

Ethical Case Study: Uber Autonomous Vehicle

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Abstract

Self-driving cars are an extremely innovative technology that come with grave consequences if not managed properly. In 2018, Elaine Herzberg was walking her bike across a road when she was struck and killed by a self-driving car that Uber was testing and collecting data for. To address the ethical lapses that occurred in this case study and prevent further tragedies from occurring, this paper aims to reach the National Highway Traffic Safety Administration (NHTSA) and National Transportation Safety Board (NTSB) for further consideration. Although autonomous, there was an attendant in the car at the time who was unable to manually stop the crash from happening in time. This uncovered many safety deficiencies in Uber's self-driving car project as well as major bugs within the software. Many ethical failures caused the death of Elaine Herzberg. We can consider the irresponsibility of the driver, the carelessness of Uber, and the imprudence of Arizona's government to all be unethical. Therefore, there should be far greater government regulations that mandate safety reports from these autonomous car companies as well as approval for these companies to test their vehicles on public roads. Furthermore, there should be accountability within these car companies and their employees to safely execute the testing of their cars.

Introduction

With the insurgence of artificial intelligence in the tech industry, self-driving cars are a popular innovation many companies have been trying to build within the last several years. One of those companies is Uber, who had been testing their self-driving cars in the streets of Arizona when it resulted in a tragic car crash and the death of Elaine Herzberg who was crossing the street with her bicycle. Soon, it was discovered that Uber had very minimal safety precautions and regulations surrounding the autonomous car project. There were also flaws within the software controlling the self-driving car which was what ultimately prevented the car from braking upon detecting Herzberg as an object in the road (Hawkins 2019). Uber had also disabled the Volvo's original braking system to prevent it from interfering with the driving

system that it was testing (Hawkins 2019). Arizona is also known to be lenient with its traffic laws, which only contributed to the lack of regulation over this project (Davies and Marshall 2019). This raised many questions about who was at fault for this accident and revealed the flaws within the many layers that contributed to this accident. The blame ultimately ended up on Rafaela Vasquez and Uber was exempt from being charged for this particular case (Conger 2020). To prevent further tragedies as such from happening, Arizona should implement stricter traffic laws that put restrictions on self-driving car companies as they test in their public streets. Further, there should be mandatory safety reports that are sent by these companies to the National Transport Safety Board for review.

Background

Many factors must be considered when analyzing the death of Elaine Herzberg: Herzberg herself, Vasquez, Uber, and Arizona's street safety laws. At the time of the crash, Herzberg was jaywalking across a large road at night while walking her bicycle (Marshall 2020). Seconds leading up to the crash, video recordings also showed Vasquez looking down at her phone rather than the road she was supposed to be monitoring (Marshall 2020). Therefore, crash prevention solely relied on Uber's software, which ultimately could not correctly classify her and halt in time. The system did detect Herzberg but kept misclassifying her as an "other" object or bicycle rather than a pedestrian crossing the street due to incompetent software (Hawkins 2019). To top these incidents, Uber had disabled the Volvo's ability to respond to a slam on the brakes to prevent the car from erratically stopping during testing, therefore putting the responsibility on the driver for any emergencies (Davies and Marshall 2019).

However, this was not the first time Uber's autonomous vehicles were involved in road accidents. It was reported that within roughly 1.5 years, there were 37 incidents involving Uber's autonomous vehicles, although only two of them were caused by Uber's cars (Hawkins 2019). The cars also showed far less progress compared to industry competitors and required much more human intervention than these other companies (Wakabayashi 2018). Therefore, many questioned Uber's decision to continue testing on fast roads when there were clear deficiencies within the software and testing procedures. But although all of these factors somehow contributed to the tragic death of Herzberg, it was ultimately determined that the crash was due to human error and lack of safety precautions at Uber (Conger 2020). Uber was not faced with

any charges and Vasquez was indicted for criminal negligence (Marshall 2020). Through this process, it also became evident that many laws were not up to par with dealing with these types of technologies. It also questions whether to blame human operators or the technology itself when analyzing these technological failures.

Engineering Failure

Several flaws were uncovered within Uber's software for the autonomous vehicle. One major error was that the software could not classify people as pedestrians unless they were at crosswalks, which is an extreme oversight considering that jaywalking is a very common occurrence (Harris 2019). The software observed Herzberg 5.6 seconds before the crash occurred, but it misclassified her multiple times within that period which prevented the system from initiating a stop (Harris 2019). The software would flip between classifying her as a bicycle and an unknown object multiple times between the time she was detected and the impact of the crash (Marshall 2020). However, this resulted in the software recalculating the trajectory of Herzberg's movement each time the classification flipped because she would be identified as a new object each time (Harris 2019). As a result, the car was unable to initiate stopping in time. The developers also made very generous assumptions when it came to object classification in the software. The car was programmed to assume that bicycles are going with the flow of traffic, and that unknown objects are always stationary, which is not always going to be the case as was with Herzberg (Harris 2019). Even further, Uber did not account for classifying pedestrians who were not on crosswalks, which only further prevented Herzberg from being safely detected (Marshall 2020).

As a safety precaution, Uber implemented a one second period where the driver could manually override the decision that occurred after a possible crash detection (Hawkins 2019). However, in situations where the operator does not take action and a crash is imminent, there is an alarm sound that plays and a gradual braking system that takes action (Hawkins 2019). Vasquez, unfortunately, did not take action which resulted in this procedure occurring 0.2 seconds before the collision (Marshall 2020). Although there was a gradual braking system, Uber had not implemented maximum braking at this point in their testing, which can be seen as an oversight considering that the Volvo's emergency braking system was also disabled for better testing. These series of oversights and mistakes all piled up and resulted in a clear example of

what disasters can ensue as results of negligence and carelessness. By referencing ethical frameworks, we can outline clear steps that should have been taken by Vasquez, Uber, and Arizona to prevent these sorts of tragedies from occurring.

Ethical Analysis

We can analyze this case study by considering the ethical implications of this incident through the virtue ethics framework. Virtue ethics outlines various characteristics that are desirable for a morally good person. We can define various morals and their extremities through their excess and deficiencies, and then aim to find the average of the two. For example, we can consider the virtue of being brave; the deficiency is cowardice, and the excess is recklessness. Therefore, in this framework, being ethical focuses on whether the person behind the act is acting on good morals. Consequently, actions done by these good people are then deemed moral as well. The culmination of these moral actions done by moral people leads to a good, full-filling life. These virtues can be developed throughout one's life, and possess various natures based on different people, also meaning they are not necessarily universal across different cultures. A criticism of virtue ethics is that it can be too vague, as there are no definitive rules to what defines a virtue. Further, it is difficult to tell the motivation for all actions, and what specific virtue could be a driving force for them. However, virtue ethics allows us to acknowledge that virtues can be developed and improved, encouraging moral growth. Therefore, through this framework, individual actions in this case study are not going to be analyzed, but rather the virtues that are shown through them.

There are several cases of ethical failures in this incident that we can consider. First, Vasquez was assigned as the car's safety operator but showed inattentiveness which led to the death of Herzberg. As an employee, Vasquez has a responsibility to oversee the car's operations while it is still in its testing phases and driving on public roads. However, video footage shows that Vasquez is on her phone and not paying attention to the road in front of her seconds before the crash. When considering the virtue of responsibility, Vasquez is deficient and shows irresponsibility and carelessness. By not performing her duties as the car's attendant, Vasquez was endangering the safety of herself and all others on the road. If she had been responsible and diligent in her duties as the attendee of the car, she may have been able to notice Herzberg crossing the street and manually stopped the car before the collision.

Second, Uber must be held responsible for their actions leading up to the car crash. Through investigations, it became clear that the company had been failing to safely implement this autonomous car project with loose regulations. Uber was under the pressure of executives and government officials to complete this driverless car project by the end of 2018, which may have been the cause of relaxed safety protocols and rushed testing (Wakabayashi 2018). The virtue of timeliness is seen in excess in this case, as to meet deadlines, Uber rushed its operations without care and favored finishing the project in time over safe and detail-oriented progress. Consequently, we can consider the virtue of being detail-oriented, and notice that Uber was deficient in being thorough about its safety protocols, leading to fatal incidents. Uber had originally worked with two attendants in the car before switching to one despite safety concerns about solo drivers being able to stay alert, even though there is much research that points out that there are risks of drivers losing focus when assigned monotonous tasks such as hours of monitoring a car driving (Davies and Marshall 2019). But despite these safety concerns from employees, Uber switched from two drivers to one which increased the risks of losing focus during these test drives (Wakabayashi 2018). It was also observed that rather than a technological advancement that allowed for this change, it was a policy change that occurred from new management (Hawkins 2019). This could very likely be a result of trying to reduce costs for the project and perhaps prioritize funding elsewhere, as Uber was already behind on developing the technology by the expected date. Therefore, Uber failed to thoroughly implement safety procedures resulting in carelessness to meet the impending deadline.

Lastly, we can look at Arizona and its street safety laws and protections. There are not many laws that are governing the traffic in Arizona, which is why many self-driving car companies decided to test their vehicles there (Lin 2018). Arizona was eager to host these large companies and their projects, although it had the potential to compromise public safety as testing occurred in public streets, and Arizona already had an extremely high pedestrian death rate (Lin 2018). This is especially apparent as other cities had rejected these projects from testing in their streets due to safety concerns (Lin 2018). Therefore we must consider the virtue of being opportunistic. Although these projects likely helped Arizona financially and attracted many large businesses, it may not have been for the better of the Arizona community. Taking up these opportunities regardless of consequences, which in this case is the safety of its citizens, can create an excess of this virtue-- imprudence.

Recommendations

To prevent this incident from occurring, several groups needed to take on various responsibilities to ensure road safety. After the incident occurred, there was much more attention on government agencies to create stricter rules and regulations for autonomous vehicle testing. It has been recommended that these government agencies implement safety protocols such as mandatory safety reports that must be evaluated, and accept applications for these autonomous car companies for testing on public roads (Davies and Marshall 2019). This can ensure that our government is leaving room for technological innovation while still ensuring the safety of its citizens on the road. Therefore, Arizona can exercise the virtue of being opportunistic by being conscientious about the potential negative consequences that could ensue, and doing what is possible to prevent them from happening.

But oftentimes, laws do not keep up with technological advancements as quickly as they should. Therefore, it is also up to the companies creating these technologies to be responsible for ethical production, testing, and deployment of these products. Uber has already taken many safety considerations since the accident to prevent a similar incident from occurring. First, Uber reverted to having two operators in each car, while also having a third party to check for real-time attentiveness of the operators (Davies and Marshall 2019). They have also implemented maximum emergency braking in cases of imminent collisions rather than its initial decision to implement suppressed and gradual braking (Hawkins 2019). There is also a new safety division within this project as well as better improvements in the software for detecting pedestrians (Davies and Marshall 2019). Through this, Uber can practice the virtue of being detail-oriented, which allows the project to be run consciously and safely.

Lastly, there should be accountability as an employee. Operating a vehicle on the road requires attentiveness and skill, especially considering the failure to do so endangers the safety of many others. Therefore, there should be extensive training and rules for autonomous vehicle operators and clear rules outlining responsibilities and consequences if there is inadequate performance. The driver can then employ the virtue of responsibility, and perform their duties with proper execution under the knowledge that they are employees with an influence on how this project turns out.

Conclusion

Although Uber has since created more extensive safety protocols, it was at the expense of human life. Therefore, technology companies must understand the risks that their products hold if not managed properly. Extensive research and preparation are required for testing technologies as dangerous as autonomous vehicles, particularly because they need to be tested in public settings. The governments allowing these operations, the companies creating these technologies, and the employees executing these tests, are all ethically responsible for a safe production cycle from start to finish.

Bibliography

Conger K. 2020 Sep 15. Driver Charged in Uber's Fatal 2018 Autonomous Car Crash. The New York Times. [accessed 2020 Nov 30].

<https://www.nytimes.com/2020/09/15/technology/uber-autonomous-crash-driver-charged.html>.

Davies A, Marshall A. 2019 Nov 19. Feds Pin Uber Crash on Human Operator, Call for Better Rules. Wired. [accessed 2020 Nov 30].

<https://www.wired.com/story/feds-blame-uber-crash-on-human-driver-call-for-better-rules/>.

Harris M. 2019 Nov 7. NTSB Investigation Into Deadly Uber Self-Driving Car Crash Reveals Lax Attitude Toward Safety. IEEE Spectrum: Technology, Engineering, and Science News. [accessed 2020 Nov 30].

<https://spectrum.ieee.org/cars-that-think/transportation/self-driving/ntsb-investigation-into-deadly-uber-selfdriving-car-crash-reveals-lax-attitude-toward-safety>.

Hawkins AJ. 2019 Nov 6. Uber's safety lapses led to fatal self-driving crash, new documents suggest. The Verge. [accessed 2020 Nov 30].

<https://www.theverge.com/2019/11/6/20951385/uber-self-driving-crash-death-reason-ntsb-documents>.

Lin P. 2019 Mar 22. Who's at Fault in Uber's Fatal Collision? IEEE Spectrum: Technology, Engineering, and Science News. [accessed 2020 Nov 30].

<https://spectrum.ieee.org/cars-that-think/transportation/safety/reflecting-on-ubers-fatal-crash>.

Marshall A. 2020 Sep 17. Why Wasn't Uber Charged in a Fatal Self-Driving Car Crash? Wired. [accessed 2020 Nov 30].

<https://www.wired.com/story/why-not-uber-charged-fatal-self-driving-car-crash/>.

Wakabayashi D. 2018 Mar 23. Uber's Self-Driving Cars Were Struggling Before Arizona Crash. The New York Times. [accessed 2020 Nov 30].

<https://www.nytimes.com/2018/03/23/technology/uber-self-driving-cars-arizona.html>.