**Autonomous Vehicles: Navigating the Ethical Crossroads**

Riley Simpson

Computer Science Department

University of North Carolina Wilmington

Wilmington, North Carolina res7348@uncw.edu

**Abstract**

The rapid evolution of autonomous vehicles (Avs) has brought in a plethora of ethical and legal quandaries. A key aspect of this discussion is the moral dilemma of decision-making during situations that risk the life the user or bystanders. From a deontological perspective, the main focus is centralized on the sanctity of human life, even if it risks the vehicles occupants, or in this case, the users. On the other hand, a utilitarian approach posits that AVs should aim for the greatest good for the majority, in a larger sense, utilitarian is society based, while deontology is people based. Legal implications further complicate the ethical standpoint of both crossroads. While some legislative frameworks lean towards safeguarding human life at all costs, others advocate for a more utilitarian approach. Moreover, public perception plays a pivotal role in shaping these debates, with social views oscillating between apprehension and acceptance of Avs’ decision-making processes. The translational aspect of this research underscores the pressing need a synchronized ethical and legal framework that not only addresses these moral dilemmas but also aligns with societal values and expectations. The potential impact of this framework would be immense, ensuring safety integration of Avs into daily lives all the while upholding the ethical standards implemented by the law.

# Keywords

Autonomous Vehicles, Utilitarianism, Deontology, Legal Liability, Programmed Dilemmas, Public Perception, Regulatory Framework

# I. Introduction

The new emergence of autonomous vehicles users a transformative era in the transportation sector, promising safer roads, reduced traffic congestion, and heightened transportation efficiency. The self-driving marvel of AVs, being equipped with state-of-the-art technology, stand strong to define conventional normal in the driving industry. However, groundbreaking innovation often includes complex issues, including ethical and legal challenged. Autonomous vehicles are no exception. The following paper delves into these challenges, emphasizing the moral dilemmas potential encountered by autonomous vehicles in life-threatening situations.

Central to this discussion is a pivotal question: In critical scenarios, should autonomous vehicles prioritize the life of its occupants or the lives of pedestrians and others in the surrounding area? This dilemma forms the foundation of the primary argument in this paper, which examines the issue through the lens of Deontology. This ethical framework takes the stance of the protection of human life remains the focus, even if it means placing vehicles at work. Exploration of Deontological principles and the implications for decision-making algorithms in autonomous vehicles follows within the first main argument. Also, potential legal ramifications of such decision-making, especially when human lives hang in the balance, receive displeasure and disagreement.

Contrasting this viewpoint, the counterargument finds its roots in Utilitarianism. This perspective vouches that in potential harm scenarios, autonomous vehicles should prioritize outcomes ensuring maximum safety for the majority, potential at the expense of the vehicle’s inhabitants. Philosophical underpinnings of this viewpoint and their effects for decision-making processes in autonomous vehicles undergo further examination, with the legal challenges and consequences of this approach in AVs also receiving attention.

Beyond these two arguments, this paper ventures into a broader discussion on ethics and legality, comparing and contrasting Deontology and Utilitarianism in the context of autonomous vehicles. Potential new legislations that can affect these vehicles in the future includes the implications of the SELF-DRIVE act, are also prominently featured. The paper concludes with an exploration of public perceptions of autonomous vehicles, potential job displacement in the transportation sector, and overarching societal implications of an AV-dominated landscape that is approaching over the horizon.

In the end, the paper aims to display, and comprehensive overview of the ethical, legal, and societal challenges presented by autonomous vehicles, offering insights that will disrupt the future of transportation.

A diagram of a road with a broken car

Description automatically generated with medium confidence

Fig.1

Examples of Utilitarianism Vs. Deontology Scenarios. [8]

**II. Argument**

**A. Deontology in Autonomous Vehicles**

The rapid advancement of technology has brought in an era of Avs, which are poised to revolutionize the transportation landscape. As the vehicles get more integrated with daily lives throughout the world, the ethical considerations surrounding their decision-making processes become increasingly paramount. At the heart of this ethical debate is the first viewpoint of implementation of morals, which is the principle of deontology. This asserts that certain actions are inherently right or wrong, regardless of their outcomes.

According to the provided text, “Deontology asserts that the justification of an act comes from whether the act itself meets ethical standards, i.e., the AV must comply with certain basic normal” [1]. This perspective emphasizes that the actions of AVs should be guided by abolished moral rules and principles, not the potential consequences and outcomes of the actions taken by the moral machine.

In life-threatening situations involving an autonomous vehicle, the deontological perspective takes the stance that the protection of human life should always be the primary consideration. This means that if an AV is faced with a split-second decision between harming multiple pedestrians even if it means risking the life of its single occupant. Such a stance is rooted in the belief that human life is valuable and that every effort should be made to preserves those lives, without even taking the consequences into account. This sentiment is further echoed in the study by Thornton et al., which proposed “the Three Laws of AVs, which specify the priority collision order of pedestrians, cars, and other objects in collision decisions” [1].

However, the application of deontological principles in real-world traffic situations is not without challenges. As the text highlights, “in the face of complex real-world traffic situations, deontology is difficult to design with full rule coverage.” [1]. This underscores the need for continuous research and refinement of ethical guidelines for AVs to ensure it aligns with societal values and expectations.

# B. Ethical Debate on Deontology

The rapid level of evolution and the integration of AVs into the transportation landscape have brought forth significant ethical considerations to many. However, as this type of vehicle becomes more prevalent and applicable to society as well, the associated liability issues are receiving increased attention as well. As noted, “As driverless cars – or more formally, autonomous vehicles – continue to attract growing interest and investment, the associated liability issues are also getting increased attention. Often, this attention comes in the form of suggestions that liability concerns will slow or even completely prevent consumer access to advanced autonomous vehicle technology.” [2]. This highlights the challenges and complexities that arise when integrating technologies with existing legal and ethical frameworks. A collective effort will have to be found to establish the bar for these laws that will be implemented in the future.

Critics of the deontological perspective argue that such a rigid ethical framework does not account for the complexities and nuances of real-world scenarios. For example, should an AV always prioritize the life of a pedestrian over its occupant, even if the pedestrian was acting recklessly? These moral dilemmas present significant challenges for the manufacturers, programmers, and policy makers as all aspects of the vehicle are designed, analyzed, and eventually implemented. To extend this further, “The legal precedents established over the last half a century of products liability litigation will provide manufacturers of autonomous vehicle technology with a very strong set of incentives to make their products as safe as possible.” [2]. This shows how essential the role of establishing the frameworks behind the AV to make sure the ethical guidelines and proper liability factuality are streamlined and correct.

**C. Legal Implications of Deontological Decision-Making**

The legal landscape surrounding the profound industry of autonomous vehicles is still in its infancy, evolving to address the unique challenges posed by this new technology. As AVs make deontological decisions prioritizing human life, they inevitable interact with existing legal frameworks, raising questions about liability, responsibility, and justice for the situation at hand. To show a valid example, assume an AV chooses to sacrifice its occupant to save multiple pedestrians. Who is held accountable? Is it the manufacture for programming the vehicle in such a manner, or is it the vehicle itself? Current legal systems are primarily designed around human decision-making, making the introduction of autonomous agents and a challenging issue to dive into.

With that being said, a good quote to start this topic of conversation is as follows: “As the automotive industry becomes more data-drive, getting consumer privacy rights will become increasingly important for establishing trust and customer acceptance of this technology. At the same time, the algorithmic decision making in AVs raises several new ethical issues that can create new safety risks and discriminatory outcomes.” [5]. This observation highlights the multifaced challenges that arise as AVs integrate into our societal fabric, not only in terms of legal liability, but also in the realms of data privacy and ethical decision making. But with all of these challenges, another big one that arises is how these new ideas are integrated into a system that is rational for all outcomes, which seems seemingly impossible. In this case, it is the judges that are playing a pivotal role in shaping the legal discourse around AVs [2], and their decisions on admissibility of evidence, expert testimonies, and other procedural matters will significantly influence the trajectory of AV-related cases. The historical precedent, such as the early 20th century rulings that affirmed automobiles as lawful means of transportation [2], suggest that the legal system can adapt to these forthcoming legal advancements, which will be required for the industry of autonomous vehicles to progress and evolve. However, the ethical complexities introduced by AVs present reprehensible challenges.

While autonomous vehicles have become an integral part of the transportation ecosystem, the ethical and legal considerations surrounding the decision-making processes will remain at the forefront of societal discourse. Balancing the deontological duty to protect human life with the practicalities of real-world scenarios will require a collaborative effort from technologists, ethicists, and legal experts. The evolving legal landscape, paired with the ethical implications of data-driven and algorithmic decisions, highlights the need for a nuanced approach to integrating AVs into daily lives.

**III. COUNTER ARGUMENT**

# A. Utilitarianism in Autonomous Vehicles

As the discourse around the ethics of autonomous vehicles continues, a contrasting perspective to deontology emerges in the form of utilitarianism. Rooted in the philosophy of “the greatest good for the greatest number”, utilitarianism evaluates actions based on their outcomes, aiming to maximize overall happiness or well-being of the individuals involved in the situation.

A utilitarian approach would dictate that the vehicle’s decision-making should always prioritize the scenario that results in the least overall harm. For instance, if an AV is faced with a situation between hitting two people walking in the middle of the road and the only option is to swerve left and hit one, it would do so. The rationale is simple: the well-being of many should take precedence over the well-being of a few. Unlike a deontological point that may have a strict set of rules like protecting innocent lives, it simply takes its calculations based on the numbers presented by the situation.

This utilitarian principle, in the context of AVs, is aptly summarized by Nelson de Moura et al., who states, “In the context of AVs, the utilitarian approach would necessitate the vehicle to make decisions that ensure the greatest overall good, even if it means compromising the safety of fewer individuals. This approach, while maximizing overall welfare, raises significant ethical concerns, particularly in scenarios where the vehicle must choose between the lesser of two harms.” [6]. The ethical complexity inherent in programming AVs is challenging in itself, and to go along with programming an inanimate object to make decisions that could potentially harm some to benefit others is a dilemma in itself.

However, there are some implications of this approach, which include the utilitarian perspective in the design of autonomous vehicles emphasizes the importance of the algorithms that prioritize the greatest good for the greatest number. This can lead to complex ethical dilemmas, especially in situations where the vehicle’s decision could result in harm to some individual for the benefit of others [7]. The moral quandaries faced by designers and programmers of AVs in embedding ethical principles into autonomous vehicles.

The utilitarian approach in AVs presents a significant ethical challenge of requiring a delicate balance between the greater good and individual rights, raising questions about the moral responsibility of these vehicles and their creators. The decisions these cars make on the user’s behalf will increasingly reflect the underlying ethical framework, making the debate around utilitarianism versus deontology more than just theoretical – it becomes a practical concern with real world implications.

# B. Ethical Debate on Utilitarianism

The ethical foundation of utilitarianism, rooted in consequentialism, posits that the morality of an action is determined solely by its consequences. This philosophy, when applied to autonomous vehicles (AVs), prioritizes outcomes over intentions, aiming to minimize harm in a seemingly objective manner. However, this approach is fraught with complexities and moral quandaries. Critics of a purely utilitarian approach in AVs raise concerns about the potential for morally questionable decisions. For example, the dilemma of whether an AV should always prioritize the lives of many over a few, even if the majority are at fault, is a significant ethical challenge. This scenario underscores the difficulties in programming ethics into machines, where decisions are not just about numbers but also about the inherent value of individual lives.

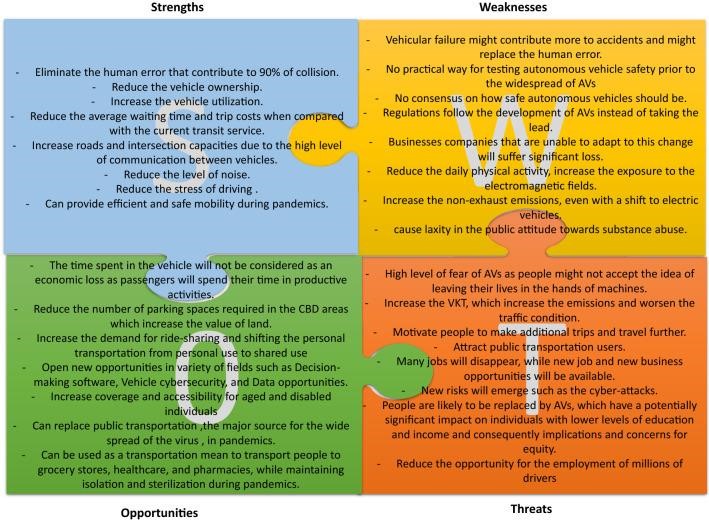
Expanding on this, Furey and Martin (2018) highlight the importance of integrating ethical instruction in AI courses, especially in the context of utilitarianism and its application in AVs. They state, "The course module introduced Utilitarianism and engaged students in considering the classic 'Trolley Problem,' which has gained contemporary relevance with the emergence of autonomous vehicles. This short paper argues for the need of providing students with instruction in ethics in AI courses. Given the strong alignment between AI's decision-theoretic approaches and Utilitarianism, we highlight the difficulty of encouraging AI students to challenge these assumptions." [11] This perspective emphasizes the need for future AI professionals to be well-versed in ethical theories and their implications in real-world applications, such as AVs.

The alignment between AI's decision-theoretic approaches and utilitarian principles presents a unique challenge. It suggests that while utilitarianism offers a framework for decision-making in AVs, it also necessitates a critical examination of the ethical implications of these decisions. The difficulty lies in encouraging AI students and professionals to look beyond the utilitarian framework and consider the broader ethical implications of their work. This includes understanding the value of individual lives and the moral responsibility that comes with developing technology that has the power to make life-altering decisions.

# C. Legal Implications of Utilitarian Decision Making

The legal challenges posed by a utilitarian approach to AV decision-making are multifaceted. If an AV, adhering to utilitarian principles, sacrifices its occupant to minimize overall harm, questions of liability and responsibility arise. Who is to be held accountable for such a decision? The manufacturer? The software developer? Or the vehicle itself?

Current legal frameworks, designed around human agency, may struggle to address the unique challenges posted by autonomous agents making decisions based on utilitarian ethics. For instance, if an AV’s decision to prioritize the greater good results in harm to its occupant, could manufacturers face legal repercussions for programming the vehicle in such a manner? Or would the law evolve to recognize the vehicle’s decision as a necessary sacrifice for the greater good.

The legal implications of the utilitarianism approach in the context of autonomous vehicles (AVs) are well illustrated by a passage from the Committee on Legal Affairs and Human Rights' document "Legal aspects of 'autonomous' vehicles." The excerpt underscores the challenges in apportioning liability in incidents involving semi-autonomous or fully autonomous vehicles. It highlights a critical aspect of utilitarianism in law: the need to adapt legal frameworks to new technologies for the greater good. The document notes, "In the case of a semi-autonomous vehicle operating under the proper control of an automated driving system (ADS), or of a fully autonomous vehicle, criminal law is not designed to deal with the conduct of non-human actors. This may create a ‘responsibility gap’, where the human in the vehicle – the ‘user-in-charge’, even if not actually engaged in driving – cannot be held liable for criminal acts and the vehicle itself was operating according to the manufacturer’s design and applicable regulations." This situation necessitates new approaches to criminal liability, reflecting the utilitarian principle of maximizing overall welfare. In this context, the welfare is the efficient and safe integration of AVs into society, requiring legal systems to evolve and find balanced solutions that align with the collective interest of public safety and technological advancement.

In the provided document, the complexities of integrating AV’s into the legal landscape are evident [3]. As AVs become more prevalent, the legal system will need to adapt to balance the need to protect individual rights with the broader societal implications of utilitarian decision-making.

While utilitarianism offers a compelling framework for AV decision-making, it is not without its ethical and legal challenges, but also poses a great risk to the health specifically related to the user of the car. A user would generally prioritize their own life in a situation that involves risk, so a deontological perspective comes into play here with hard coding a prioritization of the individual’s life that owns the car.

# Conclusion

The advent of autonomous vehicles heralds a transformative era in transportation, poised to enhance safety and efficiently on the roads. Yet, it also introduces a tapestry of ethical conundrums and legal intricacies that demand immediate attention. At the heart of these quandaries is the pressing issue of moral decision making during critical moments. A deontological approach, which should be firmly advocated for, upholds the inviolability of human life, insisting that the safety and rights of each individual should steer the moral compass of AVs.

Fig. 2

SWOT Analysis of Autonomous Vehicles. [9]

This paper, therefore, calls upon manufacturers, legislators, and society at large to enshrine deontological ethics within the very code of AVs. We must reject utilitarian calculations that treat individuals as expendable in the face of greater good. Instead, commit to an unwavering principle that no technological advancement should compromise the inherent dignity and rights of human beings.

The path forward should be charted through rigorous ethical standards, legal mandates that reflect these moral, commitments, and a public dialogue that enshrines these values. As the future of autonomous vehicles approaches ever so fast, take a moment, and collectively endeavor to craft and adhere to a framework that respects each life, ensuring that the progression of AVs is synchronous with the advancement of human rights and safety. Let this be a pledge to navigate the future not on autopilot, but with resolute moral directive that cherishes every individual on and off the roads.

**I. REFERENCES**

[1] L. Li, J. Zhang, S. Wang, and Q. Zhou, “A study of common principles for decision-making in moral dilemmas for Autonomous Vehicles,” Behavioral sciences (Basel, Switzerland), https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9495613/ (accessed Sep. 10, 2023).

[2] D. M. West, J. Bleiberg, Y. Y. Mark Muro, T. W. Blair Levin, and M. M. Timothy J. Bartik, “Products liability and driverless cars: Issues and guiding principles for legislation,” Brookings, https://www.brookings.edu/articles/products-liability-and-driverless-cars-issues-and-guiding-principles-for-legislation/ (accessed Sep. 10, 2023).

[3] “Automated vehicles for safety,” NHTSA, https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety (accessed Sep. 10, 2023).

[4] K. Othman, “Exploring the implications of Autonomous Vehicles: A comprehensive review,” Innovative Infrastructure Solutions, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8885781/ (accessed Oct. 4, 2023).

[5] I. Krontiris, et al., "Autonomous Vehicles: Data Protection and Ethical Considerations," in *Proc. of the 2020 IEEE International Conference on Omni-layer Intelligent Systems (COINS)*, 2020, pp. 1-6. DOI: 10.1109/COINS49042.2020.9191636.

[6] N. de Moura, R. Chatila, K. Evans, S. Chauvier, and E. Dogan, "Ethical decision making for autonomous vehicles," in *2020 IEEE Intelligent Vehicles Symposium (IV)*, Las Vegas, NV, USA, Oct. 2020, pp. 930-935. doi: 10.1109/IV47402.2020.9304618.

[7] M. Feroz, S. M. N. A. Senanayake, J. R. Gamage, and J. R. A. D. J. Perera, "People perception of autonomous vehicles: Legal and ethical issues," *International Journal of Advanced and Applied Sciences*, vol. 6, no. 5, pp. 15-24, May 2019. doi: 10.21833/ijaas.2019.05.003.

[8] W. Li, Y. Huang, S. Wang, and X. Xu, "Safety criticism and ethical dilemma of autonomous vehicles," Frontiers of Mechanical Engineering, vol. 12, no. 1, pp. 16-27, Mar. 2016. [Online]. Available:<https://link.springer.com/article/10.1007/s40534-016-0117-3>. [Accessed: Nov. 21, 2023].

[9] J. Rhim, J.-H. Lee, M. Chen, and A. Lim, “A deeper look at Autonomous Vehicle Ethics: An Integrative Ethical Decision-making framework to explain moral pluralism,” Frontiers in robotics and AI, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8129167/ (accessed Nov. 21, 2023).

[10] Legal aspects of “autonomous” vehicles - parliamentary assembly of ..., https://assembly.coe.int/LifeRay/JUR/Pdf/DocsAndDecs/2020/AS-JUR-2020-20-EN.pdf (accessed Nov. 22, 2023).

[11] Furey, H., and Martin, F. 2018. A module on ethical thinking about autonomous vehicles in an AI course. In Neller, T., ed., *EAAI Model Assignments*. http://modelai.gettysburg.edu/.