Data Science Seminar - MSAI 339

Checkpoint 3: Interactive Visualization

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Background and Theme:

By looking at the Tactical Response Reports, we intend to examine the areas and officers involved in violent incidents. We would then hypothesize about the crime in said areas and the officers tangled in such altercations. We will achieve this by filtering the incidents that involve certain actions associated with violence while grouping by location. For example when the police officer's taser or firearm is used against the subject. Additionally, the subjects and officer's physical state will also be taken into consideration along with the number of shots fired during the incident. Moreover, we would like to know whether officers listed in TRRs receive more awards than those who deal with less violent incidents or vice versa. One important aspect that we are going to be covering is understanding the relationship between the number of trr-s and the number of officers in a certain location. We are planning on adding additional dimensions to the data such as race and gender. This will allow us to understand whether there is over policing in certain areas of Chicago and whether the TRRs connected in said areas are likely to be violent in nature.

Introduction

For the interactive visualization part of this project, we used the D3 javascript library in ObservableHQ, in order to generate interactive and easy to understand visualizations and models for each one of the questions we proposed in our project proposal.

Findings & Results:

Figure 1: Create a sunburst to show the progressions of TRR incidents. For example, what is the most likely course of events if a perpetrator spits on a police officer?

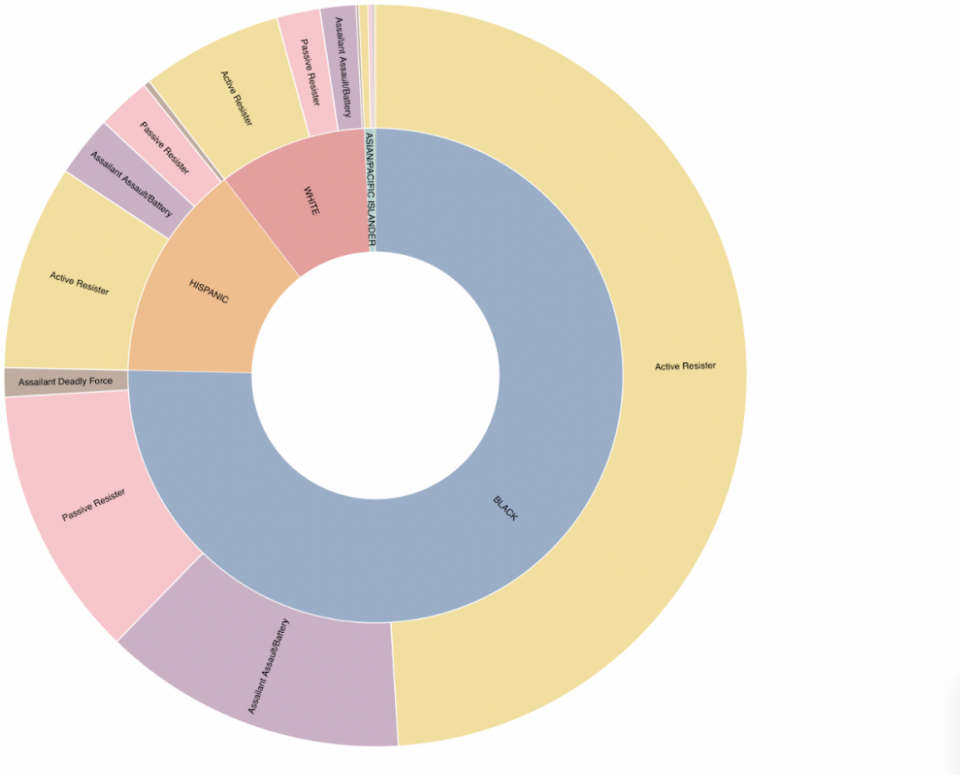

Figure 1A

The above sunburst represents the overall count of trrs grouped by race groups. From there, we also group by the type of resistance and the type of police response. Finally we group by allegation (whether or not one was filed, if it was sustained, etc.). We can see that most trr-s (around 75% belong to a black community). The majority of subject action of black community

has been described as an Active Resistor. For the Hispanic and White Communities, the subject action types are more diverse. Also worth noting is that the vast majority of TRR events do not result in allegations.

Figure 1B

The following sunburst represents the overall count of TRRs of those for whom an allegation has been made, grouped by race groups, which are in turn grouped by the subject's initial action and then by police response. Finally, they are grouped by the allegation outcome. As most TRRs do not result in allegations, the size of this data is quite a bit smaller. Again, we can see that black constitutes a vast majority (more than 75%) of all TRRs for which an allegation against a police officer has been made. However, the subject_action response for a black community has become more diverse now. Our original visualization in observable.com also contains information about the response to an allegation of a certain group. Our findings show that allegations made by members of a black community are much less likely to result in officer suspension than for the other groups. Effectively, no matter what the initial stance of the

subject, if an allegation is filed by a member of the black community, it is likely no action will be taken. While this is somewhat true for all communities, it is especially visible for the black community. It is also critical to note the difference in the allegation approval conversion rate. For white community the ratio is approximately 0.5%, while for black community the ratio is less than 0.2% that means that allegations of black community members are more than two times less likely to be confirmed.

Figure 2: Create a heat map of TRR incidents per community filtered on demographics.

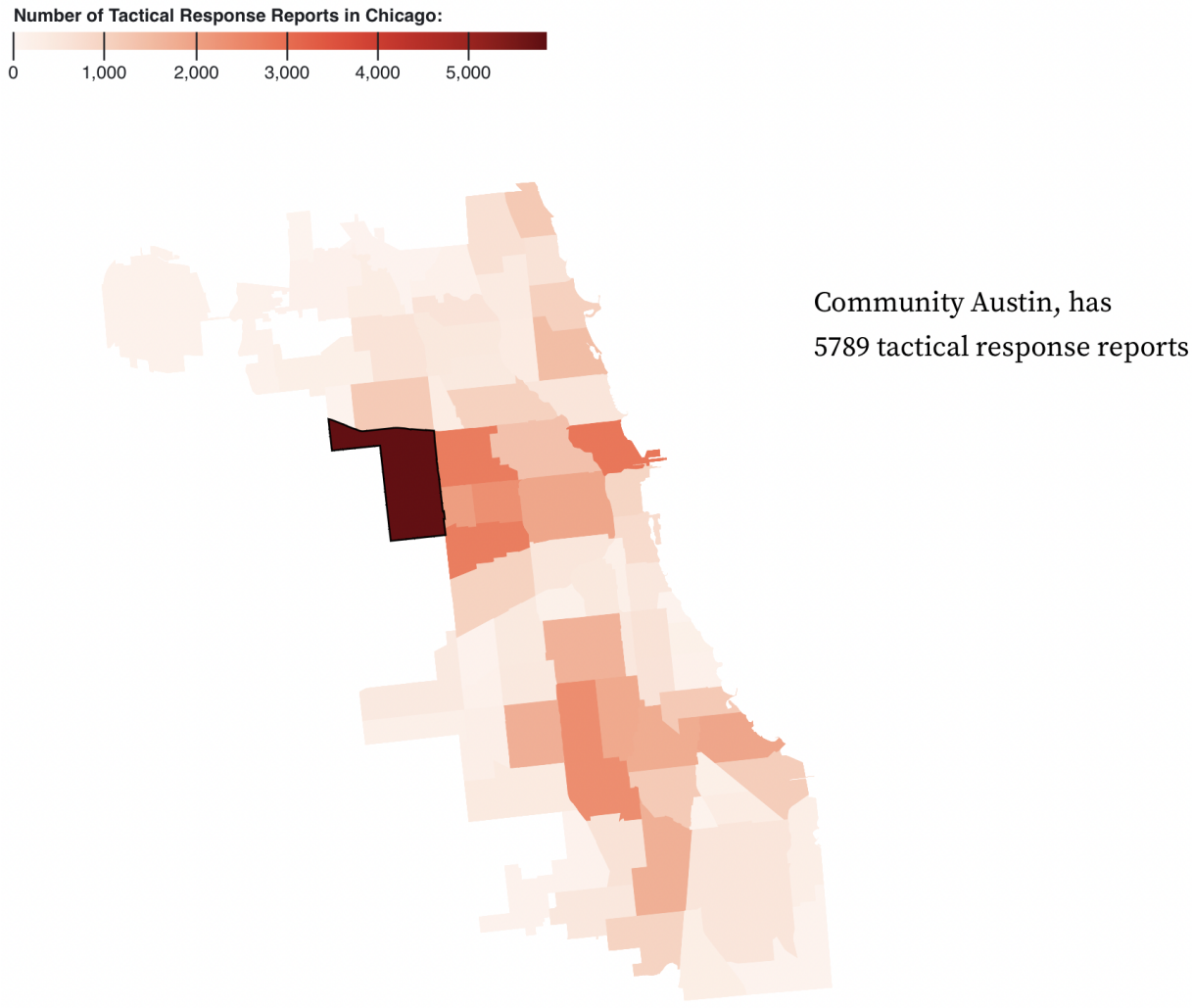

Figure 2A

This interactive heatmap has been generated based on the number of TRRs grouped by race and community. The heatmap changes it's colors based on a frequency of TRRs that occur within a community. As shown on the top left of Figure 2A, the opacity of the red gradient

changes based on how many Tactical Response Reports have been filled within a community for specific subject races. The user is able to hover their mouse over the map in order to get additional information on how many TRRs have been filed for the specific community.

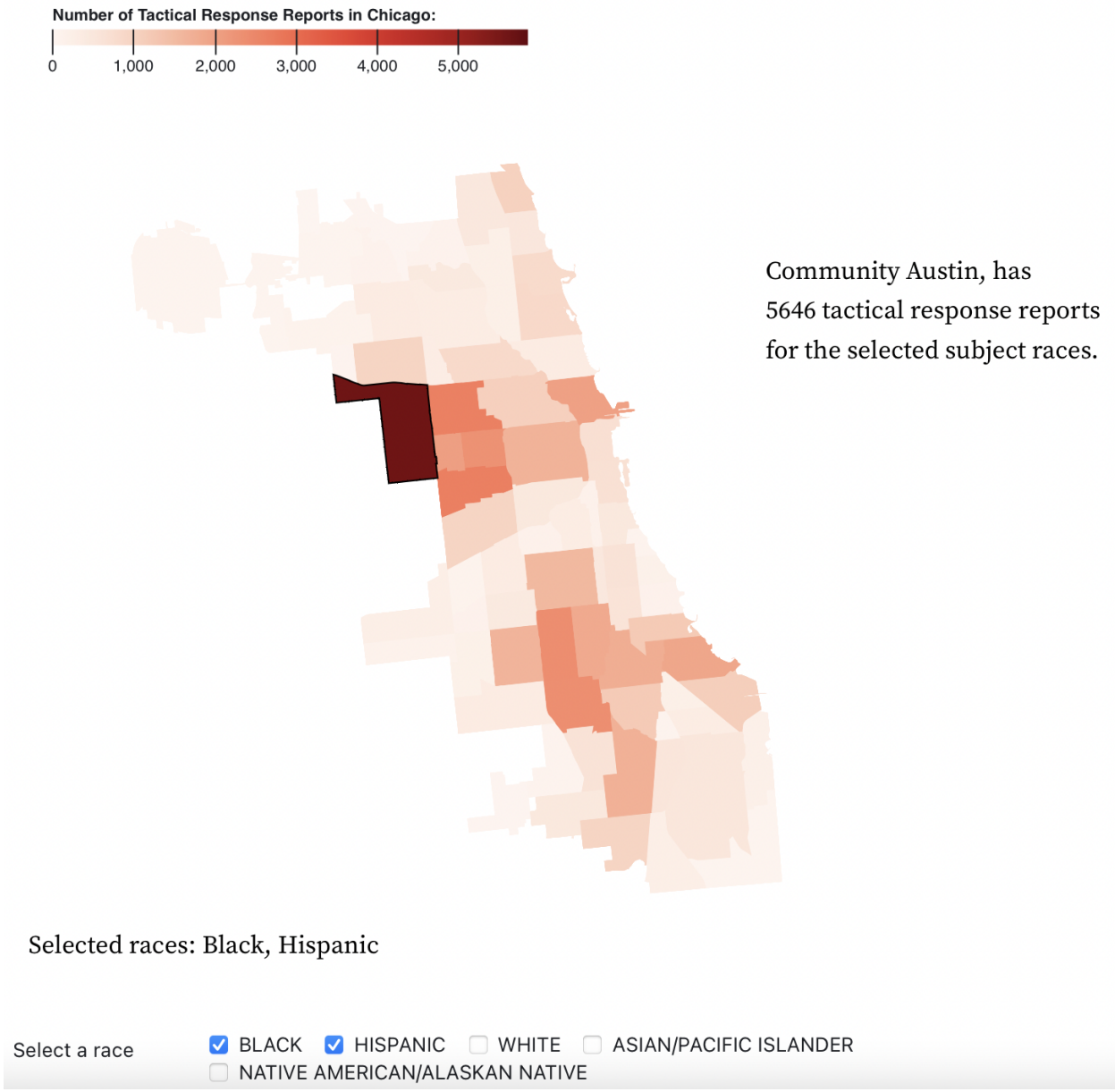

Figure 2B

Additionally, the user has the ability to choose one or more races from the checkbox menu that appears below the heat map as shown on Figure 2B. As a result, the map will dynamically adapt to reflect the options that the user has chosen. From the heatmap we can see that the majority of

TRRs belong to the members of a black community. Moreover, the communities that have the most TRRs, such as Austin, are predominantly black and those communities have the most significant percentage of all TRRs (for example Austin has approximately 10 percent of all trr's in Chicago).

Conclusion:

From the above analysis, we can conclude that the vast majority of trrs belong to the black community. In addition, for members of black communities, police officers are more likely to assign *active resistor* types, while for other groups the values are diverse. Compared to allegations of members of white communities, allegations of members of black communities are significantly less likely to result in officer suspension and much more likely to be ignored. Also, somewhat paradoxically, the ratio of successful allegations (ones that resulted in some form of punishment for the officer) for passive and active resistance are very similar. This would seem to indicate that the subject's actions during a TRR event are less important to having a successful allegation than their race.

From the heatmap, we can conclude that the communities with predominantly black population have the most significant number of trrs. Moreover, in communities with mixed populations, the majority of TRRs still belong to the black community.

All in all, we can clearly see that some form of discrimniation is likely to exist because allegations of white people are more than two times as likely to be sustained as those of black people. In addition, actions of black people are significantly more likely to be labelled as violent.

Experience with D3 & Observable:

Overall, D3 is a fairly easy to use library. Upon starting the project, most of us had relatively little experience with Javascript. It did not take too long to figure out how to use D3 to generate relatively simple outputs. However, with the time constraints imposed upon us, we had to rely heavily on snippets of code written by other developers in order to create the graphs. These code fragments typically required the data to be formatted in a very specific way or they would throw errors. Basically, we would say that roughly 90% of the time spent on this project was figuring out how to format the data. This seems too high and deviates from the purpose of the project. Observable is rather painful to use. Each line of code has to be contained within its own block and variable declaration changes when you use Observable format and javascript's format. Also, Observable gives essentially useless error messages sometimes not even revealing where an error is being triggered. Furthermore, upon completing the graphs, we discovered that

one can not use database queries on a public database. While obviously there are security concerns with being able to do this, Observable only tells you this after you publish your notebook. Also, it shouldn't be too hard to implement a system that automatically stores the data in a notebook as a csv and blocks other users from running queries. All-in-all, while it would have been harder to write in pure javascript on a template webpage, Observable is a poor second choice.