
Impact of Time and Weather on Ride-Hailing Services in Boston

MIS 373: Advanced Analytics

Ethan Wong, Ryan Jacob, Jose Enrique Escobar
Licea, Makenzie Shepherd, Ashley Lee, Lisa Desai

Meet the Team



Lisa Desai



Ryan Jacob



Ashley Lee



Enrique Escobar



Makenzie Shepherd



Ethan Wong

Agenda





Uber-Lyft Dataset

- Boston, MA from Nov 2018 to December 2018
- 57 columns and 60,392 rows
- Kaggle
- Pandas, Sci-Kit Learn

Information Provided

- Time and Price of Ride
- Pickup and Destination
- Weather conditions (wind, temperature, UV index, etc.)

Data Preparation

- 0 NaN values
- Timestamps into datetime data types
- Creating an overall weather column
 - Temperatures were below 40 -> "Cold"
 - If precipitation was present -> "Rainy"
 - All else -> "Cool"
- Calculating price per mile

Why is this important?

The ride-share industry will reach \$242.73 billion by 2028.

36% of Americans own a ride-share app.

Implications for Different Groups!

Understand what influences user behavior and demand

Ride-Hailing Companies

- Pricing strategies
- Resource allocation

General Public

- Better decisions with transportation options

City Planners and Policy Makers

- More efficient transportation systems
- Improve urban mobility and quality of life

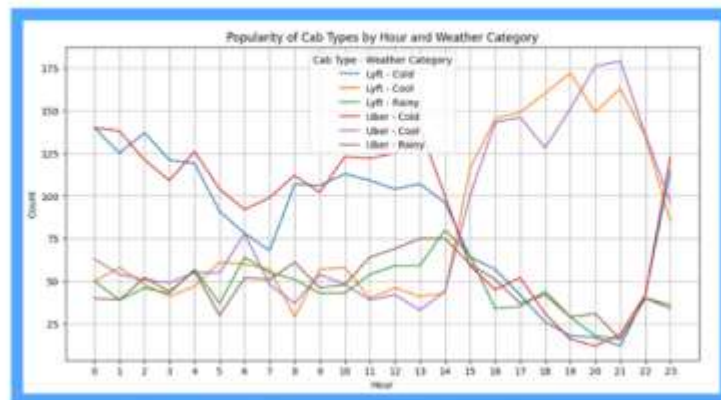
Exploratory Analysis

Weather Conditions

- Cab type minimally impacts ride frequency
- Lyft, Uber show similar patterns
- Cold weather:
 - Dips 12 AM - 7 AM
 - Levels off till 1 PM
 - Sharp decline till 9 PM
 - Spike at 11 PM
- Cool conditions:
 - Slight increase 4 AM - 6 AM
 - Drop till 8 AM
 - Steady till 4 PM
 - Sharp drop at 9 PM
- Rainy conditions:
 - Increase 10 AM - 2 PM
 - Steady decline till 9 PM
 - Small spike at 11 PM

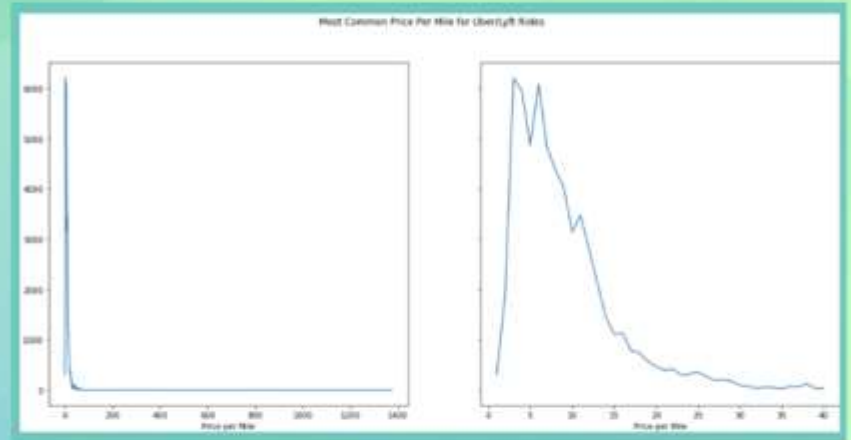
Price Difference

- Calculated price difference between Uber and Lyft
- Aggregated results hourly
- Lyft more expensive:
 - 12 AM, 2-6 AM, 1 PM, 3 PM, 7-9 PM
- Uber more expensive:
 - 1 AM, 8 AM-12 PM, 2 PM, 4-6 PM, 11 PM



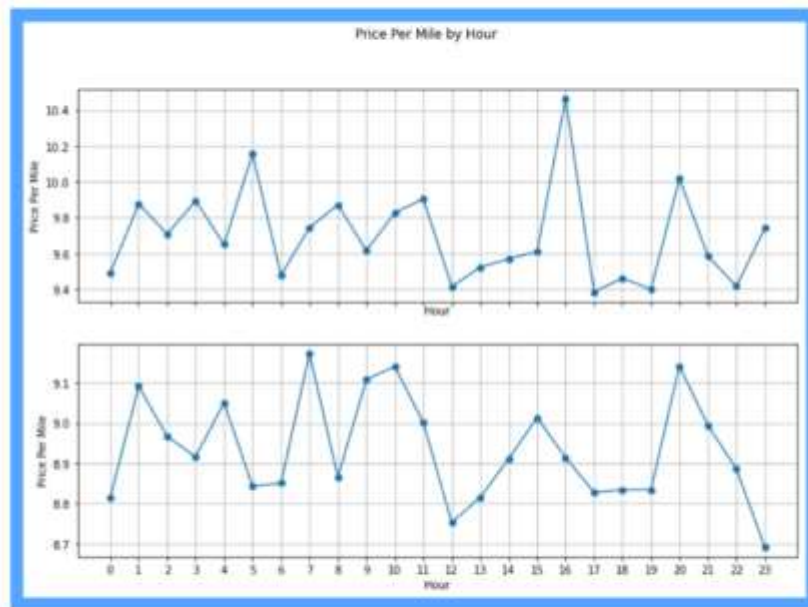
Price per Mile

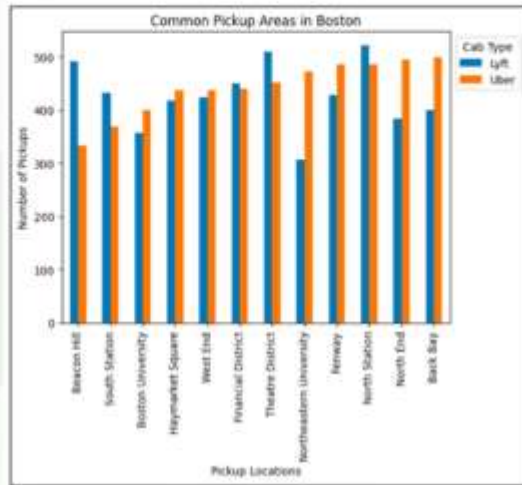
- Top 5 most common prices per mile: \$3, \$6, \$4, \$5, \$7
- Top 5 most expensive rides per mile: \$1,350, \$917, \$900, \$867, \$750



Price per Mile

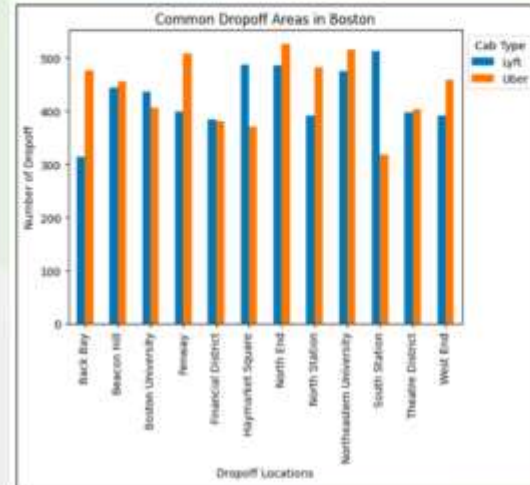
- Top graph: range a little over \$1
- Bottom graph: range about \$0.50





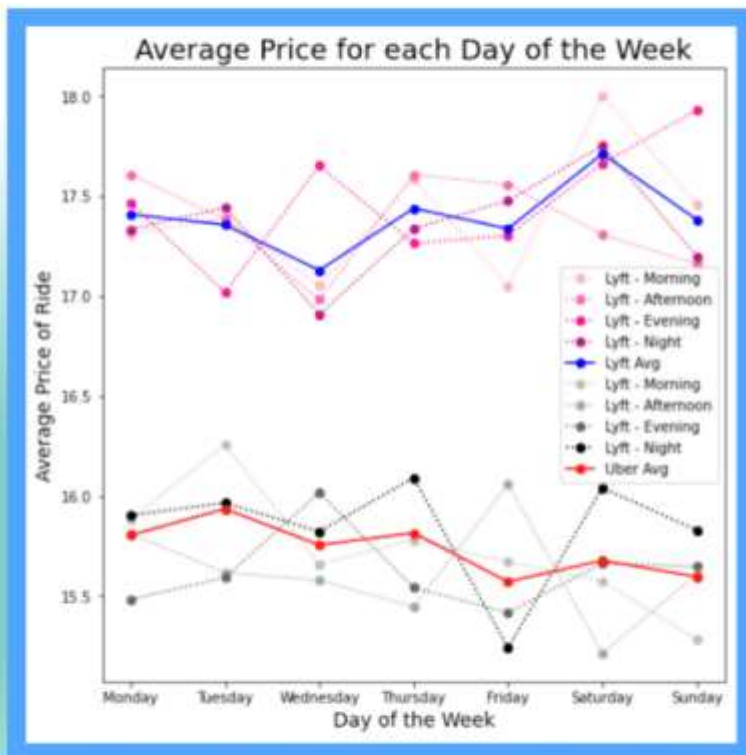
Pickups

- North Station
- Theatre District
- Fenway



Dropoffs

- North End
- Northeastern University
- Fenway

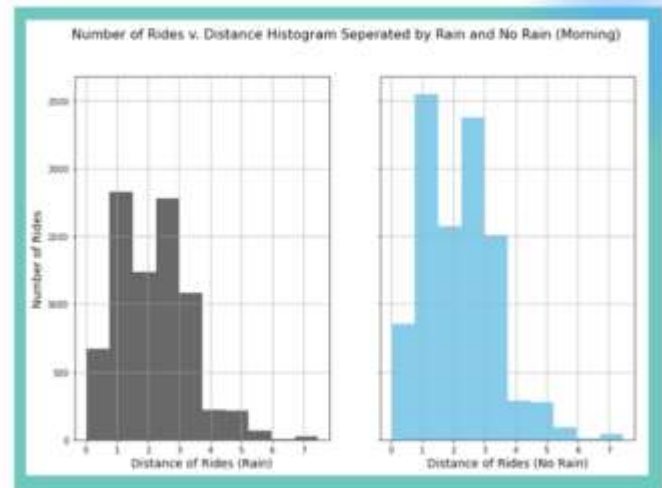
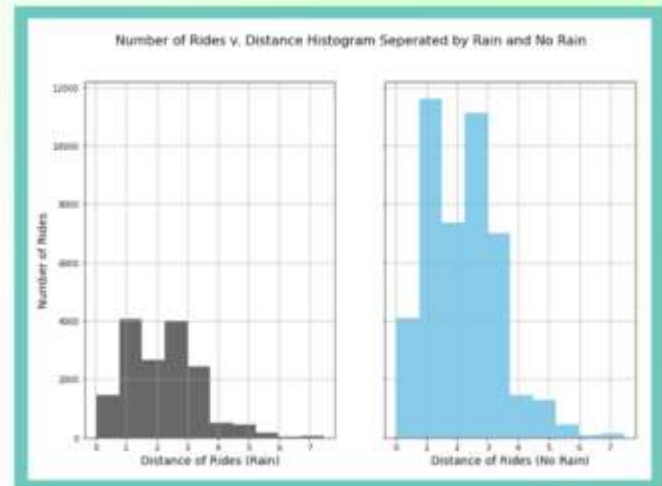


Average Prices Throughout The Week

- Lyft is more expensive
 - \$17.40 avg price for Lyft
 - \$15.74 avg price for Uber
- Prices for both ride services followed the same trend

Rain

- Rain decreases the demand for ride sharing services
- In the mornings, the impact of rain is minimal.



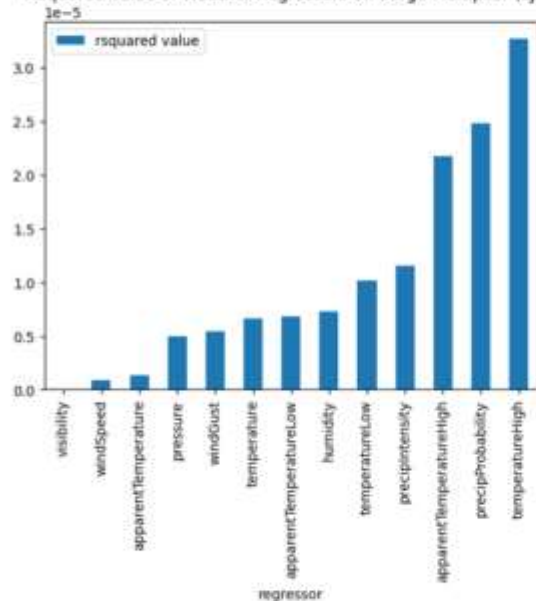
Solutions and Insights:

The impact of time and weather
conditions on ride-hailing services
in Boston

Logistic Regression

Determine a baseline for the most important weather-related regressors

RSquared Value of Weather Regressors on Surge Multiplier (Lyft)



Most Important

- temperatureHigh
- precipProbability
- apparentTemperatureHigh
- precipIntensity

Takeaway

Lyft riders face improved opportunity at prediction of surge multiplier change using changes in the temperature high and precipitation

Logistic Regression

What features determine if a ride has a surge multiplier?

Accuracies

Training: 93.22%

Testing: 93.55%

Baseline: 92.70%

Most Important

- price (8.93)
- distance (-1.93)

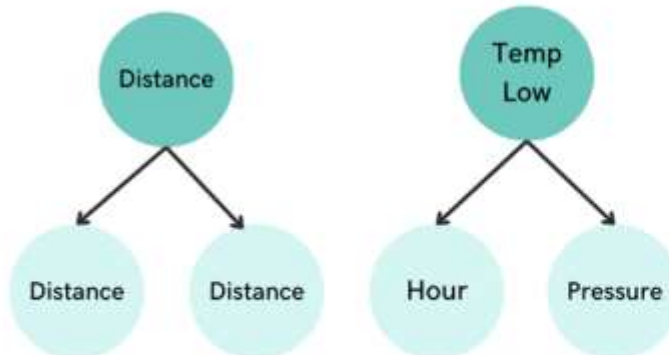
Least Important

- "Overcast" weather
- temperatureMin
- precipProbability

Decision Trees

Training: 92.6%

Testing: 92.95%



distance	-1.930536
C(ss_coded)[0.625]	-0.161935
C(ss_coded)[0.5]	-0.116957
C(ss_coded)[0.25]	-0.049061
precipIntensity	-0.047436
C(ss_coded)[1.0]	-0.045528
humidity	-0.037344
temperatureMax	-0.015647
C(ss_coded)[0.0]	0.001602
temperatureMin	0.006018
precipProbability	0.006970
C(ss_coded)[0.875]	0.007614
hour	0.021071
temperature	0.034364
temperatureLow	0.039462
longitude	0.066986
C(ss_coded)[0.125]	0.080435
C(ss_coded)[0.375]	0.117040
temperatureHigh	0.132224
pressure	0.143844
C(ss_coded)[0.75]	0.155918
windGust	0.166226
price	8.937876
dtype: float64	

Main Takeaways

Time

- Ride frequency exhibits specific patterns during different times of the day.
- Price per mile remains relatively stable throughout the day; time of day doesn't significantly impact it.
- Uber's night ride prices are consistently higher than average.

Weather

- Cab type has minimal impact on ride frequency during different weather conditions.
- Rain decreases the demand for ride-sharing services, but the distance traveled remains similar.
- Temperature high and precipitation play the largest role in explaining the variance in surge multiplier values.

Others

- Most common price per mile: \$3-\$7; long-tail effect observed.
- Different top pickup and dropoff locations for Uber and Lyft.
- Logistic regression model: price and distance are most important features; "overcast" weather, temperatureMin, and precipProbability are least important.

Thank you!

