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# Project Team 9: Pedestrians, DS 4200 F19

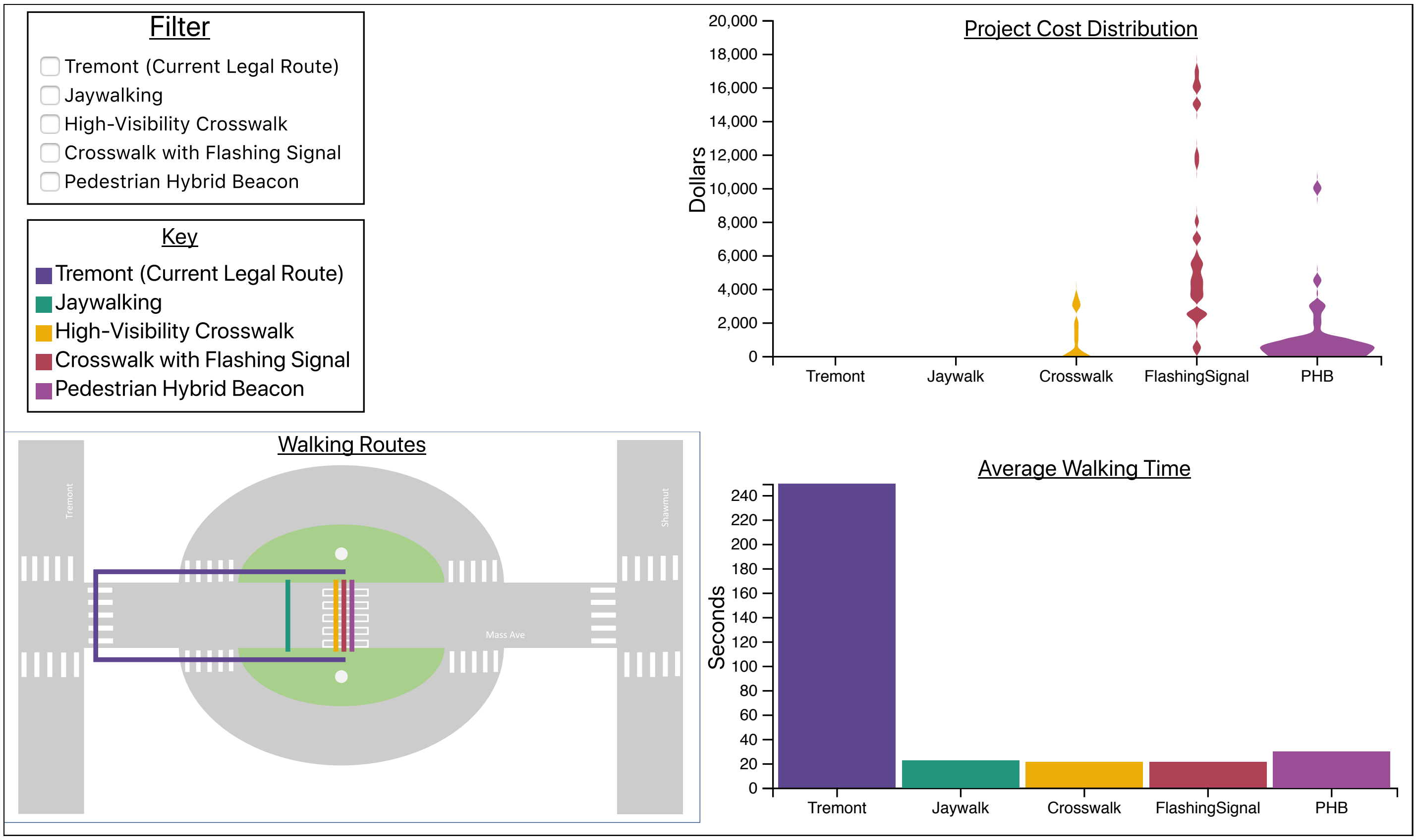
**Kyle McCrosson**, **John Clancy**, **Philip Wesley**

Service-Learning Course Project as part of DS 4200: Information Presentation and Visualization, taught by Prof. Cody Dunne, Data Visualization @ Khoury, Northeastern University.

# Motivation

Chester Park is an amazing resource for the residents of the neighborhood. However, the bisection of the park by Massachusetts Avenue makes it difficult for people to utilize both halves, effectively cutting residents' green space in two. Additionally, the lack of any type of pedestrian crossing across Massachusetts Avenue between Tremont Street and Shawmut Avenue creates an unsafe environment where pedestrians are jaywalking across Massachusetts Avenue out of convenience. We aim to provide an exploration of pedestrian behavior and crossing data in order to find potential solutions to make it more practical to cross Massachusetts Avenue safely, and to give the residents of Chester Square easy access to the full extent of the park.

# Visualization




# Demo Video

*Embedded MP4 demo video using the HTML5 <video> tag. For example, this screen recording Prof. Cody Dunne made of Mike Bostock's flexible transitions in D3 slide:*

0:00 / 0:15

ble transitions

# Visualization explanation

*final visualization screenshots (PNG images), design justifications, UI walk-through, and linked presentation slides.*

Our visualization if based on three main views that highlight the major pro's and con's of each choice of pedestrian crossing. The options we explore include leaving the road as is (pedestrians either cross at Tremont/Shawmut, or jaywalk), adding a crosswalk in the middle of the block, adding a crosswalk with a rapid flashing pedestrian sign, and building a Pedestrian Hybrid Beacon which is essentially a stoplight over a crosswalk that would give pedestrians the right of way. For simplicity, we refer to the Tremont/Shawmut option only as Tremont because the travel times, costs, and safety of each of those routes are the same, and discussing them separately is redundant.

In the lower left corner we have a map of the neighborhood, with the five options for pedestrian crossing laid out over it. This provides the user with a spatial awareness of the various intersections involved, as well as the context of where the proposed pedestrian crossing options would be installed. Hovering over each path with the mouse will provide a tooltip label to tell the user which route they are looking at, and will highlight the encodings related to that route in the other graphs on the right side of the visualization.

The bottom right corner contains a bar graph that compares the average amount of time that it takes for a pedestrian to walk the corresponding route on the map. The amount of time is encoded with length on an aligned axis and the route that the bar is referring to is encoded with color. Comparing the length of the bars on an aligned axis is the most effective way to relate that information to the user, and using the same colors to encode the bars as we did the paths over the map (along with linked highlighting and tooltip labels) unites the information from the map with the information from this bar graph.

In the top right corner we have a violin plot that provides information on the distribution of costs of various solutions we felt could effectively connect the parks in a more effective manner than currently is available. The distribution is encoded within the width of the plot at a given point, and the color encodes which route's distribution you are looking at. Using the width it is easy to compare which have distributions that skew higher or lower because they are using the same y scale so it's just a matter of comparing various widths and the height on the y axis of those widths. We liked that this made it easy to get all of the data in perspective unlike a bar graph of just the average or something along those lines.

In the top left corner we have a key which will highlight whichever route you hover over to make it easy to compare across our various graphs in the visualization, and we also ahve a filter box that allows you to narrow down the scope and more easily compare a smaller number of routes. This is especially helpful for the average walking time, because Tremont raises the number of seconds needed for the graph dramatically which makes it harder to see the differences between all the other options.

# Data Analysis

*Summary of data, data types, and data preprocessing.*

According to the data, the time it takes to cross from one side of the park to the other without jaywalking is almost 11 times greater than crossing the street directly. (based on avg_travel_times.csv) However, the average time it takes to cross a crosswalk is quite similar to that of jaywalking, but is much safer. Even if people cross when there is no signal to walk, it is still safer than no crosswalk.

Because it is a busy intersection, it would make the most sense to go for a pedestrian hybrid beacon. While the average walking time is slightly greater compared to a plain crosswalk, it would add to safety. The downside is that this is also the most expensive option, costing about 3.5 times as much to build. However, the higher cost of this crosswalk would be offset by the additional safety, where a single potential accident on this road could wipe out all the savings by not placing a signal. but this argument could be used to argue that any sort of crosswalk would save money overall, because of time saved by those who would have gone around, and injuries by those who are jaywalking. In general, the boosts in safety and speed are countered to some degree by an increase in cost as well, so the best solution isn't completely cut and dry.

# Task Analysis

*Summary of task table.*

*Expectation: Clearly describes domain tasks, processes, goals and abstract tasks for domain problems.*

We wished to have an interactive map along with graphs of time and cost that will help tell the story of the pros and cons of how best to connect the parks. The map will be used to demonstrate distance and give a spacial representation of the walking distance between the parks and walking distance to get between them. The reason we wanted to do this was to explore our important domain task of determining which solutions are the most and leas t viable from different perspectives.

We also wish to show graphs that correspond to map and show how selecting something from the graph affects the other graphs, as well as the map itself. This can be used to analyze the potential options for adding paths for pedestrians in this location.

This was achieved by creating an SVG to contain the filter checkboxes, the map, and the route. The code was written using a combination of these SVGs as well as D3 to link these SVGs together in an interative manner.

# Design Process

*Sketches and design choices to justify final visualization.*

*Expectation: Evidence of iterative improvement. Logical discussion of design choices grounded in theory from course. Discusses feedback from usability testing.*

The first thing we worked on was setting a goal for what we wanted to do. This included planning out what data we intended to collect for our project. We then collected data over the course of several days based on the plans we had made. This included standing at the intersections, counting how many people were crossing and in what manner. We also timed ourselves and others to see how long it takes to get to one side of the park to the other. We also sat at a crosswalk intersection for a half hour each to tally how many people were not following the walking signals vs how many people did follow the signals. Some of this collection was improvising as we realized a potentially valuable avenue for exploration in the moment and wanted to make sure we put our best foot forward.

Once we gathered the data, we moved on to create prototypes that would utilize our data. We did not show all the data in our visualization, as some of that data wasn't going to fit in well with the rest, but gathering an abundance of data was useful in having a good selection to choose from when in came time to creating the visualization as well as using a combination of data to create new data based on our observations about the links.

The sketch prototypes were useful for gauging what types of visualizations worked and which ones did not. from this, we moved on to create a digital prototype of the sketch using PowerPoint. PowerPoint proved to be useful as a easier to manipulate tool that was able to express a degree of interaction using slides with demo interactions. Afterwards, we were left with the actual webpage to create the visualizations along with the descriptions of what are goals are, and what we wished to do with the data and visualizations, which is what this page is.

# Conclusion

*Short summary of work completed and areas for improvement/future-work.*

*Expectation: Meaningfully wraps up project and has good future directions.*

Over the course of this project we have spent a lot of time on planning data collection, implementing that data collection and acting that out. The primary focus has been on the lack of ease of use of the park - there is not effective way to cross from one side of the park to the other. If we could go back and improve we would try and collect data that would better interact - what we ended up with provides interesting results, but doesn't allow for as complex of a visualization as we would have liked. This would make for a more engaging outcome.

Going forward, this should shift more towards the aspect of safety. We tried to provide it some focus but it wasn't the main emphasis of our visualization, that was the time aspect. This would provide another important factor in comparing different solutions. Additionally, it would make sense to investigate the effects our solutions could have on commuters - how would the addition of these potential delays slow down traffic? These and other questions would be important to answer. From there we would expect things to shift more towards making a final decision on the best solution.

# Acknowledgements

*List here where any code, packages/libraries, text, images, designs, etc. that you leverage come from.*

- D3: Data-Driven Documents by Mike Bostock.
- Pure CSS responsive "Fork me on GitHub" ribbon by Chris Heilmann
- D3 Axis Without Tick Labels on Stack Overflow
- Colored Bar Chart by Curran Kelleher
- SVG Paths and D3.js on dashingd3js.com
- Absolute-Positioned Tooltip by Mike Bostock
- selection.each example by Miles McCrocklin