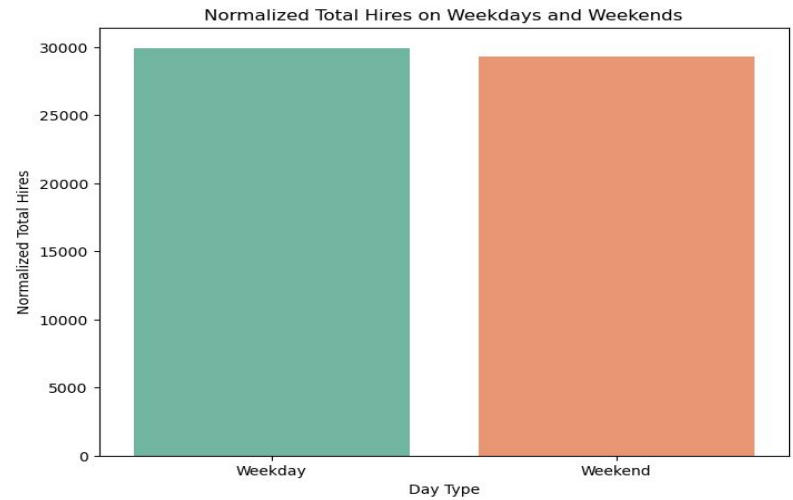
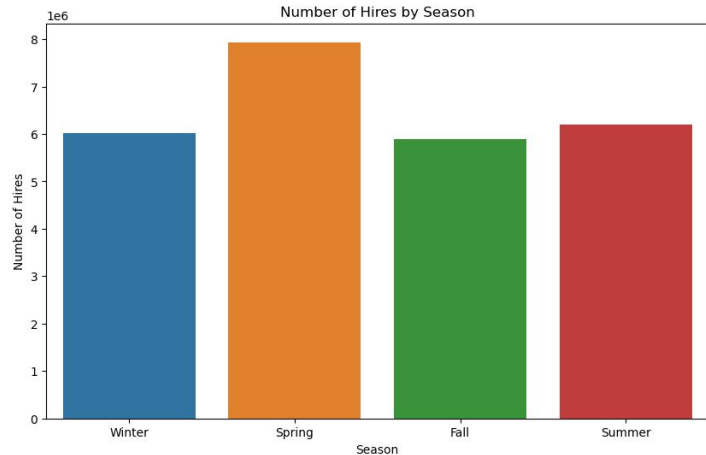
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There are 1.3x more rentals on the weekdays than weekends but when normalised they are roughly the same

The peak uses on weekdays and weekends are at different times.

- Weekdays show a clear bimodality in the morning and evening rush hours.
- Weekends show a Gaussian like (but skewed) distribution. Indicating high usage in leisurely hours.

The usage behavior is also a function of the weather



Possible Data Science Use-Cases

1. Regression -

- a. Predict next years usage for n best performers
- b. Predict next years usage hotspots (the rising stars)
- c. Predict the bike availability *

2. Pricing -

- a. Identify patterns that can be used to encourage ridership via dynamic pricing \$.

3. Causal analysis -

- a. Justify the ridership volumes.
- b. Develop an understanding of users #

- integration with places API

\$ - integration with weather services API not part of this study

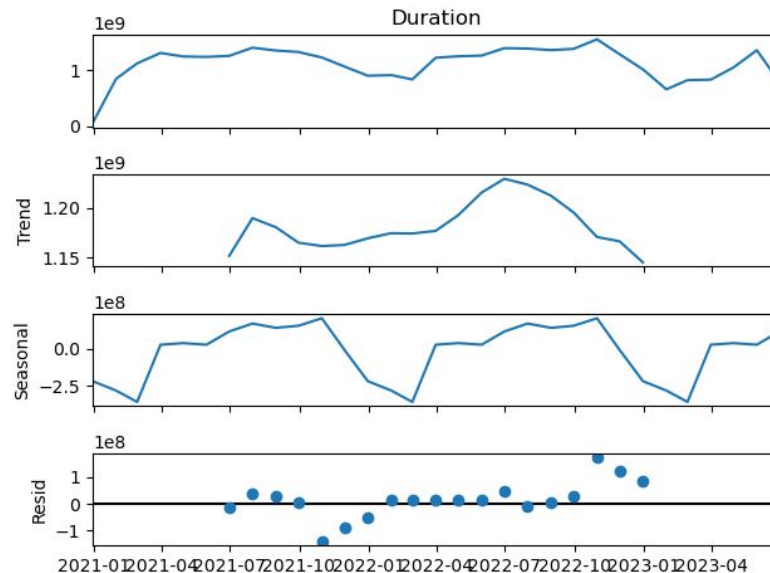
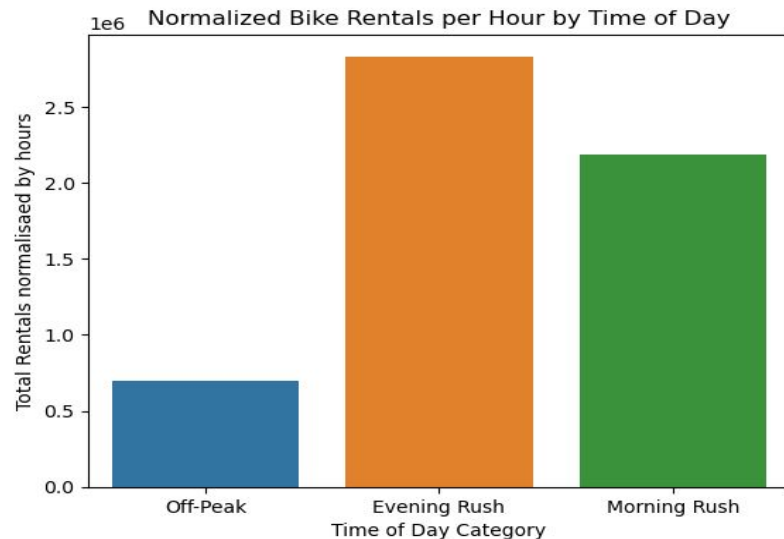
* - if the number of bike docks is known

A Tale of Two Patterns

Pattern 1: Seasonal pattern

With multi year data available, patterns can be visualised and analysed. Conducting a seasonal decomposition analysis on monthly cumulative rental duration.

- Residual is random with no discernible pattern.
- Yearly pattern/seasonality is observed from April to Oct, as seen in the decomposition plots.



Pattern 2: Daily pattern

Observed the highest demand in the evening rush hours on weekdays and weekends.

Conclusions & Recommendations

A typical short term rental in the city lasts 22 minutes. The TfL's tariff model is £1.65/ 30 min. A nominal 10p tariff hike will affect most users only once in a trip.

1. Use the daily evening rush hour pattern for adopting a dynamic pricing model: An increase of 10p in the fee during evening rush hours (between 4pm and 7pm) can result in an additional revenue of **£ 20,500 monthly or £ 246,000 annually.**
2. Use the annual seasonality pattern for adopting a dynamic pricing model: An equivalent 10 p tariff hike in the summer and spring seasons can contribute additional annual revenue of **£ 35,000 monthly or £ 426,000 annually.**