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Autonomous Vehicles: Society's Most Anxiety Inducing Potential Life Saver

A Thesis Prospectus
In STS 4500
Presented to
The Faculty of the
School of Engineering and Applied Science
University of Virginia
In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Electrical Engineering

By
Raymond Costa

May 9, 2023

Raymond Costa
Lillian Price

On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

ADVISORS

Kathryn A. Neeley, Department of Engineering and Society

Harry Powell, Department of Electrical Engineering

Impact of AI and Autonomous Vehicles on Transportation in the 21st Century

Overview:

In my research, I will uncover the answers to two questions regarding the use of AI in the development process of autonomous electric vehicles. The first question is if these vehicles would be safer and more environmentally friendly than our current methods of transportation, and the second question is if a majority of members of society are open to using these vehicles and would trust in their capabilities. My methodology in doing so will be three-fold. First I will perform an extensive literary analysis regarding the effects and impacts of this technology's safety and environmental impact. Secondly, I will survey and interview a variety of individuals of varying backgrounds regarding their current views on autonomous transportation and their methods of transportation. Lastly, I will perform a socio-technical systems analysis of the way that our current transportation methods interact with society and how this would change if autonomous EVs were to be implemented. My technical research project was developing an interactive word game in which an embedded system and a human interact. This game would help develop and gauge the level of comfort humans that interacted with an autonomous embedded system would have in a low-stakes setting. I hope that my research helps teach readers about the capabilities and benefits of a rather murky and controversial subject such as AI because it is much easier to fear that which we don't understand.

Positionality:

Engineers have shaped the world's civilizations and societies for thousands of years. The combination of engineers' innovations and the way we as a society choose to apply them have been as big a driver in bringing the world to where it sits today as any. My desire to become an engineer was largely driven by my understanding of the responsibility and importance of engineering due to my background. I grew up in Long Island, New York, and was fortunate

enough to be raised in a school district that's curriculum was ahead in terms of exposing its students to computers, robotics, and the power of technology and engineering in general at a young age. Once I reached the junior/senior high school introductory coding courses and robotics clubs, I already had a basic understanding of what programming and software development was and that it would be influential in driving the direction of our society for years to come. Entering the junior/senior high school of my district I also began to learn more about world history through various courses and the impact technological developments have had both positive and negative. When you learn about the Roman empire and the incredible achievements they attained to help make people's lives better and contrast that with the advent of the atomic bomb in the mid-20th century to wipe cities off the map you begin to understand that the implementation of new technology is as important as the inventions themselves.

Problematization:

The problems my research will be addressing are two-fold as it will first be providing insight into a potential solution to both the enormous amount of emissions being produced by personal transportation methods use of fossil fuels and deaths caused by human-operated car accidents. The flip side of this is addressing the controversy surrounding the solution that is AI and autonomous vehicles and trying to understand people's worries, fears, and current trust level of this technology. For this solution to be of use, society significantly needs to be willing to adapt, or at least become more open to, the use of autonomous electric vehicles. This change needs to occur at multiple levels from the individual consumer to government policy and legislative change to implement their use on a larger scale.

Guiding Question or Main Argument:

From my research, I would like to ascertain whether or not autonomous electrical vehicles will have an overall positive impact on society as a whole as an alternative to our current modes of personal transportation, and if people are currently trustworthy of this technology and what their concerns are.

Projected Outcomes:

My research aims to address the problem that is global warming and transit casualties by providing information about the new technology that is AI and autonomous vehicles so that those that do not trust or understand this technology can have a better understanding of its capabilities and benefits. I anticipate that my research will show that many are either afraid of or do not understand AI and its use in autonomous vehicles, and then lay out its positives and negatives clearly so that members of our society who are not experts in these fields can make informed decisions regarding this technologies use in their daily lives and its impact on them.

Technical Project Description:

My technical project was developing a word game in which a human can input a word and a computer gets an allotted amount of attempts to guess the word, and vice versa. In creating this game I had to understand and develop an embedded computer program that could run on its own and make its own decisions during gameplay. The actual game and computer algorithms were driven by an electrically powered microcontroller that used an electrical communication interface called SPI(serial peripheral interface) to receive, process, and display on a screen the words being guessed and whether or not they were correct. This microcontroller allowed for input to be received, output, and retrieved from memory simultaneously, similar to the way a human brain would but at much faster speeds. In building this game I came to understand the infinitely quicker and more accurate processing power of a computer than myself. The computer was able to guess my word much quicker and more accurately than I could, consistently. This

project provided a deeper understanding of embedded systems and our interactions with them, as well as increased my comfort in doing so. With my research paper, I hope to provide a similar layer of understanding of this technology on a larger scale so that others may feel more comfortable using it the way I did after playing my game, and understand that it operates very similarly to the way we do, just without distraction and at a higher speed.

Preliminary Literature Review & Findings:

During my preliminary literature review, I found that a number of my hypotheses regarding the benefits of autonomous electric vehicles were found to be true by prior researchers, and several STS researchers outline key factors that need to be taken into consideration. A researcher by the name of Haneen Khreis who holds a Ph.D. in transportation and health from CAL Berkeley lays out the benefits that autonomous vehicles would have on society, including a decrease in traffic fatalities and air pollution (Khreis, 2020). However, he also noted a few downsides including increased sedentary behavior and traffic congestion. Where I hope to build on this research from an STS perspective by collecting several ways that the technology has an impact on both users and non-users and making sure that the positives outweigh the negatives. One such example I found in my prior research written by Janet Fleetwood emphasizes the consideration of individual autonomy vs public health as a whole and ensuring that public safety is at the forefront of autonomous vehicle development and legislation(Fleetwood, 2017). Another example is a research paper by Kamruzzaman Faisal Asif M.D which highlights the gaps in autonomous vehicle research as it currently stands, most notably on the impact of autonomous vehicles on urban form and policy making(Asif, 2019). One way to build on this within my research would be to identify the changes that would need to be made in urban planning and policy-making to accommodate autonomous vehicles and make sure that they don’t negatively impact the communities as they currently are. In taking this value-sensitive-design analysis

approach I hope to communicate this technology overall will provide more benefits than negatives for all.

STS Project Proposal:

I believe STS to be the study of the relationships between a given technology and anything in society in which that technology has an impact both directly and indirectly. I believe that STS is an essential field of research for those developing new technologies as you can hopefully alter your proposed technology to address some of the negative relationships that your technology would create. What makes my research fall under the category of STS is that I hope to not only identify the capabilities of this technology at face value, but to display both the positive and negative relationships that come with autonomous electric vehicles and propose solutions to help better this technology, or at minimum mitigate the existing issues. Additionally, I would like to highlight ways in which we as a society can change to better our relationships with this technology as we have to implement many before.

My approach to addressing this topic stems from 3 primary ecosystems of knowledge. One approach is an ethics and values approach stemming from the need to prioritize safety for those that come into contact with this technology such as displayed in Janet Fleetwoods research paper regarding holding safety to the highest priority when it comes to decision-making surrounding autonomous vehicles(Fleetwood, 2017). She poses valuable ethical questions regarding situations that may arise such as who the car should choose to save in certain scenarios that are worth pondering within my work. Another area of approach will be from a policy perspective regarding what regulations should be in place as a result of this technology. Should you be able to use an autonomous vehicle anywhere? What changes need to be made to our planning and development of roads and cities to account for their use? Questions like these are asked in M.D Kamruzzaman Faisal Asif's work and need to be addressed for this technology.

The approach I will use is from an environmental and sustainability perspective. What are the benefits of electric cars on the environment? What are the downsides? For example, a research paper by Michael Heberling highlights the potential negative impacts of electric vehicles on the environment, challenging the prevailing notion that they are a completely positive alternative to fossil fuel-powered vehicles (Heberling, 2022). While most of my material highlights the benefits of electric vehicles such as better air quality and economic growth, understanding all potential environmental impacts of a technology is necessary and valuable to my research (Malmgren, 2016).

I will be using a value-sensitive design approach to successfully break down the nuanced impacts of autonomous electrical vehicles on all of its shareholders from a technological, empirical, and conceptual standpoint. While I am not personally designing and developing this technology, performing my research from this approach will allow me to encapsulate all of the factors that need to be considered when implementing autonomous vehicles into our society from a personal and policy perspective. I think that a value-sensitive is ideal for my STS research paper as it requires the identification and examination of all the relationships associated with a given technology, and since autonomous vehicles are under ongoing development providing an additional outlook to those that are developing this technology is of the utmost importance.

The way I plan to implement my approach is by performing extensive literature analysis on prior work about the ongoing development of autonomous and electric vehicles and their benefits, as well as what negative impacts they may have. Additionally, I will be performing a literature analysis on prior technologies and how society responded to implementing them and to identify impact areas that were not foreseen before their use. Lastly, I will be interviewing individuals from a variety of different backgrounds and expertise in autonomous and electric

vehicles to gauge their trustworthy in this technology and concerns about its use in order to identify potential "shareholders" of the technology that I had not previously considered.

Barriers & Boons

My limitations are primarily in expertise and time. While I do have some experience in software development and embedded systems, my knowledge does not extend nearly to the extent of an AI system. In order to mitigate this I can speak to someone within the field or perform additional literature analysis in regards to AI's functionality within autonomous vehicles. Additionally, I have never performed a comprehensive analysis of a technology I was helping develop beyond its direct impacts, so I can read a few examples of value-sensitive-design implementations in order to ensure I am factoring in all of the necessary components. As far as my time limitation goes, I can address this by focusing on the relationships that will be most greatly impacted by the introduction of autonomous electrical vehicles into society.

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