

# **Correlative Analysis on Transportation** Ecosystems

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### Introduction

- Traffic/ridership predictive analysis offered by limited public transit visualizations
- Challenge: Some car

### Analysis Approach (cont.)

- Train an ARIMA prediction model on the trip count at user selected station and year.
- Plot, and compare

### **Experiment & Visualizations**

### CTA



### **Experiment & Visualizations** (cont.)

### **Ridership Network**



GPS systems provide trip time estimates without overall congestion/ridership prediction

- Time series visualization helps riders plan trips efficiently across days/routes
- Can be useful for transit planning agencies and academic/industrial city-planning architects

## **Analysis Approach**

actual result and predicted result

### **Transit Data**

- **BART (SF Bay):** includes specific directed trip (station to station) data for over the past decade, around 109M records combined and
  - ~1GB in raw files.
- Air Traffic: updated hourly worldwide air traffic from 2019-2020. Sourced from OpenSky, filtered dataset is ~3M records and ~270MB in

Fig. 2 Bus Route Ridership Heatmap and Prediction (Chicago)

### Transit



Fig. 3 Metro Station Ridership Heatmap and Prediction (NYC)





Fig. 6 Force-Directed Trip Throughput (2020 acc. SF Bart Metro)

### **Ridership Chord**



Fig. 7 Chorded Trip Throughput (2020 acc. SF Bart Metro)

### Impact of COVID-19 on ridership

February 01	March 01	April 01	May 01	June 01	July 01
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Fig. 1 Integrated approach to visualize and predict ridership/traffic for multiple transit systems

- Interactive Visualizations of multiple transit systems
- Integrated daily ridership prediction into visualizations to exhibit busy times

size.

- CTA (Chicago): number of daily riders for each of CTA's bus routes by route from 2001-2020, taking up 20MB of space on disk.
  - MTA (New York): subway turnstile counts data aggregated by day and station complex for years 2019-21 (~0.35M entries, 29.6MB).
  - **Bike Share (Los Angeles):** Bike share trip records and station geographical coordinates in Los Angeles for 2019 and 2020. (~80 MB)



Fig 4. Directed Flight Heatmap and Prediction (US)

Bike





Fig. 8 Daily Ridership Percentage Change (2020 Q1/2, CTA Rail)



Fig. 9: MTA Ridership Comparison (Apr. 2019 vs Apr. 2020)

### **Observations**

- Upto ~94% reduction observed in subway ridership in May 2020 vs May 2019
- Results indicate higher ridership lead to numbers (entries, exits) better prediction accuracy



#### Fig. 5 Directed Station

Throughput Arcs (LA Bike



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