Artes Libres
Law & Social Journal

AI-Driven Traffic Accidents: A Comparative Legal Study

Muhammad Irwan

Email: muhammad.irwan@unhas.ac.id

Mursyid Mursyid

Email: mursyid.mursyid@umi.ac.id

ABSTRACT. This research explores the evolving legal landscape surrounding criminal liability in traffic accidents involving AI-driven vehicles. The study aims to analyze the conceptual and practical challenges posed by assigning criminal responsibility in such cases, particularly focusing on the comparison of legal frameworks at the international level. The research methodology employed is a normative legal study, utilizing a comparative approach to analyze existing laws and regulations related to AI-driven vehicles in the United States, the European Union, and Japan. The study examines the theoretical foundations of criminal liability, including mens rea and actus reus, in the context of AI technology. The findings of this research highlight the need for innovative legal adaptations to address the unique challenges posed by AI-driven vehicles. Concepts such as vicarious liability and ethical decision-making algorithms emerge as potential solutions to ensure accountability and safety in autonomous transportation. The study also underscores the importance of international cooperation in harmonizing legal standards to facilitate the global deployment of AI-driven vehicles.

KEYWORDS. Criminal Liability, AI-driven Vehicles, Comparative, VicariousLliability, Ethical Decision-Making

Introduction

The advent of Artificial Intelligence (AI) has revolutionized various sectors, including transportation. One of the most notable advancements in this field is the development of autonomous vehicles (AVs), which have the potential to transform our roads and redefine mobility. These vehicles, equipped with sophisticated AI systems, promise to reduce human error, increase efficiency, and improve safety on the roads. However, as with any technological innovation, the integration of AI into traffic systems brings forth significant legal and ethical challenges, particularly concerning criminal liability in traffic accidents involving AI-powered vehicles.

In the context of criminal law, the core issue revolves around the attribution of liability when an autonomous vehicle is involved in a traffic accident. Traditional legal frameworks are built around human drivers, where negligence or recklessness can be directly linked to the actions of a person. However, with the introduction of AVs, which operate based on complex algorithms and machine learning processes, identifying the responsible party becomes significantly more complicated. This raises fundamental questions about how existing laws can adapt to situations where AI systems, rather than human drivers, are in control.

From a general perspective, traffic accidents are a significant concern globally. According to the World Health Organization (WHO), road traffic injuries are a leading cause of death, with an estimated 1.35 million fatalities each year. Governments worldwide are exploring various measures to mitigate these numbers, including the implementation of technology-driven solutions like AVs. Proponents of AVs argue that these vehicles, by eliminating human error—which accounts for over 90% of accidents—could drastically reduce traffic-related fatalities and injuries. However, the occurrence of accidents involving AVs poses a new challenge for legal

systems, which must determine how to attribute criminal liability in scenarios where a machine, rather than a human, is at fault.

In specific terms, the emergence of AVs introduces a paradigm shift in how responsibility is assigned in traffic incidents. Traditional liability models rely heavily on the concept of driver responsibility. When an accident occurs, the driver's actions are scrutinized to establish fault. With AVs, this model is disrupted, as the 'driver' is a combination of hardware, software, and algorithms. This necessitates a reevaluation of liability standards and the potential creation of new legal frameworks that can accommodate the unique characteristics of AI-driven vehicles.

One of the critical phenomena underpinning this issue is the complexity and unpredictability of AI systems. Unlike conventional vehicles, where the driver's intent and control are relatively straightforward, AVs operate based on a multitude of sensors, data inputs, and decision-making algorithms. These systems are designed to navigate dynamic environments, respond to unexpected obstacles, and make split-second decisions. The decision-making process of AI, however, is not always transparent, and it can be challenging to trace the exact cause of a malfunction or error that leads to an accident. This opacity complicates the assignment of blame and challenges traditional notions of criminal liability, which are predicated on clear causation and intent.

In examining the phenomenon of AV-related accidents, it is essential to consider the concept of "moral agency" in AI. Traditional criminal law holds individuals accountable because they possess moral agency—the capacity to understand and control their actions. AI systems, however, lack this agency. They operate based on programming and data, without consciousness or intent. This distinction raises critical questions about how to conceptualize and apply criminal liability in cases where an AI system's actions result in harm. Should liability rest with the manufacturers, programmers, or owners of the AVs? Or

should new categories of liability be established to address these unique circumstances?

Research in this area is evolving, with scholars and legal practitioners grappling with these complex issues. For instance, the work of Bryant Walker Smith explores the legal and ethical dimensions of automated driving, highlighting the challenges of assigning liability in a landscape where human and machine roles are increasingly intertwined (Smith, 2012). Similarly, Gary Marchant and Rachel Lindor discuss the regulatory and liability challenges posed by emerging technologies like AVs, suggesting that current legal systems may need substantial reforms to accommodate these advancements (Marchant & Lindor, 2012).

A comparative analysis of how different jurisdictions handle AV-related accidents reveals diverse approaches to tackling these challenges. In the United States, for example, there is an ongoing debate about the extent to which federal versus state laws should govern AV liability. The National Highway Traffic Safety Administration (NHTSA) has issued guidelines that recommend a shared responsibility model, where liability is distributed among the vehicle's manufacturers, operators, and, in some cases, the technology providers. Meanwhile, the European Union has taken steps towards establishing a unified framework that addresses both civil and criminal liability, emphasizing the importance of consumer protection and safety in the deployment of AVs.

In contrast, countries like Japan have begun to implement specific legal provisions that directly address the use of AVs. Japan's Road Traffic Act has been amended to include regulations for Level 3 autonomous driving, which allows for hands-off driving under certain conditions. This legal adaptation highlights a proactive approach to integrating AVs into existing traffic systems while considering the unique legal implications of their use.

The normative legal research method provides a structured approach to exploring these issues. By analyzing existing legal doctrines, regulations, and judicial decisions, normative research aims to understand how legal systems can adapt to new technologies like AVs. This method allows for a critical examination of current liability frameworks and the identification of gaps or inconsistencies that may arise in the context of AV-related accidents. Moreover, it facilitates the development of normative recommendations for reforming legal systems to better address the challenges posed by AI in traffic scenarios.

The rise of autonomous vehicles equipped with AI technology presents a profound challenge for criminal law, particularly in the realm of traffic accidents. The traditional notions of driver responsibility and fault are being questioned as machines take on roles once reserved for humans. A comprehensive and comparative analysis of how different legal systems approach these issues is crucial for developing robust legal frameworks that can effectively address the complexities of AI-driven transportation. Through normative legal research, we can explore potential solutions and reforms that ensure accountability, safety, and justice in the era of autonomous vehicles.

Method

This study employs a normative legal research methodology to examine the criminal liability issues surrounding traffic accidents involving autonomous vehicles (AVs) equipped with Artificial Intelligence (AI). Normative legal research is particularly suitable for exploring the theoretical and doctrinal aspects of law, focusing on what the law is and what it ought to be. This methodology provides a structured approach to analyze and evaluate the legal principles and regulations that govern AVs and their implications for criminal liability.

The regulatory approach is utilized to analyze existing laws and regulations that pertain to autonomous vehicles and traffic accidents. This involves a detailed examination of statutory provisions, legislative frameworks, and guidelines issued by various jurisdictions. By exploring how current laws address or fail to address the unique challenges posed by AVs, this study aims to identify gaps and propose potential reforms. Key legal documents, such as the National Highway Traffic Safety Administration (NHTSA) guidelines in the United States, the European Union's regulatory frameworks, and specific legislative amendments in countries like Japan, serve as primary sources for this analysis. This approach provides insight into how different legal systems are adapting to the technological advancements brought by AVs and how these adaptations impact the attribution of criminal liability.

The conceptual approach is employed to explore the theoretical underpinnings of criminal liability in the context of AI and AVs. This includes an in-depth analysis of concepts such as mens rea (the guilty mind), moral agency, and causation, which are foundational to traditional criminal law. By examining these concepts, the study investigates how they can be applied or need to be redefined to accommodate scenarios where AI systems, rather than humans, control vehicles. This approach also involves analyzing the ethical considerations and philosophical debates surrounding AI decision-making and moral responsibility. Works by scholars such as Bryant Walker Smith and Patrick Lin provide critical perspectives on these issues, helping to understand the complexities and nuances of assigning liability to non-human entities.

The comparative approach involves a systematic comparison of how different legal systems address the issue of criminal liability for AVs. This approach examines the regulatory and doctrinal differences across jurisdictions, including the United States, the European Union, and Japan, among others. By comparing these legal systems, the study identifies best

practices, common challenges, and divergent approaches to regulating AVs and assigning liability in the event of accidents. The comparative analysis helps to highlight the strengths and weaknesses of various regulatory models and offers insights into how international legal frameworks can harmonize to effectively manage the legal implications of AV technology. This approach is crucial for developing a comprehensive understanding of global legal trends and for proposing informed recommendations for legal reform.

The combination of regulatory, conceptual, and comparative approaches in this normative legal research provides a robust framework for analyzing the complex issues surrounding criminal liability in traffic accidents involving autonomous vehicles. This methodology not only clarifies the current legal landscape but also offers pathways for future legal developments in the era of AI-driven transportation.

Result and Discussion

The rapid advancement of Artificial Intelligence (AI) in autonomous vehicles (AVs) has introduced a transformative shift in the transportation sector, promising to enhance road safety and efficiency. However, it also poses significant challenges to existing legal frameworks, particularly in the realm of criminal liability in traffic accidents involving AVs.

General Legal Frameworks for Autonomous Vehicles (AVs): Comparative Analysis

The United States

In the United States, the regulatory landscape for autonomous vehicles (AVs) is in a state of flux, reflecting the broader challenge of integrating cutting-edge technology into existing legal frameworks. The National Highway Traffic Safety Administration (NHTSA) has been at the forefront of this effort,

issuing guidelines that advocate for a shared responsibility model. This model suggests that liability for accidents involving AVs should be distributed among various stakeholders, including manufacturers, operators, and technology providers. The rationale behind this approach is to foster innovation while ensuring that there is accountability and safety across all stages of AV deployment and operation (NHTSA, 2017).

However, the lack of a unified federal regulatory framework has led to significant variability at the state level. For instance, California, a state known for its pioneering role in technology regulation, has implemented rigorous testing and operational requirements for AVs. These include mandatory disengagement reports, which document instances when a human driver had to take control of the vehicle, and stringent insurance and liability requirements for AV manufacturers and operators (California Department of Motor Vehicles, 2021). Conversely, states like Arizona have adopted a more laissez-faire approach, with minimal regulatory oversight to attract AV testing and development within their jurisdictions (Gurney, 2018).

This patchwork of state regulations creates a fragmented legal environment, complicating the operational landscape for AV developers and posing challenges for interstate AV operations. For example, an AV operating seamlessly under California's stringent regulations might encounter regulatory ambiguities when crossing into a state with more relaxed rules. This disparity underscores the critical need for cohesive federal legislation that provides consistent standards across all states, ensuring both the safety and operational efficiency of AVs nationwide (Smith, 2019).

Recent legislative efforts, such as the SELF DRIVE Act and the AV START Act, represent attempts to create a more unified federal approach. These bills propose establishing federal safety standards for AVs and clarifying the roles and responsibilities of various stakeholders in the AV ecosystem

(House of Representatives, 2017; Senate, 2018). However, these efforts have faced significant political and logistical hurdles, delaying the establishment of a comprehensive federal regulatory framework.

The European Union

In contrast to the United States, the European Union (EU) is moving towards a more harmonized approach to AV regulation. The EU's regulatory philosophy is grounded in the principles of safety, consumer protection, and the creation of a clear and cohesive legal framework. The European Commission has been instrumental in this effort, proposing a series of initiatives aimed at integrating AV technology into the EU's legal landscape while maintaining high safety and consumer protection standards (European Commission, 2020).

One of the EU's key regulatory frameworks is the General Safety Regulation (GSR), which mandates advanced safety features for all vehicles, including AVs, by 2022. These features include advanced emergency braking systems, lane-keeping assistance, and systems to detect driver drowsiness and distraction (European Parliament, 2019). The GSR reflects the EU's proactive stance in ensuring that AV technology meets stringent safety standards before widespread deployment.

Moreover, the EU has been proactive in addressing the legal implications of AV technology through legislative initiatives such as the European Parliament's resolution on autonomous driving. This resolution calls for the development of a unified legal framework that addresses both civil and criminal liability for AVs. It emphasizes the need for clear definitions of liability and accountability, ensuring that consumers are protected and that there is legal clarity for manufacturers and operators (European Parliament, 2018).

Germany exemplifies the EU's approach with its enactment of specific laws governing Level 3 and Level 4 autonomous driving. German legislation requires that AVs must always have

a means for human intervention and mandates that manufacturers bear significant responsibility for the performance and safety of their AV systems (Federal Ministry of Transport and Digital Infrastructure, 2017). These laws delineate the roles and responsibilities of manufacturers, operators, and users, providing a robust framework for managing the complexities of AI-driven transportation.

Japan

Japan presents another model of AV regulation, characterized by proactive legislative amendments and a clear delineation of responsibilities for all stakeholders. The Japanese government has updated the Road Traffic Act to include provisions for Level 3 autonomous driving, which allows vehicles to operate without human intervention under certain conditions (Road Traffic Act, 2019). This amendment outlines the legal responsibilities of manufacturers and operators, ensuring that there is a clear framework for accountability in the event of accidents.

Japan's regulatory approach also includes stringent requirements for the testing and deployment of AVs. These requirements are designed to ensure that AV technology is safe and reliable before it is integrated into public traffic systems. For example, manufacturers must conduct extensive testing to demonstrate the safety and reliability of their AV systems under a wide range of conditions (Ministry of Land, Infrastructure, Transport and Tourism, 2020). This approach not only promotes the safe and accountable use of AV technology but also ensures that all stakeholders understand their roles and liabilities.

Additionally, Japan has implemented a comprehensive insurance framework for AVs, which requires manufacturers to provide coverage for any damages resulting from the operation of their vehicles. This framework ensures that victims of AV-related accidents are compensated, and it incentivizes manufacturers to maintain high safety standards (Japan

Automobile Insurance Rating Organization, 2020). Japan's approach demonstrates the effectiveness of integrating specific legal provisions into existing traffic laws to address the unique challenges posed by autonomous vehicles.

Implications and Future Directions

The comparative analysis of the regulatory frameworks in the United States, the European Union, and Japan reveals distinct approaches to addressing the challenges of AV technology. Each jurisdiction offers valuable insights into how legal systems can adapt to the complexities of AI-driven transportation.

In the United States, the fragmented state-level regulations highlight the need for a cohesive federal policy that provides uniform standards across all states. This would not only streamline the operational landscape for AV developers but also enhance safety and legal clarity for all stakeholders. The EU's harmonized approach, with its emphasis on safety, consumer protection, and clear liability rules, provides a model for integrating AV technology into existing legal frameworks while maintaining high safety standards. Japan's proactive legislative amendments and comprehensive insurance framework illustrate the benefits of integrating specific legal provisions into existing traffic laws to address the unique challenges posed by AVs.

As AV technology continues to evolve, it is crucial for legal systems to develop adaptive and forward-looking regulatory frameworks that ensure accountability, safety, and innovation. International cooperation and harmonization of legal standards will be essential for managing the global deployment of AVs and addressing the cross-border implications of AI-driven transportation. By learning from the diverse regulatory approaches of different jurisdictions, policymakers can create robust and adaptive legal frameworks that promote the safe

and efficient integration of AV technology into global transportation systems.

Conceptual Challenges and Legal Adaptations

The shift from human-operated to AI-driven vehicles represents not just a technological revolution but also a profound challenge to existing legal frameworks. Central to this challenge is the reevaluation of fundamental legal concepts such as mens rea (the guilty mind) and moral agency, which are cornerstone principles in traditional criminal liability. In the realm of conventional criminal law, culpability often hinges on the presence of mens rea, coupled with actus reus (the physical act of wrongdoing). However, AI systems, including those in autonomous vehicles (AVs), operate purely on the basis of algorithms and data inputs, devoid of consciousness or intent. This fundamental difference raises complex questions about how criminal liability should be assigned in accidents involving AVs.

The Concept of Vicarious Liability

One approach to addressing the conundrum of attributing liability in AV-related incidents is through the doctrine of vicarious liability. This legal concept transfers responsibility from the AI system to the human entities involved in its creation, deployment, and operation. Traditionally, vicarious liability has been applied in scenarios where an employer is held accountable for the actions of their employees. In the context of AVs, this principle could extend to manufacturers, software developers, and vehicle owners.

For example, if an accident occurs due to a flaw in the AV's software, the software developer might be held liable for negligence in programming. This aligns with existing legal doctrines that hold creators responsible for defects in their

products. Similarly, if an accident results from a hardware malfunction, the manufacturer could be held liable under product liability laws (Gurney, 2018). These adaptations of vicarious liability principles provide a framework for attributing responsibility but require nuanced understanding to address the unique complexities introduced by AI technology.

Additionally, the role of the vehicle owner/operator can complicate liability issues. Unlike human drivers, AVs operate autonomously, which raises questions about the extent of the owner's responsibility for the vehicle's actions. Some jurisdictions may consider holding the owner liable for ensuring that the vehicle's software is updated and maintained correctly, thus extending traditional concepts of ownership and responsibility to the digital realm (Calo & Rosenblat, 2017).

Ethical and Legal Considerations in AI Decision-Making

The decision-making processes of AI systems, particularly in AVs, often involve complex ethical considerations that further complicate the attribution of liability. Autonomous vehicles must make split-second decisions in real-time, often in ethically challenging scenarios. The infamous "trolley problem," where an AV must choose between two harmful outcomes, exemplifies these ethical dilemmas (Lin, 2016). Such scenarios force AVs to make moral decisions that traditionally would involve human judgment and discretion.

Scholars like Patrick Lin have argued for the necessity of incorporating ethical algorithms into AVs to guide their decision-making processes. These ethical algorithms would theoretically allow AVs to make decisions based on predefined moral frameworks. However, the implementation of such algorithms raises additional questions. For example, who decides which ethical framework should be encoded into the vehicle? How do we ensure these decisions are transparent and consistent with societal values? (Lin, 2016).

The "black box" nature of AI algorithms further complicates these issues. AI systems, especially those employing deep learning techniques, often operate as opaque entities whose decision-making processes are not easily understood or traced. This opacity makes it challenging to audit and evaluate the decisions made by AVs, thereby complicating the attribution of liability and the enforcement of accountability (Goodman & Flaxman, 2017). Legal frameworks must therefore evolve to ensure transparency and accountability in AI decision-making processes. This could involve mandatory disclosure of algorithmic processes and independent audits to provide oversight and ensure that AVs operate within acceptable ethical and legal boundaries (Pasquale, 2015).

Comparative Legal Perspectives on AI and Liability

Different jurisdictions have begun to tackle these conceptual and practical challenges in varying ways. The European Union (EU), for instance, is taking steps to integrate AI ethics into its regulatory framework for AVs. The European Parliament's resolution on autonomous driving calls for the development of ethical guidelines and liability rules that address the unique challenges posed by AV technology (European Parliament, 2018). This approach reflects a commitment to embedding ethical considerations into the legal fabric governing AVs.

In contrast, the United States has seen more fragmented approaches. While federal bodies like the NHTSA have issued guidelines advocating for shared responsibility among stakeholders, individual states have taken diverse paths in regulating AVs and assigning liability (NHTSA, 2017). Some states, like California, impose stringent reporting requirements and liability rules, while others have more lenient regulations, reflecting different levels of emphasis on safety, innovation, and ethical considerations (California Department of Motor Vehicles, 2021).

Japan's regulatory approach, characterized by proactive legislative amendments, provides another perspective. Japanese law has been updated to include specific provisions for AVs, clearly outlining the responsibilities of manufacturers, operators, and owners (Ministry of Land, Infrastructure, Transport and Tourism, 2020). This clarity helps manage the ethical and legal challenges of AI-driven transportation by ensuring that all stakeholders understand their roles and liabilities.

Legal Adaptations and the Future of AV Regulation

As the deployment of AV technology becomes more widespread, legal systems must adapt to address the unique challenges it presents. This adaptation involves not only revising existing laws to incorporate new concepts of liability and ethical decision-making but also creating new regulatory frameworks that are flexible enough to accommodate the rapid evolution of AI technology.

One potential direction for future legal frameworks is the development of hybrid liability models that combine elements of strict liability, negligence, and product liability. These models could offer a more comprehensive approach to managing the diverse risks associated with AVs. For example, a hybrid model might hold manufacturers strictly liable for defects in their products, while also considering the role of software developers and vehicle owners/operators in maintaining and updating the AI systems (Marchant & Lindor, 2012).

Furthermore, international cooperation and the harmonization of legal standards will be crucial for managing the global deployment of AVs. Given that AV technology and its associated ethical challenges are not confined by national borders, consistent international frameworks will be essential for ensuring safety, accountability, and innovation across different jurisdictions. Initiatives such as the United Nations Economic Commission for Europe's (UNECE) regulations on automated

driving systems provide a starting point for such global cooperation (UNECE, 2020).

The transition from human-driven to AI-driven vehicles necessitates a profound reevaluation of traditional legal concepts and the development of innovative regulatory frameworks. By addressing the unique challenges of AI technology through the lens of vicarious liability, ethical decision-making, and international cooperation, legal systems can foster the safe and accountable integration of autonomous vehicles into society.

Conclusion

The advent of AI-driven vehicles presents profound theoretical and conceptual implications for legal systems worldwide. The conceptual challenges posed by assigning criminal liability in AI-related accidents necessitate a reevaluation of traditional legal concepts such as mens rea and actus reus. The concept of vicarious liability emerges as a potential solution, transferring responsibility from AI systems to human entities involved in their creation and operation. Moreover, the ethical considerations surrounding AI decision-making underscore the need for transparent and accountable algorithms in AVs. The "black box" nature of AI algorithms presents a challenge, requiring legal frameworks to ensure that AV decisions align with societal values and ethical standards. These theoretical and conceptual challenges have practical implications for the future of AV regulation. Legal systems must adapt to address the unique challenges of AI technology, incorporating hybrid liability models that combine elements of strict liability, negligence, and product liability. International cooperation and harmonization of legal standards will be essential for managing the global deployment of AVs and ensuring safety, accountability, and innovation across jurisdictions. In essence, the integration of AI technology into

transportation systems requires legal systems to evolve in tandem, fostering innovation while maintaining ethical standards and accountability. By addressing these challenges, legal frameworks can facilitate the safe and responsible integration of AI-driven vehicles into society.

References

Borenstein, J., Herkert, J. R., & Miller, K. W. (2017). The ethics of autonomous cars. The Atlantic.

Brown, D. (2020). Criminal Law: A Critical Introduction. Oxford: Oxford University Press.

California Department of Motor Vehicles. (2021). Autonomous Vehicles. Retrieved from https://www.dmv.ca.gov/portal/vehicle-industry-services/autonomous-vehicles/

Calo, R., & Rosenblat, A. (2017). The Automated Driving: Security + Privacy Challenges. IEEE Spectrum. Retrieved from https://spectrum.ieee.org/automated-driving-security-privacy-challenges

European Commission. (2020). On the Road to Automated Mobility: An EU Strategy for Mobility of the Future. Retrieved from https://ec.europa.eu/transport/sites/default/files/3rd-mobility-pack/com20190285_en.pdf

European Parliament. (2018). Resolution on Autonomous Driving in European Transport. Retrieved from

European Parliament. (2019). General Safety Regulation 2019/2144. Retrieved from https://eur-lex.europa.eu/eli/reg/2019/2144/oj

Federal Ministry of Transport and Digital Infrastructure. (2017). Automated and Connected Driving: A Regulatory Framework for Germany. Retrieved from https://www.bmvi.de/SharedDocs/EN/publications/automated-and-connected-driving.pdf

Gogoll, J., & Müller, J. F. (2017). Autonomous cars: In favor of a mandatory ethics setting. Science and Engineering Ethics, 23(3), 681-700.

Goodall, N. J. (2016). Machine ethics and automated vehicles. In Road Vehicle Automation 3 (pp. 93-102). Springer.

Goodman, B., & Flaxman, S. (2017). European Union Regulations on Algorithmic Decision-Making and a "Right to Explanation". AI Magazine, 38(3), 50-57.

Gurney, J. K. (2013). Crashing into the Unknown: An Examination of Crash-Optimization Algorithms Through the Two Lanes of Ethics and Law. Albany Law Review, 79(1), 183-267.

Gurney, J. K. (2018). Crashing into the Unknown: An Examination of Crash-Optimization Algorithms through the Two Lanes of Ethics and Law. Albany Law Review, 81(1), 109-156.

House of Representatives. (2017). SELF DRIVE Act. Retrieved from https://www.congress.gov/bill/115th-congress/house-bill/3388

Japan Automobile Insurance Rating Organization. (2020). Insurance Rating for Autonomous Vehicles. Retrieved from https://www.jari.or.jp/english/publication/pdf/2020/AV-Insurance.pdf

Levin, S. R. (2017). The Ethics of Autonomous Cars. The Atlantic. Retrieved from [link]

Lin, P. (2016). Why Ethics Matters for Autonomous Cars. In D. Maurer & C. Gerdes (Eds.), Autonomes Fahren (pp. 69-85). Springer Vieweg, Berlin, Heidelberg.

Marchant, G. E., & Lindor, R. A. (2012). The Coming Collision between Autonomous Vehicles and the Liability System. Santa Clara Law Review, 52(4), 1321-1340.

Ministry of Land, Infrastructure, Transport and Tourism. (2020). Guidelines for Autonomous Vehicle Testing. Retrieved from https://www.mlit.go.jp/en/road/AV/Guidelines_for_AV_Testing.html

National Highway Traffic Safety Administration. (2020). Automated Driving Systems 2.0: A Vision for Safety.

NHTSA. (2017). Automated Driving Systems: A Vision for Safety. Retrieved from https://www.nhtsa.gov/technology-innovation/automated-vehicles-safety

Pagallo, U. (2017). The Legal Challenges of AI: Modeling Liability for Robotics. In AI for Business (pp. 143-165). Springer.

Pasquale, F. (2015). The Black Box Society: The Secret Algorithms That Control Money and Information. Harvard University Press..

Road Traffic Act. (2019). Amendments for Level 3 Autonomous Driving. Retrieved from https://www.japaneselawtranslation.go.jp/en/laws/view/4077/en2

SAE International. (2018). Taxonomy and Definitions for Terms Related to Driving Automation Systems for On-Road Motor Vehicles.

Scholten, V., & Elkhoury, M. (2019). Regulation and Liability for Autonomous Vehicles: A Comparative Analysis. European Journal of Comparative Law, 6(2), 209-232.

Smith, B. W. (2012). Automated Vehicles Are Probably Legal in the United States. Texas A&M Law Review, 1(4), 411-521.

UNECE. (2020). Regulations on Automated Driving Systems. Retrieved from https://unece.org/transport/automated-driving