

Relation of Boston Neighborhoods to MBTA Reliability and the Demographics of Surrounding Neighborhoods

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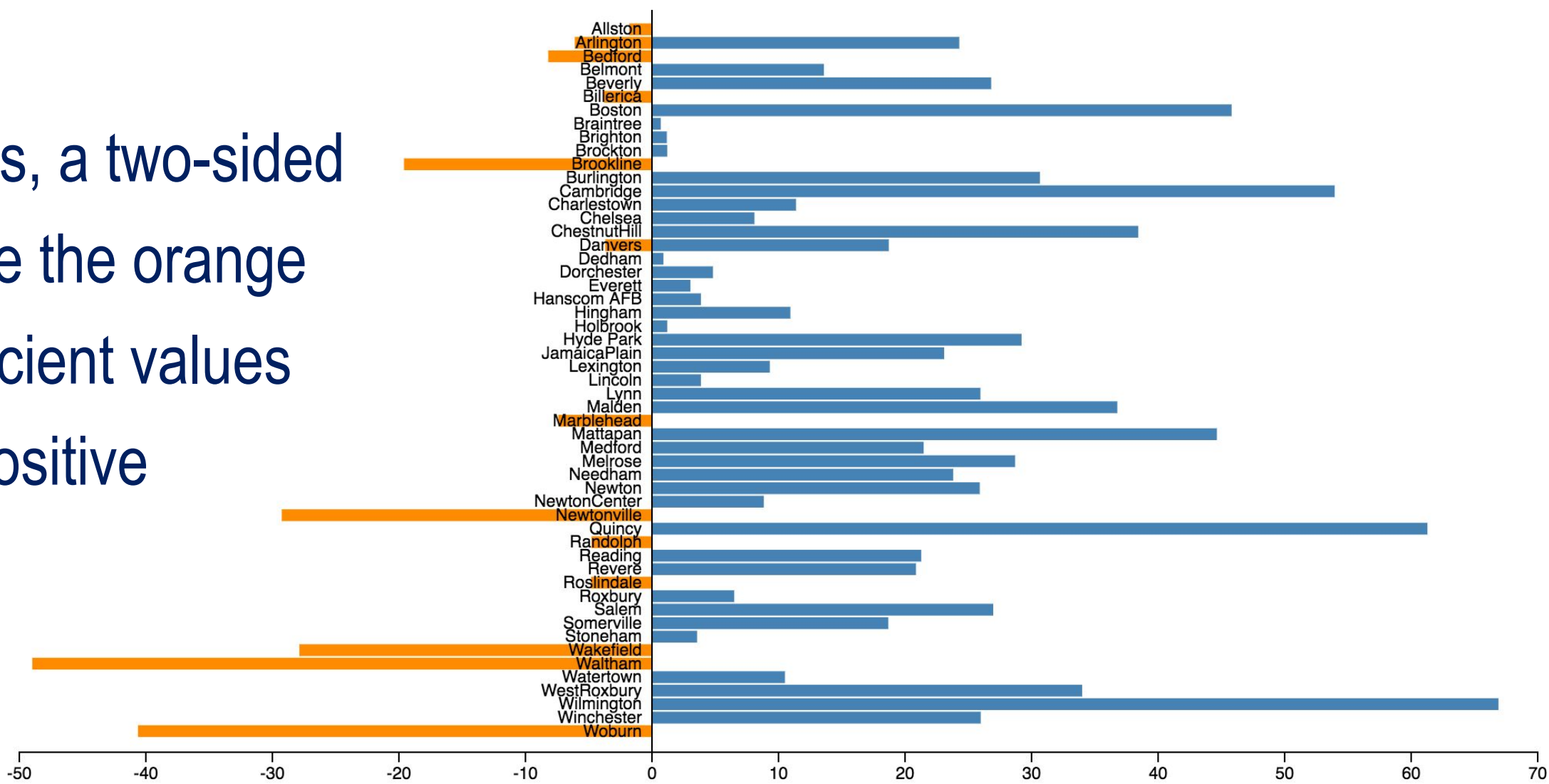
Background

- Residents of the city of Boston rely on Massachusetts Bay Transit Authority (MBTA) services to get to and from work
 - Question One:** Can we quantify how much each neighborhood in Boston contributes to the overall reliability of the MBTA?
- The city of Boston hosts a number of distinct neighborhoods with diverse demographic factors, making some more reliant on public transportation than others
 - Question Two:** Given a neighborhood A, how does geographical proximity influence the spread of various demographic factors (ex: poverty rates) from neighborhood A to its surrounding neighborhoods?

Predicting MBTA Reliability

- Relevant Data Sets**
 - MBTA Performance Data – Captures historical on-time performance data for various routes over the past year
 - MBTA Real-Time API – Given a route, returns information for all included stops
- Method – Regression analysis**
 - Given the location coordinates for each stop, determine the neighborhood that the stop is located in, then merge and summarize data to establish the neighborhoods which routes pass through
 - Independent Variables* – Neighborhoods that routes travel within
 - Dependent Variable* – Average off-peak on-time performance value for a route

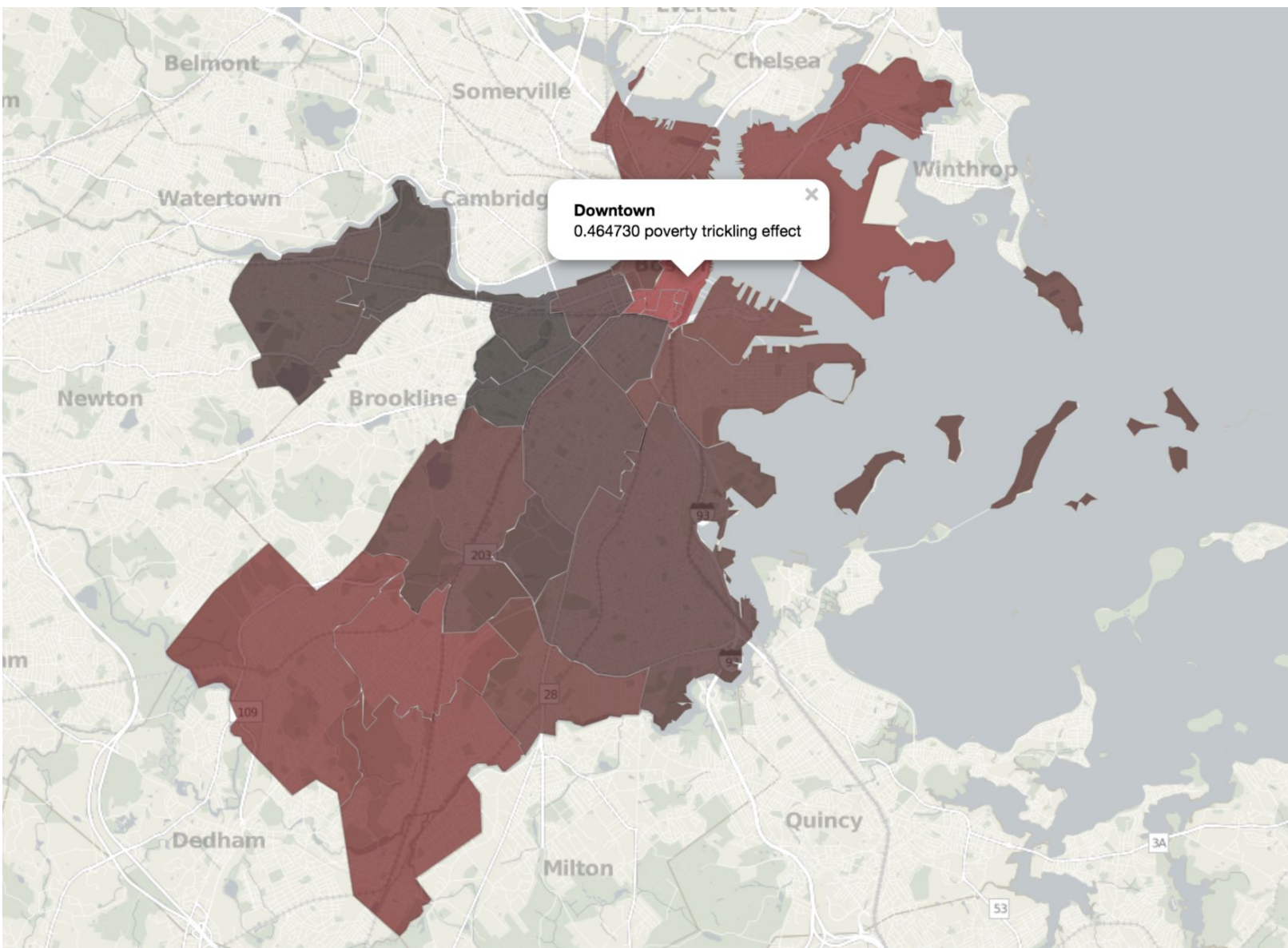
- Results**
 - From this regression analysis, a two-sided bar chart was created, where the orange bars indicate negative coefficient values and the blue bars indicate positive coefficient values



Analyzing Socioeconomic Trickling

- Relevant Data Sets** (all organized by 23 different neighborhoods in Boston)
 - Distance (in miles) between all neighborhoods
 - Poverty rates, household income, means of commuting (walk, bike, bus, subway, car)
- Method - Correlation analysis**
 - Use the distance values to decide whether a pair of neighborhoods are neighbors
 - Find the difference in demographic factors among all pairs of neighborhoods
 - Work with these values to calculate the correlation between a neighborhood's demographic factors and those of its neighbors

- Results**
 - Using these coefficients, a heat map was created to show the trickling effects
 - The map on the right shows the trickling effect of poverty. The more red an area is, the stronger its trickling effect



Future Work

- The results from both algorithms can be used in the future by policy makers in Boston, helping them to make informed decisions that would affect residents of the city
 - If policy makers ever want to consider adding another MBTA route, such as the Green Line Extension into Somerville and Medford, our algorithm would be able to predict the reliability of that route, given the neighborhoods that it passes through.
 - If any kind of reformative policies were written for a neighborhood, it is important to know if this change will trickle to surrounding neighborhoods, or if the policies will have to be explicitly implemented in surrounding neighborhoods.

