

Thesis Portfolio

Optimization of VDOT Safety Service Patrols to Improve VDOT Response to Incidents
(Technical Report)

American Policymaker Safety, Privacy, and Security Preparations for Autonomous Vehicles
(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

In this portfolio, a capstone project based on traffic safety and a research paper based on autonomous vehicle policy will be explored. The main theme of traffic safety is explored through the Capstone project involving the reorganization of the Virginia Department of Transportation's Safety Service Patrol program and the research paper pertaining to the structure of policy for fully autonomous vehicles on public roadways. Traffic safety is addressed in the VDOT project by the program's goal to target areas in Virginia with high traffic densities and risks of collision in order to route patrol vehicles to the scene to reduce time stranded on roadways and facilitate first-responder arrival. The research paper exhibits traffic safety concerns with its differentiation between federal and state legislation on fully autonomous vehicles and maintaining the balance between public safety and technological innovation. The motivation behind the technical report rests in the interests of VDOT to reduce the amount of traffic congestion on interstates that is caused due to stranded vehicles and reduce the number of drivers in distress on public road systems. Similarly, the topic of the research paper was determined based on exploring the potential of autonomous vehicles causing roadway congestion and putting drivers in at-risk situations.

The creation of a genetic algorithm to restructure VDOT's Safety Service Patrol program is the topic of the Capstone Project. This project takes current roadway data with regards to traffic density, vehicle incidents, and different severity of incidents and outputs an optimized route schedule to service forecasted incidents. The motivation behind creating an algorithm is largely based on a utilitarian perspective of attempting to do the most good with the current resources VDOT has to utilize. From a social construction of technology perspective, the routes being proposed will best serve public interests and are shaped by the needs of society. Using an

algorithm, the data collected from this year's traffic data can be reinput into the project and designate updated patrol routes for years to come; demonstrating how society drives the shape of the patrol route schedules.

The STS research paper addresses the risks posed by autonomous vehicles from the perspective of risk society, meaning the organization of autonomous vehicle policy will be centered around the perceived risks that are present. With regards to the incorporation of fully Autonomous Vehicles into nonautonomous roadways, American Policymakers are making regulations to take precautions with regards to constituent concerns, but are they accurately mitigating potential risks to public roadway systems? The research question addressed is: How are American Policymakers preparing for a future of autonomous vehicles with regards to protecting driver safety, privacy, and security? The analytical process of historical case study highlights the fatal shortcomings of American policy—evaluated on the perspective of risk analysis and the societal construction of technology. Similarly, documentary research analysis provides context to the rate Autonomous Systems are progressing, and the necessity of American Policymakers to understand the technology and how quickly it is implemented onto public transit. The expectation of evaluating the current Autonomous Vehicle policy and how American Policymakers mitigate safety on Nonautonomous Roadways is to examine the viability of a safe transit system, as well as propose how soon fully Autonomous Vehicles may be viewed as a top priority to American Policymakers. The release of Autonomous Vehicles for experimentation prompted American Policymakers to set regulations on testing, but this study will focus deeper on how developing societal concerns influence the expediency of their policymakers to adapt policy and mitigate safety concerns on modern roadways.

Working on the research paper and the Capstone Project simultaneously provides context to a potential further experiment to the technical project. The information collected on what limitations are being put on autonomous vehicles, or a lack of regulations may pose a contributing factor to the number of incidents that occur on Virginia roadways and influence the data that serves as an input to the algorithm. Adding a new layer of complexity to the algorithm, perhaps addressing the predicted number of autonomous vehicles on areas of roadways and assigning a higher/lower probability of incident based on prior records will influence where the program places patrol routes. Exploring the departments dedicated to roadway safety and the policy that is in place in our current system provided background information to how the Safety Service Patrol program was shaped and operates logistically. The two avenues of research, Capstone-based and STS-related, combines the optimization of a system with a deeper motivation behind the intent of the program and how it will further public safety and serve public interests.