The Frightening Future of Full-Self Driving: A Virtue Ethics Analysis of the Tesla's Autopilot System

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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.

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Introduction

On March 23, 2018, Apple employee Walter Huang was driving his 2017 Model X in Mountain View, California in Autopilot for about 19 minutes at about 70 mph. During this time, he was playing a video game on his phone with neither of his hands on the wheel, which is required for Autopilot to be continuously engaged. After about six minutes of the car continuously being in Autopilot, the Model X crashed into the concrete barrier of Hwy 101 and caught on fire. Although Huang survived the crash and was taken to the hospital, he died of his injuries (Goldman, 2024). Huang's family filed a wrongful death suit against Tesla in April 2019 citing that the Model X was defective and even Huang told his family that Model X kept veering into the barrier, the same one that eventually killed him (Noyes, 2019). Although many have praised Tesla as the company to bring more recognition to the electric vehicle market in many places including the United States, these positive views fail to take into account the dangers of Tesla's Autopilot feature, especially with many people believing it to be a fully-autonomous feature when it is semi-autonomous. There is much research done on the Autopilot feature by scholars across various industries, which can lend a hand in understanding both the Autopilot feature and Tesla in its entirety.

By neglecting the moral judgment of the decisions of Tesla, future engineers, automotive designers, and manufacturers are robbed of the opportunity to understand the importance of being ethical in the automotive industry. I believe that examining the Autopilot feature through the lens of virtue ethics can assist greatly in providing a moral judgment of Tesla. More specifically, I would like to demonstrate its morally unacceptable actions due to two characteristics that would apply well to the automotive industry: commitment to quality and cooperativeness.

Background

The Autopilot feature is a currently evolving advanced driver assistance system that is meant to enhance the safety of all riders in the vehicle while also making the driver experience more convenient by reducing the amount of workload a driver experiences, especially during long road trips. This is operated through multiple external cameras and advanced vision processing, which has replaced the previously used radar system. Autopilot is now standard on every new Tesla and is the baseline feature of the advanced driver assistance system tiers, the others being Enhanced Autopilot and Full Self-Driving Capability respectively (Tesla, 2024).

Literature Review

With there already being prior research done on Tesla's Autopilot feature, I want to use other works on Tesla products to help show how past innovations and behaviors are indicative of future dangers present in the current version of Autopilot that can be heightened if it goes into mass production. Many of these articles discuss the feasibility of Tesla succeeding in the larger society as well as some of the technical issues that have been present in many of the Teslas that are currently on the road today.

Ian Stuart Berry's *Mythologies of the EV Truck: A Semiotic Analysis of the First Mass-Produced Electric Trucks in the United States*, he talks about how EV trucks similar to the Tesla Cybertruck such as the Ford F-150 Lightning, Rivian R1T, and GMC Hummer EV are very influential in transforming the American truck culture for the foreseeable future. He talks about four cultural myths that essentially control the design and engineering process: (1) these trucks reaffirm current societal masculinity by merging modern masculine norms with the American

truck culture's long history of using internal combustion engines, (2) these trucks reinvent what status and symbolism looks like in the culture by changing the way power, mechanical work, and consumer culture looks like, (3) these truck perpetuate the idea of EVs being exclusive forms of mobility, and (4) these trucks don't openly give attention to the green consumer and climate change activism (Berry, 2023). Berry goes on in detail to explain how all of these factors will transform the sensory experiences of the users which will in large transform American truck culture and mobility. However, he fails to talk about how these electric trucks could pose a risk to non-users due to these cultural myths.

Maximilian Bauer's *A Review of Electric Vehicle Safety Standards and Regulations: Current Status and Future Directions* goes in-depth on the current regulations and standards that are set in the United States by the National Highway Traffic Safety Administration (NHTSA) for electric vehicles in comparison to fuel-burning vehicles and how current and future developments of EVs can shape the direction of these regulations and standards in the foreseeable future. Bauer talks about how on top of the same crash test ratings EVs get to fuel-burning vehicles, there are also additional standards that are always evolving as electric vehicle technology evolves as well including cybersecurity, autonomy, global standards, and environmental standards. (Bauer, 2022). Although Bauer adequately goes into detail about the dangers that electric vehicles pose to the larger society if the standards and regulations are lackluster and can't evolve with electric vehicle technology, the problem with his argument is that it is missing the external factors that influence the design of the standards and regulations such as politicians, car manufacturers, and ultimately the leads behind the car companies.

In all of the literature discussed, there is a commonality that the very much of the design of today's design of Tesla's products has been greatly influenced by the current market of today's electric pickup trucks as well as the current evolution in today's electric vehicles and their standards and regulations. Although learning about the standards and regulations behind electric vehicles as well as the cultural myths that surround them can give us a better understanding of how the implementation of features such as Autopilot can be improved, it must also be asked what unquantifiable factors such as culture, politics, and personal values can lead to the development of a dangerous vehicle being deemed safe and allowed to be driven freely on the streets primarily by consumers who have a false sense of the Autopilot feature. The current body of research determines the root cause being unsatisfactory regulations and standards for electric vehicles coupled with cultural myths, failing to consider the engineers' character traits to result in distasteful practices. This paper will use a virtue ethics framework to create a normative judgment of Tesla.

Conceptual Framework

The morality of Tesla can be methodically analyzed using a virtue ethics framework. In *Normative Ethics*, virtue ethics is "based on a notion of humankind in which people's characters can be shaped by proper nurture and education, and by following good examples. (van de Poel, I., & Royakkers, L., 2011)" We use virtue ethics to achieve the final goal of human action: achieving the good life, the state of being a good person. Thinking about the virtues that exemplify virtue ethics, designers, manufacturers, and especially engineers need to use these

virtues to become morally responsible. Designed by Michael Pritchard in 2001, he listed several virtues that are required for morally responsible engineers (box below) (Pritchard, 2001).

1. professionalism
2. ability to communicate clearly and informatively
3. cooperativeness (being a good "team player")
4. willingness to compromise
5. perseverance
6. habit of documenting work thoroughly and clearly
7. commitment to objectivity
8. openness to correction
9. commitment to quality
10. being imaginative
11. seeing the "big picture" as well as the details of smaller domains

Figure 1: Prichard's 'Virtues for Morally Responsible Engineers'

To consider a character trait a virtue, it must be a quality that is in the middle of two extremes. For example, openness to correction does not mean being completely ignorant of the flaws of a product. However, it also does not mean to take into account every single criticism that is given about the product. Therefore, openness to correction means considering the criticisms given and how much they would impact the final product to the larger community. For this paper, it can be assumed that Tesla does not exhibit a particular virtue due to any repeated or severe actions about that virtue. Therefore, the analysis section will analyze the decisions by two of the virtues: commitment to quality and cooperativeness.

Analysis

Tesla is lackluster in two of the categories presented in the virtues necessary to be deemed morally responsible engineers: commitment to quality and cooperativeness. Looking at the current design of the Tesla Cybertruck, it is apparent that these key virtues were absent throughout the process. According to Pritchard, if one of these virtues is absent then an engineer

or group of engineers cannot be deemed morally responsible. Through the lens of virtue ethics, the Tesla engineers failed to practice these three key virtues since they are not virtuous actors from their actions and circumstances. In each of the following paragraphs, the three key virtues will be addressed that were not addressed by the Tesla engineers one by one, and discuss the repeated decisions and actions by the Tesla engineers behind the Autopilot feature.

Commitment to Quality

Commitment to quality ensures that the consumer can receive a product that can last over time, ensuring the consumer is getting their money's worth out of the product. If any problem arises with it, the company can ensure that the product can be fixed and returned to a similar or better state than the product previously was. Commitment to quality can be best defined as setting high standards for performance through management and employee input, by creating the processes and procedures to best achieve those high standards and measuring the performance of an individual or entity through strong quality control programs (Carmacks, 2023). Tesla has been recognized as a large contributor to the advancement and awareness of both the electric vehicle and autonomous vehicle markets as a newer and small-scale company at the time. In fact, "Tesla now produces a top-selling luxury car and has a market capitalization twice that of Fiat Chrysler and half that of General Motors or Ford (Stringham, E. P., Miller, J. K., & Clark, J. R., 2015)." However, this also comes with the downsides of being committed to the highest standard of quality both on the software and hardware sides.

On the hardware side, Tesla has been caught numerous times throughout the years for a variety of quality issues. Just last year Reuters reviewed thousands of documents from 2016 to

2022 from the company along with interviews with customers and former technicians of the company and the results concluded that Tesla was aware for a long period of the severity and frequency of faulty parts than was disclosed to safety regulators and consumers (Jin, 2023). Some of these consumer reports talked about issues that would certainly have killed or severely injured them if any external factors had worsened. These issues included the “front wheel [falling] off while driving on Autopilot at 60 mph” while another customer losing steering control making a slow turn and the front-right suspension collapsing even though the vehicle only had 115 miles on the odometer (Jin, 2023). Although these issues were clearly not the fault of the customers who brought these Teslas, they were forced to pay thousands of dollars out of pocket to replace these parts.

It gets worse on the software side. Tesla has boasted about the Autopilot Mode in their vehicles, which has promised the future ability to be able to get consumers from Point A to Point B by telling the vehicle where to go and not having the consumers touch the wheel at any point during the ride. Tesla has mentioned that “there are about 1.25 million automotive deaths worldwide. If the current safety level of a Tesla vehicle were to be applied, it would mean about 900,000 lives saved per year (Bailey & Erickson, 2019)” However, early adopters and current users have suffered many issues with the Autopilot mode, some even losing their lives. One of the most notable accidents happened in March 2017 when Jeremy Banner was driving his Tesla Model 3 in Autopilot Mode when only seconds later it crashed into the underside of a semi-truck at 68 mph, ripping the top half of the vehicle off and instantly killing the driver. This also followed a very similar death that happened in May 2016, which was the first Autopilot-related accident to be reported. A Tesla spokeswoman chalked it up to the fault of the driver, stating that

their data of one billion miles with Autopilot proved that the driver was simply inattentive and was not prepared to take control of the wheel (Lee, 2019).

It is seen that on both ends Tesla refuses to properly work towards improving the quality of their work. Instead of working to make sure that its Autopilot system was safe enough to be used on the highways and other roads with stronger confidence, it slapped a “Beta” label on the feature and let the consumers be guinea pigs to the feature. This was especially done in an attempt to remove the liability from themselves. Additionally, it must be considered that instead of Tesla outsourcing for more stable parts and improving the manufacturing process to make sure that new Teslas are able to run smoothly it have kept to themselves vital information about the quality of the parts in the Teslas in order to uphold its reputation and save costs at the expense of its consumers’ lives. So although not all of the issues were in Tesla’s fault, its response to these quality issues have shown a lack of concern that the products it sells to consumers violate the virtue ethic of commitment to quality.

Some might argue that it is invalid to criticize Tesla on the fact that it is upholding its commitment to quality and is always willing to fix the issues with its products. This is due to the opposition believing that since the consumers have been given warnings about the quality of its products such as the “Beta” label on the Autopilot feature or announcements such as needing to expand to ramp production, it would be completely on the consumer’s end whether or not to buy a Tesla product in exchange for a higher risk to not get the consumer’s financial worth out of the product or being severely injured or dying due to their vehicles being more likely to have a fatal error due to its early age. While I do agree that you do take a great risk by becoming the adapter

of a newer technology being in its early stages, I would also like to point out that it is also on Tesla to make sure that these early adaptations of their vehicles can keep the consumer as safe as possible. To quote one consumer, “The on-screen labels it "Beta" software, and compares Autopilot to mobile app software that's ready to ship, as if that means it's acceptable for highway use. It is not. These guys are jokers when it comes to marketing their stuff, and the engineers should be ashamed of what the marketing team has done to their stuff (Lee, 2019)" Therefore, I am claiming that Tesla was immoral in commitment to quality because the quality of their Autopilot feature is not suitable for the variety of uses for their consumers and yet they still choose to put it out into the market for the sake of a profit and a reputation that can greatly tarnish the company and the electric vehicle and autonomous vehicle markets if things go south greatly. I fear that if Tesla continues to bring an absent commitment to the quality of their Autopilot feature, more fatal accidents will occur in the future.

Cooperativeness

When dealing with other companies or individuals, being cooperative ensures that everyone can be on the same page and ensure a product that can satisfy each group’s/individual’s standards. Cooperativeness can be defined as “working or acting together willingly for a common purpose or benefit (Dictionary.com, n.d.).” Tesla has had a history of its products not being compliant with federal automotive regulations as well as issues with labor laws, more specifically in the European Union. In December 2023, it became public about several unions throughout the European Union that have hampered the production of Teslas due to failed unionization efforts for the mechanics. Starting in October 2023, several countries such as Sweden, Finland, and Denmark have joined in condemning Tesla for their resistance against unionization which Tesla

has openly threatened workers with retaliation. This also comes as Sweden does not have minimum wage and labor market regulation so many workers in Sweden do not get fair compensation for their work. According to IndustriALL general secretary Atle Høie, "Elon Musk's business model is to avoid respecting human rights. Now he is taken on by one of our strongest unions. We must defeat the Tesla business model, and Sweden is the best place to start (Englundh, 2023)"

In terms of federal regulation laws, there are several reasons that any consumer will need an EU trucking license to operate the Cybertruck. One of these issues is the weight of the vehicle, which at its minimum weight is 4 tons, .5 tons higher than the maximum weight a vehicle can be considered a passenger vehicle. In this case, a passenger will need a C1 license (which is the equivalent of a truck driver's license). The charging technology that is used highly in the US for Teslas is not the same that is dominant by other electric vehicles in the EU. Additionally, there is an unfavorable popularity for hulking pickups in the EU, since many of the countries are designed to be walkable or for smaller vehicles (Carter, 2023). All of these factors put Tesla into a tough spot in whether or not it feels it is worthwhile to make these changes to accommodate these changes.

When thinking about cooperativeness, it is a company that is willing to meet ways with all parties making the products to satisfy their needs, wants, and concerns. Here, Tesla is shown to want to be in control and maximize the labor of others with minimal consequences. Tesla not wanting to cooperate with unionization with the same people that are responsible for making their products shows their uncooperative attitude and as a result, strikes that have hampered their

production in the EU have been rising. These unionizations are needed for the workers to be able to meet their basic needs as well as live a comfortable lifestyle while still enjoying their work. Additionally, their failure to cooperate with the EU regulation standards puts them at a risk of losing out on a very valuable market that already buys Tesla products. Therefore, the uncooperative attitude of Tesla towards their workers and federal regulations deem them immoral as they violate the virtue ethic of cooperativeness.

Conclusion

Informed judgements on Tesla's character can be made based on the decisions they have made regarding the failures of the Autopilot feature. The analysis showed that it greatly failed to exhibit two of the values necessary to be morally responsible: commitment to quality and cooperativeness. Tesla failed in these key virtue ethics because it failed to uphold the quality of their special features like Autopilot as well as its mechanical parts which could put the occupants of the car in danger. Additionally, the company is stubborn in cooperating with a market that is unfavorable towards large pickup trucks as well as cooperating with the regulations that would allow its Cybertrucks to thrive throughout the European Union. Therefore, it can be concluded that through the virtue ethics framework, its actions can be considered immoral.

As engineers, we hold a greater responsibility over the users and non-users who are affected by the technology that we use over the technical work that goes into designing the technology. Therefore we should also be able to uphold the morally responsible virtues that guide us to holding this greater responsibility. If we are not able to do this, I fear a society in which the lives of all humans are at risk at the expense of personal gratification.

Word Count: 3309

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