### Problem Description

With more than 120,000 gas stations all across the country, with some stations just opposite the street of each other at some intersections, Americans have vast options and choices when it comes to refueling their vehicles. Despite taking over nearly every single other form of commerce in the 21st century, gas prices (a significant monthly expense for the average citizen) have not been significantly rattled by the internet. Consumers do not choose to look up gas prices, and many do not even shop around. If they do choose to even do so, it only occurs when the price at their local pump is much higher than usual. And search is not systematic or coordinated. Most only look at the nearest 2-3 pumps before selecting the best one. There are platforms like *GasBuddy* where, by crowdsourcing, users can figure out the price of gas beforehand, thereby making the most cost-effective decision. However, the lowest figure in dollar amounts may not necessarily be the *best*option. If one is to consider a myriad of factors like traffic times, fuel and time needed to actually get there, time of day, day of week, etc., then the answer does not remain as straightforward as previously perceived. I strongly believe that upon taking into account all these various factors one can be identify a *singular* best gas station to recommend to users. The goal of this research is to example all these factors and come up with a model to use said factors, assign weights to each and then simplify the decision that users need to make. The long-term goal of this project is to develop a working digital platform that, upon taking user’s location and other related information, can recommend the best gas station for that particular user. This project account for gaps in knowledge, such as missing or incomplete data, and will automatically tweak predictions accordingly. It will also implement features for electric and autonomous vehicle drivers, as those types of vehicles come with many benefits, and along with all those benefits, there come new complexities that must be addressed.

### Related Work

Apart from the actual physical parameters that go into making an informed decision – such as distance to nearest gas station, opportunity cost of traveling to said station, time taken to drive and in traffic and probability of risk (that the price is not as advertised), there is also human psychology to consider. Commonly considered physical conditions are whether the vehicle is ICE/EV, the time of day, the distance from known fueling stations, the price difference between fueling stations, the brand of fueling station (whether the customer is part of a royalty program at certain brands) and pure convenience (pump gas at a close station at more cost). In the future one may also consider if the vehicle contains autonomous capabilities, and if they want to take “eco” routes. For EVs, home charging also has to be taken into account. Finally, existing fuel – urgency of refueling can also be taken into consideration.

As for human psychology, there are many studies that indicate that human behavior is rather strange and difficult to predict. Humans are stringently loss-aversive, choosing only to look for better prices when prices overall are higher than they expect. Conversely, they might also not choose to take risks if they notice the first few pumps are priced much higher, which actually provides the highest probability of finding a lower price. This results in an asymmetric, risk aversive search, which doesn’t guarantee the best outcome each time. Humans also don’t take into active account the search costs when it comes to fuel. Time and fuel investments are often overlooked. Despite being rational creatures, most fuel shoppers consider luck, reassuring themselves that it is just bad luck that all the stations are overpriced, which might not necessarily be the case. If a customer sees a higher cost often, he/she might learn to accept that higher cost, despite not knowing if that is a universal trend. There are other observations about human psychology that makes human search for better fuel costs inefficient and not optimal, but these are the select most important.

### References

(in the other document)