Coursera Capstone Report

A Better way to Bicycle

Introduction/Business Problem

City roads in America today are not just for cars and buses but many other forms of transportation including bicycles, scooters, and skateboards, just to name a few. The many modes of transportation were not in the original plans when city engineers laid out the street plans. Narrow streets, limited parking, and inability to widen the roads all play a factor into the current traffic system, however in recent years more and more cities have been adding bike lanes. These lanes have come at the expense of lane width, parking lane removal, or total street layout redesign. These are all problematic when you look at accidents that involved a bicycle as riders continue to be at risk.

According to data from the Seattle Department of Transportation bikes accounted for 5,524 of the 194,673 accidents between 2004 and today or 2.84%. However those same bike accidents accounted for 4805 or 8.25% of all accidents that resulted in a serious injury. According to the "2019 FREE-FLOATING BIKE SHARE EVALUATION REPORT", a report released by the SDOT on the operation of the city's bike share program ridership increased in 2019 by 4% to 2.2 million rides total, not accounted for are the riders who use their own bikes on the road in addition.

Rider behavior however is a factor that is rarely accounted for when creating new patterns and laws. While exploring traffic accident data from the city of Seattle we will analyze if possible to instead of having city engineers continue redesigning city streets that city officials should instead be working with police departments and local riders to change rider habits. Safer roads for bicycles and individual modes of transpiration will translate into safer roads for all even if it means not changing the roads.

Data

The data being used comes from Seattle Police Department (SPD) and recorded traffic records. It includes all collisions from the year 2004 to present, and is updated on a weekly basis. For this report we will be focusing mostly on accidents that have at least one bicycle indicated in the column "PEDCYLCOUNT." "SERVITYCODE.1" will be used to show the type of injury that came from the accident, 0-none, 1-Property Damage, 2-Injury. "ADDRTYPE," which shows where in the road did the accident occurred "Block," "Alley," or "Intersection." "ROADCOND" describes the road as either "Wet" or "Dry" and is used to show whether traction or stopping distance could've played a roll in the accident. "ST_COLCODE" will be used to show the type of collision that occurred which will provide insight into how the accident occurred Here is a link to the data and link to the metadata for the report.

Methodology section

The data was analyzed for patterns using various different factors to determine if there were more accidents occurring under specific circumstances. The first factors looked at included 'ROADCOND', and 'ADDRTYPE' of accident to determine where most accidents occurred and if the road could have played a factor. The 5 factors of the two categories were then combined as patterns emerged. Through analysis it was found that 79.74% of accidents occurred on dry roads, meaning the road would have played a limiting factor. Accidents at intersections and mid-block made up 99.15% of all accidents with intersections leading the way at 56.9% or a total of 3,126 bike accidents. When combined the total number of accidents at an intersection on dry roads was 2,479 or 44.85% of all bike accidents and 78.8% of all intersection accidents. Those accidents resulted in 2,220 serious injury accidents, which is 46.2% of all bike accidents that resulted in a serious injury.

Once it was determined where and under what conditions the accidents were happening, the type of accident was then evaluated. There were 85 collision codes provided in the data set, each having its own unique description. Based on the description one could potentially derive who was at fault, motorist or bicyclist, however that determination is not being used in this study as overall safety for all is being based on the total number of bike accidents regardless of who was at fault. Of the top 5 accident types at intersections three types combined for a total of 2,276 accidents or 72.35% of the total number of intersection accidents. The three accident types and their description are below.

CODE	**Description**
18	MOTOR VEHICLE STRUCK PEDALCYCLIST, FRONT END AT ANGLE
51	PEDALCYCLIST STRUCK MOTOR VEHICLE FRONT END AT ANGLE
11	MOTOR VEHICLE STRUCK MOTOR VEHICLE, FRONT END AT ANGLE

Since all involved impacts were “FRONT END AT ANGLE” these accidents were grouped into singular category for analysis. This is due to front end impacts occur when someone travels outside the lane or maneuvers dangerously. These three accident types contained 2,041 or 42.5% of all bike accidents with a serious injury.

The final sample pool was for accidents that occurred with at least one Pedal Cyclist, was on a dry road, at an intersection, and with a “Front End at an Angle” impact. This sample pool was picked for final analysis because of its size in number of samples. A pool too little would have minimal impact on the overall accidents.

The last step was to generate a heat map to display where this type of the accident is occurring in Seattle. This heat map can be used to determine problem areas and intersection. The picked problem areas can then be studied to determine if riders in these places are obeying traffic patterns and if something can be done to lower the number of accidents involving a bicycle without having to redesign the streets.

Results

Utilizing the heat map that was generated from the selected pool of accidents a few different areas can be seen to have a large portion of bike accidents. These areas include the downtown area in and around Pike Place Market extending back to 14^{th} street, the western blocks surrounding the University of Washington, Green Lake, Leary Way between Ballard Bridge and 3rd Street, and the northern corridor that is Phiney Ave and Green Ave. Each map can be found in the Appendix section of the report.

The color scale of each map shows blue for one accident and moves to red as the number for each area increases. Depending on how far one zooms out or in the data can become meaningless, as the area is either too large or too small to derive any results from. The annalist kept a general neighborhood area that was not too large but high accident areas could be seen, and not too small so that the flow of the bikers through neighborhoods can be considered instead of just one intersection.

Discussion

The data shows that bikers are disproportionately affected by accidents as the rate of serious injury from an accident occurs more frequently for bikers. Whether motorist or bikers not following the rules of the road bring this on was left out of this study. However one can still determine that areas of Seattle need to offer better protection for bicyclist in high traffic areas. As we mentioned at the start of this report the goal is to not redesign the streets to accommodate additional bike lanes.

We can do this through the results of the heat map and seeing the high accident areas and trying to determine what can be causing so many accidents at these intersections. The downtown area is a prime example as almost every corner over the last 15.5 years has had an accident. The downtown of Seattle has the bulk of traffic as many different forms of public transit, in addition to more dense amounts of cars, bicyclist, and pedestrians all convene together in this area. Limiting bikes in this area to certain streets or thoroughfares could reduce the number of accidents. A key place to do this would be on the tram lanes that run in this section of the city and having the bikers share it with them.

There are two additional studies that should be conducted as highlighted by the results. Sections of the cities with a high density of intersection accidents should have key intersections from this study monitored to determine if the intersection is to blame for accidents. An analysis of the bike lanes in these areas should have their usage studied as well. Bike lanes can only help when they are used and often city engineers put bike lanes out of the way but that causes bicyclist to ignore them and ride the roads without lanes, as they are faster.

Lastly a campaign can be run by the city to get bicyclist to slow down, and ideally stop at all intersections. This campaign can incorporate advertisements and enforcement enhancement for bad behavior at intersections. The advertisements should be run along bike corridors.

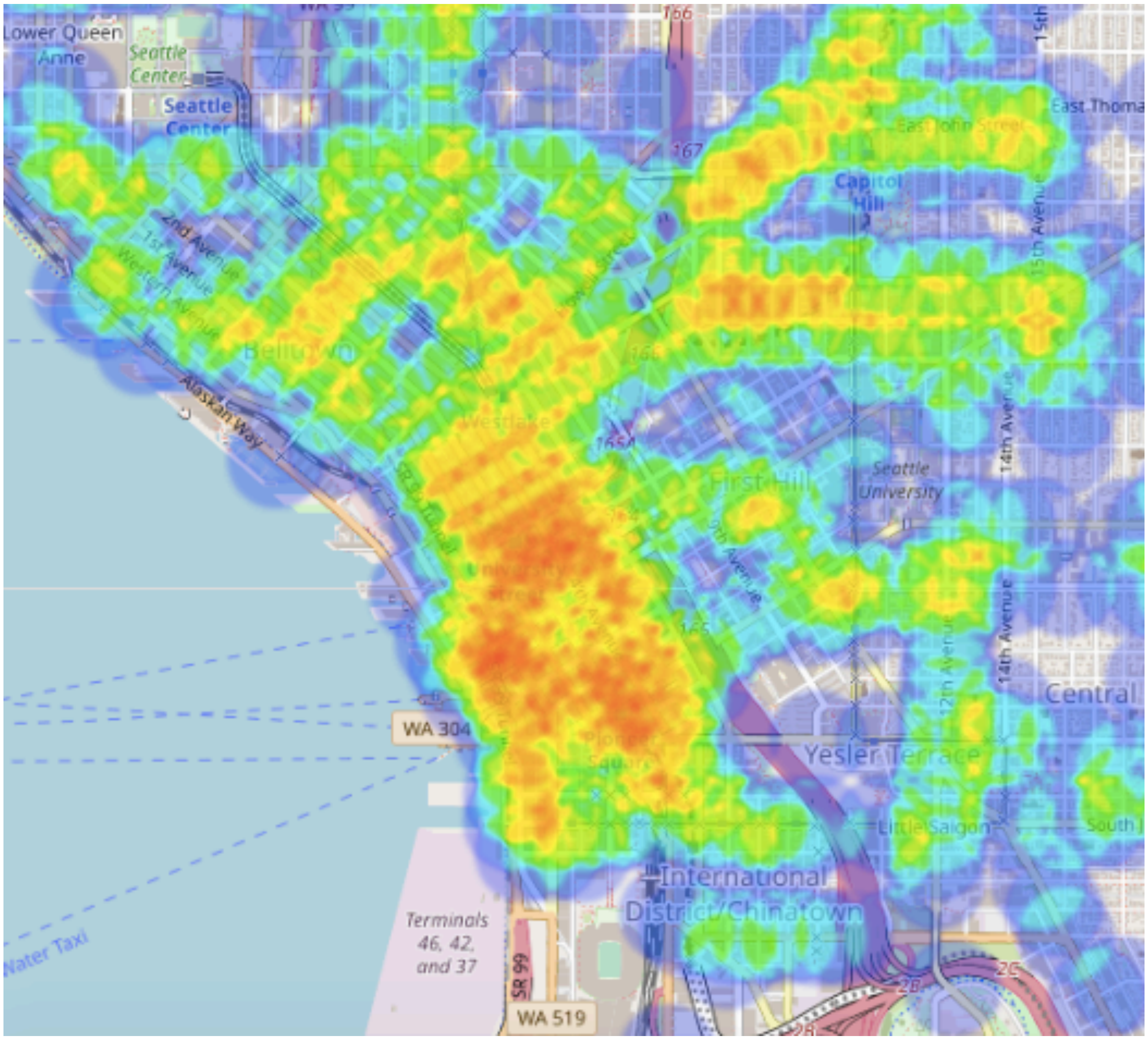
Conclusion

While it is difficult to pinpoint just one culprit for this many accidents a step in the right direction would be to start looking at if the intersection layout can be responsible for the number. A campaign to create better bicyclist behavior at intersections may help in the short term to lower the rate of accidents. It is the bicyclist who is going to be hurt by not doing anything.

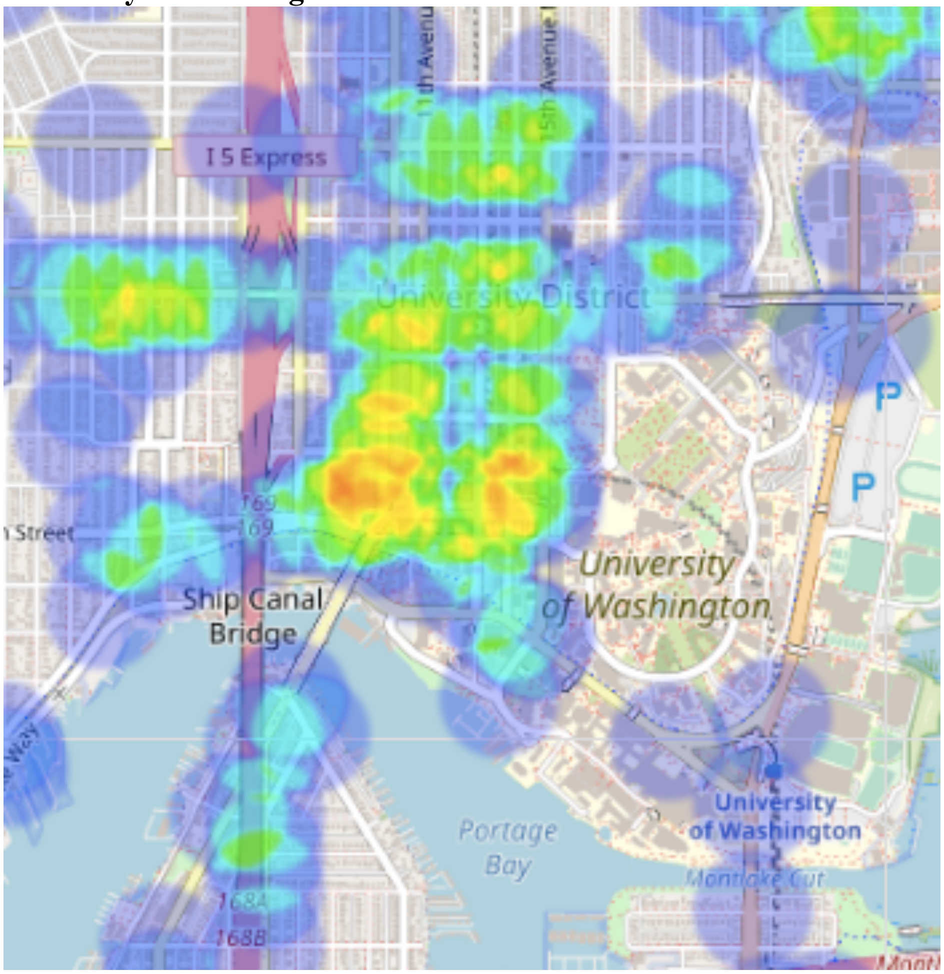
Sources

SDOT Project Team. "2019 FREE-FLOATING BIKE SHARE EVALUATION REPORT." *Seattle.Gov*, Seattle Department of Transportation, Apr. 2020, www.seattle.gov/Documents/Departments/SDOT/BikeProgram/2019_FreeFloat_BikeSharePermit_Evaluation.pdf.

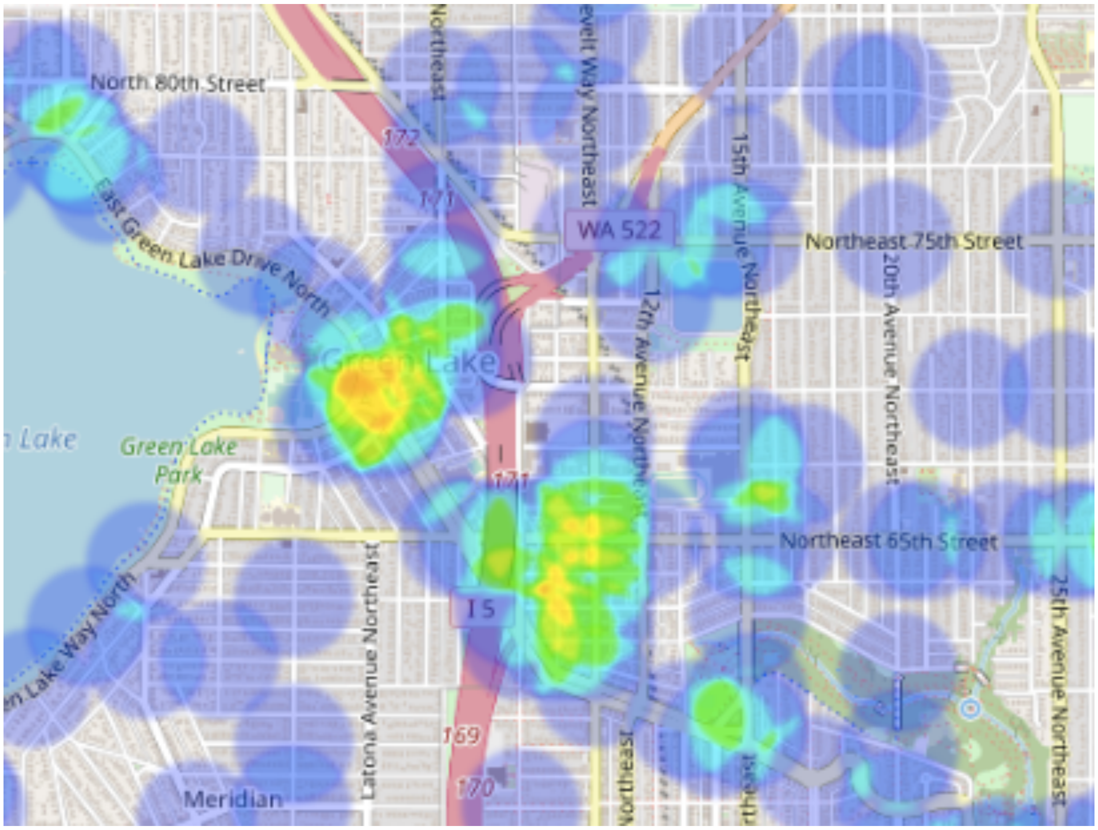
SDOT "Collision-All Years."
SDOT Traffic Management Division, Traffic Records Group
https://s3.us.cloudobjectstorage.appdomain.cloud/cfcoursesdata/CognitiveClass/DP0701EN/version-2/Metadata.pdf

Appendix
Downtown 1.1


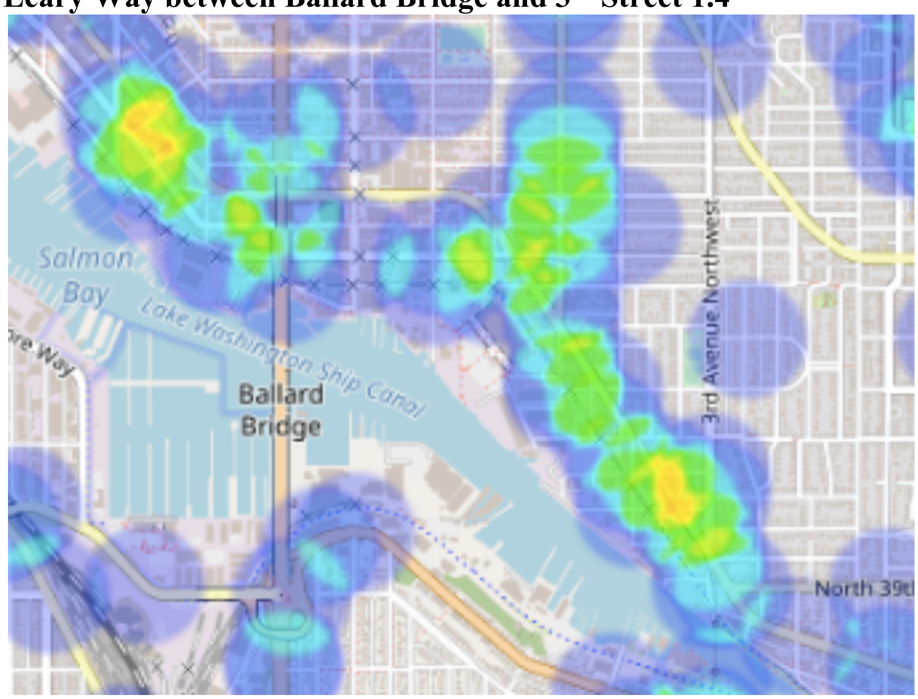
University of Washington 1.2



Green Lake 1.3



Leary Way between Ballard Bridge and 3rd Street 1.4



Phiney Ave and Green Ave northern Corridor 1.5