Capstone Assessment

Ayush Verma

For my senior design project I will be working with a longtime friend on a project that I don't have too much of an academic background on coming into it. Our project is to create an app that can be installed in most current automotive vehicles, with a primary focus on Honda's newer models. The app will give drivers control over what kind of data is being sent out by the vehicle back to the dealership to provide increased insight and privacy on what exactly their car does. One inspiration for this project came from an incident relating to Toyota where they managed to deny the warranty on a car by citing that it had once went over 85 MPH while being used, which is data they only had access to because of the car constantly sending it back to them. From my own academic perspective, despite the lack of experience with automotive vehicles I can still be invested in this project as we're looking to improve the user experience of one of the most widely used machines in the world. One of my main passions and reasons for getting into computer science was to leverage computers to solve difficult problems and improve a person's quality of life, and improving the automotive experience will be a valuable problem to solve.

Throughout my college curriculum I've had the opportunity to take various courses that I can now apply to the development of this project. Foremost among them is CS 4065, Computer Networks, taught by Professor Giovani Abuaitah who we also decided to work with as our advisor for this project due to how relevant the course is to our project. Wireshark is one application we're planning to heavily use while working on our project so that we can start viewing and parsing the network traffic that comes from a car. All the labs that I completed in Computer Networks revolved around using Wireshark to investigate different protocols and packets, and I can now again use this application on my own senior design project. Another class that will play a role in our project is EECE 4029 Operating Systems since we will be directly working with the OS of a vehicle. While brainstorming different avenues that we can take to complete our project, having intimate knowledge of the kernel in an operating system will be very beneficial in understanding what options are available to us.

When it comes to my co-op experiences, very few of them have direct technical relevance to my current senior design project. Most of my rotations have been spent at 84.51 as a software engineering co-op or intern where I worked on a full-stack web application with a backend in Java Spring Boot. The other project I worked on as an intern at 84.51 was a pure back-end application in Python where I refactored an old project to make it much more modular and reusable across the company. There are still plenty of non-technical lessons I can take away from my work that can be applied to the project, such as the project management skills I gained on the intern project I completed. I was largely left to my own devices on how I wanted to implement it so I had to come up with my own process to implement and complete parts of the project while making sure it still came together cohesively. I can take apart a system into the different parts that will need to be made and understand the best way to implement each part so that there won't be problems down the line when putting it all back together or when trying to make improvements.

One of my biggest motivations when tackling this project is from all the new technology that I get to learn and use as we develop it. I've never made a mobile application from start to finish before, much less working on an app for an automotive vehicle. I'm still confident that I'll be able to learn and deliver a valuable product at the end as I've shown throughout my professional career that I am an extremely adaptable and quick learner so that new technologies won't be much of a roadblock for me. One preliminary approach we've already thought of is to first design an app that we install on Android phones that will block any network traffic it attempts to send to a specific service we choose, such as Twitter. If

we get this working then that would be enough proof that our project can be implemented and adapting it to then work in the operating system of a Honda vehicle won't be too much of an extra stretch. My teammate also has extensive experience working with Honda vehicles and can help collect additional information regarding the car itself so that we can understand what will and won't be possible in terms of potential implementations.

Our expectation is that we have a fully working app that someone can immediately install onto a Honda vehicle to view various pieces of data getting sent back to the dealership with options to enable and disable sending those specific parts. It would end up being fairly easy to use with a clear and simple UI since it would be displayed on an infotainment system inside a car. Accomplishing this project would mean giving drivers increased insight into what their car is doing and increasing the security of it if they choose to not send out this data, as attackers could also try to utilize vulnerabilities to get after this network traffic. When evaluating my own contributions, it will largely be a shared effort between myself and my teammate as we bounce ideas off each other and set aside time to work on it together throughout the semester. If we can successfully install the app in a car and then view the pertaining network traffic as it runs to see that the corresponding packets containing data that the user has disabled from sending don't show up in an application like Wireshark, then we know that the project is a success. Our main metrics for ensuring we do a good job is in making the application as easy to use as possible for a user so that it can evolve into an actual product and not just a proof of concept.