

# The Ethical Dilemma of Self Driving Cars

Immunization Design

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## INTRODUCTION

In this proposal we will be discussing autonomous cars and the potential dangers of having a computer system make decisions that could risk the lives of its passengers.

In 1885, Carl Benz invented the automobile and later that year, he took it out for the first public test drive and ran it into a wall. Since then we've been looking for way to improve the automobile and make them safer, more affordable, and more convenient. Unfortunately, 1.3 million people are killed on the road each year, 37,000 of which are in America. (ASIRT, 2015) Experiments have been conducted on autonomous cars since the beginning of the 1920s. By the 1980s the first truly self-sufficient and autonomous car was constructed by Ernst Dickmanns. They built a vision-guided Mercedes-Benz robotic van that achieved a speed of 19 miles per hour on streets without traffic. As of July of 2015, Google announced that it's autonomous Google car has passed numerous driving tests without human control, their cars can recognize every street sign, they obey all traffic laws, and they haven't been in a single accident in which it was at fault after driving for over 1.7 million miles (Ziegler, 2015). Our proposal will outline a system of checks and balances that an autonomous car should go through when presented with a situation in which a decision needs to be made. These situations will include those that may put the driver in danger in order to avoid striking a pedestrian or other vehicle that is in the car's path.

*"People are in favor of cars that sacrifice the occupant to save other lives-as long as they don't have to drive one themselves."*

This is an important factor to consider when manufacturing and buying an autonomous car. Machines lag behind animals in interpreting their environments, but they have the potential of being aware of everything around them. So while humans have the ability to make decisions based on what they think, the car will make decisions based on what it has been programmed to do and the environment in which it sees. For example, a

car being driven by a human at night is coming over a hill on the highway and at the last second he realizes that someone wandered into the road and now he is on a collision course with this pedestrian. To the driver's right, is a forested area and if he swerves into there he will almost surely hit a tree and become critically injured if not dead. To the left, are guard rails but he is still going fast and hitting the rails could flip his car resulting in another dangerous situation. The reality is, that pedestrian shouldn't be there and now the driver is faced with the dilemma of making a life and death split second decision. And that decision may be to just keep going forward while slowing down as much as they can, because in this situation their livelihood is still protected. In the same situation, but with an autonomous car, does the car have the right to risk the passenger's life in order to avoid the pedestrian?

The rest of this proposal will cover the current level that autonomous cars can operate, a plan that can be put in place to ensure the passenger of the autonomous car remains safe in dangerous situations, potential counter arguments and alternatives to the the car's decision making process, and our final thoughts on the topic.



## CURRENT SITUATION

Technology is advancing very rapidly and is also allowing us to simplify many of the everyday things we do in our lives. Self-driving cars have been a new and emerging topic for a long time now and there are several reasons why companies and engineers are trying to create a car that could make people see the idea become a reality. The big companies who currently have projects with self-driving cars claim that handing over control to the machines will allow for a better future and a more simplistic one (Davies). Thus the cause for the current situation of creating self-driving cars is mainly for simplicity and ease of transportation on humans. Bryant Walker Smith, an assistant professor and chair of the Emerging Technology Law Committee of the Transportation Research Board of the National Academies says that 90% of automobile accidents are caused by human error and the hope is to eliminate these kinds of crashes significantly with the automation of cars (Kirkpatrick). Companies and engineers creating the self-driving car want to leave it up to the machine to make decisions to eliminate human error. The driverless cars of the future will most likely to be able to outperform most humans during routine driving tasks. This is because of the better perceptive abilities, better reaction times and driverless cars will

not suffer from distractions (texting, eating, phone calls). People are also interested in the luxury of the self-driving car with being able to let the car do all the work on a cross-country trip. Having driverless cars would eliminate the inconvenience of paying attention for long trips. But, with all these amazing features that a driverless car would provide, there are important ethical and moral decisions that would have to be made.

There are a lot of ethical issues and decisions involved with the idea of an autonomous car. As the general public looks at a final version of a driverless car, they want to be assured that they and their families will be safe in them. The quality and reliability engineers are creating a machine and testing for the likelihood of people getting killed by flaws in the system (Brombacher). But even with very little flaws in the system, people will still question the moral and ethical decisions that the self-driving car will make on its own. "If an unavoidable crash situation arises, a driverless car's method of seeing and identifying potential objects or hazards is different and less precise than the human eye-brain connection, which likely will introduce moral dilemmas with respect to how an autonomous vehicle should react", according to Patrick Lin, director of the Ethics and Emerging Sciences Group at California Polytechnic State University (Kirkpatrick). The question really does arise in how the vehicles will be making it's own decisions and which decision is the right decision. For example,

if you have a family crossing a bridge and the decision is either to hit the family or swerve off the road and possibly injure the driver, who makes that decision? Or will the car be able to recognize different kinds of objects? These are many ethical questions that people have about the self-driving car.

The problem also arises in the probabilities of each situation in which a driverless car is put in. An algorithm or some sort of system will have to be put in place in order to make decisions about the different kind of objects or living things. As we are about to endow millions of vehicles with autonomy, taking algorithmic morality seriously has never been more urgent (“Why”). The questions arise in how this algorithm put in place will work and if the driver could possibly override the controls of the autonomous car. If the car has complete control, the driver may not be comfortable with that feeling of not being able to be in control in crazy situations. A lot of these ethical issues and decision-making issues are the reason that we do not see a lot of autonomous cars on the road today. There will have to be flawless systems put in place that make the drivers feel safe while traveling in these new and emerging machines.

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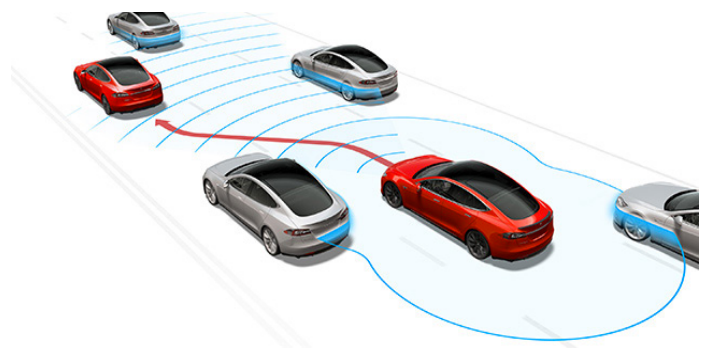
## PLAN

Innovation in technology has become a common occurrence in today’s world, but often the difficulties of that technology are kept in the shadows. One example of this is the decision making process for automated vehicles and more specifically, how decisions are made by the car in unpredictable situations. One of the most common examples used for this is how a car should react when a child runs out in front of the car and there is another vehicle coming in the opposite direction. The easiest ways to describe the possible outcomes of the decision are to allow the collision with the child to happen or to avoid the child and allow a collision with the oncoming vehicle. By allowing the crash to happen the chances that the kid is killed or severely injured are greatly increased. By going into oncoming traffic drivers in both lanes are put into danger, which could end in a greater death toll than hitting a single per-

“No matter the situation there is always a definite solution.”

son. After researching this problem we came to the conclusion that the best plan of action for this situation is to attempt to stop but to remain in its own lane because this puts the fewest number of people at risk of injury, and can easily be applied to other similar situations and returns a definite response that can be applied using programming.

When working with algorithms, the plan can go through conditions but no matter the situation there is always a definite solution in the end. For our plan the first step in the algorithm is once the sensor system detects a person in the current path of the car, it will begin to decrease the speed. Then using the sensors the system will determine if there are any cars in adjacent lanes that would present a hazard.



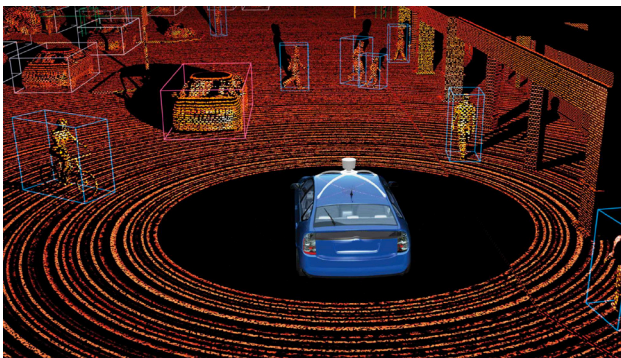
If there is an adjacent lane open and a path that will allow the car to stay on the road then the car can swerve to avoid a collision. But if there is not an open lane in adjacent lanes or a safe way to avoid the object, then the car will continue to brake. This braking process will be done so that car brakes as quick as possible while remaining safe for the passengers. The desired end is that the collision is completely avoided by this process, but if the crash is unavoidable then by slowing down the chances of the person surviving is

increased when compared to the car going at full speed at impact. People may not like this decision process when applied to the example of the child in

the road because it will end with a child most likely being injured. One of the arguments is that a human should be able to control this situation because a person will be able to react in what is deemed the morally more acceptable way. This may be true because “there is no obvious way to effectively encode human morality in software.” (Goodall) But humans do not

always make the best decisions when driving, and this has led to nearly 34,000 deaths in motor vehicle deaths a year. (CDC) Also, the problem with a self driving car is that after people have used it for a while they will be less likely to pay attention to their surroundings because they will have confidence that the car will react appropriately. For this reason a manual override should not be an option when a crash is detected by the sensors. While people may not like cars making a decisions for them, I think most people would be in favor of a car that is generally safer, does all the work for them, and will not sacrifice the lives of its passengers.

This decision can also be examined from an economic perspective because a car that places lesser value on the lives of its owners will not sell. The MIT Technology Review explores this aspect of the problem by polling people to see how they say they would respond in similar situations. Most people say they would prefer the cars to avoid the person in the street. But this response is only situational, as shown when it says, “people are in favor of cars that sacrifice the occupant to save other lives-as long as they don’t have to drive one themselves.” This quote perfectly shows why this situation is a tough decision, and it is because people want to do the right thing until there own life is put on the line. People should not have to fear being in a self driving car because their true purpose is to make the roads a safer place. This will happen by allowing self driving cars to become the norm because a computer has to follow the rules of the road and will be programmed to drive safer than most humans by doing things such as following at safer distances and also because the sensors create a 360 degree view of what is happening, while for human drivers every car has blindspots. So by using a self driving car people will actually make the roads a safer place for everyone.



As stated previously, there is always a definite solution to any problem when dealing with computers.

That solution is based on a series of inputs that the computer sees, and the other side to fixing the solution lies in the inputs rather than just the decision process. Computer processing power is immense, and in order to take advantage of this, the computer needs to have as much information as possible. By increasing the performance of the laser and sonic scanning devices, the car will be able to paint a much fuller picture of the situation in which it finds itself. This will allow the computer more time and more information to make the best decision. Another aspect of this new technology that is being explored is the ability for cars to communicate to each other while on the road. Being able to signal obstructions or irregularities in the roadway to cars who have yet to reach that location could prove invaluable in accident prevention. A third option that can be explored is the “learning” capability of the car. If a car is forced to re-calculate its decision when in an abnormal situation that it has previously encountered, then that wastes precious time. By remembering every new scenario it comes into contact with, an autonomous car may become even safer. The point of all this is to decrease the likelihood that a car will be put in a situation where it must make the life or death choice for its passenger.

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## COUNTER ARGUMENT

In the AI world, ethics is always a hot topic in terms of debates. Creating automated machines to make life changing choices based on a configured algorithm is something that is not easy to answer. Many people agree that the car should always make choices in favor of the passenger. Others may not think the same. A possible alternative is to have a variable setting that the driver chooses. In a recent article written by an online non-profit robotics community, RoboHub, they asked their readers “who should make the decision for their car’s AI settings”? 12% of the readers said that the Manufacturer should be the decision maker. 33% said that lawmakers should choose and 44% said that the passenger should have the ultimate say. Having a car that only gives priority to the passenger is an extreme decision that shouldn’t weigh one sided.

Another possible alternative is to scrap the automated car idea altogether. With the implications of essentially “playing God” as people argue and bicker to the

end of time with who should decide, maybe leave the decision to nature itself. The more automated and interconnected our daily tools become, the more dangerous it is to give evil people the ability to hack into electronics and cause destruction. Many government agencies have their network security comprised every year. What's to say that would be any different for the same people to take control of automated cars? This raises an important question of how much we rely on technologies that we think we might have the peace and mind to trust.

Going down the road of implementing AI to our daily lives is a slippery slope. Who is to say what kind of laws will be modified and created with this complicated concept? To determine who is responsible for the accidents that occur with these newly automated vehicles creates an impossible decision for any one person or organization to make.

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## CONCLUSION

Despite the current ethical and technological issues plaguing the development of self-driving cars, they are an inevitable part of our future. The drastic decrease in deaths due to car accidents alone is enough of an incentive to drive developers to overcome the problems they are facing and eventually bring self-driving cars to the public market. Once all of the kinks have been worked out consumers will be unable to resist the allure of easy and relaxing cross country road trips, as well as the increased productivity that being able to conduct their work while on the road will bring.

Even though it may seem like fully autonomous vehicles are still far in our future, they may be available much sooner than you would think. Reports from the leaders in autonomous driving technology such as Google and Audi suggest that self-driving cars will be on the market by 2025, possibly even as early as 2020. The autonomous technology in these cars is currently estimated to add \$7,000-10,000 to the base price, but this number will drop as new innovations occur. They will still cost more than a standard vehicle, but the safety and productivity advancements will be well worth the price.

The current prototype self-driving cars are performing incredibly well already. However, there will always be a chance, no matter how slight, of encountering an unknown situation or obstacle in a self-driving car. Every day these prototypes are being tested and new data is being gathered to help improve the technology these vehicles use. With time, and even more advances in the technology and programming involved, driverless cars will be the safest vehicles on the road.

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