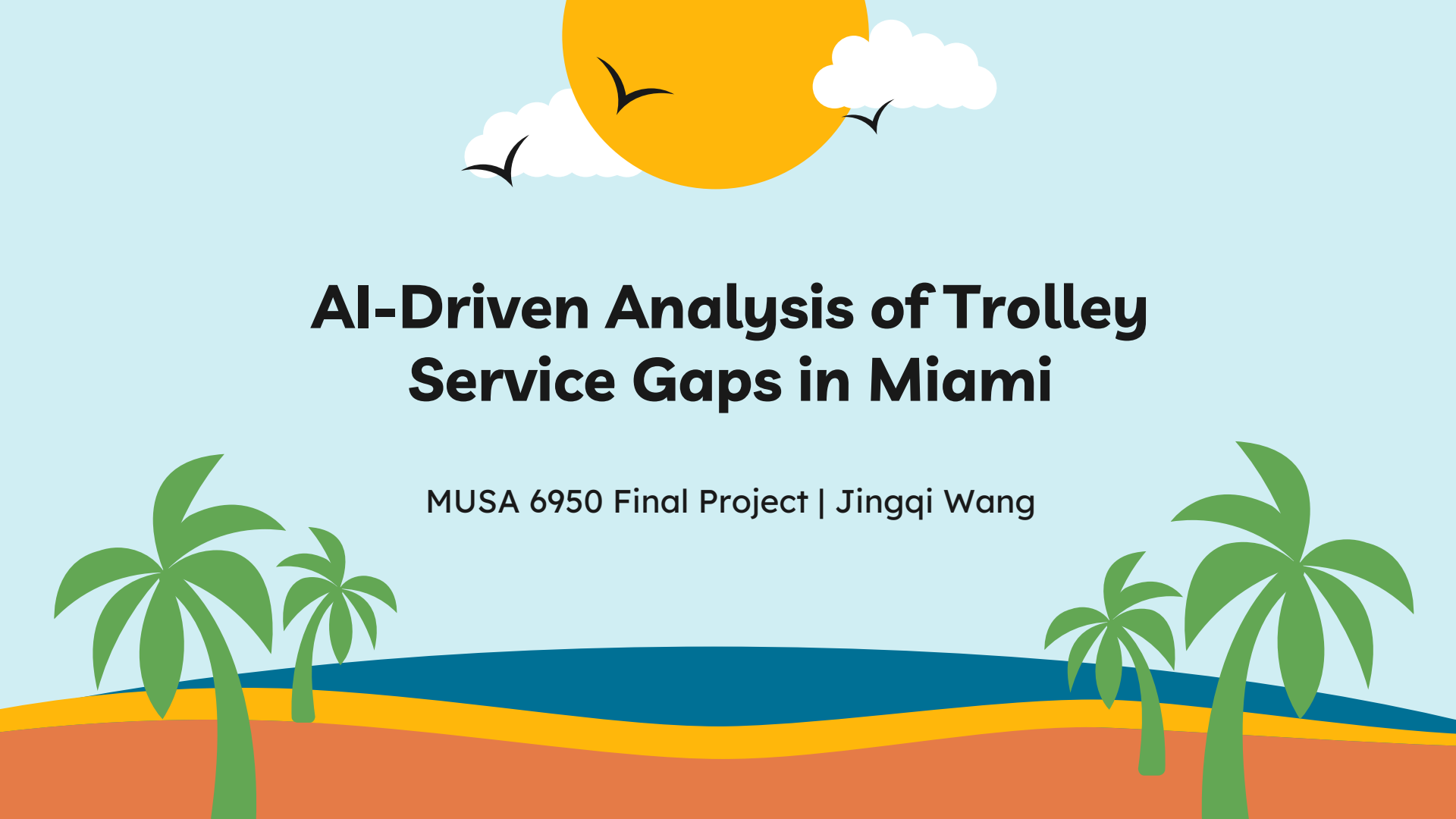


AI-Driven Analysis of Trolley Service Gaps in Miami

MUSA 6950 Final Project | Jingqi Wang

Background & Motivation

Miami's urban vibrancy relies on accessible public spaces and landmarks.
Inadequate trolley coverage may limit residents' and tourists' access.
Service gaps at key landmarks impact urban equity and livability.
This project identifies coverage gaps and prioritizes underserved neighborhoods for service improvements.

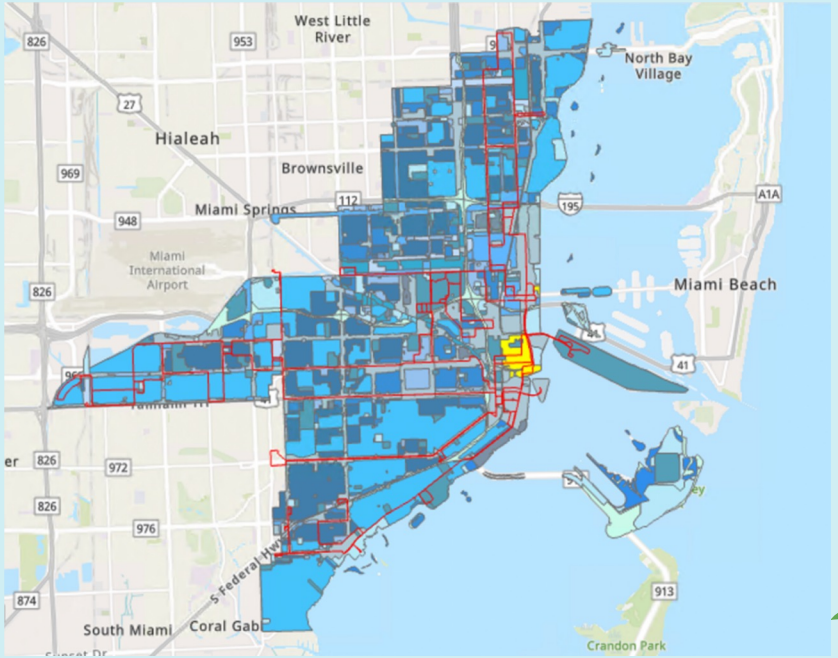
Data Sources

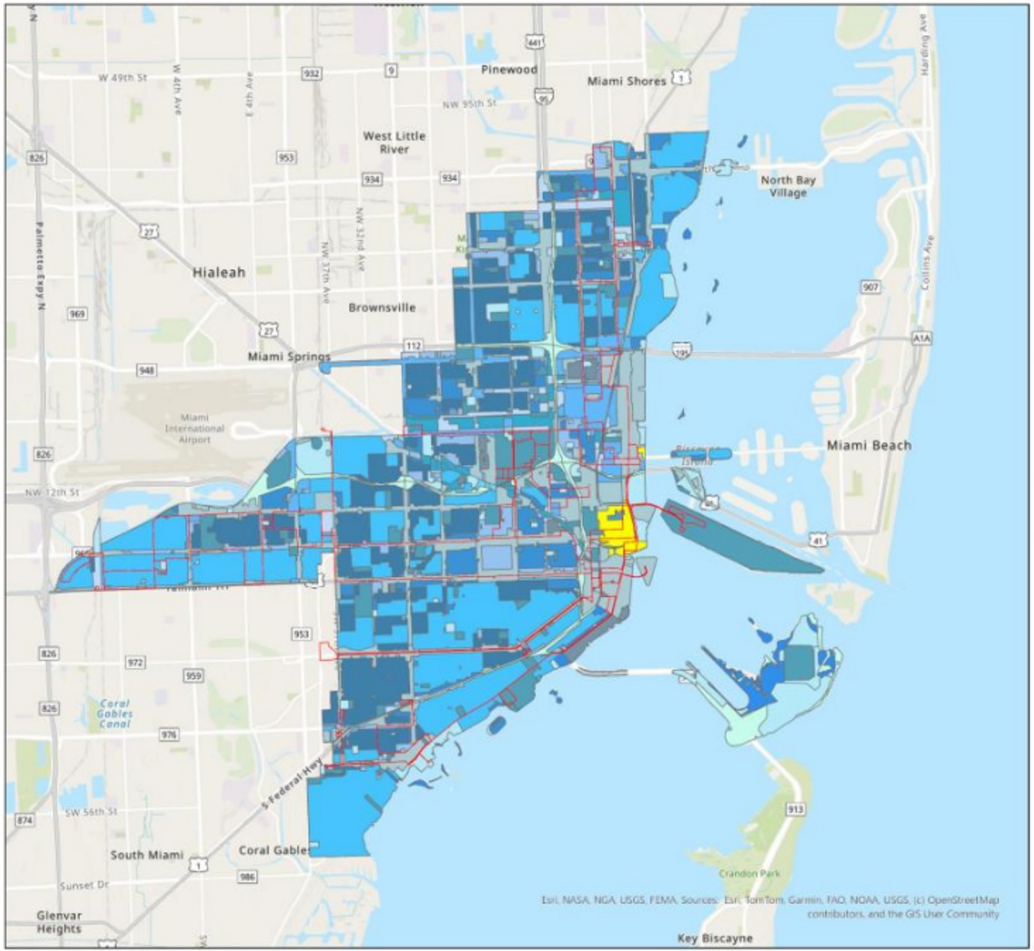
Miami Trolley Routes (GeoJSON)

Landmarks (GeoJSON + CSV)

Neighborhood Boundaries (GeoJSON)

Miami-Dade Census Tract Population (Shapefile)

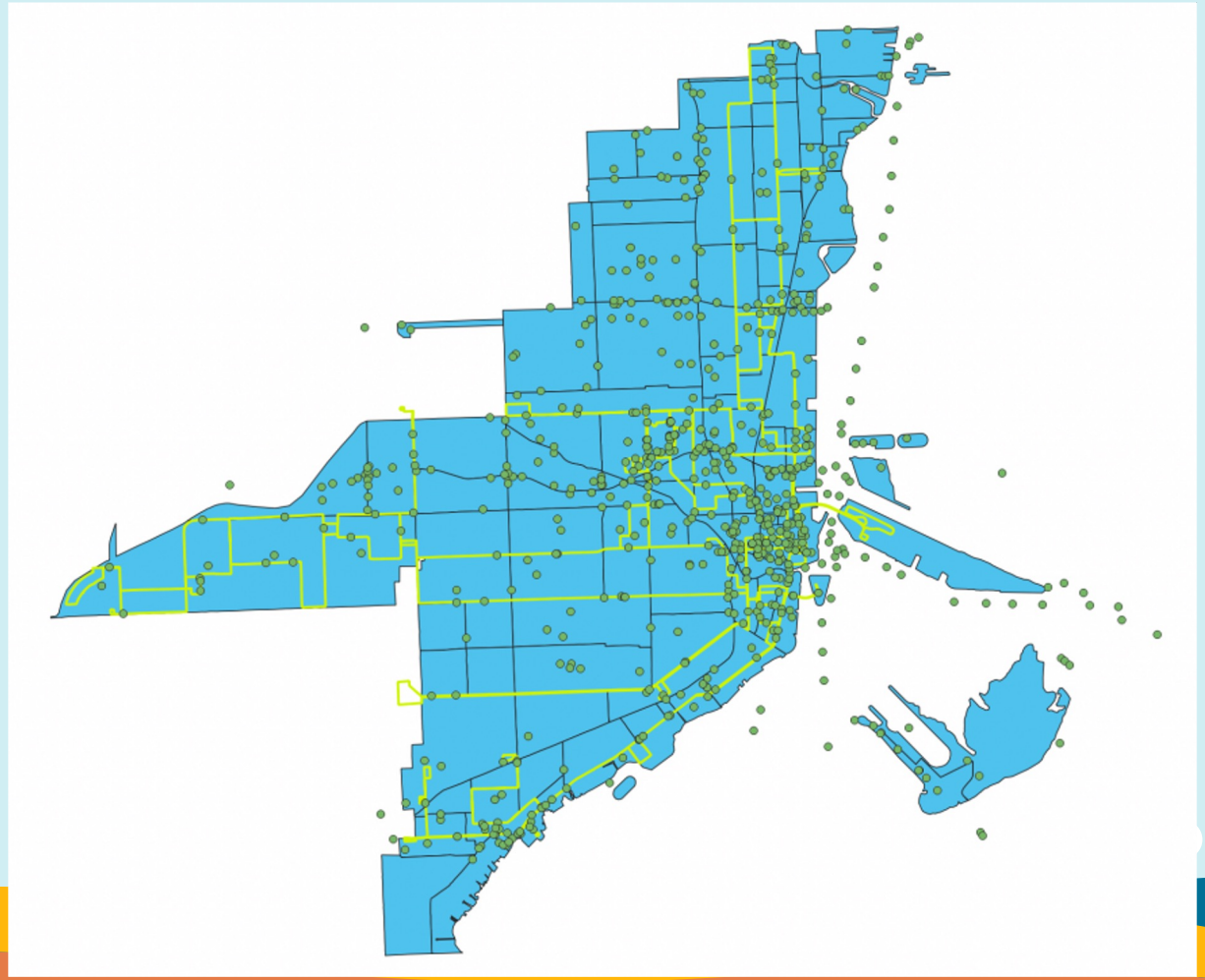




Legend

Land_Use
FLUDESC

- Central Business District
- Conservation
- Duplex - Residential
- General Commercial
- High Density Multifamily Residential
- Industrial
- Light Industrial
- Low Density Multifamily Residential
- Low Density Restricted Commercial
- Low Denstiy Restricted Commercial
- Major Inst, Public Facilities, Transp And
- Medium Density Multifamily Residential
- Medium Density Restricted Commercial
- Public Parks and Recreation
- Restricted Commercial
- Single Family - Residential
- <all other values>
- Miami_Neighbor



Overall Workflow

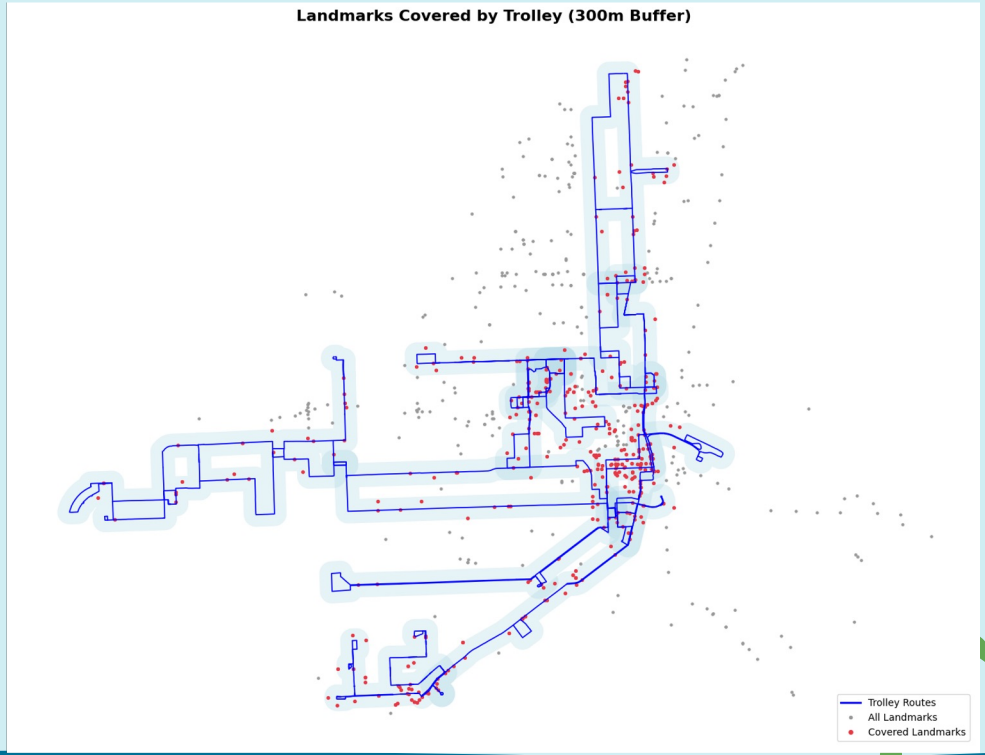
Accessibility Coverage Analysis → Service Gap Clustering (DBSCAN) → Neighborhood-Based Reporting → Population-weighted Prioritization → Coverage Prediction via Random Forest

Accessibility Coverage Analysis

300m buffer created around trolley routes.

Landmarks classified as Covered or Uncovered.

Focus on critical landmarks: Parks, Tourist Attractions.

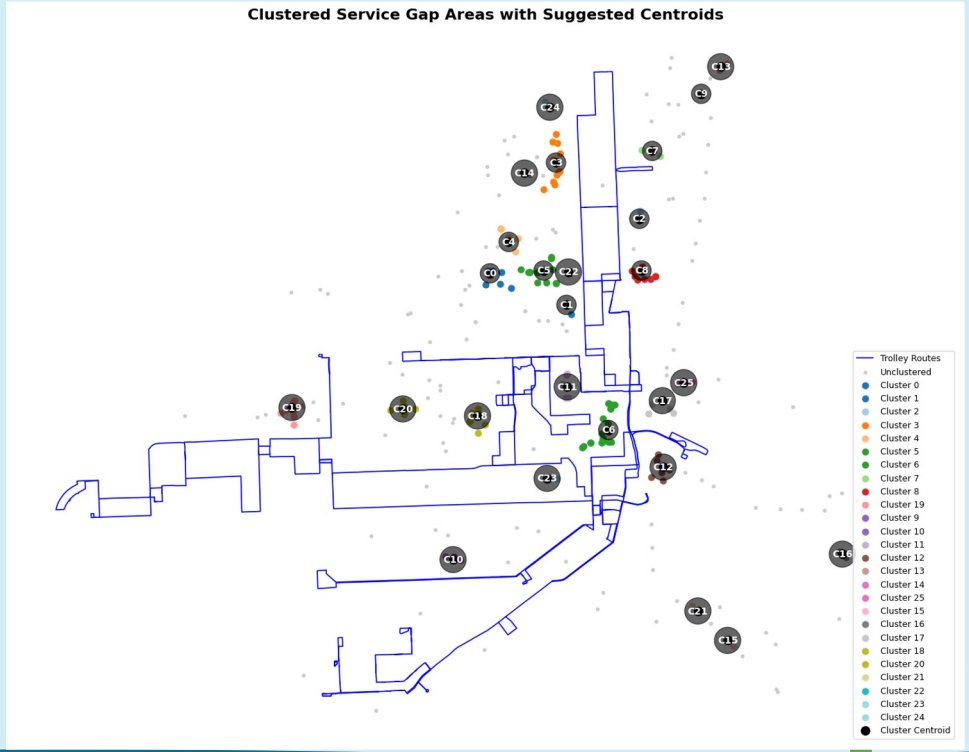


Service Gap Clustering

DBSCAN clustering applied to uncovered landmarks.

Clusters represent potential service gap hotspots.

Centroids suggested as future service hubs.

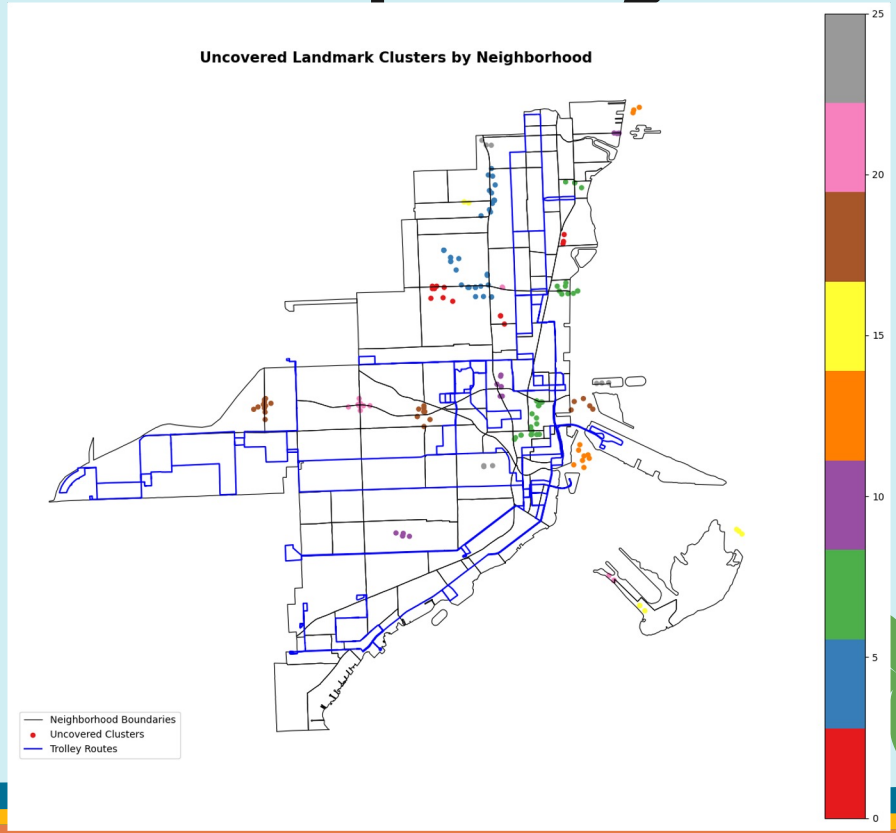


Neighborhood-Based Reporting

Spatial join with Miami neighborhoods.

Ranking based on the number of uncovered landmarks per neighborhood.

Targeted planning for service extension.

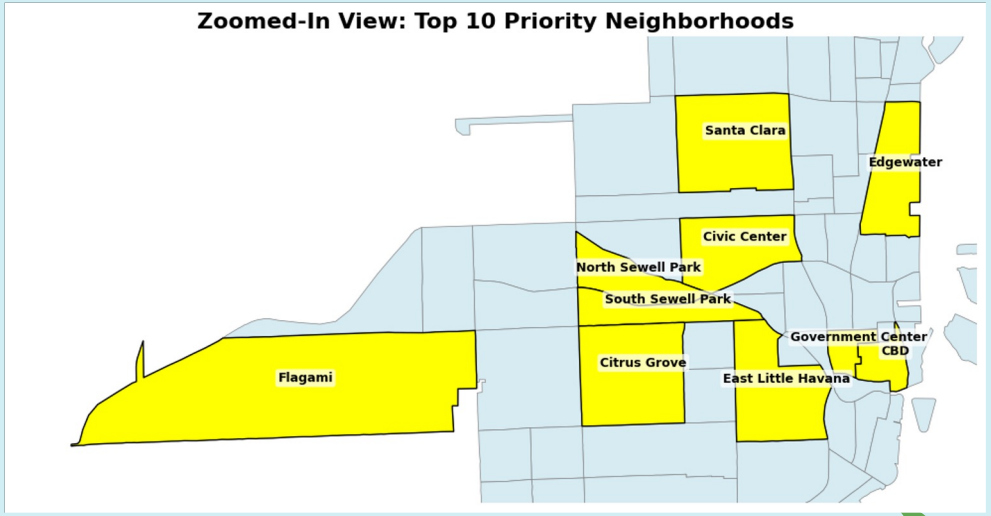


Population-Weighted Prioritization

Integrated uncovered landmarks with neighborhood population.

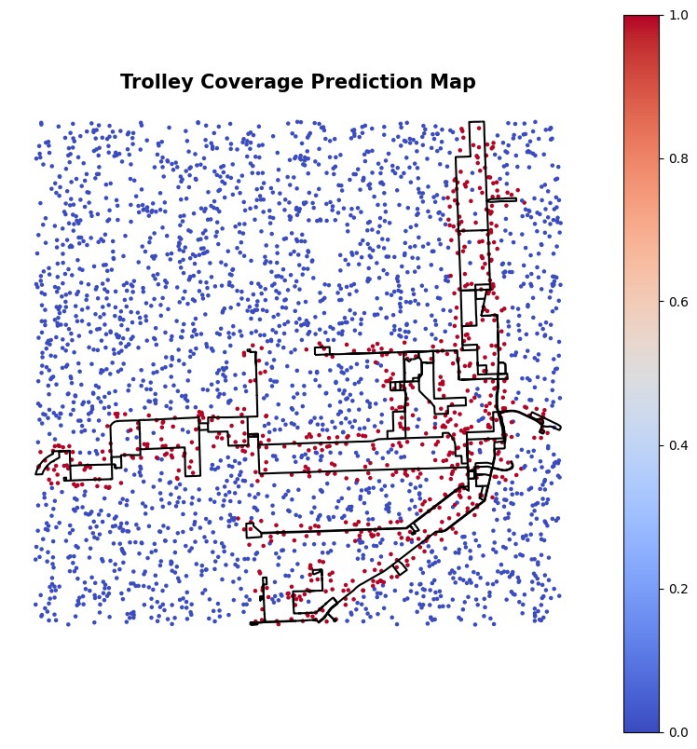
Developed a weighted score: Priority Score = (Uncovered Landmarks) × (Population)

Identified neighborhoods with highest service needs.



Machine Learning-Based Coverage Prediction

Randomly generated sample points across Miami
Trained a Random Forest model to predict whether a location is likely to be covered by the trolley
Features used: proximity to trolley routes, landmark density
Helped validate coverage patterns and extend inference beyond labeled landmarks



Key Findings

Specific clusters of service gaps identified.

Some neighborhoods consistently lack trolley access.

Population-weighted analysis reveals equity implications.

Data-driven recommendations for trolley service extension planning.

Machine learning-based prediction reinforces service gap insights, suggesting broader applicability of the method


Thank
You!