



ART Signal Priority

Patrick Martin



Signal Priority

ART supposedly has “green light priority” along Central Avenue, however anyone who’s ridden the ART knows that it gets stuck at red lights often

Can we see just how often?

Other Premium Features

- Free high-speed WiFi is available on all ART buses and stations. Remember to bring headphones.
- ART has bus-only lanes in high-traffic areas to help get you to your destination more quickly.
- ART will be the most consistent way to travel along Central Avenue because of traffic signal prioritization, which gives buses green light priority.
- ART has a level boarding platform, which makes boarding time shorter.

Dataset

CABQ publishes real-time bus locations at <http://data.cabq.gov/transit/realtime/route/>

The data includes time, gps location, trip ID, speed, and other fields.

This does not have historic data, but if you write a script to download it all day...

I have a full day's worth of bus data for 14 days in September and October 2022

Cleaning the data

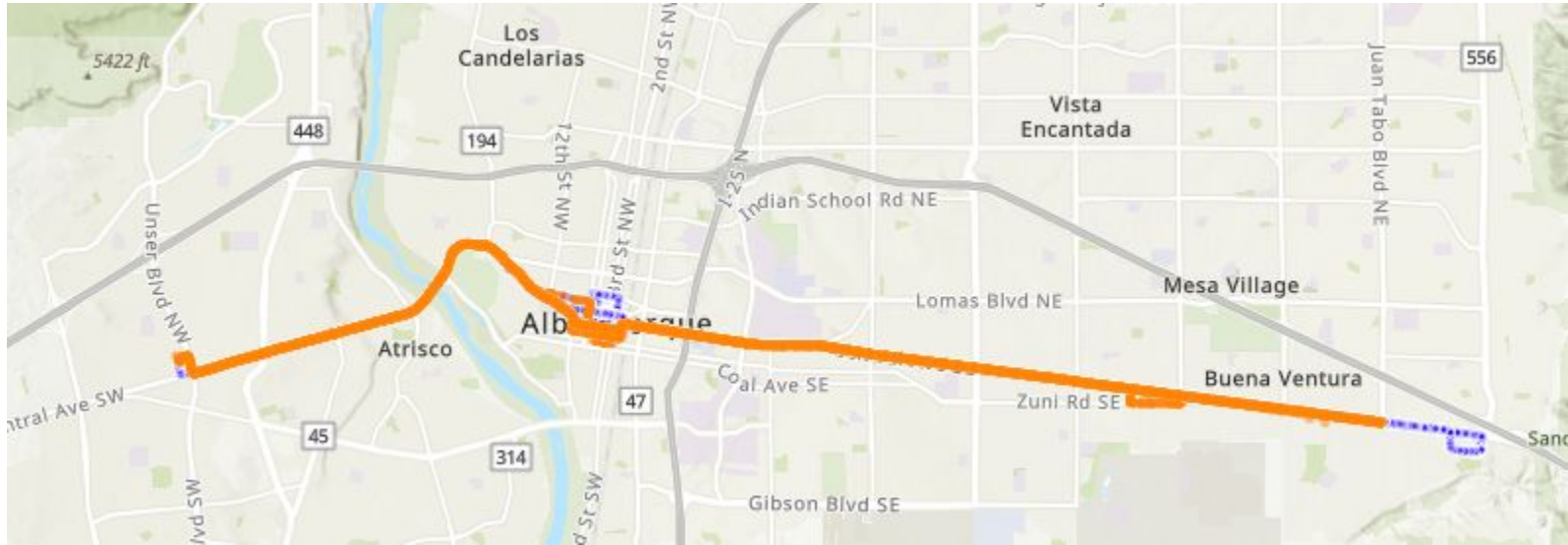
Those 14 days contain 1,450 trips labelled as being done by ART 777, which will be our focus

Various issues cause the trips to be abnormal; i.e. they run only a segment of the route, take a detour to the freeway, etc

Automatic filtering: First, the ARTs are divided based on whether they are going eastward or westward generally. Then, for both parts separately, the median first and last location are found, and all trips are truncated to fall within those two locations. Finally, any routes that don't come within 700 feet of each ART station are removed, as are any routes that are abnormally long.

This leaves 267 EB and 485 WB trips to analyze.

The cleaned data



Measuring total delay

How much time is lost overall due to traffic lights and/or excessive dwell?

Two analyses:

- For each pair of consecutive stations, examine all ARTs that stop at both, and compare segment travel time among all such ARTs to segment travel time among those ARTs that do not stop between the stations
- For each station, examine all ARTs that stop at it and compare how long the bus stays at the station to a maximum dwell allowance

Result: 10 minutes of travel time lost due to traffic lights between stations, 1 minute of travel time lost to traffic lights/dwell at stations.

Highlights: inter-station delays

The average ART 777 takes 42 minutes to travel from West Central (Coors) to Eubank, excluding station stops. Averaging nonstop segments yields a travel time of 35 minutes, or 17% time reduction.

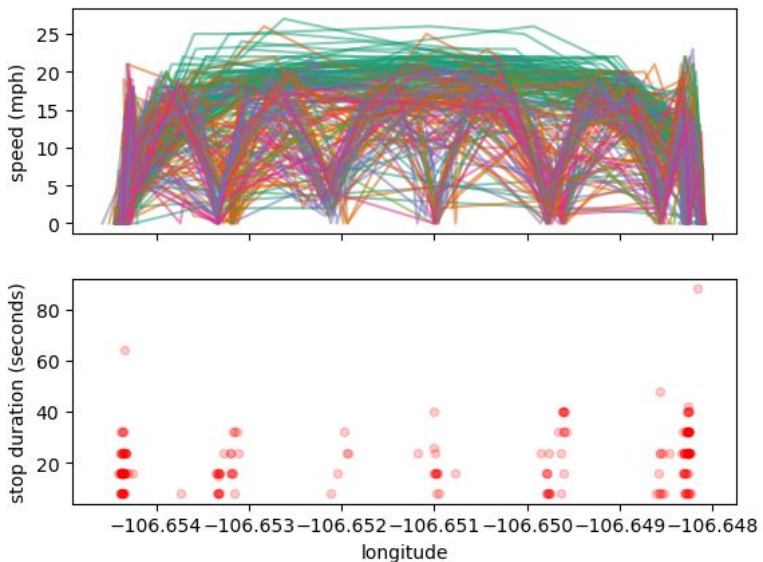
Westbound, travel from Eubank to The Bluffs (Yucca) takes 40 minutes, while nonstop it is 32 minutes, a 20% reduction.

Some segments have especially large differences. Those with a 30% time reduction or greater are:

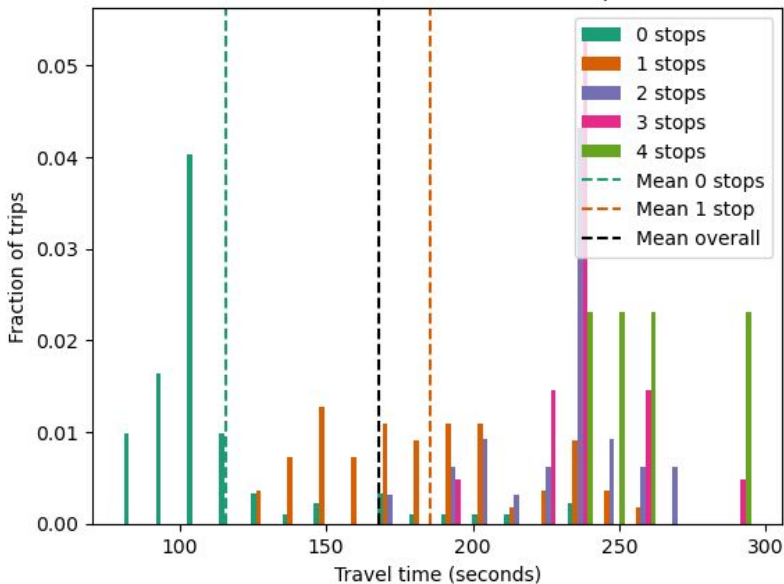
- Barelas - ATC (EB)
- UNM Popejoy - Nob Hill (WB, EB)

Barelas to ATC (EB)

ART - Barelas Station to ART - Alvarado Transportation Center

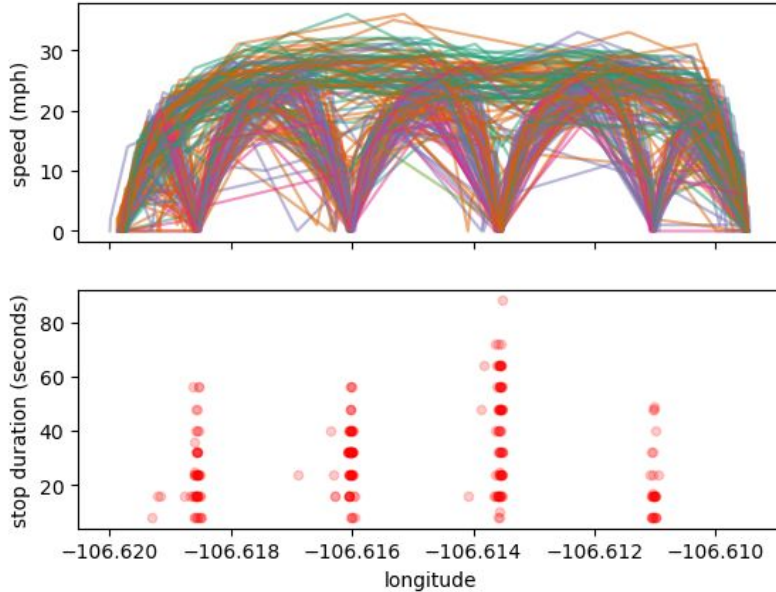


ART - Barelas Station to ART - Alvarado Transportation Center

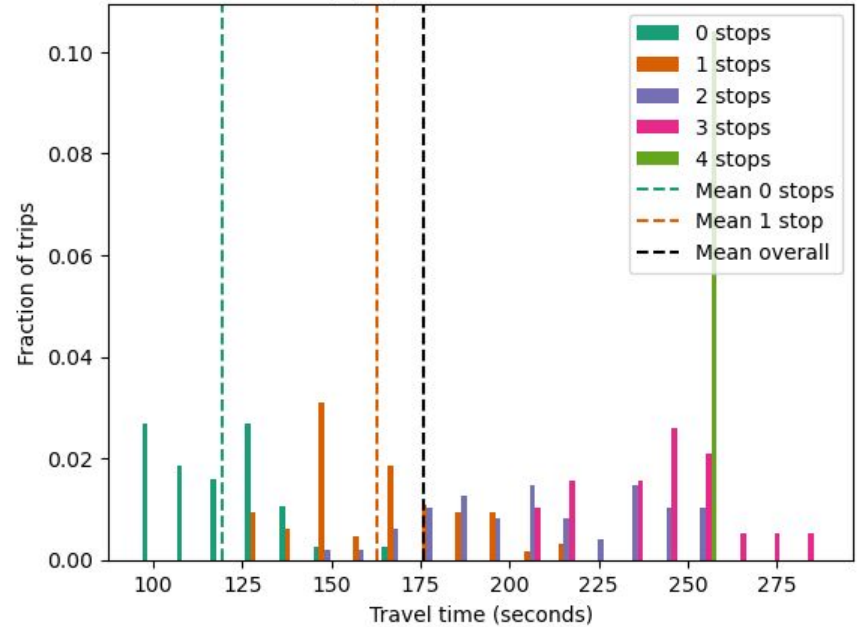


UNM Popejoy to Nob Hill (EB)

ART - UNM Popejoy Station to ART - Nob Hill Station

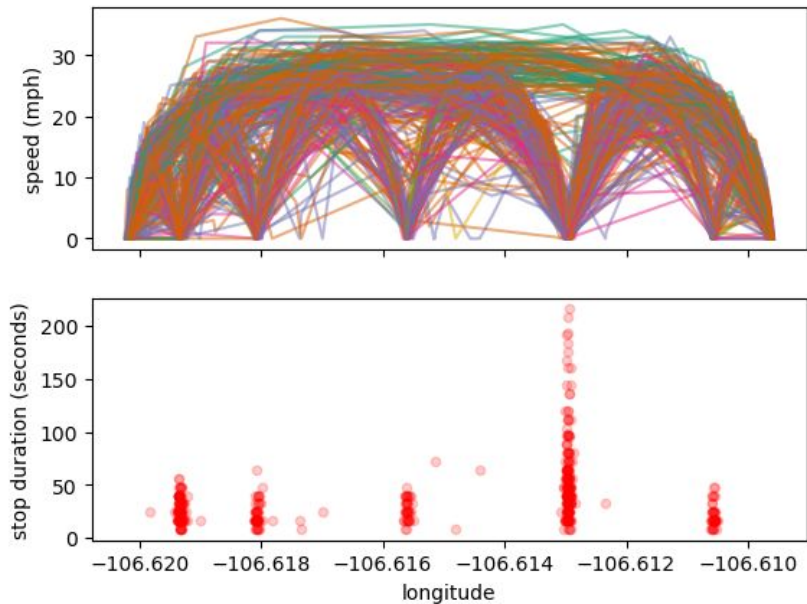


ART - UNM Popejoy Station to ART - Nob Hill Station

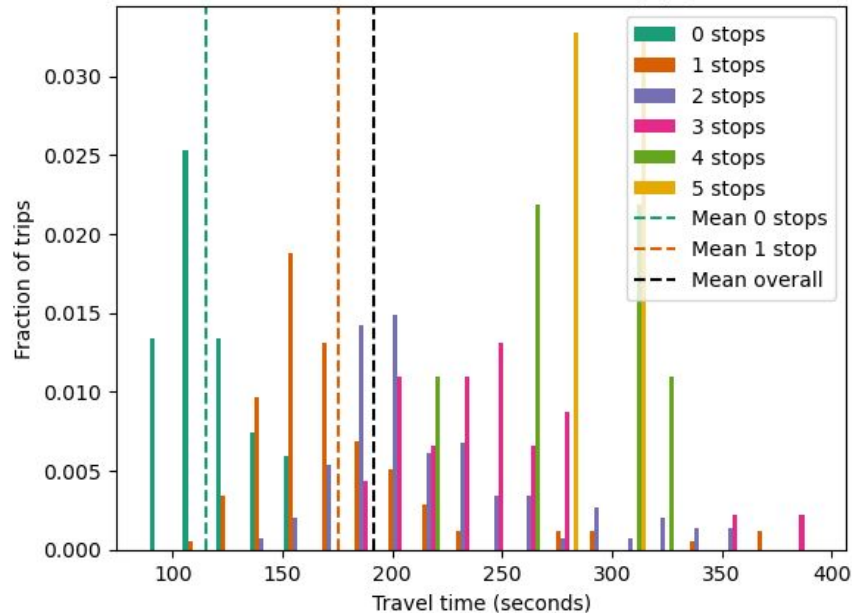


Nob Hill to UNM Popejoy (WB)

ART - Nob Hill Station to ART - UNM Popejoy Station



ART - Nob Hill Station to ART - UNM Popejoy Station



Highlights: station dwell

There are 24 stations across both directions that are not immediately before a traffic light, with an overall average station dwell of 40 seconds.

There are 10 eastbound ART stations nearside to a traffic light, with an overall average station dwell of 60 seconds, or 3 minutes of delay.

There are 5 westbound ART stations nearside to a traffic light, with an overall average station dwell of 52 seconds, or 1 minute of delay.

Stations where the ART loses at least 20 seconds to excessive dwell

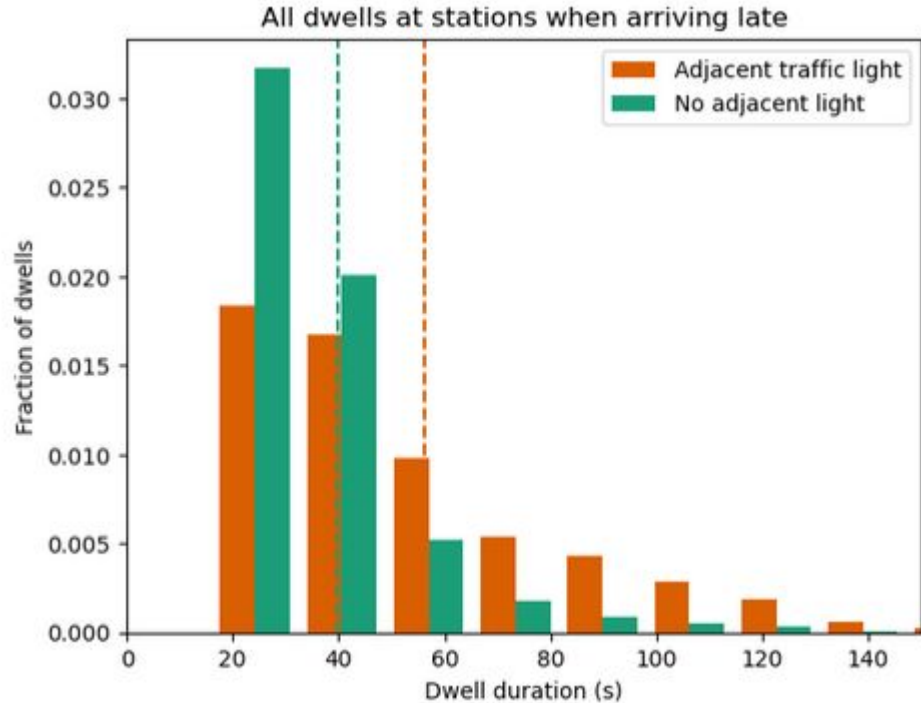
- ATC (EB) - 22s
- UNM Popejoy (EB) - 28s
- International District (EB) - 53s

Analysis considers only dwells where the ART arrives to the station late in order to avoid intentional dwells*.

Dwell time at stations

Stations without an adjacent traffic light

- The Bluffs EB
- Atrisco WB
- BioPark
- Old Town
- West Downtown
- Presbyterian WB
- UNM/CNM EB
- Popejoy WB
- Nob Hill
- Nob Hill East
- Highland WB
- San Mateo WB
- San Pedro
- International District WB
- Wyoming
- Eubank



Overview of results

An initial analysis indicates that predictive priority would save about 9-10 minutes of travel time over the analyzed section of the ART 777:

- Eastbound:
 - 7 minutes between stations + 3 minutes at stations
 - Average trip length is 51:44 → 20% time reduction
- Westbound:
 - 8 minutes between stations + 1 minute at stations
 - Average trip length 49:23 → 18% time reduction

Travel time reductions are concentrated in and between the Downtown, UNM, and International District areas, with some segments seeing 40% reductions in travel time.

Additional effects that may reduce travel times not computed:

- Removing decelerations at a light that ends up turning green
- Increased consistency improving usage of single-lane segment

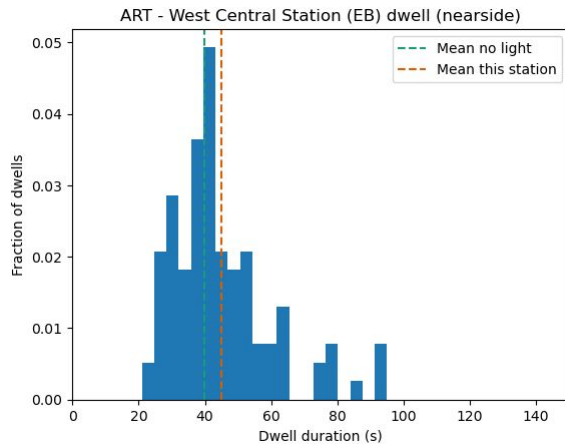


Bonus: A typical EB ART 777

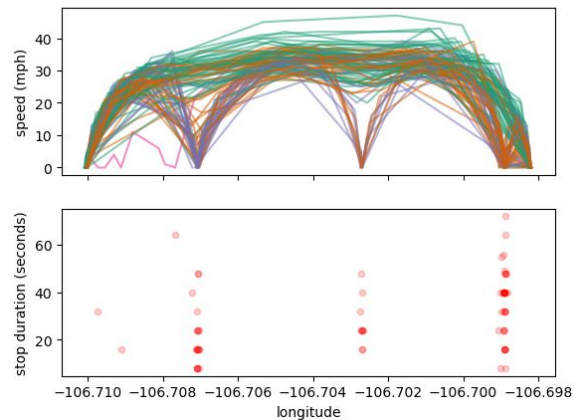
West Central Station

- 5 seconds lost waiting at West Central
- 34 seconds lost en route to The Bluffs

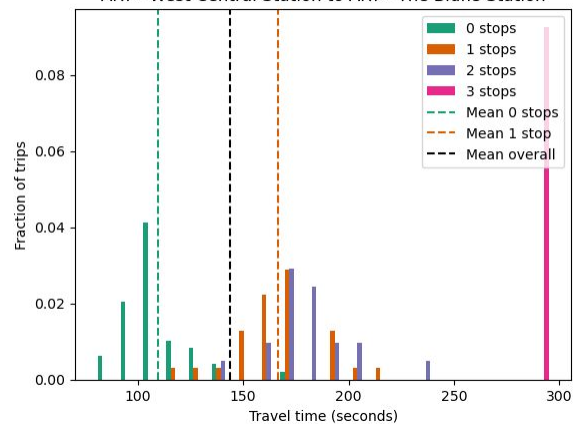
2:32 travel time; 26% lost



ART - West Central Station to ART - The Bluffs Station



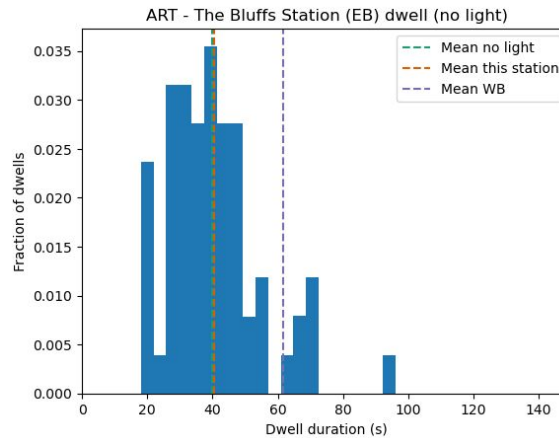
ART - West Central Station to ART - The Bluffs Station



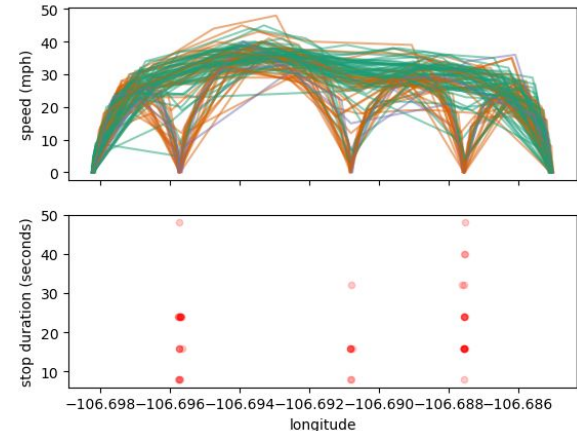
The Bluffs

- No light to delay station departure
- 15 seconds lost en route to Atrisco

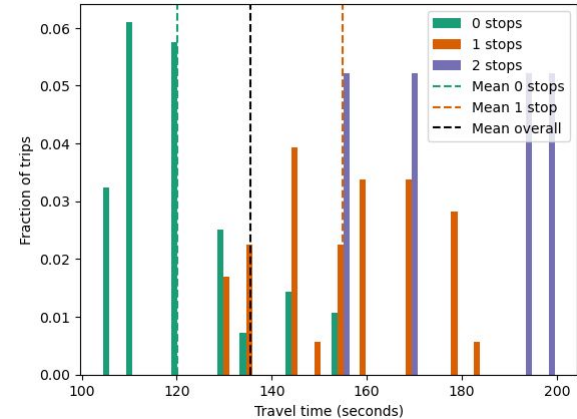
2:20 travel time; 11% lost



ART - The Bluffs Station to ART - Town of Atrisco Station



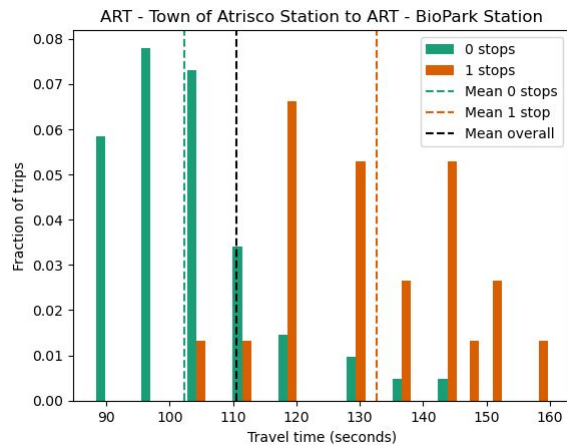
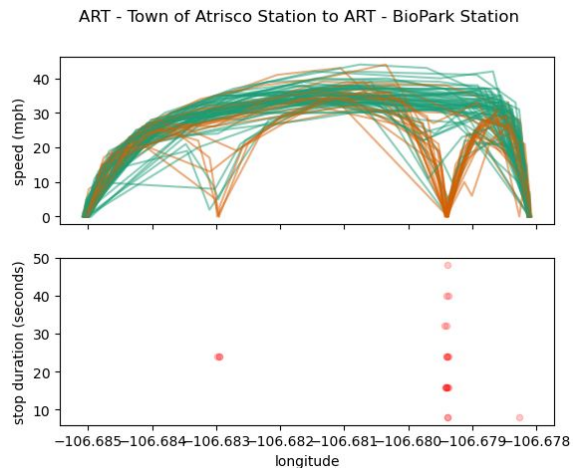
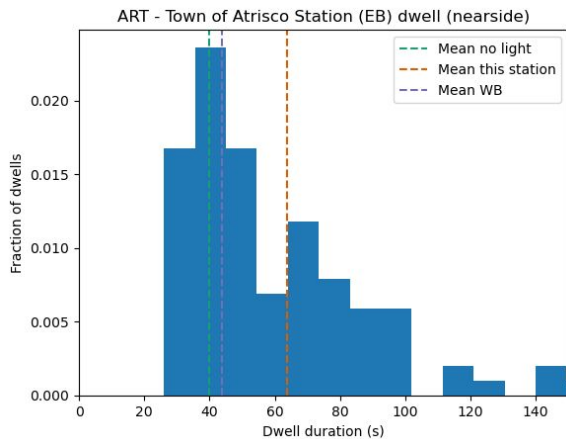
ART - The Bluffs Station to ART - Town of Atrisco Station



Town of Atrisco

- 24 seconds lost waiting at Atrisco
- 8 seconds lost en route to BioPark

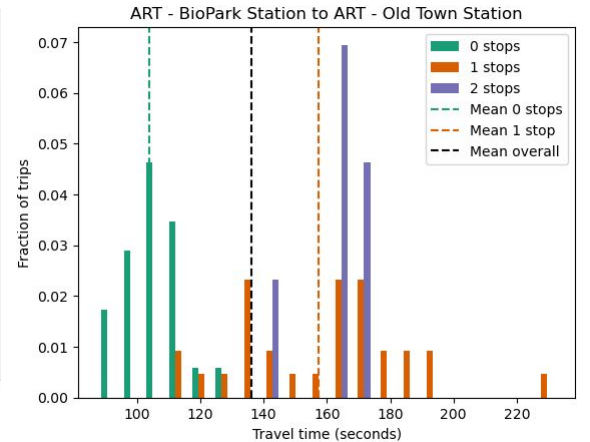
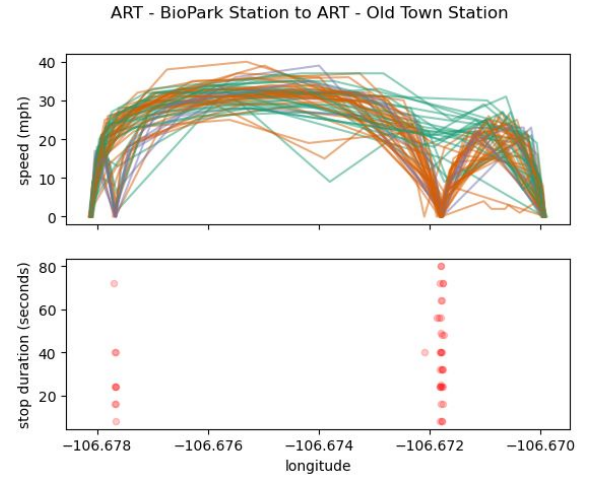
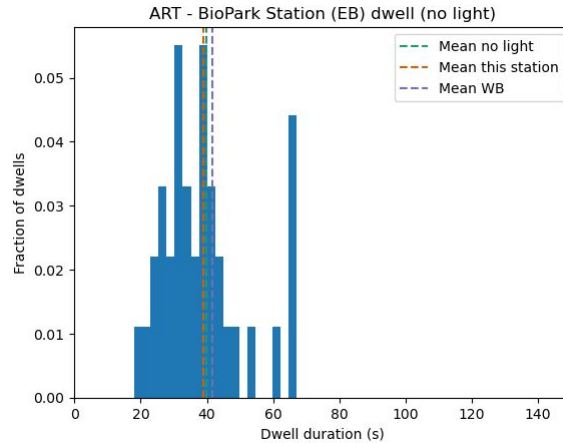
2:19 travel time; 23% lost



BioPark

- No light to delay station departure
- 32 seconds lost en route to Old Town

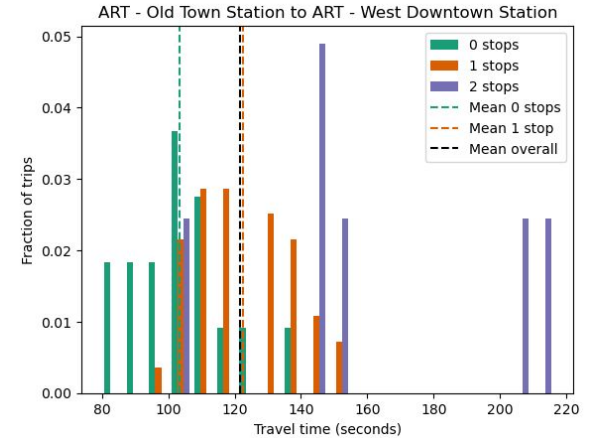
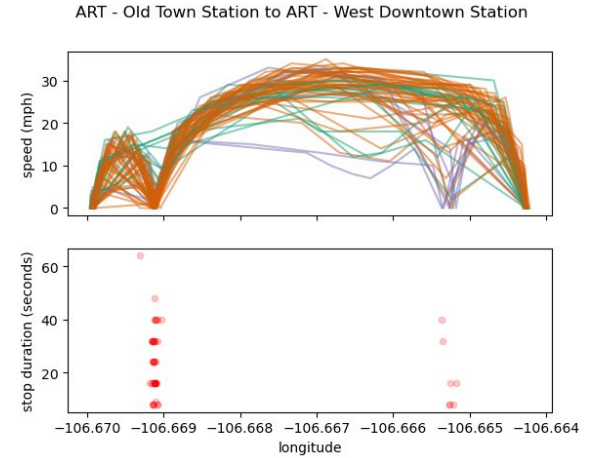
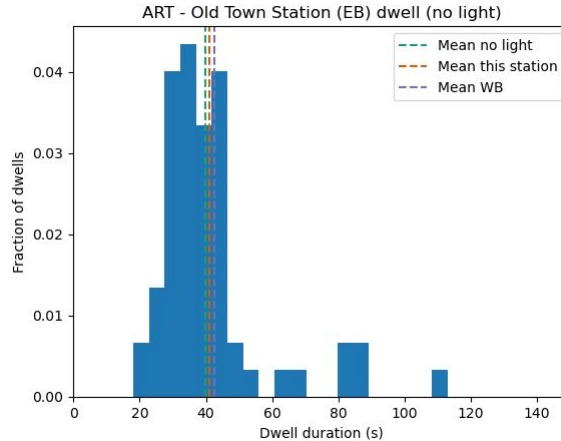
2:23 travel time; 22% lost



Old Town

- No light to delay station departure
- 18 seconds lost en route to West Downtown

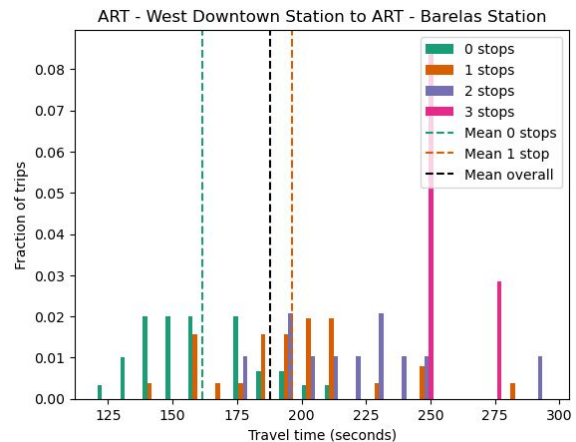
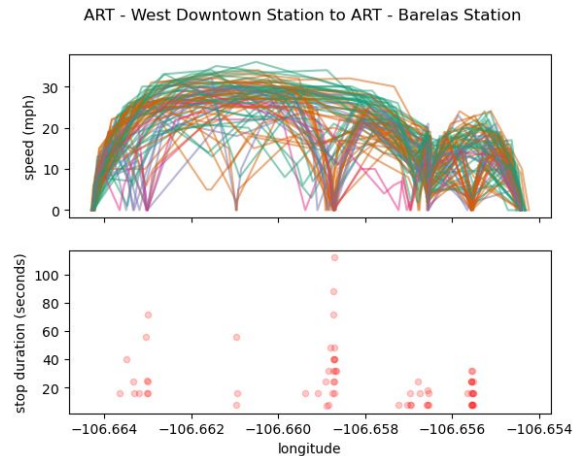
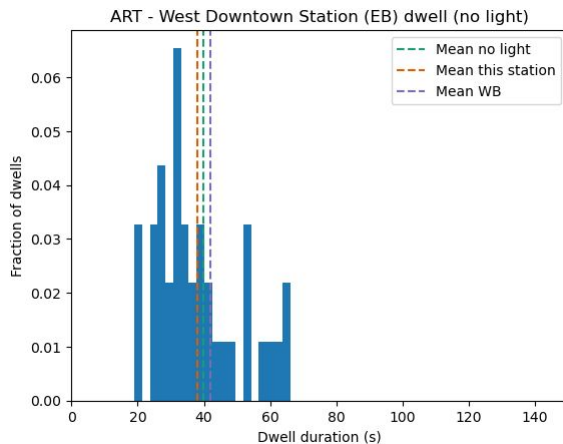
2:06 travel time; 14% lost



West Downtown

- No light to delay station departure
- 26 seconds lost en route to Barelas

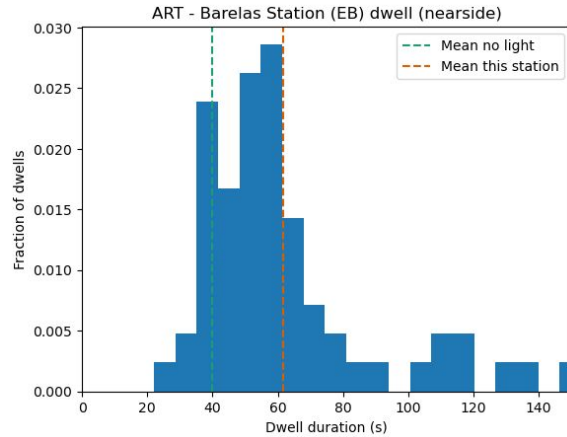
3:11 travel time; 14% lost



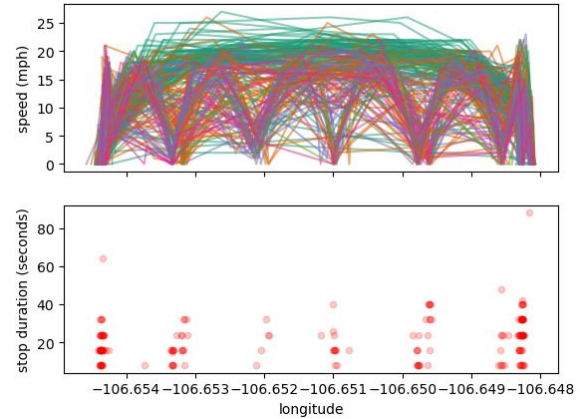
Barelas

- 22 seconds lost waiting at Barelas
- 52 seconds lost en route to ATC

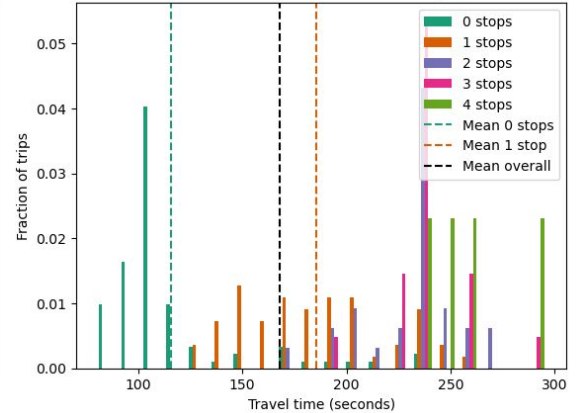
3:10 travel time; 39% lost



ART - Barelas Station to ART - Alvarado Transportation Center



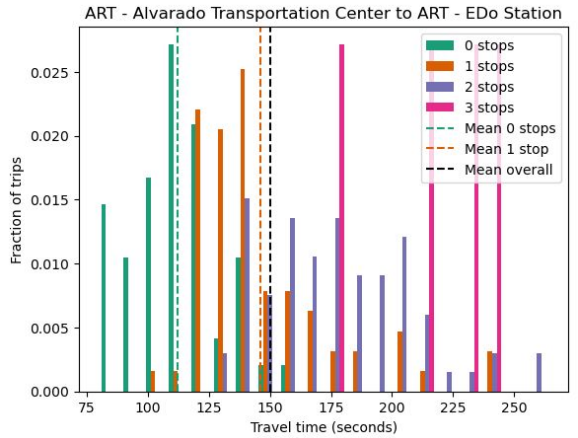
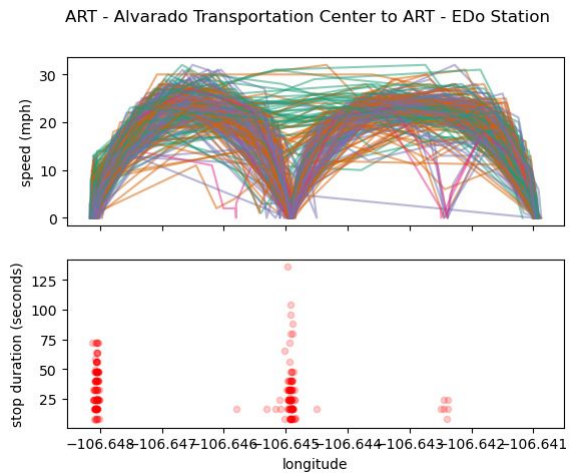
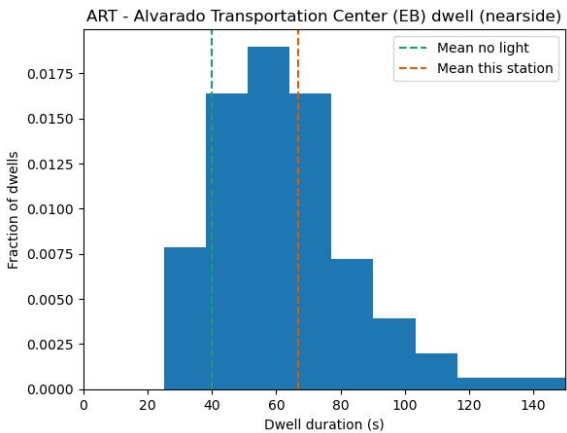
ART - Barelas Station to ART - Alvarado Transportation Center



ATC

- 27 seconds lost waiting at ATC
- 38 seconds lost en route to EDO

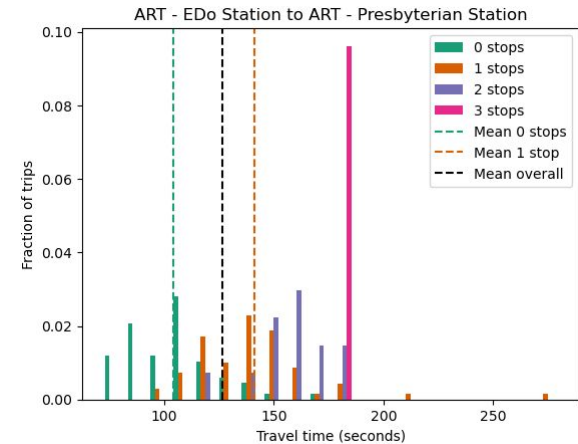
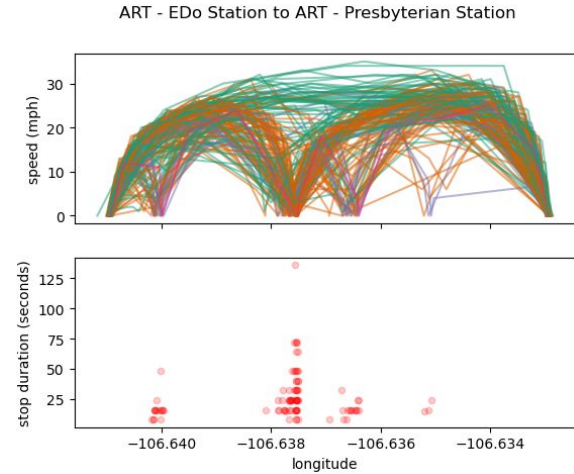
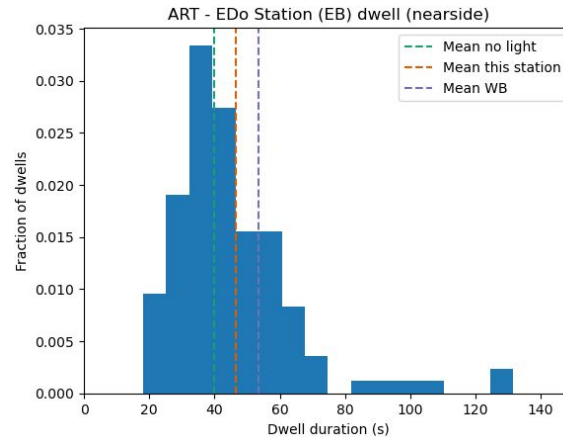
3:06 travel time; 35% lost



EDo

- 7 seconds lost waiting at EDo
- 22 seconds lost en route to Presbyterian

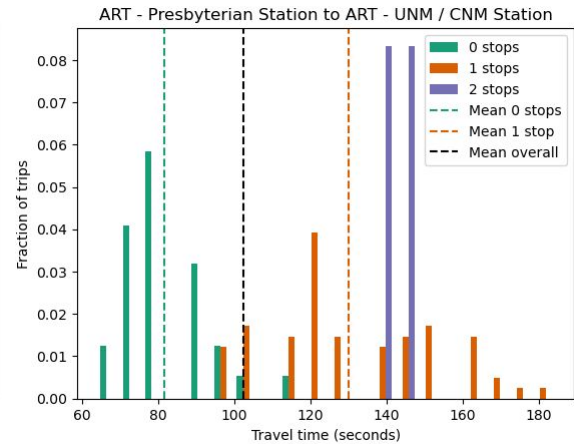
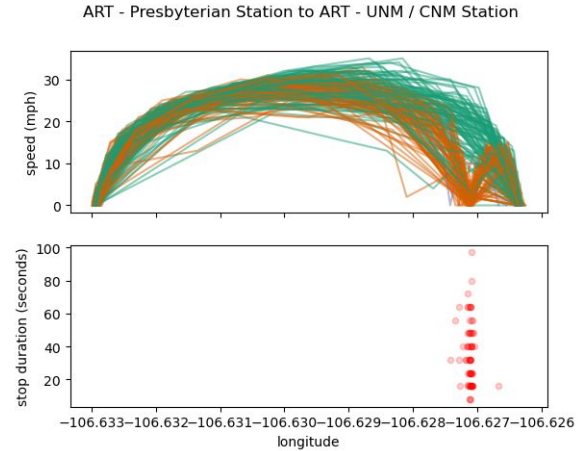
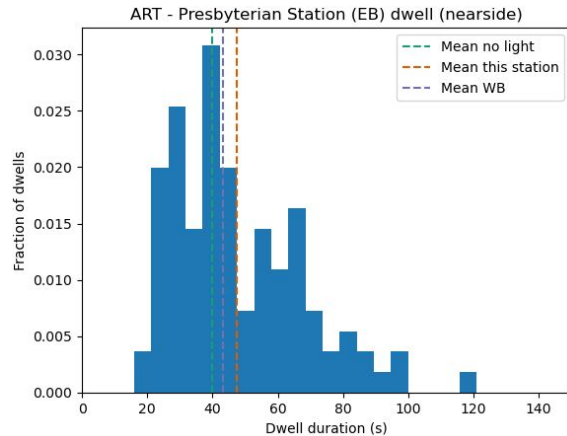
2:16 travel time; 21% lost



Presbyterian

- 8 seconds lost waiting at Presbyterian
- 21 seconds lost en route to UNM/CNM

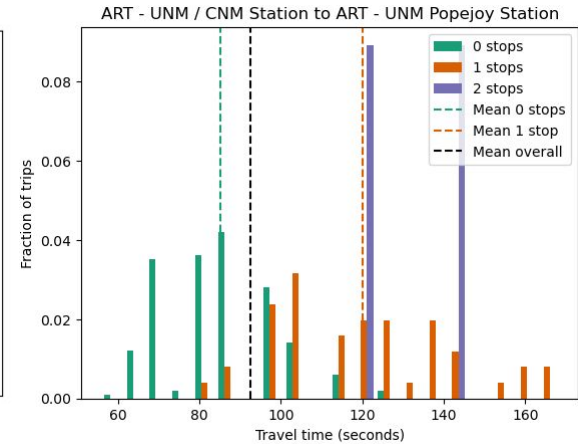
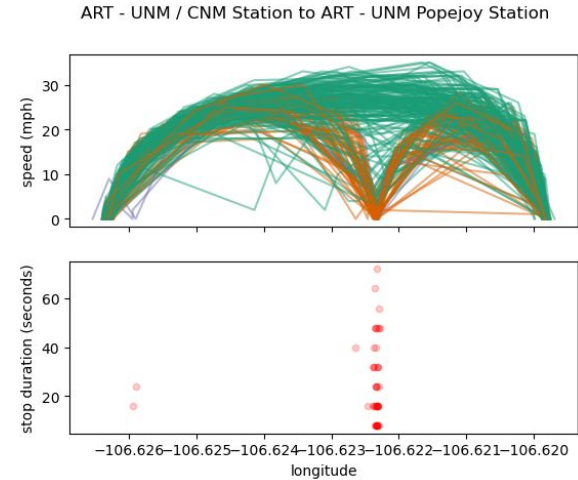
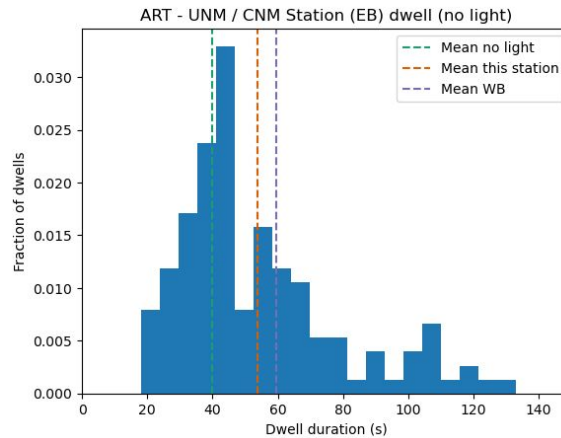
1:53 travel time; 26% lost



UNM / CNM

- No light to delay departure*
- 7 seconds lost en route to Popejoy

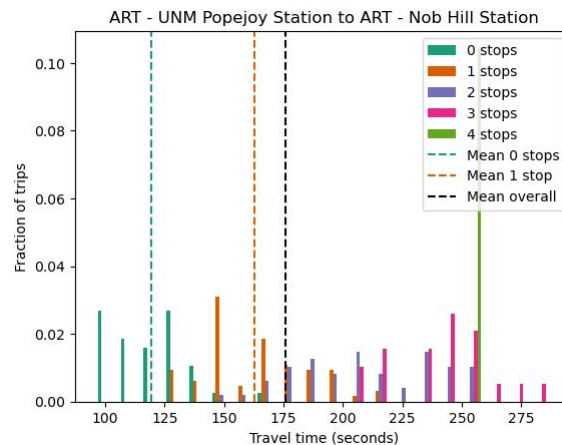
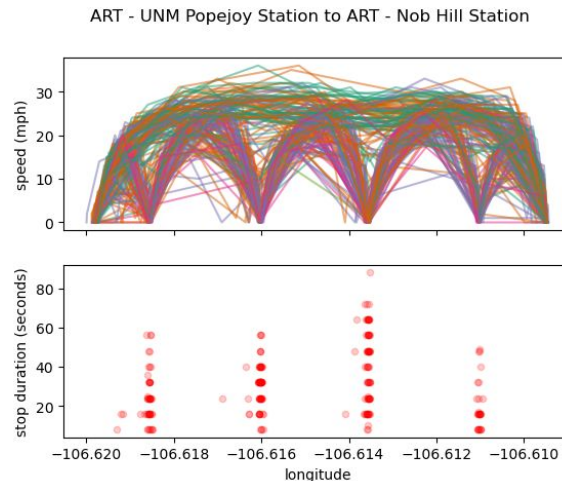
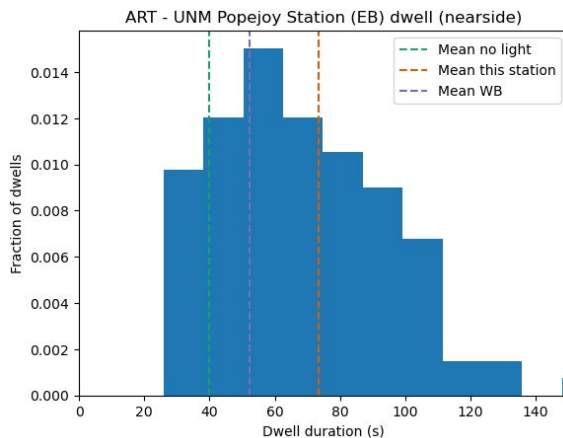
1:48 travel time; 6% loss



Popejoy

- 34 seconds lost waiting at Popejoy
- 57 seconds lost en route to Nob Hill

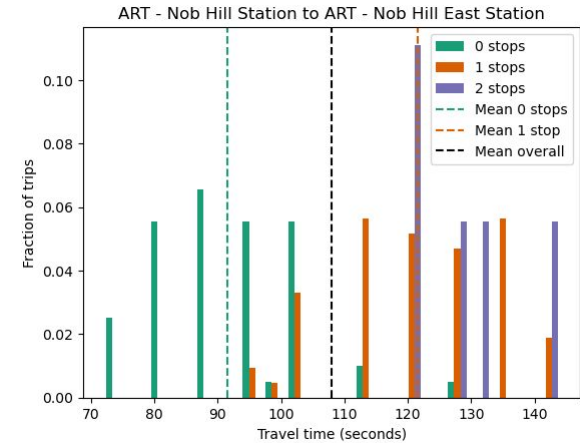
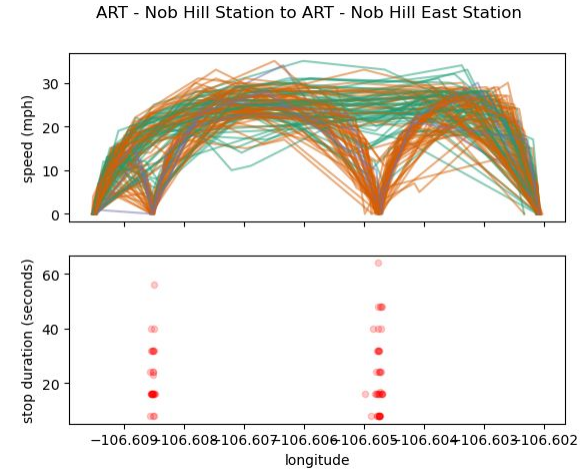
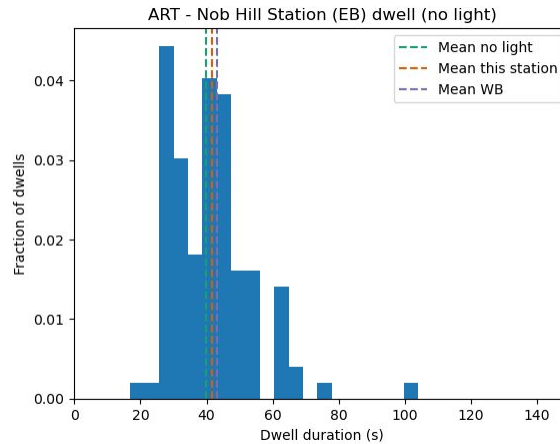
3:34 travel time; 42% loss



Nob Hill

- No light to delay departure
- 16 seconds lost en route to Nob Hill East

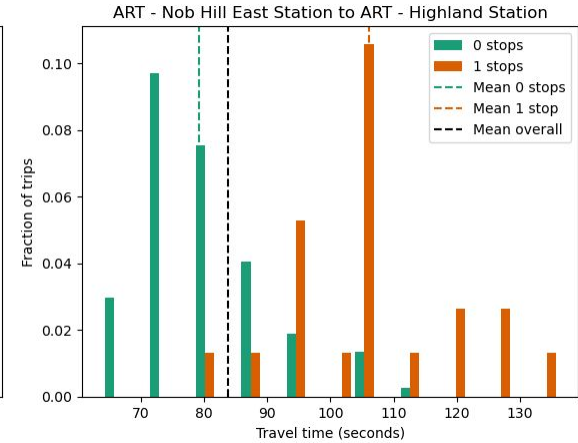
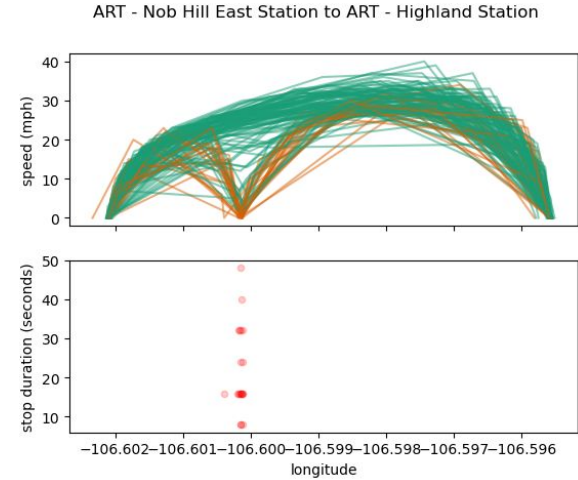
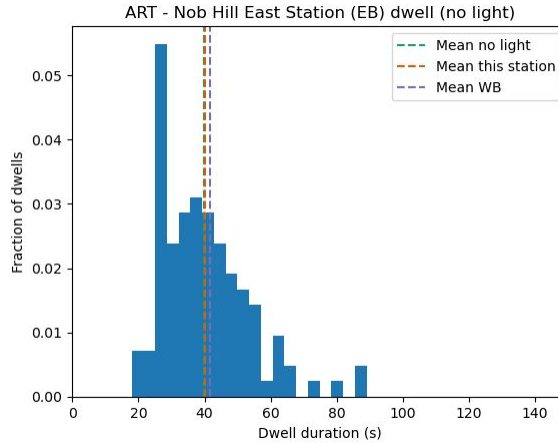
1:59 travel time; 13% loss



Nob Hill East

- No light to delay departure
- 5 seconds lost en route to Highland

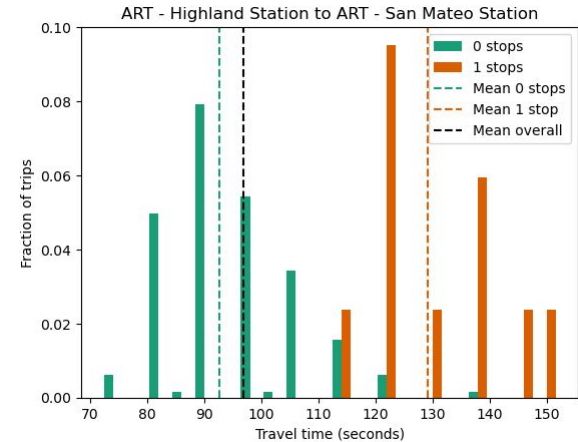
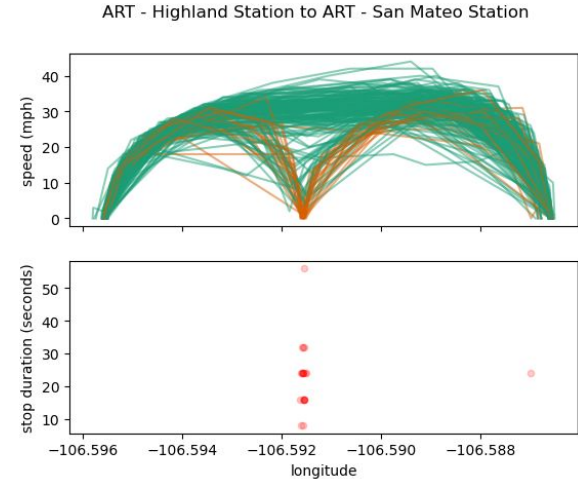
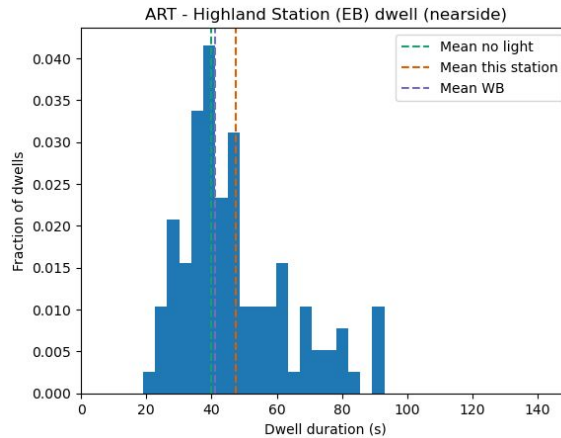
1:27 travel time; 6% loss



Highland

- 8 seconds lost waiting at Highland
- 4 seconds lost en route to San Mateo

1:47 travel time; 11% loss

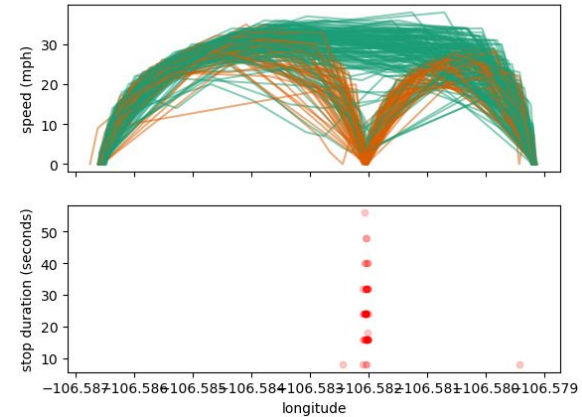


San Mateo

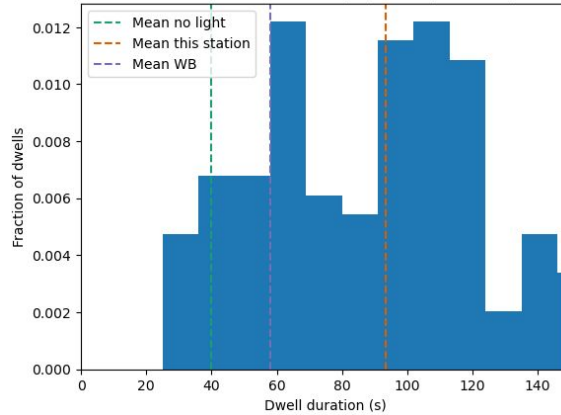
- 53 seconds lost waiting at San Mateo
- 10 seconds lost en route to San Pedro

2:30 travel time; 42% loss

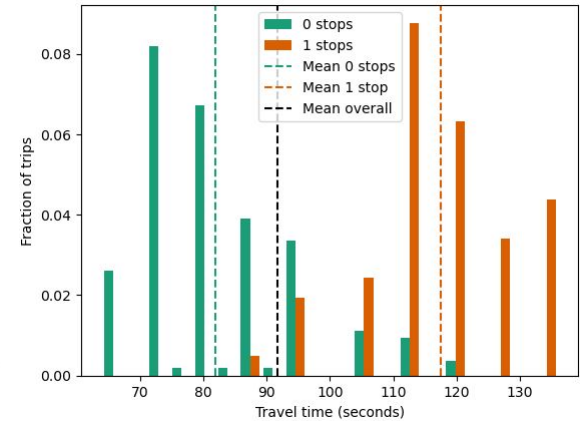
ART - San Mateo Station to ART - San Pedro Station



ART - San Mateo Station (EB) dwell (nearside)



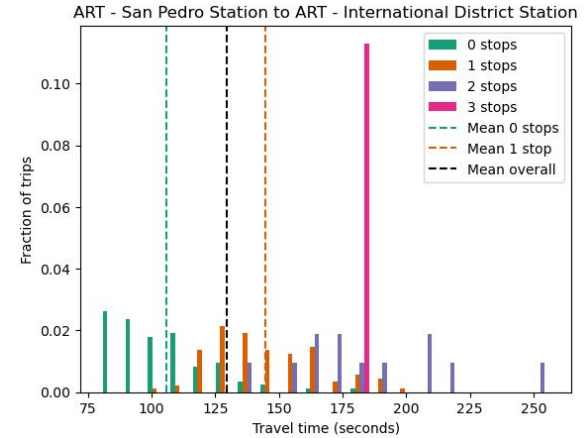
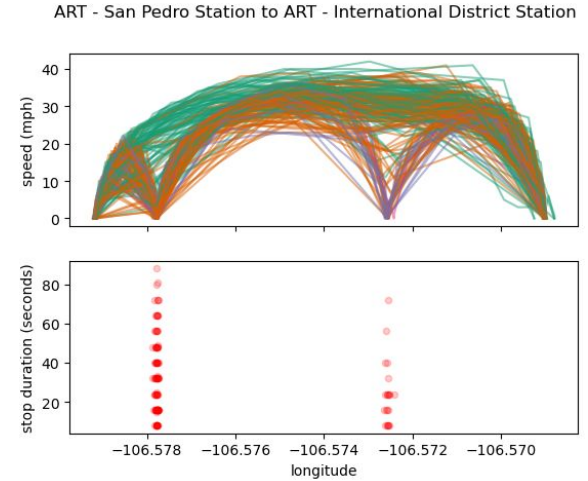
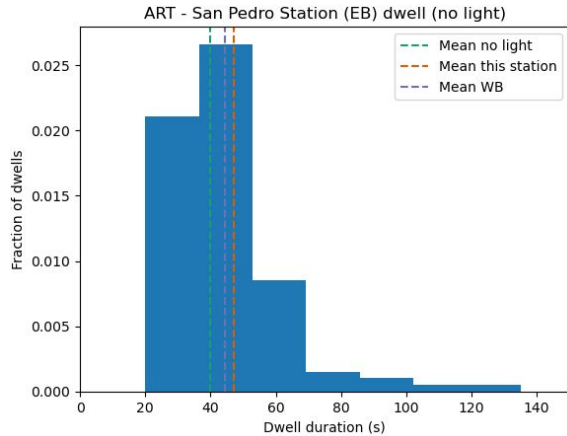
ART - San Mateo Station to ART - San Pedro Station



San Pedro

- No light to delay departure*
- 23 seconds lost en route to the International District

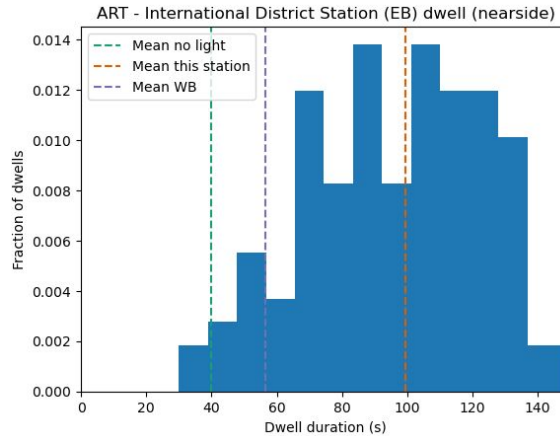
2:19 travel time; 17% loss



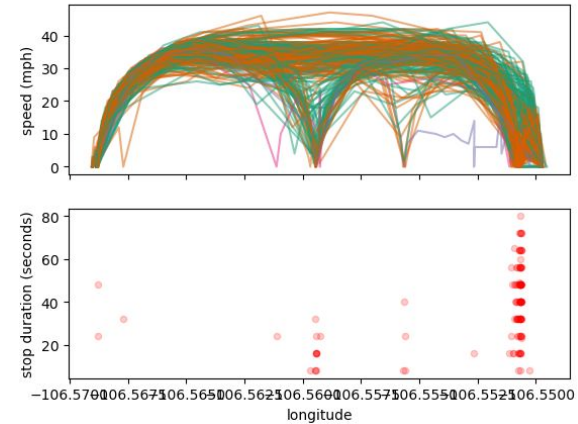
International District

- 60 seconds lost waiting at the ID
- 23 seconds lost en route to Wyoming

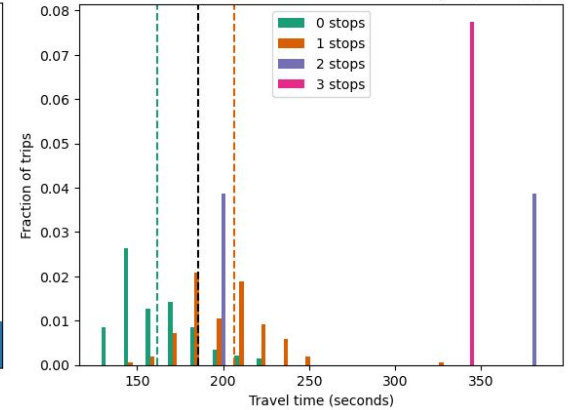
4:07 travel time; 34% loss



ART - International District Station to Central @ Wyoming (ART)



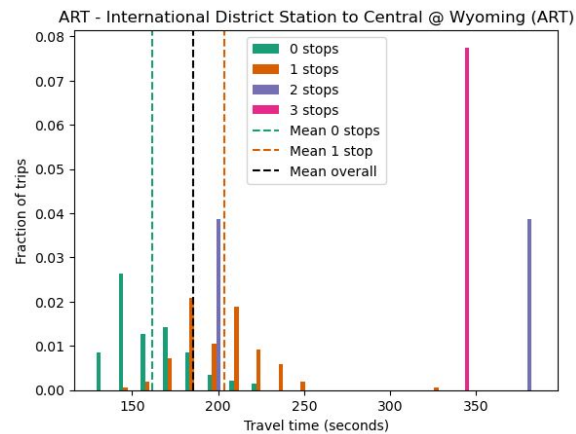
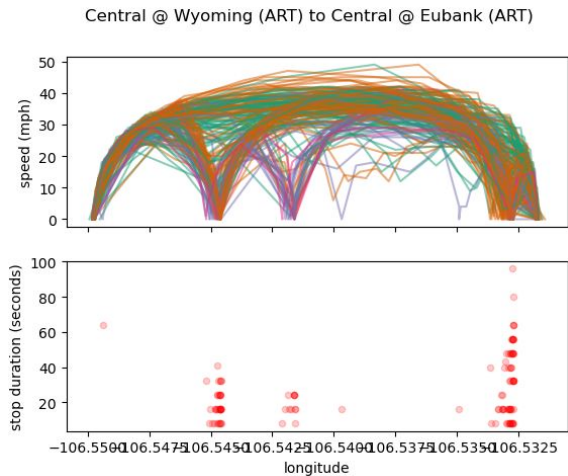
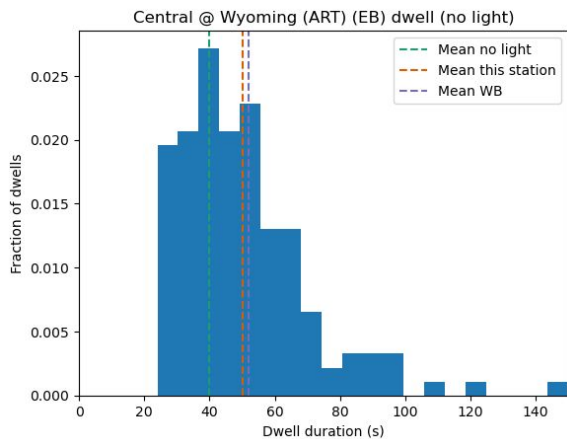
ART - International District Station to Central @ Wyoming (ART)



Wyoming

- No light to delay departure*
- 23 seconds lost en route to Eubank

3:14 travel time; 12% loss



Eubank

- No light to delay departure*

