Optimizing San Diego's Metro Transit System

Improving MTS experience for low-income/high population San Diego communities

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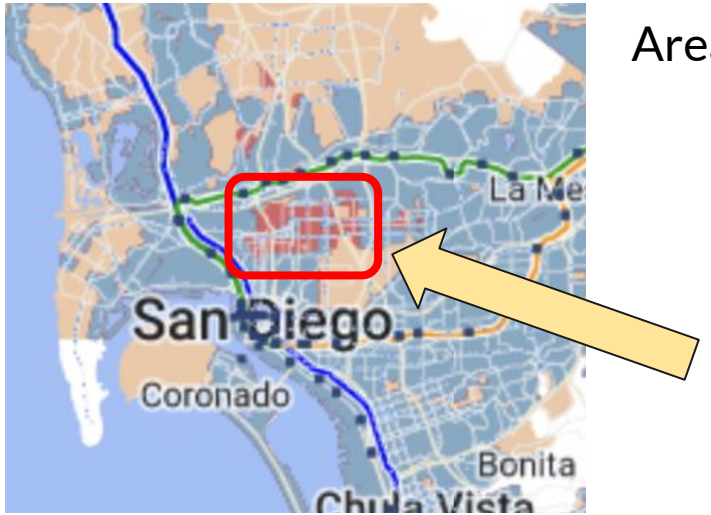
The Problem: Insufficient access to public transportation



https://alltransit.cnt.org/gap-finder/

Area of Interest: University Heights and North Park

Median Income : 57,000*

https://statisticalatlas.com/metro-area/California/San-Diego/Overview

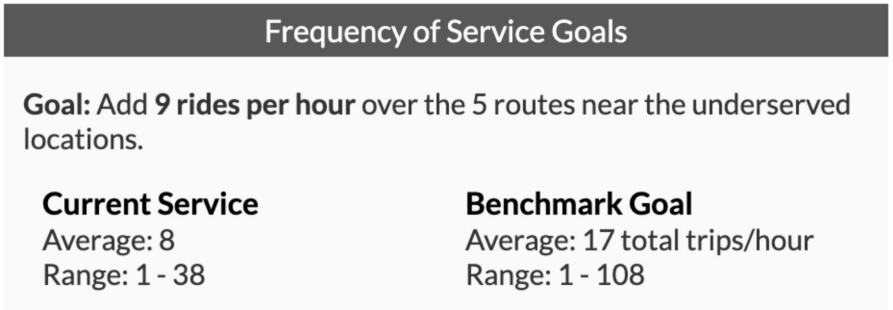
Low Income in San Diego: < 93,000*

https://statisticalatlas.com/metro-area/California/San-Diego/Overview

* for a family of 3

Our Solution

- Redistributed the total number of departures to stops that service lower income areas and higher populations
- Maintained at least 1 departure every 10 minutes for top 80th percentile of block groups
- Planned a new possible route for additional departures



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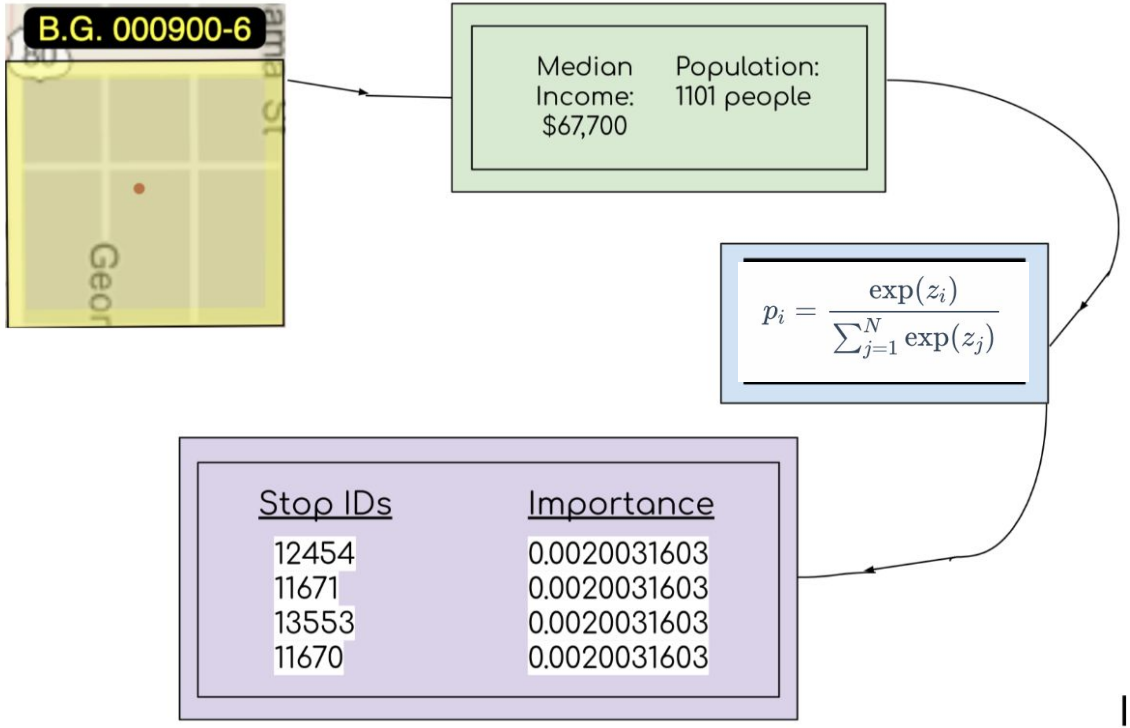
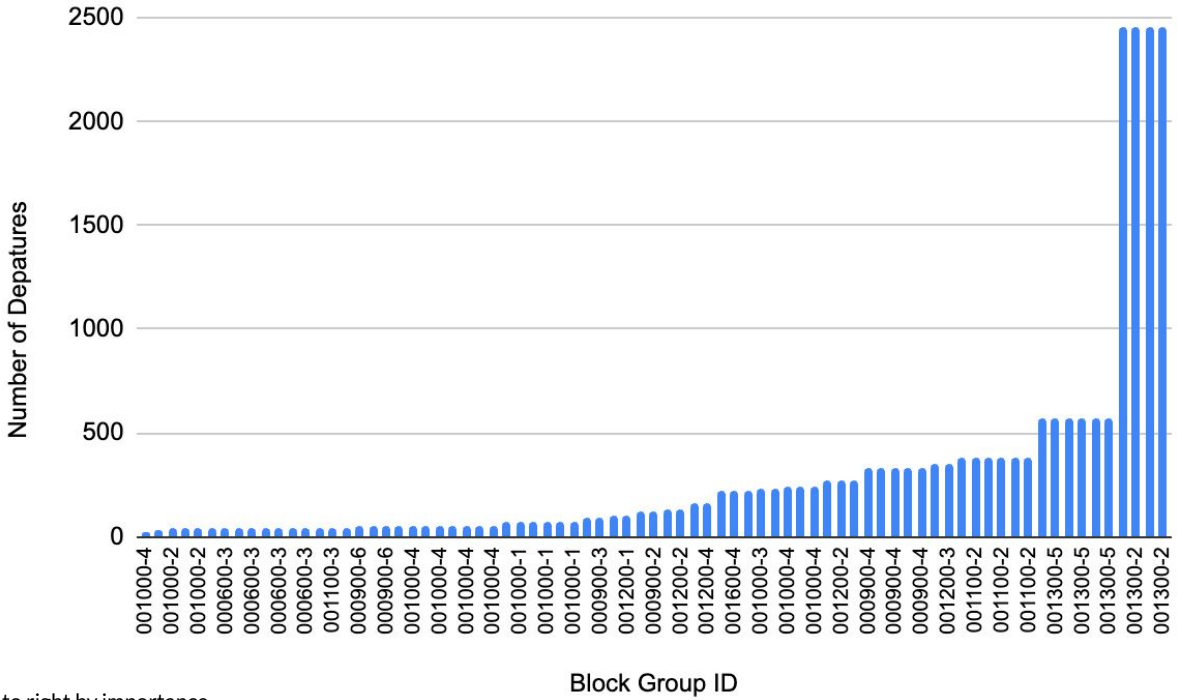
Assigning an Initial Importance



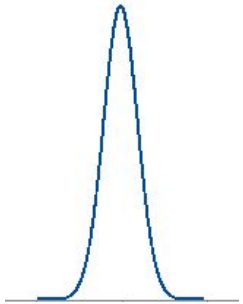
1st Attempt at Departure Redistribution

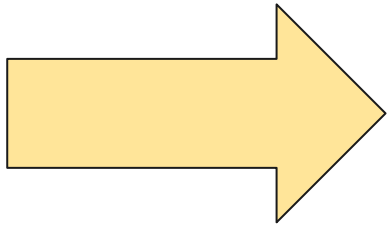


*block groups are ordered left to right by importance

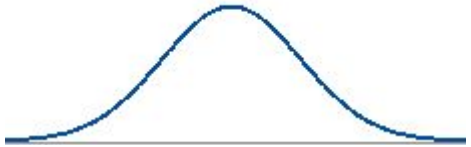
Heating things up…

$$p_i = \frac{\exp(z_i)}{\sum_{j=1}^{N} \exp(z_j)}$$

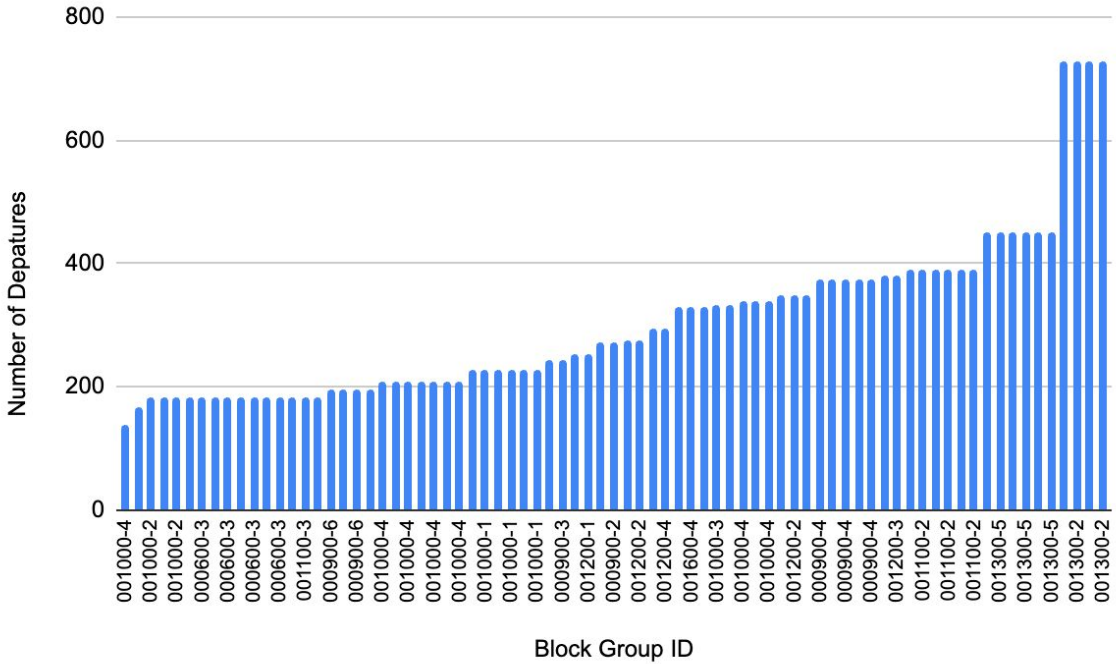




$$p_i = \frac{\exp(x_i/\tau)}{\sum_{j=1}^{N} \exp(x_j/\tau)}$$



2nd Attempt of Departure Redistribution



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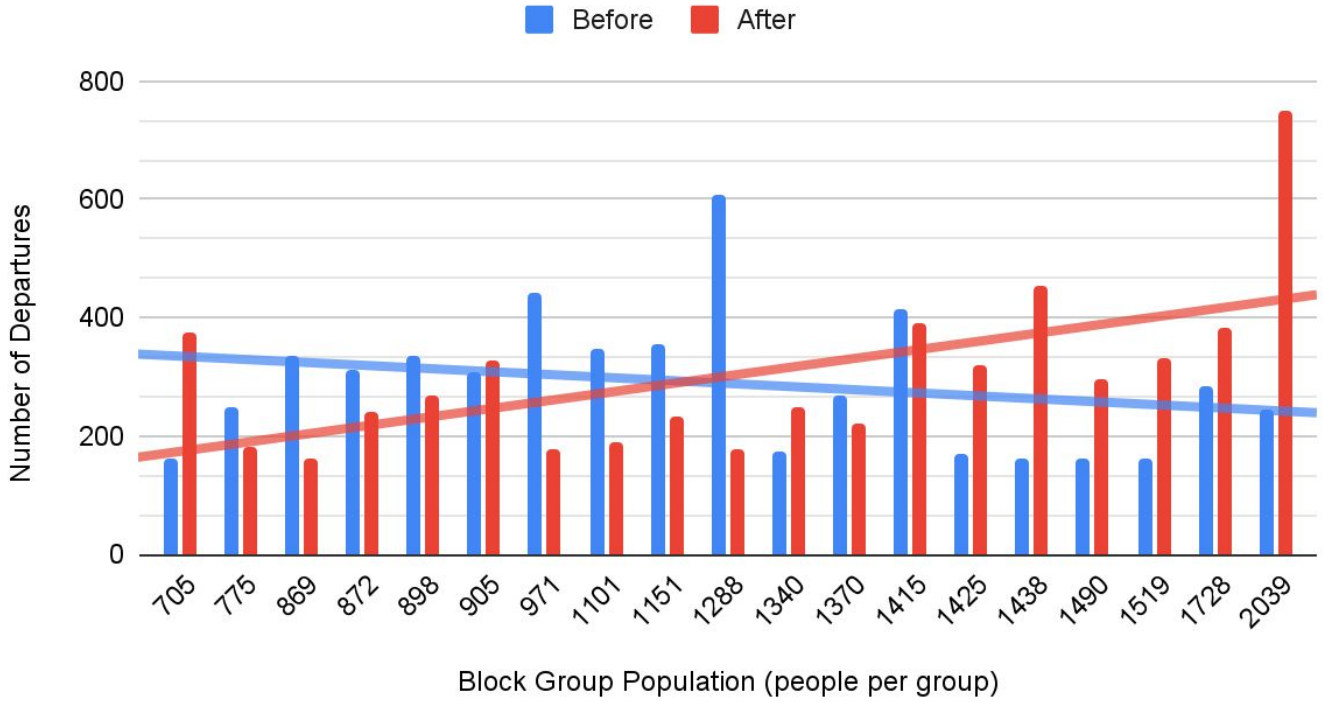
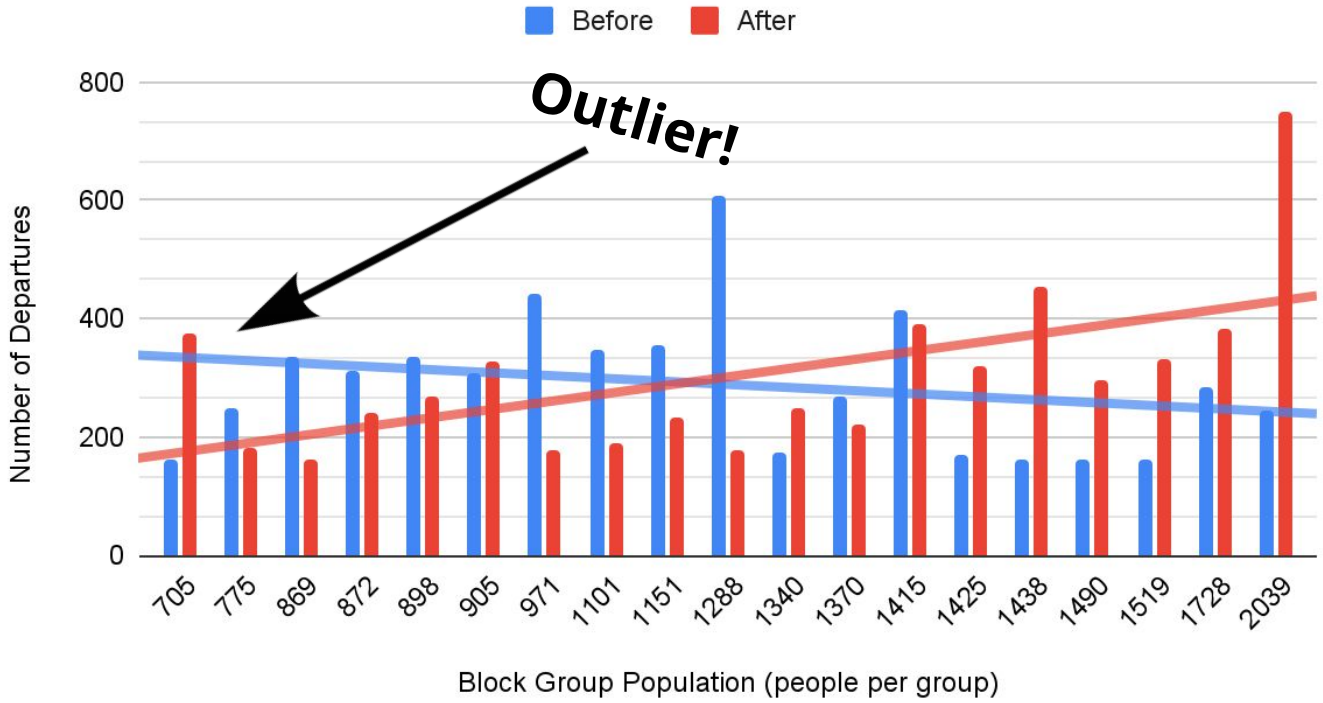
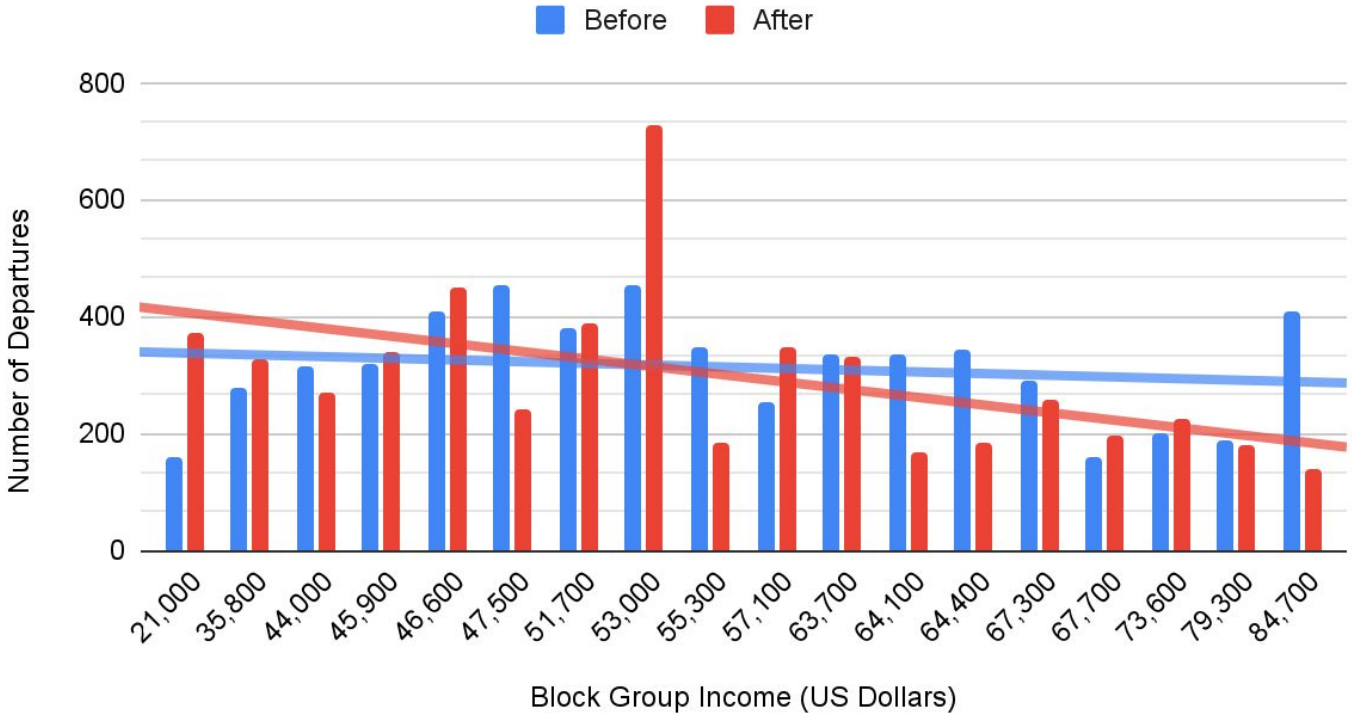
Population vs Departures



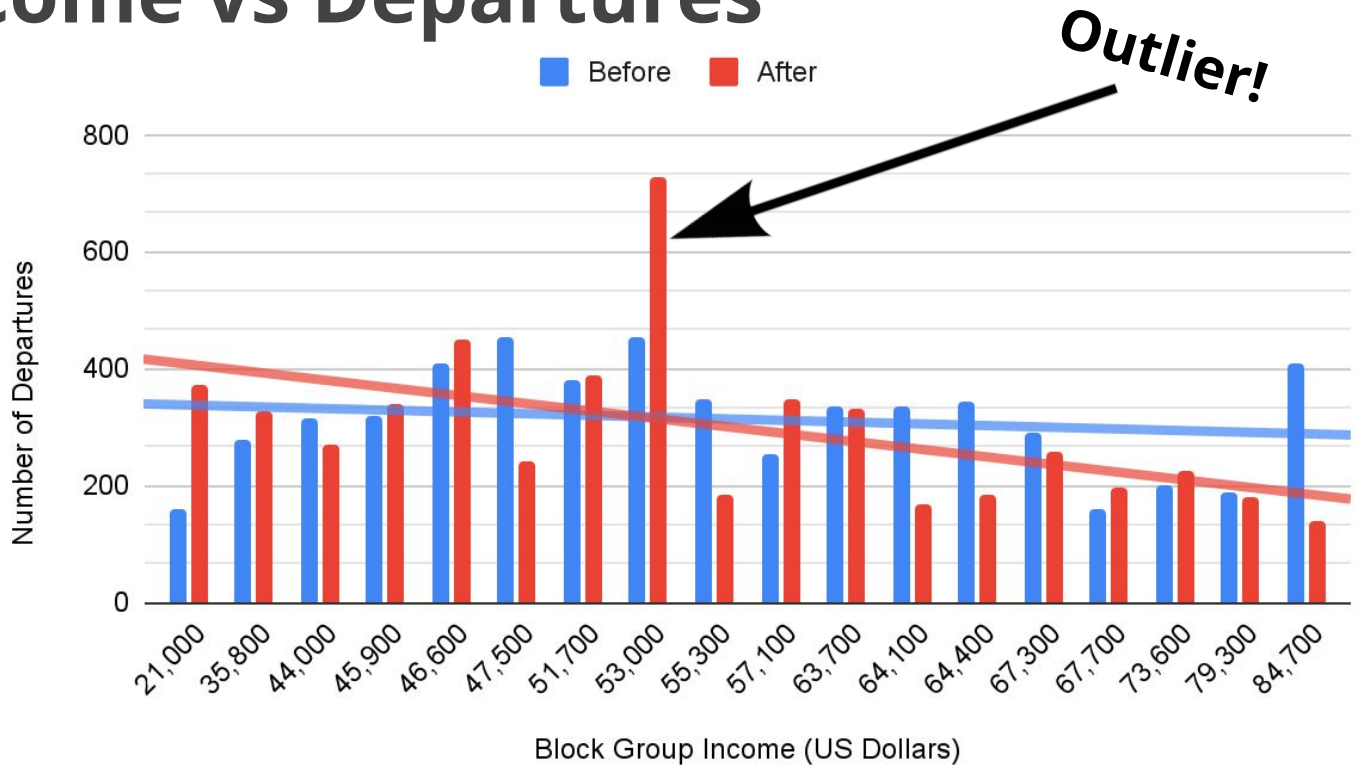
Population vs Departures



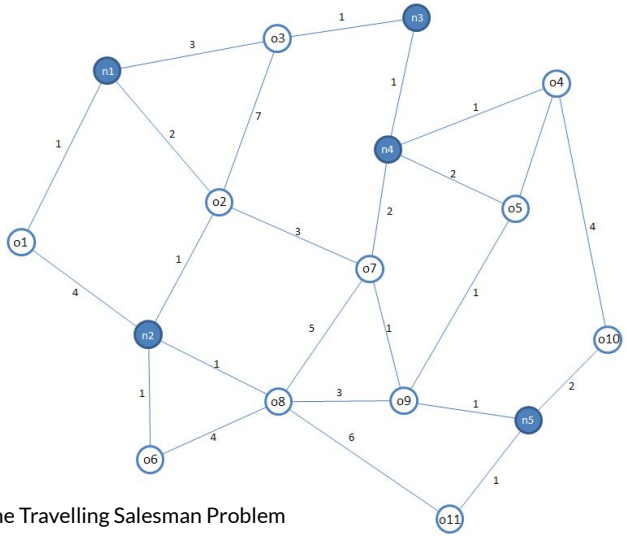
Income vs Departures



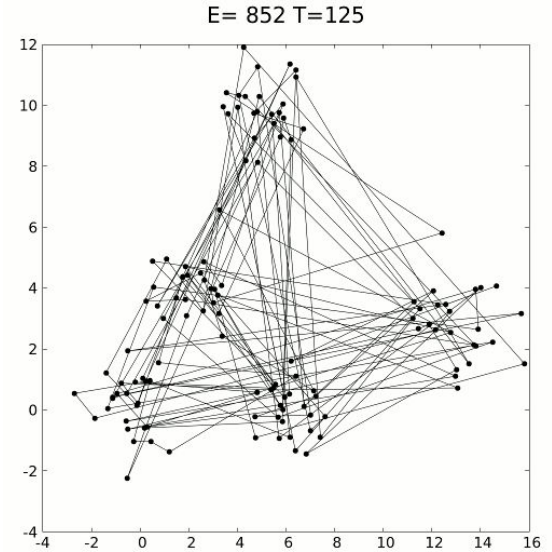
Income vs Departures



Simulated Annealing:
The Travelling San Diego Bus Passenger

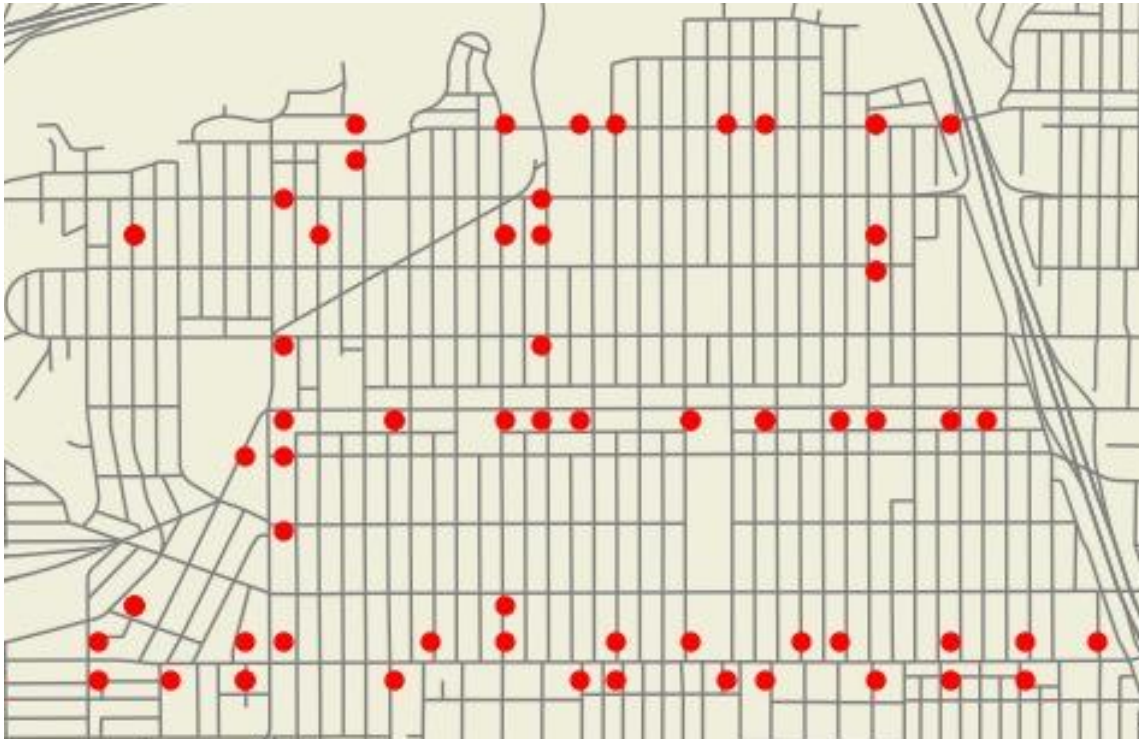


The Travelling Salesman Problem

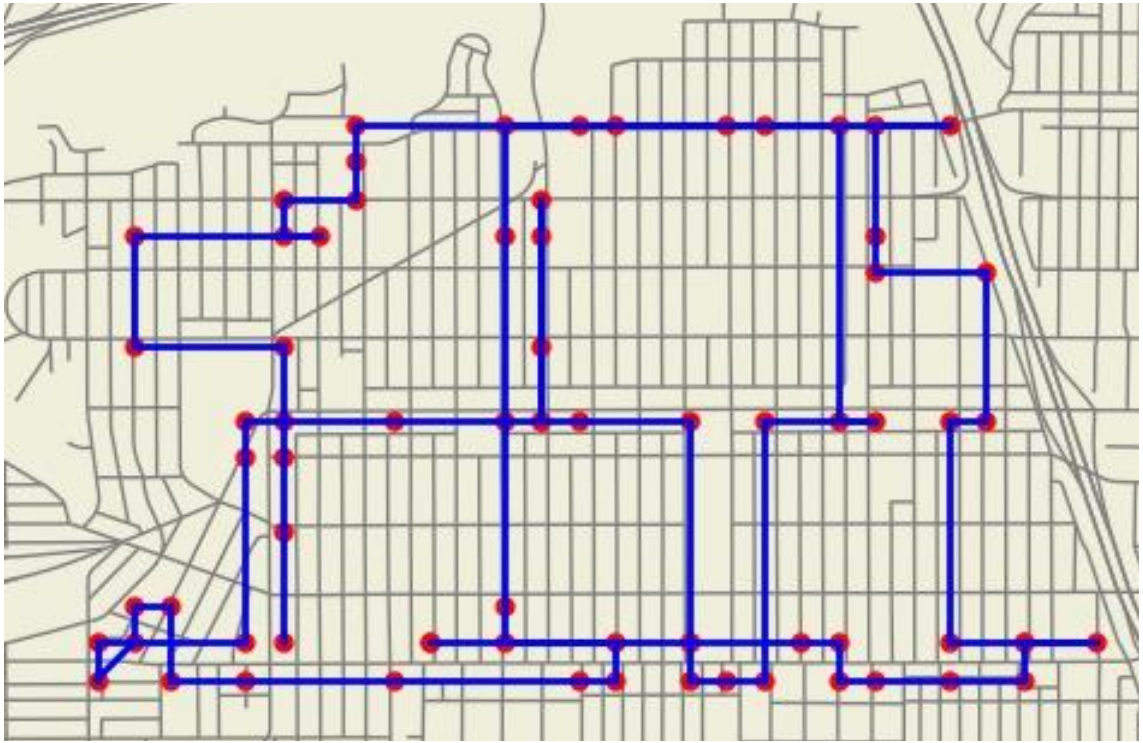


Simulated annealing

Map of Stops: University Heights/North Park



An Optimal Bus Route



Thank you!