Self-Driving Vehicles and Their Impact on the European Convention on Human Rights

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ABSTRACT

The integration of artificial intelligence (AI) into criminal justice systems has grown rapidly, offering significant potential to enhance efficiency and decision-making. However, this advancement also raises ethical and legal concerns, such as data privacy violations, algorithmic bias, and transparency in AI-driven processes. This research examines the legal and ethical implications of AI in criminal justice, focusing on its applications in law enforcement and judiciary systems. Through a normative legal analysis, employing statutory, conceptual, and comparative legal approaches, the study draws insights from the European Convention on Human Rights (ECHR) and international literature. The findings highlight societal apprehensions regarding autonomous systems, inadequacies in current legal frameworks, and ethical challenges in programming AI for decision-making. These challenges include ensuring privacy, data protection, and adherence to fair trial principles. The study concludes that prudent legal regulations are crucial for ensuring responsible and ethical deployment of AI in criminal justice systems. Ultimately, the research emphasizes the importance of balancing technological innovation with the protection of fundamental human rights, contributing to a framework for the ethical and sustainable integration of AI into legal systems globally.

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1. Introduction

The European Parliament resolution of 6 October 2021 on artificial intelligence in criminal matters and its use by police and judicial authorities in criminal matters, point M, states that artificial intelligence (hereinafter: AI) is already used by law enforcement authorities in several areas.[1] The Resolution includes facial recognition technologies, searches of criminal databases of the defendants, identification of victims of human trafficking or sexual exploitation and abuse of children, automated license number plate recognition, speech recognition, speaker identification, lip-reading technologies, auditory monitoring (shot detection algorithms), autonomous search and analysis of identified databases, the foresight

[1] Francesco Rouhana and others, 'Ensuring a Just Transition: The Electric Vehicle Revolution from a Human Rights Perspective', *Journal of Cleaner Production*, 462 (2024), 142667 https://doi.org/10.1016/j.jclepro.2024.142667

(predictive policing and criminal hot trace analysis) behavioral monitoring tools, advanced virtual autopsy to determine the cause of death, autonomous tools to identify financial fraud and terrorist financing, social media monitoring (data collection for data mining links) and automated surveillance systems with various detection capabilities (such as heart rate monitoring and thermal cameras).[2] Point N also points out that the judiciary is now using AI tools and applications in many countries worldwide. The resolution includes, for example, the justification of arrest decisions, sentencing, calculating the likelihood of recidivism and probation, online dispute resolution, case law management, and ensuring easier access to justice. At the same time, the principle of responsible innovation means that AI should be allowed only within proportionate ethical and legal limits. In many countries, the use of these tools is still very limited and the role of AI is still rather distanced.[3]

This may be due to a general fear of novelty, and a reluctance to use autonomous software and machines capable of making decisions, but there are also real dangers in the use of AI. Point O of the above Resolution lists here the protection of individuals' fundamental rights (e.g. opaque decision-making, different types of discrimination, inherent flaws in the underlying algorithm, risks to privacy and personal data protection, protection of freedom of expression and information, the presumption of innocence, right to an effective remedy and to a fair trial, and risks to the freedom and security of individuals). It is interesting to note that the draft Regulation of the European Parliament and the Council laying down harmonised rules on artificial intelligence (2021/0106 COD, Brussels, 21. April 2021 states that law enforcement is the only area where there is no requirement for natural persons to be informed in advance that they have been in contact with an AI system other than a natural person unless these AI systems are publicly available for reporting criminal offences.[4]

As Lauritsen aptly puts it, professors who are skilled in AI are said to be as rare as vegan butchers. Therefore, although there have been numerous articles on AI in both the national and international literature, it is perhaps not superfluous to briefly review the concept of AI.[5]

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[2] Mark Brady, Kieran Tranter, and Belinda Bennett, 'Automated Vehicles, the "Driver Dilemma", Stopping Powers, and Paradigms of Regulating Road Traffic', *Computer Law & Security Review*, 56 (2025), 106076 https://doi.org/10.1016/j.clsr.2024.106076

[3] Tina Sever and Giuseppe Contissa, 'Automated Driving Regulations – Where Are We Now?', *Transportation Research Interdisciplinary Perspectives*, 24 (2024), 101033 https://doi.org/10.1016/j.trip.2024.101033

[4] Lin Xu and others, 'Impact and Revolution on Law on Road Traffic Safety by Autonomous Driving Technology in China', *Computer Law & Security Review*, 51 (2023), 105906 https://doi.org/10.1016/j.clsr.2023.105906

[5] Stefanie M. Faas and Martin Baumann, 'Pedestrian Assessment: Is Displaying Automated Driving Mode in Self-Driving Vehicles as Relevant as Emitting an Engine Sound in Electric Vehicles?', *Applied Ergonomics*, 94 (2021), 103425 https://doi.org/10.1016/j.apergo.2021.103425

Since we started with a resolution of the European Parliament, let's see what the term AI used by the European Parliament means. According to this definition, AI refers to the human-like capabilities of machines, such as reasoning, learning, planning and creativity. It allows technology to sense its environment, deals with what it perceives, solves problems and plans its actions to achieve a specific goal. The computer not only receives data (already prepared or collected through its sensors, such as its camera) but also processes and reacts to it. This study is urgent and necessary as AI technologies are rapidly evolving, and their legal and ethical frameworks need to be carefully constructed to ensure they serve society's interests without infringing on fundamental rights.[6]

AI is already capable of modifying its behaviour to some extent, by analysing the effects of its previous actions and working autonomously. The two types of AI are software-based AI (e.g. virtual assistants, image analysis software, search engines, speech and facial recognition systems) and physical AI (e.g. robots, self-driving cars, drones). Thus, the primary aim of this research is to shed light on the legal challenges and propose a framework that balances the benefits of AI with its potential risks, thereby contributing to the discourse on responsible AI deployment in the legal field.[7]

The concept of AI used by the European Parliament is essentially in line with the international scientific literature. For example, according to Rigano AI is the ability of a machine to autonomously sense and react to its environment without direct human intervention, thereby performing tasks that would typically require human intelligence and decision-making processes. According to Grishin and Naumov, AI is capable of acting, determining its actions and evaluating their consequences without full human control over the information processing results from the external environment. In Morhat's terminology, AI is a computer program with a learning mechanism that mimics the human brain. Kaplan and Haenlein highlight the AI's ability to correctly interpret external data, learn from it, and use this knowledge to achieve specific goals and objectives through flexible adaptation.[8] But it can also be said to be a set of programs that simulate cognitive functions, with training and problem-solving functions. Overall, AI behaviour can be

[6] Nils Brinker, 'Identification and Demarcation—A General Definition and Method to Address Information Technology in European IT Security Law', *Computer Law & Security Review*, 52 (2024), 105927 https://doi.org/10.1016/j.clsr.2023.105927

[7] Ella Rebalski and others, 'Brace for Impacts: Perceived Impacts and Responses Relating to the State of Connected and Autonomous Vehicles in Gothenburg', *Case Studies on Transport Policy*, 15 (2024), 101140 https://doi.org/10.1016/j.cstp.2023.101140

[8] Andreas Kaplan and Michael Haenlein, 'Siri, Siri, in My Hand: Who's the Fairest in the Land? On the Interpretations, Illustrations, and Implications of Artificial Intelligence', *Business Horizons*, 62.1 (2019), 15–25 https://doi.org/10.1016/j.bushor.2018.08.004

considered intelligent if a human would behave in the same way in a given situation according to McCarthy, who first used the term AI.[9]

Most definitions of artificial intelligence (AI) agree that a system is considered intelligent if it meets certain criteria: it thinks like a human, mimicking human cognitive processes such as reasoning and learning; it behaves like a human, demonstrating actions or interactions that resemble human behavior; it thinks rationally, applying logical reasoning to solve problems and make decisions; and it acts rationally, performing actions that align with its goals and lead to optimal outcomes. These core characteristics highlight the focus of AI on both human-like cognition and rational behavior, which are central to its development and evaluation. In the scientific literature, a distinction is made between "weak AI" (a machine that behaves intelligently only in a very specific area) and "strong AI". The latter no longer simulates human thinking but is itself a mind. "Weak AI" can also evolve and learn, but only according to the task profile assigned to it. Most AI systems are "weak AI". These are usually rule-based programs, so you can't realistically talk about intelligence.[10] They work on the basis of so-called "if-then" statements. In order to do this, the necessary knowledge base (data set) has to be created manually, which can be extremely tedious. The quantum leap in AI research, according to Scherer, came with the so-called "dataquake", the emergence of massive amounts of data.[11]

Therefore, "weak AI" is essentially a great help in that it can process and communicate the results of the databases at its disposal, which are often unmanageable for humans, in a very short time.[12] There is no sharp line between "weak AI" and "strong AI". For this reason, a concept of "moderate AI" has also appeared in the scientific literature, which represents a higher level of AI than algorithmic processing, but does not yet reach the ability to solve complex

[9] Alessandro Mantelero and Maria Samantha Esposito, 'An Evidence-Based Methodology for Human Rights Impact Assessment (HRIA) in the Development of AI Data-Intensive Systems', *Computer Law & Security Review*, 41 (2021), 105561 https://doi.org/10.1016/j.clsr.2021.105561

[10] Ennio Cascetta, Armando Cartenì, and Luigi Di Francesco, 'Do Autonomous Vehicles Drive like Humans? A Turing Approach and an Application to SAE Automation Level 2 Cars', *Transportation Research Part C: Emerging Technologies*, 134 (2022), 103499 https://doi.org/10.1016/j.trc.2021.103499

[11] Maxi Scherer, 'Artificial Intelligence and Legal Decision-Making: The Wide Open?', *Journal of International Arbitration*, 36.Issue 5 (2019), 539–73 https://doi.org/10.54648/JOIA2019028

[12] Frederico Cruz-Jesus and others, 'Pragmatic and Idealistic Reasons: What Drives Electric Vehicle Drivers' Satisfaction and Continuance Intention?', *Transportation Research Part A: Policy and Practice*, 170 (2023), 103626 https://doi.org/10.1016/j.tra.2023.103626

problems autonomously.[13] Instances of "strong AI" in the table can be said to be more accurately described as "moderate AI".[14]

However, the evolution from "weak AI" to "strong AI" is clearly visible. Suffice it to say that while IBM's Deep Blue machine beat world chess champion Garry Kasparov in 1997 by feeding in almost all the moves of his previous (relevant) chess games, the AlphaGo developed by Google beat the current world go champion in 2015, even though go is a much more complex game and cannot be fed in an almost infinite number of move variations. Not to mention IBM's Watson machine (which is not a machine, but an AI system), which can now solve more complex language tasks, not only reproducing the data it is fed but also doing creative "thinking".[15]

As mentioned earlier, self-driving vehicles are a very important manifestation of physical AI. The rapid advancement and widespread adoption of self-driving vehicles have created an urgent need to examine their relationship with human rights. As these technologies become more integrated into daily life, they pose significant risks concerning privacy and safety. The integration of AI technologies into the justice system has attracted the attention of numerous researchers, such as Rigano and Grishin, who have focused on the autonomous capabilities of AI.[16] Studies from the United States often concentrate on algorithmic bias, while European research emphasizes privacy concerns under the GDPR framework. However, it is important to note that the current literature lacks a detailed review of how these ethical concerns have been addressed in different jurisdictions or contexts. Without a comprehensive legal framework, there is a real danger that individual rights could be compromised.

The lack of harmonized international guidelines exacerbates this issue, leading to inconsistent practices and potential violations of fundamental human rights. This research is imperative an urgent, because it addresses and focuses on the immediate need for robust, universally applicable legal and ethical frameworks. By

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[13] Tatyana Sushina and Andrew Sobenin, 'Artificial Intelligence in the Criminal Justice System: Leading Trends and Possibilities', in *Proceedings of the 6th International Conference on Social, Economic, and Academic Leadership (ICSEAL-6-2019)* (Paris, France: Atlantis Press, 2020) https://doi.org/10.2991/assehr.k.200526.062

[14] Trix Mulder and Nynke E Vellinga, 'Exploring Data Protection Challenges of Automated Driving', *Computer Law & Security Review*, 40 (2021), 105530 https://doi.org/10.1016/j.clsr.2021.105530

[15] Eckard Helmers and others, 'CO2-Equivalent Emissions from European Passenger Vehicles in the Years 1995–2015 Based on Real-World Use: Assessing the Climate Benefit of the European "Diesel Boom"', *Atmospheric Environment*, 198 (2019), 122–32 https://doi.org/10.1016/j.atmosenv.2018.10.039

[16] Benjamin K. Sovacool and others, 'Income, Political Affiliation, Urbanism and Geography in Stated Preferences for Electric Vehicles (EVs) and Vehicle-to-Grid (V2G) Technologies in Northern Europe', *Journal of Transport Geography*, 78 (2019), 214–29 https://doi.org/10.1016/j.jtrangeo.2019.06.006

focusing on the protection of individual rights, the study aims to fill the gaps in current regulatory approaches. The urgency is further highlighted by the rapid deployment of AI technologies in critical sectors like transportation and law enforcement, where the consequences of inadequate regulation can be severe. By proposing solutions that balance innovation with ethical considerations, this research seeks to ensure that self-driving technologies serve societal interests without undermining fundamental human rights. Engaging with these issues now is crucial to guide policymakers and stakeholders in shaping a future where technology and human rights coexist harmoniously.[17]

2. Research Method

This study employs a normative legal research methodology, incorporating a statutory, conceptual, and comparative legal approach. In particular, it examines the content of the European Convention for the Protection of Human Rights and Fundamental Freedoms (ECHR), signed in Rome on 4th of November in 1950, and its eight additional protocols. The study provides a detailed analysis of Article 2 of ECHR on the right to life, Article 6 of ECHR on the right to a fair trial, Article 7 of ECHR on the prohibition of the imposition of punishment without due process of law, Article 8 of ECHR on the right to respect for private and family life, Article 10 of ECHR on freedom of expression, Article 14 of ECHR on non-discrimination and the rule on freedom of movement contained in Article 2 of the Fourth Additional Protocol. Furthermore, the research adopts a comparative approach to the major international scientific studies on self-driving vehicles, which serve as sources of qualitative data. Among these, it is worth mentioning Cappellini's research on the criminal law issues of self-driving cars, Coca-Vila's study, which also analyses the criminal law issues related to self-driving vehicles, and the articles by Gless/Weigend and Seher on this topic. The comparative study shows that Italian, Spanish and German (but also Japanese and American) authors generally reach the same conclusions on the criminal liability of self-driving vehicles and thus their relation to human rights. It also illustrates the possible link between safety and the uptake of self-driving vehicles. We will develop specific regulatory and ethical recommendations designed to guide the public, professional communities, policymakers, legislators, as well as researchers, developers, and industry stakeholders.

3. Results and Discussion

Legal, Ethical, and Social Implications of AI-Powered Self-Driving Vehicles: A Comprehensive In-Depth Analysis

The aim of the following in-depth analysis is to provide a comprehensive overview of the legal, ethical, and social implications of using artificial intelligence (AI) in self-driving vehicles. First, we will review the relevant legal, societal, and

[17] Anton Rozhkov, 'Harnessing European Policies for Energy Planning in Illinois: Overcoming Barriers and Transitioning to a Climate-Neutral Society', *Sustainable Cities and Society*, 98 (2023), 104803 https://doi.org/10.1016/j.scs.2023.104803

technological background, with particular emphasis on the applicable European Parliament resolutions and international examples. We will then explore how AI affects fundamental human rights in transportation—including the right to life, the right to a fair trial, the right to privacy, and the prohibition of discrimination—and examine issues of liability and decision-making across different legal systems.[18] In the course of the analysis, we will highlight the tension between technological innovation, ethical expectations, and regulatory challenges.

The ethical dilemmas associated with algorithmic decision-making and consider how the widespread adoption of AI may profoundly reshape transportation infrastructure and related social norms. We will develop specific regulatory and ethical recommendations designed to guide the public, professional communities, policymakers, legislators, as well as researchers, developers, and industry stakeholders. Thus, this examination not only offers a theoretical framework, but also sheds new, interdisciplinary light on how the development of AI-equipped self-driving vehicles can be harmonized with the protection of human rights and social expectations, providing practical guidelines for future legislative, developmental, and market processes.[19]

The study's conclusions and recommendations encourage legislators, developers, and industry players to jointly create regulatory frameworks that promote innovation while respecting the rule of law, human rights, and building public trust. Practical consequences include clarifying liability relationships, ensuring the transparent programming of decision-support algorithms, and strictly controlling the handling of personal data. Moreover, the study emphasizes the need for continuous review and adaptation of the regulatory environment in response to new technologies, ensuring that these developments serve not only technical, but also human-centered goals through the involvement of broader social dialogue.[20]

Basic Questions on Self-Driving Vehicles

When the first motor vehicles appeared on the roads, there was such fear among the people that a man with a red flag had to run in front of the cars to warn of the approach of the vehicle, which can be seen to have slowed down the

[18] Peter Letmathe and Maren Paegert, 'External Effects of Urban Automated Vehicles on Sustainability', *Journal of Cleaner Production*, 434 (2024), 140257 https://doi.org/10.1016/j.jclepro.2023.140257

[19] Alessandra Calvi, 'Data Protection Impact Assessment under the EU General Data Protection Regulation: A Feminist Reflection', *Computer Law & Security Review*, 53 (2024), 105950 https://doi.org/10.1016/j.clsr.2024.105950

[20] Yu-Chi Lee, Feina Wen, and Chao-Hung Wang, 'Round-Trip Driving Effects on Driving Performances and Mental Workload under Different Traffic Rules', *International Journal of Industrial Ergonomics*, 95 (2023), 103437 https://doi.org/10.1016/j.ergon.2023.103437

progress of the vehicles somewhat.[21] According to Gless, the fear of the introduction of self-driving vehicles is similar to that when horse-drawn carriages were replaced by motor vehicles, and there was a reluctance, even an over-cautiousness, to do so.[22] Today, however, there are a number of driver assistance applications in vehicles that are trusted, even though we often do not know when the vehicle will take over the control of the motor vehicle for us. A good example of this is the Aschaffenburg case analyzed by Hilgendorf. In the spring of 2012, a vehicle equipped with lane departure warning systems drove at high speed into Alzenau near Aschaffenburg. Before reaching the town sign, the driver suffered a stroke and lost most of his consciousness, but was still able to pull the car's steering wheel to one side so that the car drove into the bushes before entering the town. However, the lane departure warning system guided the car back onto the road. The car then drove into Alzenau at high speed, hitting a woman and her child in the centre of the town. Both were killed instantly, while the father managed to save himself by jumping to the side, injuring only his leg.[23]

The emergence of self-driving vehicles (self-driving cars, autonomous vehicles, driverless cars, robocars, etc.) dates back much earlier than we might think. The first attempts to create automated driving systems date back to the 1920s (the Milwaukee Sentinel). The first semi-automatic vehicle was developed in Japan in 1977. This vehicle could only travel on specially marked streets at speeds of up to 30 km/h. The most significant development in the field of self-driving vehicles was the creation of the Defence Advanced Research Project Agency (DARPA) in the United States in 1984. DARPA played a huge role in the development of self-driving vehicles.[24]

Nevada was the first US state to allow self-driving vehicles, the second in Columbia (Columbia Autonomous Vehicle Act of 2012). In California, self-driving vehicles have been allowed on public roads since 25 September 2012. This was initially limited by the requirement that a person capable of driving must be at the wheel at all times. However, since April 2018, pedal- and steering-wheel-less self-driving vehicles have been allowed on the road in California by requiring manufacturers to develop a way for police officers to communicate with and stop

[21] Wale Arowolo, Magnus Larsson, and Isabelle Nicolaï, 'Governance of Automated Vehicle in the Urban Transport System: Insight from a Willingness-to-Use Survey and Norwegian Cultural Context', *Transportation Research Interdisciplinary Perspectives*, 24 (2024), 101040 https://doi.org/10.1016/j.trip.2024.101040

[22] Sabine Prof. Dr. Gleß and Thomas Prof. Dr. Weigend, 'Intelligente Agenten und das Strafrecht', Zeitschrift für die gesamte Strafrechtswissenschaft, 3.126 (2014), 561–91 https://doi.org/https://doi.org/10.515/zstw-2014-0024

[23] Dasom Lee, David J. Hess, and Michiel A. Heldeweg, 'Safety and Privacy Regulations for Unmanned Aerial Vehicles: A Multiple Comparative Analysis', *Technology in Society*, 71 (2022), 102079 https://doi.org/10.1016/j.techsoc.2022.102079

[24] Paula Campos Pinto, 'At the Crossroads: Human Rights and the Politics of Disability and Gender in Portugal', *Alter*, 5.2 (2011), 116–28 https://doi.org/10.1016/j.alter.2011.02.005

a self-driving vehicle. Since 2012, 41 US Member States have allowed self-driving vehicles on the road. Out of these, 29 states have adopted legislation on self-driving vehicles, while other Member States have government directives on the issue.[25]

There are several classification systems for self-driving vehicles. The most internationally recognized is ME International's (Society of Automotive Engineers) standard J3016 (SAE), which classifies automotive automation into six levels from 0 to 5.[26] The levels of driving automation progressively reduce the driver's control over the vehicle, with each level increasing the role of automation. At Level 0 (no driving automation), the driver is fully responsible for both forward and lateral control of the vehicle. At Level 1 (driver assistance), the driver is assisted by systems such as cruise control or lane-keeping assist, but remains in control of both longitudinal and lateral driving. Level 2 (partial automation) introduces systems that can manage both longitudinal and lateral driving, such as traffic jam assist, though the driver must still monitor the system. Level 3 (conditional automation) allows for highly automated driving in specific conditions, such as traffic jams, where the driver does not need to constantly monitor the system but must be ready to take control if prompted by the system. As the level of automation increases, the driver's role diminishes, with the vehicle taking on more responsibilities for driving tasks. Level 4 (high management automation, other sources call it full automation, no need for a driver, the system handles all situations automatically (e.g. a car parking in a garage), but the driver must be present. Level 5 (full driver automation, other sources call it driverless system, no need for a driver from start to finish, with the automatic system taking over the driving task in all road types, speed ranges and environmental conditions, e.g. the robotic taxis already in use in many parts of the US).[27]

In the US, in 2020, the National Highway and Transportation Safety Administration (NHTSA) will issue new federal guidelines for automated driving systems, based on previous guidance issued in 2016. This new guidance focuses on levels 3 to 5 of the SAE international automation system detailed above. The guidance attempts to provide an analysis of best practices for legislatures, incorporating common safety-related elements that states should consider when enacting legislation. The policy is intended to facilitate and encourage the

[25] Lichen Luo, Giancarlos Parady, and Kiyoshi Takami, 'Evaluating the Impact of Private Automated Vehicles on Activity-Based Accessibility in Japanese Regional Areas: A Case Study of Gunma Prefecture', *Transportation Research Interdisciplinary Perspectives*, 16 (2022), 100717 https://doi.org/10.1016/j.trip.2022.100717

[26] Lisa Hansson, 'Regulatory Governance in Emerging Technologies: The Case of Autonomous Vehicles in Sweden and Norway', *Research in Transportation Economics*, 83 (2020), 100967 https://doi.org/10.1016/j.retrec.2020.100967

[27] Andrea Martinesco and others, 'A Note on Accidents Involving Autonomous Vehicles: Interdependence of Event Data Recorder, Human-Vehicle Cooperation and Legal Aspects', *IFAC-PapersOnLine*, 51.34 (2019), 407–10 https://doi.org/10.1016/j.ifacol.2019.01.003

development and deployment of life-saving technologies. In 2021, NHTSA promises to guide the industry in establishing principles for the safe operation of fully autonomous vehicles.[28]

However, the development of self-driving vehicles is not limited to the state level. More and more companies are testing self-driving vehicles. Well-known manufacturers such as Tesla, Mercedes, Volvo and BMW are working on various test projects.[29] There are many advantages to the introduction of fully self-driving vehicles, despite the fact that, for the time being, society is more afraid of the new than supportive. According to Cappellini, the degree of "tolerated risk" should take into account the collective benefits and drawbacks of a given activity, within a certain framework of technological development and social sensitivity. It is reasonable to assume that, over time, social reluctance and fears about new technology will gradually diminish as the 'unknown technology' becomes less and less unknown.[30]

According to the NHTSA, 3.2% of crashes are caused by driver drowsiness, 2.4% are caused by the driver becoming impaired at the wheel, 40.6% are caused by errors in recognition, and 34.1% are caused by errors in decision-making.[31] It's easy to see that these errors (80.3% of all accidents in the US, 87% in our country!) do not occur entirely in self-driving vehicles, because the automated system does not get drowsy, do not get sick at the wheel, and its reaction and decision-making errors are much smaller than those of a human driver. A fully self-driving vehicle will not speed or cross the line, not to mention drink-driving, which is cited as a major cause of road accidents.[32]

Tesla is already networking all its vehicles so that each vehicle's self-driving system can learn from and override other vehicles. Once a self-driving vehicle has learned something during a journey, the knowledge is (in theory) available to all Tesla vehicles.[33] In addition to reducing the number of accidents, another benefit is

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[28] Ivo Emanuilov and Katerina Yordanova, 'Business and Human Rights in Industry 4.0: A Blueprint for Collaborative Human Rights Due Diligence in the Factories of the Future', *Journal of Responsible Technology*, 10 (2022), 100028 https://doi.org/10.1016/j.jrt.2022.100028

[29] Thierry Bellet and others, 'From Semi to Fully Autonomous Vehicles: New Emerging Risks and Ethico-Legal Challenges for Human-Machine Interactions', *Transportation Research Part F: Traffic Psychology and Behaviour*, 63 (2019), 153–64 https://doi.org/10.1016/j.trf.2019.04.004

[30] Md Mahmud and others, 'Lithium-Ion Battery Thermal Management for Electric Vehicles Using Phase Change Material: A Review', *Results in Engineering*, 20 (2023), 101424 https://doi.org/10.1016/j.rineng.2023.101424

[31] Aleksey Nikolsky and Antonio Benítez-Burraco, 'The Evolution of Human Music in Light of Increased Prosocial Behavior: A New Model', *Physics of Life Reviews*, 51 (2024), 114–228 https://doi.org/10.1016/j.plrev.2023.11.016

[32] Róisín Commane and Luke D. Schiferl, 'Climate Mitigation Policies for Cities Must Consider Air Quality Impacts', *Chem*, 8.4 (2022), 910–23 https://doi.org/10.1016/j.chempr.2022.02.006

[33] Sabine. Gless, '„Mein Auto fuhr zu schnell, nicht ich!" – Strafrechtliche Verantwortung für hochautomatisiertes Fahren', in Intelligente Agenten und das Recht, ed. by Sabine Gless and Kurt

that self-driving vehicles would be distributed on the roads, significantly reducing congestion, according to a study by the Swedish Transport Agency on autonomous driving. What's more, they would also allow for a changed cityscape, as roads would not need to be as wide because self-driving cars would drive with greater precision.[34]

The benefits should not be overlooked, of course, but the dangers of introducing self-driving vehicles should also be mentioned. Even the most perfect software can be forced to make a choice between two bad choices, with the lesser of two bad consequences. The dangers of road traffic cannot be overridden even by the precision of a computer since they cannot be immediately interpreted when a human or animal element appears in a traffic situation.[35] According to Iwan, the division of driving automation levels is influenced by three key factors: the extent to which the management facilitation system affects steering, acceleration, and deceleration; the system's role in monitoring the driving environment; and the system's ability to handle the recurrent performance of dynamic driving tasks. These factors help determine the degree of automation and the level of driver involvement required at each stage of automation.[36]

The reason why the SAE division starts with level zero (and not one) is that it also indicates that at the lowest level the car is completely in the driver's hands and driving is not assisted by any automation. While at driving level 0 there is no automation in the car (which is almost unthinkable in today's world, as at least steering wheel and brakes controlled by electronic control unit (ECU) are found in all cars), level 5 means that the car is so automated that there is not even a steering wheel or pedals. In other words, the user of a Level 5 (completely) self-driving vehicle has no control over the vehicle's movement, and therefore cannot be called a driver. The accidents caused by such vehicles, but also by the vehicles themselves, their participation in traffic, and even the images and videos recorded of them stationary, raise a number of human rights issues, which I will address in the next chapter.[37]

Seelmann (Baden-Baden., Nomos: Nomos Verlagsgesellschaft mbH & Co. KG, 2016), pp. 225–51 https://doi.org/https://doi.org/10.5451/unibas-ep51884

[34] Vishal Singh Patyal, Ravi Kumar, and Shiksha Kushwah, 'Modeling Barriers to the Adoption of Electric Vehicles: An Indian Perspective', *Energy*, 237 (2021), 121554 https://doi.org/10.1016/j.energy.2021.121554

[35] Shunxi Li and others, 'Policy Formulation for Highly Automated Vehicles: Emerging Importance, Research Frontiers and Insights', *Transportation Research Part A: Policy and Practice*, 124 (2019), 573–86 https://doi.org/10.1016/j.tra.2018.05.010

[36] Dominika Iwan, 'Autonomous Vehicles – a New Challenge to Human Rights?', Adama Mickiewicza University Law Review, 9 (2019) https://doi.org/https://doi.org/10.14746/ppuam.2019.9.04

[37] Kimberly M. Lukaszewski and Dianna L. Stone, 'Will the Use of AI in Human Resources Create a Digital Frankenstein?', *Organizational Dynamics*, 53.1 (2024), 101033 https://doi.org/10.1016/j.orgdyn.2024.101033

The Connection Between Self-Driving Vehicles and Human Rights

The European Convention for the Protection of Human Rights and Fundamental Freedoms (ECHR), signed in Rome on 4 November 1950, and its eight additional protocols, regulate a wide range of human rights. Among these, the right to life, the right to a fair trial, the prohibition on punishing without due process of law, the right to respect for private and family life, freedom of expression, the prohibition of discrimination, and freedom of movement may be more closely or more broadly related to self-driving vehicles. Each of these rights may raise specific legal and ethical questions in the context of the development, use, and regulation of self-driving vehicles.[38]

For reasons of limited scope, the study does not address other human rights (fundamental rights with a human rights dimension), although there are several such rights that could be affected by the introduction of self-driving vehicles. In the literature, this includes, for example, the rights to personal security and cybersecurity.[39] Regarding the latter, Altunyaldiz points out that fully self-driving vehicles could be a breeding ground for hackers who could potentially take control of the vehicle (e.g. Bluetooth, keyless entry systems, mobile or other connections), but the hacked data could also be financially valuable to hackers, as it could be sold to third parties.

According to Article 2 ECHR, the law protects everyone's right to life and no one shall be intentionally deprived of his or her life. Violation of the right to life in relation to self-driving vehicles may arise primarily when the accident caused by the self-driving vehicle has a fatal outcome. Like conventional motor vehicles, self-driving vehicles can cause accidents. Even now, before the advent of completely self-driving vehicles, there are numerous reports of accidents involving vehicles that are not completely self-driving (usually up to level 3). Although, contrary to popular belief, in most (perhaps almost all) cases it has been established through criminal prosecution that the self-driving vehicle (or its driver) was not responsible for the accident, these cases also highlight the specific issues of the right to life in relation to self-driving vehicles.[40]

[38] Franziska Poszler and others, 'Applying Ethical Theories to the Decision-Making of Self-Driving Vehicles: A Systematic Review and Integration of the Literature', *Technology in Society*, 75 (2023), 102350 https://doi.org/10.1016/j.techsoc.2023.102350

[39] Chris Tennant and others, 'Public Anticipations of Self-Driving Vehicles in the UK and US', *Mobilities*, 2024, 1–18 https://doi.org/10.1080/17450101.2024.2325386

[40] Murat Kirişci, 'Interval-Valued Fermatean Fuzzy Based Risk Assessment for Self-Driving Vehicles', *Applied Soft Computing*, 152 (2024), 111265 https://doi.org/10.1016/j.asoc.2024.111265

The graph below shows the countries with the highest rates of fatal accident rates

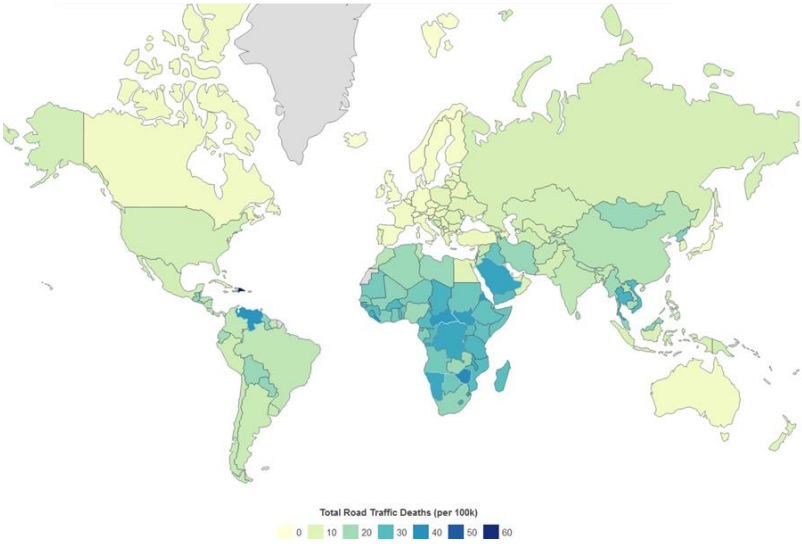

Figure 1. World Population Review, Country Rankings, https://worldpopulationreview.com/country-rankings/

The next figure shows the number of Tesla vehicles in use around the world

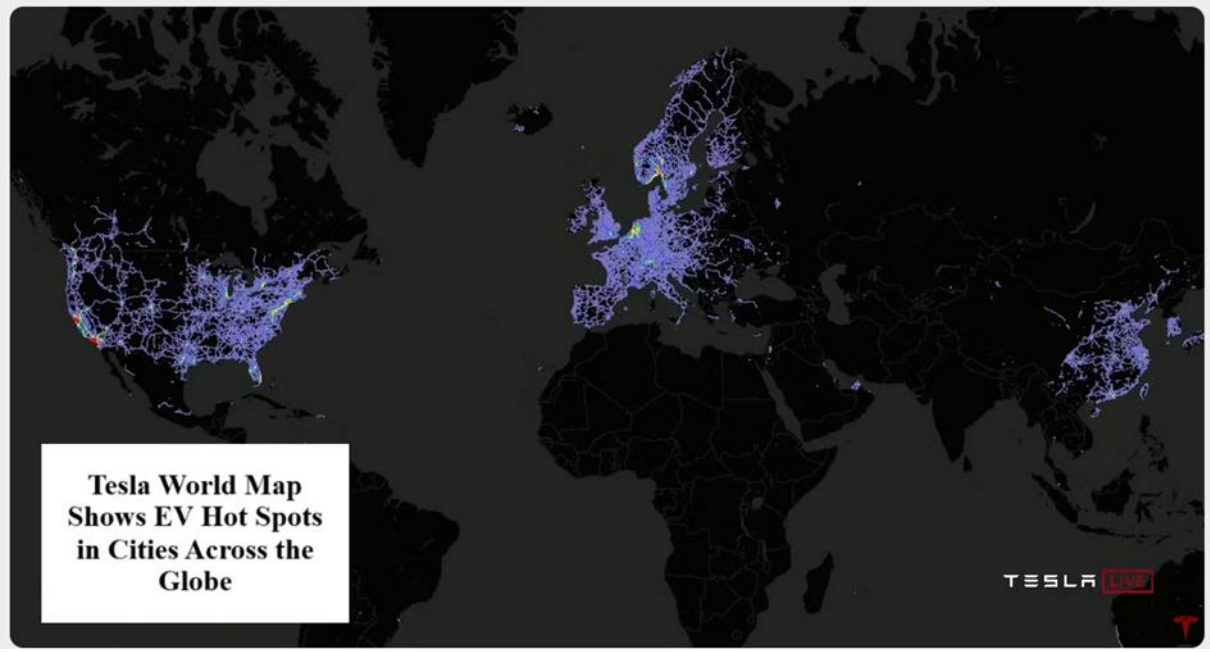

Figure 2. Inverse, Tesla's Fleet Learning Map: How Tesla's Data Sharing is Shaping Autonomous Driving, https://www.inverse.com/science/55170-tesla-s-fleet-map

It is very interesting to note that the region with the lowest road fatality rate is the part of the world with the highest uptake of self-driving vehicles. Since the number of self-driving vehicles is not yet significant compared to conventional

vehicles, no clear correlation can be established, but it is very interesting to compare the two figures.[41]

It is also useful to compare the number of fatal accidents per 100,000 inhabitants. As the graph below shows, in line with the above graph, road fatalities are not highest in developed countries: even Romania, which "boasts" the highest rate in the EU, has about a quarter as many fatalities as Eritrea, which ranks 5th, and the EU average is still about half as high:[42]

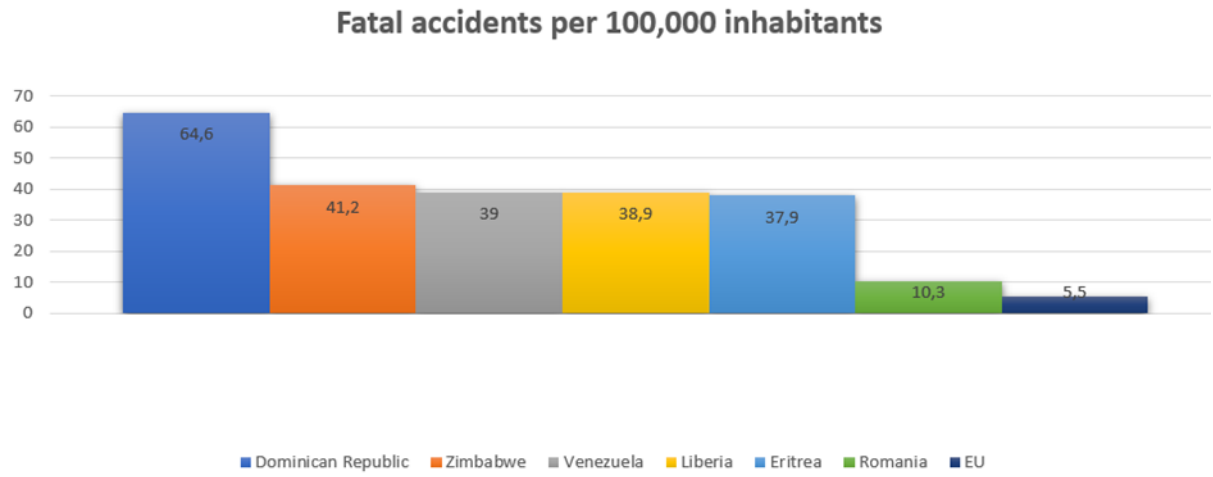

Figure 3. World Population Review, Country Rankings, (2024) https://worldpopulationreview.com/country-rankings/

The problems of who the self-driving vehicle should choose to hit: a little child or two elderly people?, two pedestrians who are driving in the wrong direction or one who is driving lawfully on the pavement?, etc., also arise in everyday driving.[43] However, while the responsibility of the ordinary driver depends on whether he has broken the rules himself (no moral issues are raised), self-driving vehicles must be pre-programmed to deal with such situations (as they cannot think), and it is much more difficult question of what to program the vehicle to do. If the driver of a conventional vehicle pulls the steering wheel out of the way because of a pedestrian in front of him/her, drives onto the pavement and hits a pedestrian, he/she will not be held responsible for his actions, as he/she was trying to save the life of the pedestrian crossing the road and cannot be expected to assess the consequences. If the same situation arises in a self-driving vehicle, where sensors detect that a pedestrian would be hit by the vehicle if the vehicle were to avoid a person moving in a lawful manner, the self-driving vehicle must be

[41] Ehsan Vakili, Abdollah Amirkhani, and Behrooz Mashadi, 'DQN-Based Ethical Decision-Making for Self-Driving Cars in Unavoidable Crashes: An Applied Ethical Knob', *Expert Systems with Applications*, 255 (2024), 124569 https://doi.org/10.1016/j.eswa.2024.124569

[42] Zejia He and others, 'Tridimensional Vector Path Abstracting and Trajectory Tracking Control on Ramps of Full Self-Driving Vehicle', *Control Engineering Practice*, 139 (2023), 105626 https://doi.org/10.1016/j.conengprac.2023.105626

[43] Yiran Zhang and others, 'Human–Machine Cooperative Decision-Making and Planning for Automated Vehicles Using Spatial Projection of Hand Gestures', *Advanced Engineering Informatics*, 62 (2024), 102864 https://doi.org/10.1016/j.aei.2024.102864

programmed to resolve this dilemma. And the question here is what should be the content of the pre-programming in each case? Unlike humans, who in an emergency situation lack the ability and time to add and quantify the utility in question, self-driving vehicles can in many cases make these calculations and provide reliable answers in a matter of moments.[44]

When programming a self-driving vehicle, social interests must be taken into account (to minimise harmful outcomes). However, a car that puts social interests ahead of the interests of its occupant, according to Coca-Vila, no one will buy. Cappellini also points out the same: if in exceptional situations the car "sacrifices" its passenger, this could lead to "commercial sabotage" of these products. So, if the self-driving vehicle can only save the life of its passenger by going down into the emergency lane where it hits two little children who die, it should be programmed to swerve because we are dealing with equal interests.[45]

At the same time, society would not accept a self-driving car (and thus would not get much of a licence) that is programmed to put the life (or physical safety) of its passenger first at all costs. As I mentioned, these problematic life situations arise for the conventional driver, it's just a different question of how he or she makes decisions in an emergency, and how a car should be pre-programmed to make decisions in such situations.[46] According to Coca-Vila, a quantitative aggregation of lives does not change the comparative value of one of them (the prohibition of addition), nor can it justify the difference in ranking of the lives of two people (the prohibition of gradualism). In other words, not only is the life of the elderly person in need the same as that of the most recent Nobel laureate, but one human life is worth the same as one hundred.[47]

In the case of a conflict between equivalent obligations, the majority of the literature always holds that the duty to omit takes precedence over the act. In other words, if a pedestrian steps onto the road in an irregular manner and his/her life can only be saved by stopping with an emergency brake, but in this case, the motorcyclist behind him, who did not keep the following distance, dies, then one should not brake (act), because the one who can be saved by omission (and not the one who can be saved by action) takes precedence over the two irregularities. Zimmermann also prefers passive to active behaviour, since he believes that the

[44] Surabhi Gupta and others, 'Pedestrian's Risk-Based Negotiation Model for Self-Driving Vehicles to Get the Right of Way', *Accident Analysis & Prevention*, 124 (2019), 163–73 https://doi.org/10.1016/j.aap.2019.01.003

[45] Tom Kathmann, Daniel Reh, and Julia C. Arlinghaus, 'Autonomous Vehicles as Self-Driving Assembly Items: Functional Requirements and Ramifications for Assembly Sequences, Automotive Design and Performance', *Journal of Manufacturing Systems*, 70 (2023), 327–44 https://doi.org/10.1016/j.jmsy.2023.08.003

[46] Anas Charroud and others, 'Enhanced Autoencoder-Based LiDAR Localization in Self-Driving Vehicles', *Applied Soft Computing*, 152 (2024), 111225 https://doi.org/10.1016/j.asoc.2023.111225

[47] Yi-Ching Lee, Ali Momen, and Jennifer LaFreniere, 'Attributions of Social Interactions: Driving among Self-Driving vs. Conventional Vehicles', *Technology in Society*, 66 (2021), 101631 https://doi.org/10.1016/j.techsoc.2021.101631

legal system generally favours the maintenance of the status quo. Coca-Vila, however, points out that it is not always possible to say in general that omission takes precedence over action. That is why, in his view, whatever the car decides in such a situation is legitimate. Weigend also argues that there is a choice between action and inaction.[48]

The right to a fair trial under Article 6 ECHR may raise interesting questions in relation to self-driving vehicles. Article 6 itself can clearly only be interpreted in relation to a natural person, but in the light of some theories of criminal liability for offences committed by self-driving vehicles, it is not so abstract.[49] As long as the level of automation of the self-driving vehicle is low (level 2 or less), the traditional liability system should be considered, as the vehicle does not drive but only provides driving assistance. In other words, at these levels, the responsibility is almost always that of the driver (unless it can be demonstrated that the cause of the accident is attributable to someone else, e.g. if the car was returned from the workshop without the screws on the wheels being properly tightened, the mechanic could be held responsible). As automation increases (from level 3), the driver's activity becomes more and more that of observation, without the need for active intervention for long periods of time. For level 4 self-driving vehicles, a partial discharge of responsibility for the driver (passenger) may be justified, while for level 5 he/she cannot be held responsible, since he/she could not intervene even if he/she wanted to (unless the possibility of a "stop button" is created).[50]

For level 4 and especially level 5, if the passenger (user) is not responsible, who or what is? In this case, the responsibility of the manufacturer, the programmer, the owner/operator and even, according to some specific notions, the car itself, all digital persons, may arise. If it is the manufacturer (programmer, owner/operator) who is responsible, then the provisions of Article 6 ECHR (their right to a fair trial, i.e. to a fair and public hearing by an independent and impartial tribunal within a reasonable time, the presumption of innocence, etc.) can be interpreted in their respect. On reflection, these rights can also be enforced if the legislation reaches the stage where the self-driving vehicle itself is liable for an accident caused by the self-driving vehicle (under a specific liability regime). After all, if the vehicle is held liable, it is also entitled to a fair, public trial within a reasonable time, an independent and impartial tribunal and even the presumption of innocence.[51]

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[48] Pericle Salvini, Lars Kunze, and Marina Jirotka, 'On Self-Driving Cars and Its (Broken?) Promises. A Case Study Analysis of the German Act on Autonomous Driving', *Technology in Society*, 78 (2024), 102628 https://doi.org/10.1016/j.techsoc.2024.102628

[49] Takeyoshi Imai, 'Evolution in Japan's Legal System for Ensuring Traffic Safety', *IATSS Research*, 48.3 (2024), 456–63 https://doi.org/10.1016/j.iatssr.2024.07.005

[50] Praveena Penmetsa and others, 'How Is Automated and Self-Driving Vehicle Technology Presented in the News Media?', *Technology in Society*, 74 (2023), 102290 https://doi.org/10.1016/j.techsoc.2023.102290

[51] Yingji Xia and others, 'Understanding Common Human Driving Semantics for Autonomous Vehicles', *Patterns*, 4.7 (2023), 100730 https://doi.org/10.1016/j.patter.2023.100730

The Prohibition on Punishing Without Due Process of Law

Article 7 of the ECHR provides that no one shall be held guilty of an act or omission which, at the time when it was committed, did not constitute a criminal offence under national or international law (nullum crimen sine lege) and that no heavier penalty may be imposed than that applicable at the time when the offence was committed (nulla poena sine lege).[52]

The provisions of this Article may also be of particular interest to our topic if the legislation reaches the stage where the self-driving vehicle itself is liable for the offence committed by the self-driving vehicle. In the Japanese literature, the concept of a "digital person" has been proposed, which could transform or simplify the system of liability for acts caused by self-driving cars (and robots in general). A similar view is expressed by Altunyaldiz, who argues that if the Level 5 vehicles appear, new criminal offences could potentially be created, which could raise the question of whether the AI responsible for driving the vehicle could be held criminally liable, possibly as a “legal person”. The criminal liability of cars is also examined by Seher, who calls "intelligent agents" ("intelligenten Agenten") "robots", "machines" or "software agents" that are programmed to combine and evaluate the information they receive in some way for future reactions. Since these reactions are not entirely determined by programming, the actions of the “intelligent agent” are “open” in advance, not mapped in advance to individual cases.[53]

The ability to respond to legal norms is a prerequisite for acting in a legally relevant way. Thus, "intelligent agents" could only be recipients of the law (and thus legal persons) if they were able to understand the commands in the norms themselves and incorporate them into their reactions. In the foreseeable future, however, “intelligent agents” are likely to lack the “understanding” of norms as commands, since these “intelligent agents” will operate solely on the basis of previously installed programming, without grasping legal norms in their own autonomous way, and will therefore remain responsible, either partially or jointly, for the producer, owner/operator or user.[54]

According to Seher, the interesting case is not when there is a programming error (in which case liability may be clear), but when the "intelligent agent" has caused harm based on supposedly correct programming. If the operation of “intelligent agents” is regulated by a licensing procedure, then operators are

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[52] Evangelos Paschalidis and Haibo Chen, ‘Moral Disengagement Mechanisms in Interactions of Human Drivers with Autonomous Vehicles: Validation of a New Scale and Relevance with Personality, Driving Style and Attitudes’, *Transportation Research Part F: Traffic Psychology and Behaviour*, 90 (2022), 196–219 https://doi.org/10.1016/j.trf.2022.08.015

[53] Nan Zhou and others, ‘Correntropy Based Model Predictive Controller with Multi-Constraints for Robust Path Trajectory Tracking of Self-Driving Vehicle’, *Journal of the Franklin Institute*, 360.10 (2023), 6929–52 https://doi.org/10.1016/j.jfranklin.2023.04.021

[54] Zhihan Lv and others, ‘Memory-augmented Neural Networks Based Dynamic Complex Image Segmentation in Digital Twins for Self-driving Vehicle’, *Pattern Recognition*, 132 (2022), 108956 https://doi.org/10.1016/j.patcog.2022.108956

exempt from punishment, provided that they have a specific licence and comply with administrative rules in their operation. From a criminal law perspective (in addition to intentionality), it may be relevant (in terms of negligence) when the designer or user has overlooked something in the programming or operation, or the operation of the device exceeds the authorised risk due to inattention.[55]

Applied to "intelligent agents", the question arises whether their harmful actions are considered by the community as an attack on legal norms? The answer to this is no, as long as robots, drones and self-driving cars are considered "things". Nor can "intelligent agents" be punished. The retributive theory holds that punishment is a way of compensating for the injustice done by the perpetrator and thus remedying the lack of justice. But is punishing the "intelligent agent" an appropriate retribution? According to Gless and Weigend, even the destruction of the "intelligent agent" i.e. the "quasi-death penalty" would not give the victims' families a sense that justice has been restored. Nor can special prevention goals be applied to "intelligent agents" according to Seher, because they are unaware that they are being punished. Only a person with explicit emotions can experience criminal sanctions. Anyone ("anything") who (that) does not perceive the normal order as a pressure to control action cannot understand the punishment and cannot appreciate the sanction, thus the purpose of the punishment cannot be realized.[56]

At the same time, artificial intelligence controlling a self-driving vehicle cannot only work based on fully pre-programmed algorithms preset by humans, because too many variables would have to be taken into account to instruct the machine to the "right" behaviour to be applied in all possible road and traffic situations, so enabling machine learning is inevitable. Thus, while in the case of current self-driving vehicles (up to level 3), the driver is at least negligent for the accidents caused, in the case of level 4, and especially level 5 self-driving vehicles, there may be a "liability gap", since culpability or "mens rea" is crucial in European criminal law systems and difficult to interpret for a machine.

The Right to Respect for Private and Family Life

Under Article 8 ECHR, everyone has the right to respect his private and family life, his home and his correspondence. According to Glancy, self-driving vehicles can affect privacy in three main ways: personal privacy, information privacy and surveillance.[57] Data protection plays a very important role in the European Union.

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[55] Fernando M. Ortiz and others, 'Road Traffic Safety Assessment in Self-Driving Vehicles Based on Time-to-Collision with Motion Orientation', *Accident Analysis & Prevention*, 191 (2023), 107172 https://doi.org/10.1016/j.aap.2023.107172

[56] Angus McKerral, Kristen Pammer, and Cassandra Gauld, 'Supervising the Self-Driving Car: Situation Awareness and Fatigue during Highly Automated Driving', *Accident Analysis & Prevention*, 187 (2023), 107068 https://doi.org/10.1016/j.aap.2023.107068

[57] Sebastian Hemesath and Markus Tepe, 'Framing the Approval to Test Self-Driving Cars on Public Roads. The Effect of Safety and Competitiveness on Citizens' Agreement', *Technology in Society*, 72 (2023), 102177 https://doi.org/10.1016/j.techsoc.2022.102177

The graph below shows the five EU countries with the highest data protection (GDPR) fines:

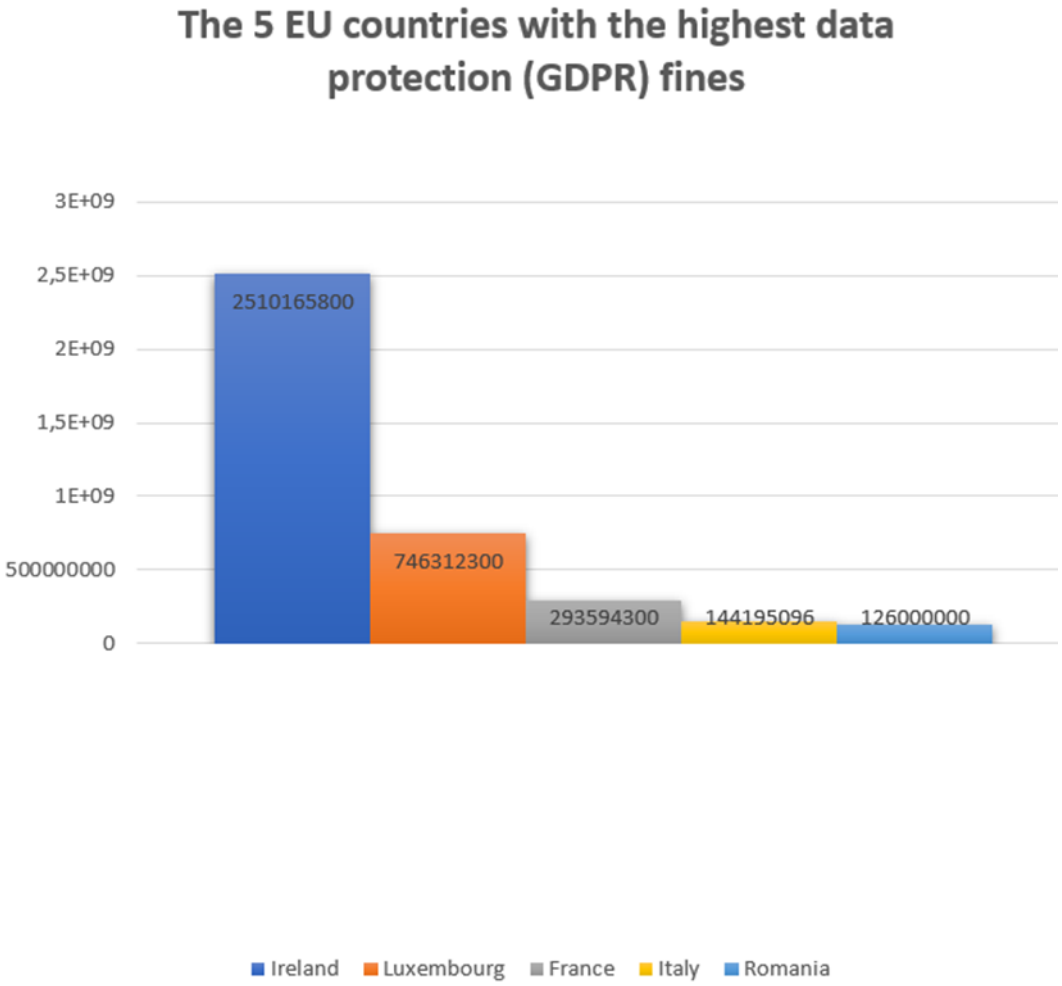

Figure 4. Privacy Affairs, GDPR Fines Overview, https://www.privacyaffairs.com/gdpr-fines/

Ireland received the highest fines, mainly for taking action against large tech companies (such as Facebook), as many companies have their European headquarters there.[58] Luxembourg was fined mainly for financial sector and multinational companies in breach of GDPR, while France fined several large tech companies for the incorrect way in which they handle user data. Italy has been fined in particular for data breaches involving public service providers and private companies, and Romania for a lack of data security measures and data management irregularities.[59]

[58] Peter Moertl and others, 'Trustworthy Automated Driving through Increased Predictability: A Field-Test for Integrating Road Infrastructure, Vehicle, and the Human Driver', *Transportation Research Procedia*, 72 (2023), 650–57 https://doi.org/10.1016/j.trpro.2023.11.451

[59] Michael Wicki, 'How Do Familiarity and Fatal Accidents Affect Acceptance of Self-Driving Vehicles?', *Transportation Research Part F: Traffic Psychology and Behaviour*, 83 (2021), 401–23 https://doi.org/10.1016/j.trf.2021.11.004

Recently, an Uber driver busted an unfaithful husband and posted a video of the incident on Tik-Tok, causing a stir online. In the video, a woman from Dallas named Roni describes how she busted one of her passengers in front of her family. The driver says she witnessed the man kissing his wife and hugging his children before getting in the car with her. The husband got into the car and indicated that he had added another stop and asked Roni to go to the new address. At the newly added address, a woman got on with a small suitcase and kissed the man.[60] "I'm so glad you finally got rid of your damn wife," the new passenger said afterwards, and started kissing the man in the back seat. She then started to complain that he was always shaking her off and asked when he was going to leave his family, to which he apologetically said that they would discuss it later. That's when the Uber driver intervened. As they were only about 5 miles from the starting point, Roni decided to turn around and simply dropped the unfaithful husband and his mistress off at the husband's house, leaving them with luggage on both the husband and his mistress. Her act of hubris sparked controversy (51,000 comments!), some praising her, others saying she had nothing to do with the privacy of her passengers.[61]

The video was downloaded 8.3 million times in five days, which means it received a huge amount of publicity. It is easy to see how a system equipped with cameras that record the movements of the self-driving car and its surroundings around the clock (even when stationary) could very easily cause similar problems. It could be very useful for self-driving vehicles on the road to record everything, not only to provide direct evidence of accidents in which they are involved but also (because they record everything) to help detect other crimes.[62] A car camera on the road can pick up bank robbers running out of the bank and getting into the car during the bank robbery that was taking place, but by comparing the camera footage of individual self-driving vehicles, it can track the movements of anyone, even if each car only detects a person or vehicle for certain stretches. However, these recordings may also contain information that is already invasive of someone else's privacy.[63] It is easy to see from the camera footage, as in the example above, that the unfaithful husband was at his mistress's house instead of at work, but in general, any footage may violate the constitutional, human right to privacy. There

[60] Tiju Baby and others, 'Development and Classification of Autonomous Vehicle's Ambiguous Driving Scenario', *Accident Analysis & Prevention*, 200 (2024), 107501 https://doi.org/10.1016/j.aap.2024.107501

[61] Menglin Li and others, 'Attentive Hybrid Reinforcement Learning-Based Eco-Driving Strategy for Connected Vehicles with Hybrid Action Spaces and Surrounding Vehicles Attention', *Energy Conversion and Management*, 321 (2024), 119059 https://doi.org/10.1016/j.enconman.2024.119059

[62] Uijong Ju and Sanghyeon Kim, 'Willingness to Take Responsibility: Self-Sacrifice versus Sacrificing Others in Takeover Decisions during Autonomous Driving', *Heliyon*, 10.9 (2024), e29616 https://doi.org/10.1016/j.heliyon.2024.e29616

[63] Michael A. Nees, 'Safer than the Average Human Driver (Who Is Less Safe than Me)? Examining a Popular Safety Benchmark for Self-Driving Cars', *Journal of Safety Research*, 69 (2019), 61–68 https://doi.org/10.1016/j.jsr.2019.02.002

is clearly no way to ensure that these recordings are edited out wherever there are details not relevant to the case, but there is a way to ensure that they are only made public in exceptional and justified cases. Iwan argues that the most important thing is that individuals should be able to determine the scope of the data that is disclosed to and shared with others, including whether it can be shared, for example, for commercial purposes, as social networking sites and search engines do today, often without our explicit consent.[64]

The other two privacy issues—data protection and surveillance—warrant further analysis. In the context of data protection, Iwan emphasizes the right to anonymity, while Altunyaldiz identifies key concerns related to data protection, including: what type of information is collected, for what purpose the information is gathered, who controls and has access to the information, how long the information is stored, and whether the data recorded by self-driving vehicles should be automatically shared, and if so, with whom (such as a central system, insurance companies, police, etc.). These questions highlight the complexities and ethical considerations surrounding the use of personal and vehicle data in autonomous systems.[65] Vehicle observations can provide a wealth of useful data. Among these, Iwan highlights data on speed, location, passengers and driver behaviour, which may be of particular relevance not only for criminal but also for civil liability. At the same time, these activities should be subject to ongoing legal restrictions.[66]

Article 10 ECHR regulates freedom of expression. This right includes the freedom to impart information and ideas regardless of frontiers and without interference by public authority. This, therefore, adds to the question analysed in the previous point: although everyone has the right to privacy, they also have the right to communicate the information they have come across. However, it is easy to see that, in the event of competition between the two rights, the former takes precedence.[67] From a programming point of view, if there is a choice between consequences of similar weight, in the case of a self-driving vehicle, there are, according to many, two possibilities: the programmer (or the user) determines the resolution of conflicts in advance through a subjective decision, or the car is

[64] Robin Cazes, Valérie Camps, and Céline Lemercier, 'Effect of Situational Factors Known to Elicit Anger on the Willingness to Take over the Driving Activity in a Highly Automated Vehicle: A Scenario-Based Study', *Transportation Research Part F: Traffic Psychology and Behaviour*, 103 (2024), 53–71 https://doi.org/10.1016/j.trf.2024.03.014

[65] Sever and Contissa.

[66] Haoran Li and others, 'Personalized Driving Behavior Oriented Autonomous Vehicle Control for Typical Traffic Situations', *Journal of the Franklin Institute*, 361.10 (2024), 106924 https://doi.org/10.1016/j.jfranklin.2024.106924

[67] Seiran Heshami and Lina Kattan, 'Towards Self-Organizing Connected and Autonomous Vehicles: A Coalitional Game Theory Approach for Cooperative Lane-Changing Decisions', *Transportation Research Part C: Emerging Technologies*, 166 (2024), 104789 https://doi.org/10.1016/j.trc.2024.104789

programmed to draw lots to decide whose life takes precedence. The pull (random decision) is also the right solution in such cases because it excludes the violation of the prohibition of discrimination as laid down in Article 14 ECHR, i.e. discrimination on grounds not permitted (age, sex, religion, colour, etc.). Eisenberger explicitly refers to Articles 2 and 14 of the European Convention on Human Rights, according to which no distinction can be made on the basis of the aforementioned subjective characteristics. And according to Weigend, the car cannot be programmed in any circumstances to choose in advance whom to kill (or even to kill anyone), so in some cases it will inevitably be in a situation of conflict if someone has to die anyway.[68]

Finally, mention should also be made of the right contained in Article 2 of the Fourth Additional Protocol to the ECHR on certain rights and freedoms additional to those already included in the Convention and the First Additional Protocol. According to the human right to freedom of movement, all persons lawfully resident in the territory of a State enjoy freedom of movement and residence and are free to leave any country, including their own.[69] This human right can also be interpreted in relation to self-driving vehicles. The general concern about self-driving vehicles makes it more difficult than easy to place this type of car on the market. According to Cappellini, it will be a long process to get to fully self-driving cars. But as fully traditional cars are replaced (have been replaced) by driver-necessary cars (emergence of power steering, lane-keepers, etc.), more advanced cars will be introduced in the future. Takeo argues that the introduction of fully self-driving vehicles is conditional on the application of the principle of trust to self-driving technology, and that there is a societal trust in the "proper behaviour of machines". Once this is achieved, the question of the rights and obligations of this type of car will arise. And while a machine may never have "human rights", some human rights can be applied to it, with the right interpretation.[70]

4. Conclusion

Vehicle assistance systems have significantly enhanced driving safety and convenience, although accidents have still occurred due to faults in these systems. With advancements in technology, the development of fully self-driving vehicles (Level 5) is becoming a reality. However, this technological shift necessitates not only innovation in engineering but also a comprehensive legal framework. Both

[68] Anh-Tu Nguyen and others, 'LPV Unknown Input Observer-Based Estimation of Driver Intervention Torque and Vehicle Dynamics for Human-Machine Shared Driving', *IFAC-PapersOnLine*, 56.2 (2023), 5679–84 https://doi.org/10.1016/j.ifacol.2023.10.498

[69] Mauro Da Lio and others, 'Complex Self-Driving Behaviors Emerging from Affordance Competition in Layered Control Architectures', *Cognitive Systems Research*, 79 (2023), 4–14 https://doi.org/10.1016/j.cogsys.2022.12.007

[70] Apostolos Ziakopoulos and others, 'Perceptions towards Autonomous Vehicle Acceptance: Information Mining from Self-Organizing Maps and Random Forests', *IATSS Research*, 47.4 (2023), 499–513 https://doi.org/10.1016/j.iatssr.2023.11.002

civil and criminal law must adapt to regulate self-driving vehicles, as they present new challenges distinct from traditional driving scenarios. Additionally, human rights must be integrated into this legal framework to ensure that individual rights are protected. This study examines the challenges of introducing self-driving vehicles through the lens of fundamental rights as outlined in the European Convention on Human Rights. The primary focus is on ensuring that the deployment of these technologies respects and safeguards human rights. The research recommends the creation of clear, detailed legislation to define liability, establish strict safety standards, and ensure transparency in data management to prevent conflicts with fundamental rights. The need for careful regulation stems from the legal system's role in maintaining social order and justice, which can only be achieved through clear, predictable, and fair legal frameworks. In conclusion, self-driving vehicles may affect multiple human rights, such as the right to life, privacy, and freedom of movement. However, prudent legislation can address and resolve these challenges.

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