The project that I propose is the optimization the highway portion of my drive to and from campus with the following objectives:

1. Minimize fuel consumption.
2. Average a pre-defined minimum speed.
3. Maintain speed between the speed limit - 5 mph and the speed limit + 10 mph.

**To complete this project I will use the following process:**

1. Gather elevation data about the drive using either online resources or a garmin gps unit.
2. Create a model that can estimate the force necessary at any point to maintain the current velocity based on friction, acceleration, and the grade of the road. Lower forces should in theory correspond to lower fuel consumption.
3. I will have constraint functions for the speeds.
4. The simulation will use a rolling average to allow for an average speed constraint.
5. I will optimize for minimum force at each point.
6. Once the ideal model is complete I will simulate real road conditions, such as traffic and variable wind, to allow the model to compensate optimally.
7. If possible to do so safely I will try to replicate the optimal driving pattern recommended by the model to validate the results in the real world.

**Scholarly article summaries.**

Full discloser, I skimmed them, I did not read them in depth as I did not want to waste time on articles that may not be completely relevant.

1. <https://web.mit.edu/sloan-auto-lab/research/beforeh2/files/IreneBerry_Thesis_February2010.pdf>

There is a gap between what manufactures claim as fuel efficiency from testing, and what drivers experience. This study examens what the root cause of this is.

1. <https://www.osti.gov/servlets/purl/1010863>

Accelerating slowly and driving at 40 mph improve fuel economy significantly. This is due to the fact that accelerations require more force and velocities under 40 mph generally are not significantly inhibited by aerodynamic drag.

1. <https://zenodo.org/record/1274692/files/article.pdf>

This article gets into how vehicle mass properties effect fuel economy.