

MBTA PARATRANSIT SERVICES: Demand + Cancellation Forecasting & Automated Address Geocoding



Project Overview

The RIDE

- MBTA's door-to-door shared ride paratransit service
- Responsible for 1.8 million trips in 2019

Predictions

- Forecast demand and cancellations for each hour of next service day
- Understand factors that drive both

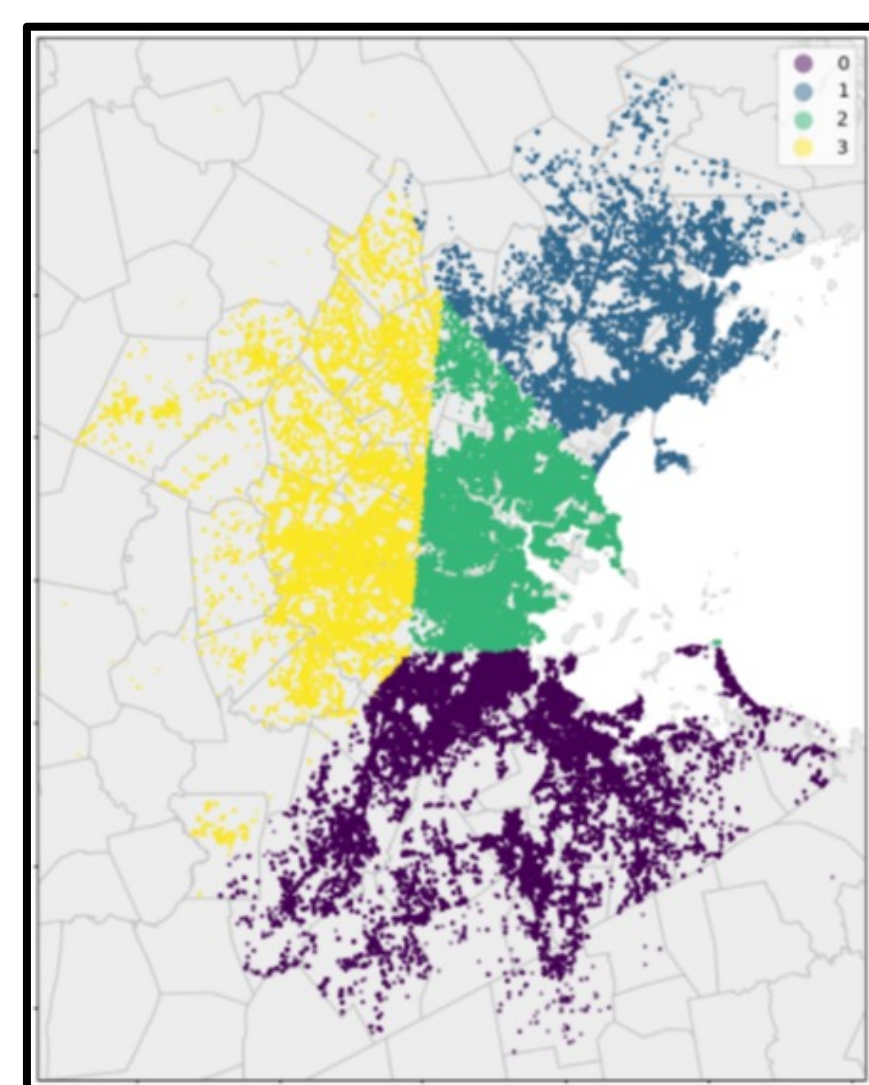
Geocoding

- Automate geocoding of requested pick-up and drop-off addresses
- Refine coordinates of most visited locations

Predictions

Clustering Analysis

- Performed k-means clustering on pick-up and drop-off positions
- Predictions to be made for each pick-up and drop-off cluster pair per hour to capture geographical patterns (16 total pairs)



Prediction Framework

Features			
Pick-up Cluster	Drop-off Cluster	Time of Day	Day of Week
Weather Factors	Holidays	Daily Lags	Hourly Lags

Target

Trips/Cancellations

Results

Time	Prediction	R ²
Pre-Covid	Demand	0.979
	Cancel	0.842
Post-Covid	Demand	0.975
	Cancel	0.854

Methodology

- Regression Trees, Random Forest, Gradient Boosting, Optimal Regression Trees, Optima Regression Trees w/ Linear Predictions & Ensemble Methods

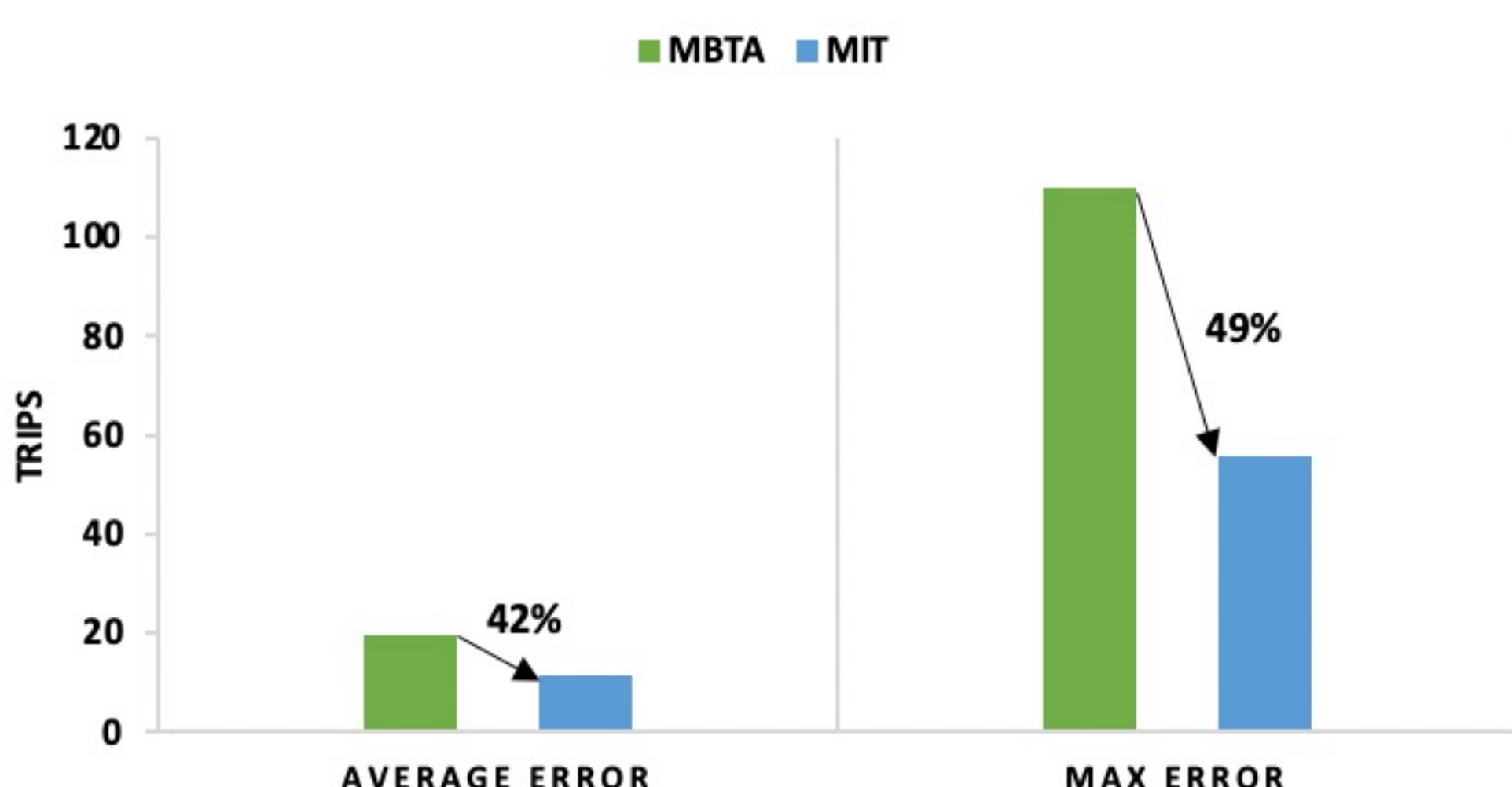
Covid Effect

Time	Train	Test
Pre-covid	2018	2019
Post-covid	Sept. 2020 - May 2021	June 2021

Takeaways

- Critical Factors: daily/hourly lags (seasonality), geography & time of day

DEMAND PREDICTION IMPROVEMENT



Automated Geocoding

Geocoder

- "Geocode address: " to trigger slackbot
- Only returns coordinates in The RIDE service area
- Tuning: obtained list of top addresses for manual recoding based on discrepancies in trip GPS data, up to discretion of booking agent

Examples

Geocode address: 100 Main St, Cambridge, MA 02142

Geocoder APP 3:08 PM
Latitude: 42.36135215 Longitude: -71.08252089725973

Address: E62 - MIT Sloan School of Management, 100, Main Street, East Cambridge, Cambridge, Middlesex County, Massachusetts, 02142, United States

Geocode address: 1623 Main St, Agawam, MA

Geocoder APP 3:08 PM
Unable to find address with first geocoder. Trying second geocoder...

Address does not appear to be in the service area. Please check that the address is valid or manually geocode this address.



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