Ease and Equity of Point of Interest Accessibility via Public Transit in the US

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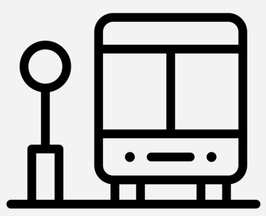
Motivation

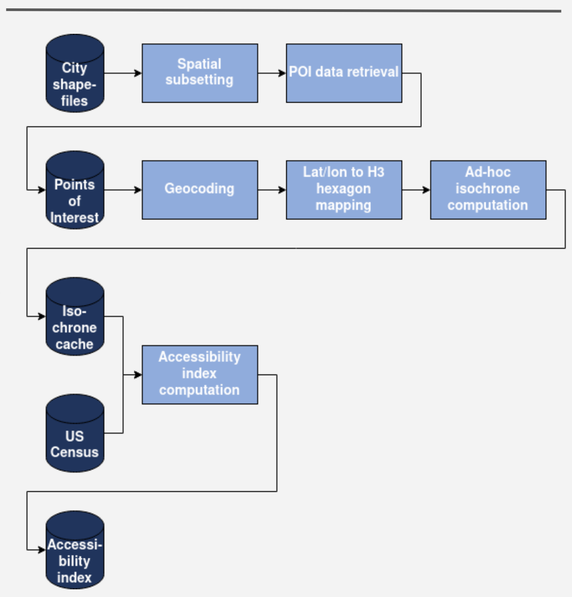


17% of Atlanta households have no access to a car, impeding access to critical facilities like hospitals and vaccination centers

Data

The tool leveraged multiple data sources including Open Street Map, the US Census, GTFS data, and CDC data

Methodology



We employed a custom, Dockerized travel time isochrone service based on OpenTripPlanner which computes accurate isochrones based on supplied GTFS and OSM data.

We also created a normalized dataset with GeoPandas and Uber's H3 hexagons being the atomic unit of location. The mapping is done by finding the hex which overlaps with a given POI. The area of each hex was set to be ~0.1 km^2.

Isochrones were combined with the Census data to compute the accessibility index (A_h) using the 2SFCA method – an interpretable gravity model:

$$R_j = \frac{|supply\ units|}{\sum_j catchment\ pop_j}$$

$$A_h = \sum_{j \in j \cap h} R_j$$

All the data was stored in a PostgreSQL database and cached using Redis for low-latency querying.

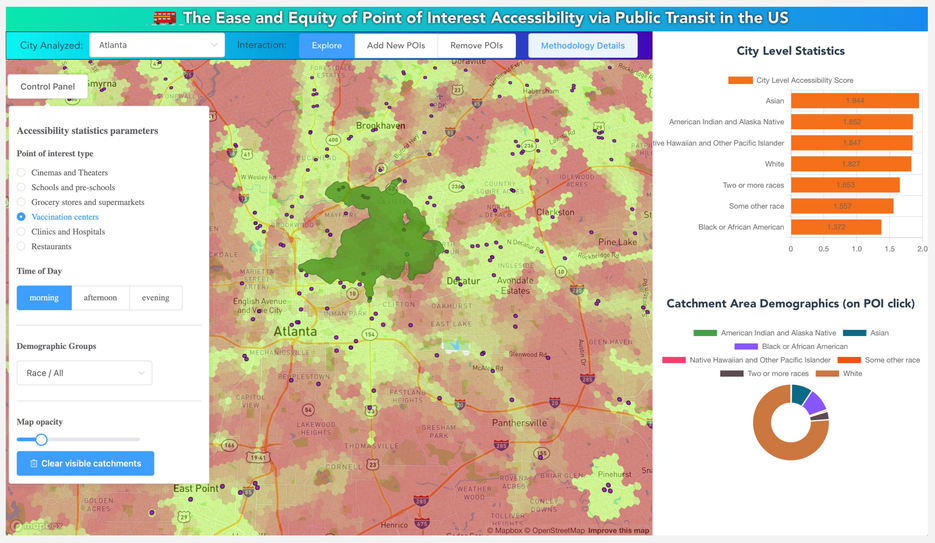
The tool was developed with FastAPI, Vue.js, and the Deck.GL mapping library was used to display the interactive visualization on the H3 hexagon scale. City and catchment level statistics were displayed using Chart.js and drew from the PostgreSQL backend. The post-hoc analysis was done using sklearn's Extra Tree Regressor, Random Forest, and Linear Regression.

Understand the accessibility of POIs through public transit

Break down the transit equity of POIs by demographic groups

Support for scenario-based explorations

Tool Benefits

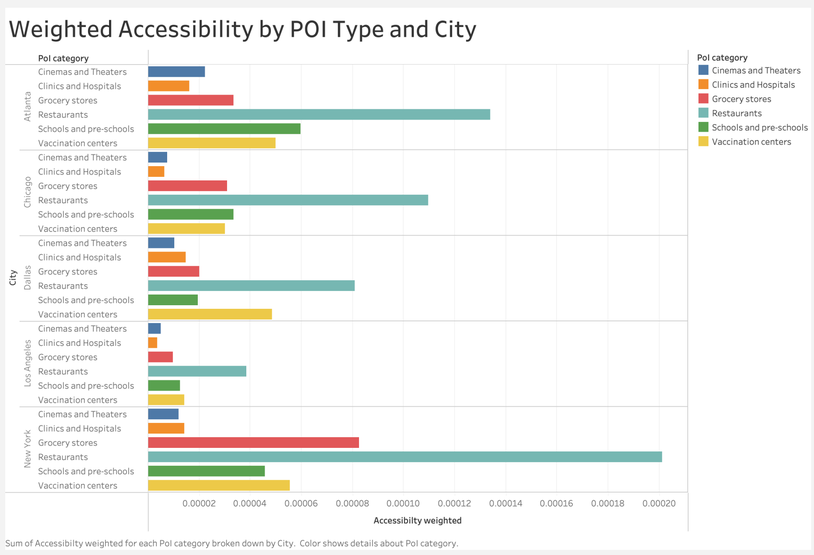


User Interface

User Feedback

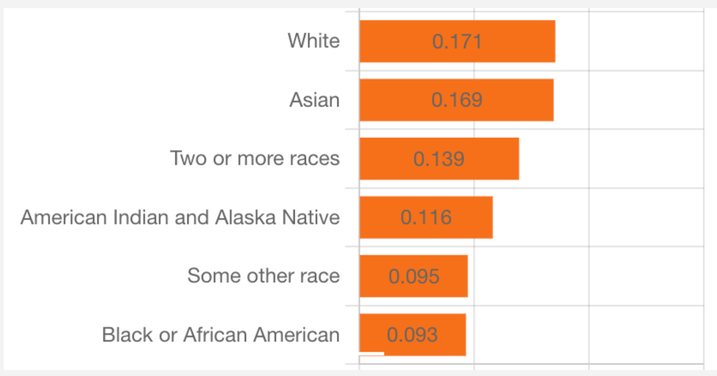
Received positive feedback from ATLDOT Deputy Commissioner, Doug Nagy and Head of Data and Analytics, Jordan Dowdy

Evaluations and Results



Average accessibility scores by city, per POI type. Atlanta has the highest accessibility scores across cities for 3/6 POI types.

City-wide Accessibility Comparison



Accessibility of clinics and hospitals in Atlanta indicate stark accessibility inequalities for White and Black populations. Prediction model showed that race could be predicted from accessibility with a F1 score of 0.87.

Demographic Inequity