

Capstone Project

Project Proposal

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Phenomenon I Wish to Explore:

Since there have been cars, there have also been car crashes. According to the [CDC](#), about 38,000 people are killed from injuries sustained from car wrecks per year in the United States of America. In 2018, these fatal crashes resulted in the loss of \$55 billion.¹ The goal of this paper is to not only try to reduce the number of fatal crashes, but car crashes as a whole.

For the sake of this paper I will keep the scope limited to just Kansas City, Missouri. I have two main reasons for doing so. First, the sheer amount of data on car crashes is extremely large. For example, in Kansas City alone there have been 1068 crashes involving 1973 people since a year ago today.² There are about 500,000 people that live in Kansas City, Missouri. Now imagine if we expanded our scope to the entire country. That's 330 million people and there are about 6 million car crashes per year.³ There must be millions of unique streets in the United States as well. Furthermore, we would want to have data for at least 10 years to see what streets have the most wrecks occurring on them. This would require copious amounts of data. Instead, I believe that limiting the scope and focusing on what we can do with a smaller data set is the best approach. It is always possible to expand the scope afterwards.

My second reason is strictly personal. I grew up in Kansas City. I currently live in Kansas City. I have a certain feel about the streets. This may allow me to make insights that I would not be able to do if I started with a larger scope.

My Objective:

We know that auto-insurance companies have mitigated loss from car crashes by increasing the monthly payment for select groups. The three groups that come to mind are 18-25 year olds, men, and people that drive sports cars. We also know how governments try to reduce the amount of car wrecks. Their main concern is keeping roads in the best of conditions (even though they seem to be in usually

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<https://www.cdc.gov/transportationsafety/statecosts/index.html#:~:text=About%2038%2C000%20people%20are%20killed,year%20in%20the%20United%20States.&text=Traffic%20crash%20deaths%20resulted%20in,families%20and%20friends%20in%202018>.

² <https://www.mshp.dps.missouri.gov/HP68/SearchAction?searchTroop=A>

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<https://www.ddlawtampa.com/resources/car-accident-statistics-you-need-to-know-in-2021/#:~:text=Total%20Number%20of%20Car%20Accidents%20per%20Year%20in%20the%20U.S.&text=On%20average%2C%20there%20are%20over,losing%20their%20lives%20each%20year>.

rough conditions, especially here in Kansas City). They also try to add lanes, and widen lanes to streets that have become busier in recent years. My objective is to find a new way to reduce the amount of car crashes.

My Plan to Reach my Objective:

My plan is to essentially make cars travel in a “safest way” possible. What I mean by this is I want to create a graph. Each node of the graph will be a street. Each edge will carry a weight. The weight will carry the probability of a car wreck happening on that street. Then when a car goes from point A to point B it is not concerned about the quickest way possible (Dijkstra), but it will be instead worried about keeping the lowest probability of a car crash. Then using this I would like to run simulations. Ultimately, I would like to add a time travelled component, but realistically it might be better to add a nodes passed component. I would like to be able to change the amount of additional time (or nodes passed) that a driver will be willing to do and for each change I would calculate and answer the following research questions.

Research Questions:

1. How many wrecks have been reduced?
2. How much money have drivers saved?
3. How much money would insurance companies save?
4. **How much additional time (or nodes passed) is needed to create a large impact?**

* Obviously, question 4 would be answered at the end after all the simulations have been run.

Data Sources:

- 1) <https://www.mshp.dps.missouri.gov/TR15Map/Search>
 - a) This is the Missouri State Highway Patrol database on crashes. I will collect the data from today's date to 10 years prior. Each crash(observation) has the following: a report number, the day of the week, the date, the time, the amount vehicles involved, agency, troop, county, city, type, severity, the street it occurred, the cross street, light conditioned, amount injured, amount killed.
- 2) https://geographic.org/streetview/usa/mo/kansas_city.html
 - a) This is a list of all of the streets in Kansas City, Missouri. Using this I would like to come up with a list of cross streets for each street. I will also need to include highways.
- 3) <https://injuryfacts.nsc.org/all-injuries/costs/guide-to-calculating-costs/data-details/>
 - a) This is the average cost of certain crash results. I would like to use this information and just create an average cost per crash.

- 4) <https://www.nerdwallet.com/article/insurance/how-much-is-car-insurance#:~:text=The%20national%20average%20cost%20of,of%20about%20%24136%20per%20month.>
 - a) This is the average car insurance prices per state based on the type of coverage. Again, I would like to just make an average cost for the state of Missouri regardless of coverage type.
- 5) <https://worldpopulationreview.com/us-cities/kansas-city-mo-population>
 - a) This is Kansas City, Missouri's population. With this number I can calculate how many drivers there are in Kansas City, how much money car insurance companies get per year.

Prior Research:

- 1) <https://www.makeuseof.com/google-maps-safe-routes/>
 - a) Google maps offers a safest route option now. Their version includes current weather conditions, road conditions, and various other things.
- 2) <https://dl.acm.org/doi/abs/10.1145/2567948.2577023>
 - a) These researchers have created a "safer" route option based on sentiment analysis of real-time, location based tweets. It honestly doesn't sound the safest because it's banking on people tweeting while driving, but it is interesting.

This is the previous research I could find that specifically dealt with people drivers. There is a lot of research about self driving cars and reducing the chance of them being in collisions.