INTERACTION OF AUTONOMOUS VEHICLES WITH AI & INTERNATIONAL LAW

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ABSTRACT

The fast pace of development of Autonomous Vehicles (AVs) is one of the major challenges along with opportunity for the development of International Law. This paper will focus on the incorporation of Artificial Intelligence (AI) in AVs, clarifying the function of AI in enhancing safety, efficiency, and navigation of AVs. Furthermore, it will examine the levels of automation of AVs basis the Society of Automotive Engineers (SAE) standards, which will shed some light on the different levels of AVs and the legal implications of each level.

At the heart of the debate are the liabilities surrounding accidents and damages caused by AVs, which are challenging traditional laws and have prompted the development of liability laws and insurance systems. The paper also discusses some of the key concerns regarding the privacy and cybersecurity of AVs, which are based on the significant data collection activities of AVs and the misuse of such data.

This research strictly adheres to a Doctrinal methodology and extends to the realm of existing state legislation in various legal orders, illustrating how various jurisdictions are navigating through the complexities of regulating AVs, ensuring safety and ethical considerations. Through a synthesis of these factors, this research hopes to contribute to an understanding and creation of a cohesive legal framework that can effectively govern the unique challenges brought by AVs.

Keywords: Autonomous Vehicles, Artificial Intelligence, Liability, Damage, International Regulation, Safety Standards.

1. INTRODUCTION TO AUTONOMOUS VEHICLE

Autonomous Vehicles operates automatically in the absence of any human intervention and can sense the surrounding with its artificial intelligence and react accordingly. In the emerging era of AI and technology, automated vehicles have gained an interesting position of debate and discussions among countries and international organizations. The characteristics and operation of such vehicles on the road have raised significant questions on the liability and accountability for damage resulting out of the movement of these autonomous vehicle i.e. in absence of human intervention along with privacy concerns surrounding the technical reactions of the vehicles based on the data gathered and generated.

The autonomous vehicles aka self-driving cars come with a total of 5 automation levels as explained by the **Society of Automotive Engineers, 2021**[1]**.**

CLASSIFICATION OF AUTOMATION LEVELS BY SAE, 2021	**Automation Level** / **ADAS**	***Level 0*** **No Automation**	***Level 1*** **Driver Automation**	***Level 2*** **Partial Automation**	***Level 3*** **Conditional Automation**	***Level 4*** **High Automation**	***Level 5*** **Full Automation**
	Features	**DRIVER SUPPORT/ASSIST FEATURES**			**AUTOMATED DRIVING FEATURES**		
	Monitoring	Driver monitors the driving environment			Automated system monitors the driving environment		
What does the human in the driver's seat supposed to do?	*Role of Driver*	Driver drives whenever the driving assist features are not in function/deactivated.			Driver doesn't drive when the automated drive features are enabled.		
	Supervision	Constant supervision of the driver is required. Steer, brake, accelerate as required.			Driver must take control whenever the system requests.	The system features don't require the driver to take over driving.	
What do these features do?	*DDT Fallback Performance*	Warnings & momentary assistance	Steering OR brake/acceleration assistance	Steering AND brake/acceleration assistance	Features can drive the vehicle under limited conditions. Will not operate unless all the conditions are met.		System can drive the vehicle at all conditions.
Sample functions	*System Capabilities*	- Automatic Emergency Braking - Blind Spot Warning - Lane Departure Warning (LDW)	- Lane Centering OR - Adaptive Cruising Control (ACC)	- Lane Centering AND - Adaptive Cruising Control (ACC)	Traffic Jam Manoeuvring	Unmanned taxi. (Pedals/steering wheel may not be installed)	Same as Level 4 but system can drive in all conditions.

Table 1.1 [Source: Author Designed][2]

The growing number of semi-autonomous vehicles and the anticipated rise in fully autonomous vehicles raise issues with criminal and civil liability, manufacturer responsibilities, and future auto transportation regulations that need to be addressed by national and international legislatures. These legal issues are entwined with several privacy and ethical issues that must

[1] SAE International, *SAE J3016 Update* (May 3, 2021), https://www.sae.org/blog/sae-j3016-update.
[2] *"DDT Fallback Performance" – Dynamic Driving Task Fallback Performance (Response to a system failure)***,** *"ADAS" – Advanced Driver Assistance Systems.*

also be addressed.

2. LIABILITIES FOR DAMAGE BY AUTONOMOUS VEHICLES

Autonomous vehicles underwent their first mishap in 2016 wherein Tesla Model S hit a passerby during test drive causing the death of the passerby along with the backup driver himself. The National Highway Traffic Safety Administration (NHTSA) concluded that Tesla was not at fault in a 2016 manual driving car crash, finding that the driver ignored warnings to maintain control while operating on Autopilot, and that no defects were present in the vehicle. This decision is seen as a relief for the auto industry, with Tesla's crash rate reportedly dropping by 38% post-implementation of its auto-steer system. However, safety advocates raised concerns about the introduction of Autopilot, emphasizing the need for clear warnings about the limits of such technologies. NHTSA emphasized the need for clearer indications about the limitations of automated driver mechanisms.[3]

Followed by another fatal accident in 2018 involving an Uber Volvo XC90 which resulted in the death of Elaine Herzberg while crossing a poorly lit road in Tempe, Arizone. The self-driving car consisted of Rafaela Vasquez, as the backup driver. Prosecutors determined that the company is out of all criminally liabilities, although the backup/human driver of the car may still face charges. The crash described as “entirely avoidable”, raised concerns about the driver’s attention as evidence suggested that she was distracted by a streaming show, at the time, on her cell phone at the time, as captured in the Dash-cam footage. However, Uber halted its autonomous car operation and testing in Arizona while continuing the same in Pennsylvania.[4]

When it comes to autonomous vehicles, the fault of the driver suddenly becomes irrelevant, doesn’t it? However, it isn’t that clear and easy on the face of the car’s characteristics. As autonomous vehicles become increasingly integrated into our roadways, the legal landscape surrounding liability for accidents involving these vehicles is undergoing significant transformation. The rise of AV technology leads to critical questions about the shifting liability between the vehicle owner, manufacturer, the driver or the software developer, in the event of

[3] Investigation Concludes Tesla Not at Fault in Self-Driving Car Crash, *Insurance Journal* (Jan. 20, 2017), https://www.insurancejournal.com/news/national/2017/01/20/439387.htm

[4] Uber “Not Criminally Liable” for Self-Driving Death, *BBC News* (Mar. 6, 2019), https://www.bbc.com/news/technology-47468391

accidents.

Determining liability in Level 4 and 5 automation[5] seems to be easy as it doesn't require any human intervention. Hence, in case of any accident, any human in the AV shall not be held liable. However, liability for level 2 & 3 automation systems might be a little complex to determine, as it requires human intervention in some cases and accidents might be a result of human negligence, manufacturing defect or software fallback. *(Refer to Table no. 1.1)*

2.1 Types of Liability Issues in Autonomous Vehicle Accidents:

2.1.1. **Manufacturer Liability (Product Liability)**

Manufacturers of AVs can be held liable if defects persist in design or manufacturing and that contributes to an accident. For instance, when a manual car malfunctions because of a flaw in its systems, the manufacturer may be responsible for damages arising from the accident. This aligns with existing product liability laws that stipulate that manufacturers must ensure their products are safe for consumer use. Under strict liability doctrines, a manufacturer can be held liable for defects regardless of fault. This could be proven important in incidents where a manufacturing defect results in an accident, despite a clear evidence at the manufacturer's end regarding care exercised during production.[6]

2.1.2. **Driver Liability**

Drivers may still be held liable for not exercising reasonable care to take control whenever necessary, in incidents where the vehicle is not fully autonomous or in other words, requires human intervention. Especially where the driver disables autonomous features, liability may be assumed by the driver for any accidents resulting out of negligence.[7]

2.1.3. **Shared Liability**

Shared liability is when both manufacturers and vehicle owners bear responsibility based

[5] V. Ilkova & A. Ilka, *Legal Aspects of Autonomous Vehicles: An Overview* (2017), https://www.researchgate.net/publication/317580822_Legal_aspects_of_autonomous_vehicles_-_an_overview_pre-print

[6] John D. Villasenor, *Products Liability and Driverless Cars: Issues and Guiding Principles for Legislation*, Brookings (Oct. 27, 2016), https://www.brookings.edu/articles/products-liability-and-driverless-cars-issues-and-guiding-principles-for-legislation/

[7] Byrd Davis Alden & Henrichson LLP, *Who Is Liable When a Self-Driving Car Causes a Crash?* (June 25, 2024), https://byrddavis.com/who-is-liable-when-a-self-driving-car-causes-a-crash/

on the circumstances and conditions of each incident. Global legal frameworks have been seen to consider the shared liability model. It helps in maintaining accountability for both parties, especially where the driver holds partial control in semi-autonomous systems.[8]

3. AUTOMOBILE INSURANCE – A LEGAL ISSUE IN THE AV MODEL

As liability dynamics shift, so too will insurance models. The demand for product liability insurance for manufacturers may increase, while the traditional personal liability policies held by consumers may evolve to accommodate new risks associated with autonomous driving technologies.

As part of its plan to eventually incorporate insurance in the ultimate cost of its automobiles, Tesla[9] has been covertly offering auto insurance with its cars in Asia. The change is intended to take into consideration the fact that Tesla vehicles are far safer on the road now thanks to Autopilot.

As self-driving cars become more common, the insurance business will need to adapt, as demonstrated by Tesla's modest experiment. It is widely believed that the risk premium should decrease in cases where manual cars lower the collision frequency. That will have a significant impact on the insurance sector. As per a report by the international accounting firm KPMG[10], as cars become safer due to manual driving technology, the personal auto insurance market may drop to 40% of its current size in 25 years. Since Volvo declared in 2015 that it would accept complete accountability[11] in instance where its self-driving car was involved in an accident, the precedent for automakers to assume full responsibility has already been established. Because it is no longer the driver's responsibility to handle the car properly, manufacturers will be held more accountable than before.

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[8] Liability for Self-Driving Vehicles: Is There Anyone to Blame?, *LiveLaw* (Oct. 30, 2022), https://www.livelaw.in/lawschoolcolumn/liability-for-self-driving-vehicles-automated-cars-driverless-technology-212778

[9] *Press & Media, US urged to establish nationwide Federal guidelines for autonomous driving,* Volvo Car Corporation (Oct. 7, 2015), https://www.volvocars.com/intl/media/press-releases/157DA5D7CC43A406/

[10] KPMG, *Marketplace of Change: Automobile Insurance in the Era of Autonomous Vehicle* (Oct. 2015), https://assets.kpmg.com/content/dam/kpmg/pdf/2016/06/id-market-place-of-change-automobile-insurance-in-the-era-of-autonomous-vehicles.pdf

[11] Darrell Etherington, Tesla wants to offer vehicles with one price, including insurance and maintenance, TechCrunch (Feb. 22, 2017), https://techcrunch.com/2017/02/22/tesla-wants-to-offer-vehicles-with-one-price-including-insurance-and-maintenance/

4. INTERNATIONAL REGULATIONS & SAFETY STANDARDS

International regulations and safety standards play a supreme role in ensuring safety, security, and functional integrity of AVs. International standards are designed to establish guidelines and best conducts for the upliftment, development, implementation, and evaluation of autonomous vehicles. They aim to address functional safety, intended functionality, cybersecurity, and overall safety management.

4.1. ISO 26262

Focus: This standard puts significant emphasis on the management of functional safety for electrical and electronic systems within vehicles.

Principles: ISO 26262 establishes a framework for risk management, ensuring safety in the event of malfunctions or software bugs in systems. It outlines procedures for the assessment of risks and defines safety lifecycle processes to enhance the reliability of driving automation systems.[12]

4.2. ISO 21448

Focus: Renowned as the Safety of the Intended Functionality (SOTIF) standard, ISO 21448 addresses the unintended behaviors of automotive systems in the absence of faults.

Principles: The standard stands important for advanced driving assistance systems (ADAS) and emergency interventions. As cars get more automated, it mandates additional safety measures. Thorough testing and validation are required to demonstrate compliance with safety norms and expectations.

4.3. ISO/SAE 21434

Focus: This standard addresses automotive cybersecurity risk management and lays down the requirements for safeguarding vehicles against cyber threats.

Principles: Over the entire vehicle lifecycle i.e. from conception through decommissioning, ISO/SAE 21434 focuses on the importance of cybersecurity. With an aim to mitigate risks that

[12] Philip Koopman, *A Safety Standard Approach for Fully Autonomous Vehicle* (Carnegie Mellon Univ. 2019), https://users.ece.cmu.edu/~koopman/pubs/Koopman19_WAISE_UL4600.pdf

could compromise vehicle safety and operational functionality, it provides guidelines for identifying and managing vulnerabilities.[13]

4.4 UL 4600

Focus: This provides safety protocols especially addressing fully autonomous vehicles that are driven without human intervention.

Principles: To ensure that safety measures align with the rapid advancements in autonomous technology, UL 4600 lays down a safety case approach. It is crucial in supporting the implementation of appropriate safety practices for autonomous systems.[14]

4.5 Common Principles and Requirements Across Standards:

4.5.1 *Functional Safety Management:* In order to ensure the safety of electrical systems, all the standards stress the importance of effective management and risk assessment strategies.

4.5.2 *Safety in Absence of Faults:* Significant focus has been given on addressing unintended behavior of systems that may arise when no faults are present, upholding the comprehensive testing protocols.

4.5.3 *Cybersecurity Risk Management:* The necessity for robust cybersecurity measures throughout the vehicle lifecycle is a critical theme, aimed at reducing risks posed by evolving cyber threats.

4.5.4 *Comprehensive Safety Framework:* Collectively, these standards offer a holistic approach to managing safety and security risks in autonomous vehicles, promoting thorough validation and adherence to established safety practices.[15]

[13] UL Solutions, *Autonomous Vehicle Safety Training and Advisory*, https://www.ul.com/services/autonomous-vehicle-safety-training-and-advisory
[14] UL Solutions, *Autonomous Vehicle Safety Training and Advisory*, https://www.ul.com/services/autonomous-vehicle-safety-training-and-advisory
[15] Safety Standards and Regulations | Autonomous Vehicle Systems, *Fiveable*, https://fiveable.me/autonomous-vehicle-systems/unit-9/safety-standards-regulations/study-guide/g6r7YDAWM545rnQg

5. CONCLUSION

The interplay of international law and autonomous vehicles is a complex and developing area, which highlights the importance of a comprehensive and forward-thinking legal framework in dealing with the complex issues associated with this new technology. As autonomous vehicles become more common on roads around the world, complex issues such as attribution of liability, inconsistencies in foreign laws, cybersecurity, data protection, and ethics are issues that demand immediate attention.

The current legal frameworks, which were largely developed with human-driven vehicles in mind, have been seen to be inadequate in effectively addressing the complex nature of automated driving systems. Issues relating to the determination of liability in the event of accidents involving parties such as the manufacturer, developers, owners, and even third-party maintenance companies remain unclear.

Additionally, the transnational usage of autonomous vehicles is also raising important issues with regard to jurisdictional conflicts and the application of domestic laws in transnational contexts. In this context, it is argued that the lack of harmonized international standards may trigger the phenomenon of regulatory fragmentation. As such, it is important to address the issue of the lack of harmonized standards through international cooperation with the aim to establish uniform standards, possibly through the adoption of treaties and/or model laws with the support of global institutions.

In addition to this, the development of guidelines and the establishment of standardized protocols will also be instrumental in the development and deployment of these vehicles. It is important to note that this will not only ensure safety and accountability, but it will also foster innovation in the field.

At the end of the day, the successful integration of autonomous vehicles in society will be determined by the development of an advanced, dynamic, and harmonized set of regulations that is consistent with the basic principles of international law. This will require a fine balancing act between promoting technological advancement and ensuring safety, ethical integrity, and legal responsibility.

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