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The Impact of Artificial Intelligence on the Rules of Civil Liability for a Machine Guard

O Impacto da Inteligência Artificial nas Regras de Responsabilidade Civil de Protetores de Máquinas

Impacto de la Inteligencia Artificial en las Normas de Responsabilidad Civil de los Protectores de Máquinas

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ABSTRACT

Context: The rapid advancement of artificial intelligence (AI) technologies has led to their integration into various sectors, including autonomous systems. This integration has raised numerous legal and ethical challenges, particularly concerning civil liability for damages resulting from the actions of such machines. The "machine guard"—the individual responsible

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for supervising and controlling the machine—represents a central figure in these legal concerns.

Objective: This study aims to examine the impact of artificial intelligence on the civil liability rules applicable to the machine guard, by clarifying the roles and responsibilities of individuals overseeing intelligent machines and assessing the applicability of traditional legal doctrines to situations in which machines make autonomous decisions.

Methodology: The research adopts a critical analytical approach by reviewing conventional civil liability rules and comparing them to the emerging legal realities imposed by AI technologies. It also relies on hypothetical scenarios and comparative legal models where appropriate.

Results: The study concludes that traditional rules of civil liability, including those governing the role of the machine guard, are insufficient to address the legal issues arising from decisions made by AI systems. These rules are based on the assumption of direct human intervention, which is often absent in many AI applications. Therefore, there is an urgent need to either reform existing legal rules or establish new legal frameworks that accommodate the complexities of modern technology while maintaining a fair balance between innovation and accountability.

Keywords: AI; civil liability; machine guard; legal frameworks; ethical considerations.

RESUMO

Contexto: O rápido avanço das tecnologias de inteligência artificial (IA) levou à sua integração em diversos setores, incluindo os sistemas autônomos. Essa integração gerou inúmeros desafios jurídicos e éticos, especialmente no que diz respeito à responsabilidade civil por danos decorrentes das ações dessas máquinas. O "guardião da máquina" — o indivíduo responsável por supervisionar e controlar a máquina — representa uma figura central nessas questões jurídicas.

Objetivo: Este estudo tem como objetivo examinar o impacto da inteligência artificial nas regras de responsabilidade civil aplicáveis ao guardião da máquina, esclarecendo os papéis e responsabilidades dos indivíduos que supervisionam máquinas inteligentes e avaliando a aplicabilidade das doutrinas jurídicas tradicionais em situações nas quais as máquinas tomam decisões autônomas.

Metodologia: A pesquisa adota uma abordagem analítica e crítica, por meio da revisão das regras convencionais de responsabilidade civil e da comparação com as novas realidades

jurídicas impostas pelas tecnologias de IA. Também se baseia em cenários hipotéticos e modelos jurídicos comparativos, quando apropriado.

Resultados: O estudo conclui que as regras tradicionais de responsabilidade civil, incluindo aquelas que regem o papel do guardião da máquina, são insuficientes para lidar com as questões jurídicas decorrentes das decisões tomadas por sistemas de IA. Essas regras pressupõem uma intervenção humana direta, o que frequentemente não ocorre em muitas aplicações de IA. Assim, há uma necessidade urgente de reformar as normas jurídicas existentes ou estabelecer novos marcos legais que atendam à complexidade das tecnologias modernas, mantendo um equilíbrio justo entre inovação e responsabilidade.

Palavras-chave: IA; responsabilidade civil; guardião da máquina; marcos legais; considerações éticas.

RESUMEN

Contexto: El rápido avance de las tecnologías de inteligencia artificial (IA) ha conducido a su integración en diversos sectores, incluidos los sistemas autónomos. Esta integración ha generado numerosos desafíos legales y éticos, en particular en lo que respecta a la responsabilidad civil por los daños resultantes de las acciones de dichas máquinas. El "guardián de la máquina", es decir, la persona responsable de supervisar y controlar la máquina, constituye una figura central en estas preocupaciones jurídicas.

Objetivo: Este estudio tiene como objetivo analizar el impacto de la inteligencia artificial en las normas de responsabilidad civil aplicables al guardián de la máquina, aclarando los roles y responsabilidades de quienes supervisan máquinas inteligentes y evaluando la aplicabilidad de las doctrinas legales tradicionales en situaciones en las que las máquinas toman decisiones autónomas.

Metodología: La investigación adopta un enfoque analítico y crítico, revisando las normas convencionales de responsabilidad civil y comparándolas con las nuevas realidades jurídicas impuestas por las tecnologías de IA. Asimismo, se basa en escenarios hipotéticos y modelos jurídicos comparados cuando corresponde.

Resultados: El estudio concluye que las normas tradicionales de responsabilidad civil, incluidas aquellas que regulan el papel del guardián de la máquina, resultan insuficientes para abordar los problemas jurídicos derivados de las decisiones adoptadas por los sistemas de inteligencia artificial. Estas normas se basan en la presunción de una intervención humana directa, la cual suele estar ausente en muchas aplicaciones de IA. Por ello, existe una necesidad urgente de reformar las normas legales existentes o establecer nuevos marcos

jurídicos que se adecuen a la complejidad de la tecnología moderna, manteniendo un equilibrio justo entre la innovación y la responsabilidad.

Palabras clave: IA; responsabilidad civil; guardián de la máquina; marcos jurídicos; consideraciones éticas.

1 INTRODUCTION

Artificial intelligence is bringing about many changes that strongly affect the institutional framework, and numerous legal sectors are currently dealing with the related problems. This study aims to fill a large gap in the literature and in the use of jurists by investigating the impact of artificial intelligence on the rules of civil liability for a machine guard. The obligation of the machine guard, codified in the Italian Civil Code, is a perfect referee that implements the deductive syllogism to verify respect for a rule of conduct without, however, ever being compared to a moral person. The significant social cost of accidents has led to a gradual limitation of the content of the machine guard's obligation to constantly adapt to the development of new technologies considered important for protecting safety. Today, the main means of improving safety and ensuring it is the car. According to the legislator and the courts, the machine is a good that is subject to a target protection regime, hyper-safety. The machine may have some defects that are dangerous for the consumer. The rules of civil law then indicate that the market value of the machine is that of a dangerous work tool.

The increase in the application of artificial intelligence in all areas of society has led to the fact that not only the manufacturer and the length of the machine, but also the company that has put the machine into operation, have to confirm that this good fully respects established safety standards. If an accident occurs, it will be possible to request compensation from the manufacturer or the operator on the grounds of liability with all the implications of the case. It is important to remember that not only in existing legislation, conventions, and references are enshrined that regulate the application of artificial intelligence in Italy and Europe, but in various degrees of affirmation are in a phase of realization now and in the future. It is therefore evident that this is only the beginning of a difficult process. This can be considered as the phase of digital transformation.

The importance of the study: Accelerated technical developments imposed on us conditions reflected in the legislative system as in influencing the legal rules of machine guard responsibility in light of technological developments, Many aspects had to be explored, including the adequacy of traditional rules to solve problems arising from the use of smart machines that have the ability to make decisions within the AI system s rights ", where such

harm is caused, who is responsible for compensation and what guarantees are granted to the victim.

Accordingly, we can judge the compatibility of those legal norms or need contemporary legal frameworks that accommodate modern technical challenges. This is done by reviewing previous studies in this area and making legislative comparisons.

Study Objectives: The study seeks to explore appropriate legal frameworks to identify elements of liability and to find a mechanism to ensure compensation for those affected by smart machine accidents that lack security conditions, whether censorship, de facto authority, direction or supervision.

This is done by examining in depth the traditional legal norms of the guardian's responsibility and researching the extent of its ability to cope, while making recommendations on the need to develop those legal norms or to introduce legislation that addresses the challenges of artificial intelligence and balances human rights with technical developments.

Study Questions:

a) what are the notions of smart instruments?
b) what are the foundations of the machine guard's responsibility?
c) are traditional legal norms sufficient to address technical challenges?
d) what safeguards can we provide to the victim about damages to smart accidents?
e) are there guarantees of ethical considerations in the field of smart machine?

2 UNDERSTANDING ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) is generally understood to be intelligent behavior exhibited by machines and refers to the branch of computer science that studies and develops intelligent machines. AI refers to a machine's ability to learn or to function by performing human-like tasks such as learning, reasoning, analyzing, understanding, and decision-making, which can be seen in the development of software systems based on the structure of the human brain, neural networks (Dajeh, 2024a).

Two of the big goals of AI are the creation and understanding of computers and software that exhibit human-like general intelligence; that is, they are able to understand and learn complex tasks, operate over time and in a wide variety of settings, and learn without supervision or external information or help. This is sometimes referred to as strong AI. More recently, researchers have also worked towards the development of AI systems that function in very limited senses – systems with capabilities that, when they are successful, can easily be programmed. The capabilities of such systems should also not be compared to AI in films or

TV – a depiction of intelligence long beyond their actual capabilities, where AI appears to operate in dimensions of human emotion and intuition.

The use of AI in controlling and monitoring homes and workplaces is already a reality. Applications range from learning algorithms for robotics to advanced security products. One of the branches of security entrepreneurship that is loved by most entrepreneurs now is machine guard technology, which reduces the reliance on intelligent human workers, who are prone to mistakes. AI-based security applications offer performance and cost benefits unmatched by other human-based systems (Javaid *et al.*, 2023).

2.1 DEFINITION AND TYPES OF AI

Artificial Intelligence, like many other pseudoscientific terms, does not have a single interpretation or a strictly defined definition. In this research, the term 'Artificial Intelligence' will be considered in the sense of a sub-field of computer science that seeks to understand and develop systems that show intelligence. Problem-solving systems or speech recognition systems, for example, are considered 'intelligent' systems, which is why they have often been classified as belonging to the field of AI. In the literature, there are different ways to classify AI according to different categories of Artificial Intelligence:

a) main categories;
b) some people use different criteria for classifying AI in forms, which are;
c) but also consider an older version of AI, which has;
d) some analysts in the field classified AI, taking into account the periods in which developments were made in the field of AI. In this research, we have decided to make a classification of AI according to main categories.

The main categories consider the following types of AI, these being the forms of classification that have been proposed by at least two or three authors:

a) reactive machines;
b) limited memory;
c) theory of mind and;
d) self-awareness.

We will briefly discuss each of these categories, pointing out the distinctive features of the systems that belong to these categories. There is a significant difference between these four types of AI. While Reactive Machines are capable of making decisions, they do not store data from the previous ones. The systems from Limited Memory and Theory of Mind are based on the analysis and accumulation of information on certain interpretable contexts. Finally, Self-awareness systems are the most sophisticated because of self-reflection. The

difference should be significant concerning the liability law and the obligations of self-aware systems or platforms as machine guards (Dajeh, 2024a).

2.2 APPLICATIONS IN MACHINE GUARDS

Over the last few years, important research has been done about how AI can be used to improve safety systems in a smart factory. This work illustrates the potential of AI used in machine guards. One of the most important applications can be the prediction of maintenance. This is very useful in the machine guard because the safety system may need maintenance more often than other devices. When maintenance is not predicted in advance, the safety system can go down, provoking a machine stop, which results in operational loss for the factory. Likewise, this use case can also be applied to protect the safety system itself, which usually protects the operators. AI can be used, for example, to detect physical anomalies in some parts of a light curtain before a failure.

Furthermore, machine learning can be used to alert the system that an application was not planned, and there would be a risk. In general, event anomaly detection is very important for machine guards. Whether in manufacturing use cases or not, there are general use cases where AI algorithms are used in safety applications to either ensure a safer environment for the workers by ensuring a fast shutdown of a machine or ensuring faster fault detection. All these use cases have in common that they impact end-user safety but are also critical for efficient operation by avoiding the degradation of productivity. More generally, most of the research presently done about AI in safety focuses on integrating AI into conventional security systems. This trend has the advantage of providing a quick response to security threats, but it also has negative impacts since it increases the attribution of responsibility. Indeed, as intelligence increases, demonstration takes more and more precedence in decision-making. According to law, manufacturers are liable if their products are defective and this has caused personal injury or injury to items of use. Thus, if the machine enters a state of disrepair and if the decision process implemented is shown to be defective, the question that arises is whether the use of AI would increase the demonstrability requirement (Dajeh, 2024b).

3 CIVIL LIABILITY IN THE CONTEXT OF MACHINE GUARDS

Since artificial intelligence-driven machines will frequently need a machine guard as a physical safety measure, an important question arises: what are the rules of civil liability in the case of machine guards? The role of a machine guard is to shield a worker from the

hazards of a machine. However, some accidents are also caused by machine guards themselves, or the failure of the safety protection system of a machine equipped with a machine guard. Do current laws contain the rules of accountability when machine guards are faulty or do not operate properly, for example, in the case of an inseparable link between a guard and the machine? Do the general principles of determining liability for monitoring machines apply when machine guards are supported (to various degrees) with artificial intelligence algorithms? As questions of this kind will become much more frequent as more advanced smart machine guards supported with AI technology are released into the market, it is suggested that the new legal concept concerning civil liability on a machine guard with AI be elaborated.

Manufacturers must develop autonomous machines with AI that are safe by design, as an essential part of the safety requirement. Other entities, i.e., importers, distributors, or AI-using operators, also have duties concerning the proper functioning of AI. A two-tier safety requirement increases the chances of more responsible conduct and raises the degree of safety overall. These provisions eliminate the examination of the question of which of the public and private agents would be more suited to bear the costs of their association with society. It seems that the new civil liability regime is trying to incorporate the responsibilities of each of the subjects involved in the process of use. One question remains: what will the position of public or private agents be if the above assumptions are not fulfilled?

3.1 LEGAL FRAMEWORK AND RESPONSIBILITIES

In the construction of a machine or system for controlling it, its designer or manufacturer must comply with certain legal obligations, such as safety, traceability, information to be collected, and technical documentation. Sometimes this obligation is also extended to the user after good technology and compliance with the instructions for use. The starting point for the machine guard from a civil liability position is the concept of duty of care. This principle sets out the obligations to behave in a manner consistent with the behavior of other players in human society to trigger legal responsibility.

The normative standard connected to the concept of duty of care is given by the imperium of law made of an outline of the latter day of technological developments that could make useful a deep innovation in the type of behavior held by design and assembly firms. The thing guarded, in this case, is the machine equipped with an artificially intelligent element. Therefore, one could consider that the standard is always that of the obligation to produce a machine guardian number or, at most, that regulates the obligation to produce a machine guardian according to the principle of a thinking being. In the light of these, it must

be admitted the importance of the supervisory and controlling plan in the liability of the company that produces a machine guardian with an attitude and possibly independent thought. A new reinforcing effect would possibly be attributed to regulatory bodies on the concept of duty of care to be held by those who design or make. Lastly, the necessity of a list of definitions to be put in place by a legislator is pointed out in order to be able to mix current regulations and future possibilities created by AI technologies in the legal field, to be certain in ways that robot line entrust limits to those who choose to adopt AI for making responsible and responsive robots. These definitions in a normative scheme are important because ambiguity in the liability of some logic of never-ending would be pernicious.

4 CHALLENGES AND ISSUES IN ASSIGNING LIABILITY TO AI-DRIVEN MACHINE GUARDS

Assigning liability is now being challenged by the feasibility of ascertaining who is responsible in the event of an accident involving a machine guard based on AI decision-making. In many cases, the machine will autonomously make decisions without involving the physical presence of a human to control the production machine on the spot. The feature becomes an issue of the machine guard and has a larger effect on the liability allocation in the future. The AI system's autonomous decision-making will complicate the accountability distribution in the event of an error that results in an accident. In general, the use of AI systems as a machine guard triggers multiple pending and complex issues, for example, concerning the possibility of, and the procedures for, attributing liability to the breakdown, with the related consequences in terms of their allocation, contractual relationships, and insurance cover. Explainable AI research can propose domains and specific applications. The recent interest in AI chains influenced the development of a series of procedures for auditing AI systems in use, raising ethical, legal, and social issues.

Given the difficulty of ascribing a technical element in isolation from the management and organizational setup of companies, in a judiciary environment characterized by increasingly limited judicial resources and a judicial response that is not particularly timely, the issue is quite pressing. The breakdown caused by the AI chain to security could be classified in two different ways: one concerning the initial structural choices that contributed to the realization of the AI system, and one related to the specific operational context. In principle, accidents could occur in both of these circumstances, but it is reasonable to think that the event is more likely in the second case. The explanation lies in the fact that currently, the algorithms are engineered without assuring fairness, and therefore the introduction of subjectivity in choices increases the likelihood of damage occurring. Not surprisingly, the

effectiveness of AI chains operating in sensitive sectors is the subject of widespread public distrust, as in the health sector.

4.1 LACK OF HUMAN INTERVENTION

The shift to AI-driven machine guards presents various issues under current liability principles, such as the issue of there being no human intervention. In traditional systems, lack of human intervention means that the machine guard is not in use. As a result, the traditional guard would not be operational. When malfunctions happen, it stands to reason to hold the employer liable for failing to keep the guard in place. In AI-driven machine guards, however, the lack of human intervention implies that the human 'intervention' simply did not take place. It is not a malfunction of a guard that can be held against the employer. It is, in fact, the independent malfunction of the AI. In these cases, pinpointing liability becomes more complicated.

The AI's autonomy also clashes with two traditional liability principles. Foreseeability of AI malfunction is problematic, as the unpredictability of an AI system increases with the autonomy of a self-learning system. Hence, it becomes more difficult for a developer to minimize the risk of damage, as he can no longer foresee what his system can do. In principle, control could be exercised by a user over the AI. And temporary control will and can still exist. However, in the long run, AI that is fully capable of taking on all tasks related to a machine guard requires no human input to function. Hence, this offers a way for the manufacturer/developer to avoid liability through navigating the use of these traditional principles.

As AI is increasingly capable of independent operation, liability rules built on the necessity of preventative human oversight might refashion AI manufacturers to bear the risk of harm generated by autonomous systems, and the 'human safety net' may degrade to a somewhat precarious guarantee. It is the policy of requiring a safety-interventionist human that no longer aligns with our contemporary robot lawmaking. Hence, AI cannot be integrated under the same legal regulations used in the traditional machine guard environment.

5 COMPARATIVE ANALYSIS OF INTERNATIONAL LEGAL APPROACHES TO PATROL THE MACHINE GUARD LIABILITY

5.1 UNITED STATES

Legal Surroundings.

The United States does not have specific legislation and regulations in place that would regulate the use of AI in machine guards. However, a series of trade standards in the relevant regulatory framework establish safety rules and refer to liability. Injury and litigation are also governed by general provisions of the civil code, including rules applicable in tort. The United States has a comprehensive and detailed civil liability system. In addition to the legal standards in the code, judicial opinions, known as precedents, are also relevant.

The US legal system is based on a common law system, which means that courts are important sources of law. The way in which liability law is to be interpreted and applied varies from state to state in the United States. In many cases, several competent judges make decisions, and state courts in the first instance may refer to the opinion. This makes it extremely complex to predict the direction of the case law and interpret judgments. Principles, changes, and developments in the law are also made part of the law through the opinions of legal authors. This state of affairs examines the use of AI as a measure of the general legal system in civil liability, tort liability, and other liabilities in order to identify certain features of the legal system required to address issues related to the use of AI in a machine guard. There is also an overview of the ongoing discussion on the establishment of civil liability in new technologies, which can lead to the correction of certain principles of liability. Finally, it examines the extent to which legal certainty can be established through a discussion of the relevant questions related to AI and the application of general principles to the judicial process (Welser, 2017).

The US legal system is essentially rooted in the philosophy of protection of individual autonomy; actors are generally responsible for the harmful consequences of their actions. The US introduced this system of strict liability with a notable case. This strict liability is now organic because it is detailed in a specific section of the Restatement of Torts. This instrument fixes a two-class system, the burdens. Actually, it creates a prima facie case, and then the right to adduce the evidence is shifted to the defendant. This notion of liability without fault also holds for manufacturers submitting to the customs of a standard safer community.

5.2 GERMANY

The relevant section of the Bürgerliche Gesetzbuch has been created to be flexible, and the jurisprudence fills out the broader details. The German legal philosophy articulates the legal system in providing broad legal resiliency to cover risk liability, and in particular, to control industrial risk, but also the liability for owners and possessors of anything. According to the Bürgerliche Gesetzbuch, the liability is due even when there is no fault in the sense of

its esteemed theater facts. The absence of fault is compensated for by a legal fiction that guilt is established when the victim is injured. The liability of manufacturers is almost strict by analogy to another section of the BGB. This regulation is mitigated by the concept of built-in oil. The manufacturer has indeed the right to prove that the defect comes from a lack of scientific reconnaissance and was therefore unknowable at the time when the product was placed on the market. This liability is almost strict, as first of all, the consumer doesn't need to prove the fault of the repairer; the absence of any fault by the injured has been compensated by the introduction of infallible absolute proof when the infringement was suffered (Towards [...], 2024).

5.3 EUROPEAN UNION

In the area of emerging technologies, due to the supranational character of the European Union and the increasing technological convergence in the internal market, considerations of harmonization are constantly in the background of the discussion on the specifics of the rules of machine guards. This subsection analyzes the settings defined for the operation of a machine guard, discussing the layer of both civil liability for the damages inflicted by the guard and for the obligation of the machines with respect to their user protection. The latter is based on the most comprehensive regulatory framework defined on a global level as of the date of preparation of the present paper, which is aimed at covering aspects inherent to the new technology. In addition to the general guidelines, there is no shortage of sectoral directives, soft law tools, and case law which are interconnected, hence contributing to the delineation of the relationships between the subjects involved. The most recent proposals provide for the creation of a regulatory framework specifically designed for AI and robotics and, more generally, of a European agency to support and supervise the single national authority in the verification of the conformity of the AI system with European legislation in the field. The approach of the European Union can be compared with that regarding the guards. Both are based on the principle of safety by design, the distinction between low- and high-risk systems, and the composition of a mandatory code of conduct. Also, while waiting for the introduction of a regulation on vulnerability in the EU, some legislative interventions made by Member States require the introduction of features that, in broad terms, are found in the machinery directive (such as transparency, ethics, traceability, explanation, and minimization criteria). Differences exist especially at a general level, due to the different reference to the extent of respect for fundamental rights, ethical standards, and jurisdictional assessment. According to some of these legislative texts, the courts could carry out an evidential assessment of the AI system in the light of the technologies applied to it, in

the manner of traditional expert advice. Other legislative provisions at a national level do not involve any legal consequences but leave room for the introduction of self-regulatory codes of a professional or corporate nature, with a view to ensuring compliance with ethical standards. These differences appear to be the result of the complexity of the task of aligning the laws of the twenty-seven jurisdictions, as well as belonging to non-homogeneous legal systems, and are based on diverse traditions which, according to some, represent the basis of the differentiated approach characterizing the European Union's political strategy on artificial intelligence, which seeks to create mutually reinforcing mechanisms with its Member States. Thus, the proposal of a horizontal AI Act at the level of the twenty-seven Member States would be widened with EU added value in several respects, setting the floor under a vision where the interest in compliance with fundamental rights and high ethical standards is more explicit and, at the same time, technology-neutral. In accordance with the spirit of the machinery directive, it is actually the type of oversight that matters, hence the specific function of a machine guard. More specifically, the machine guard can provide evidence of a malfunction, breach of the obligations inherent in the guard's own function, and/or guilt of the injured party. Being, however, connected to the control functions of the machine, a duty of the guard to monitor the practical impact of the relative rules – except for sectoral regulations – cannot be ruled out (Wendehorst, 2020; EU, 2024).

6 PROPOSED FRAMEWORKS FOR ADDRESSING AI-RELATED LIABILITY CONCERNS

Other proposed models approach "civil" or contractual liability, but they do so through novel, technology-respectful lenses. Some emphasize developers' or users' proactive steps to ensure AI system safety, such as using or creating codes of conduct, safety plans, and compliance tools. These models represent AI technology values in important ways. They provide a proactive rather than reactive approach to both developer guidelines and liability standards. This is important because AI system users might not only be harmed by an AI system, but also an AI system's non-compliance might leave them with a flawed product even when they are not physically injured. Carrying assurance devices for counsel might aid them in defense of AI system liability lawsuits, especially if they are on the commercial end. Moreover, non-binding coalition standards might push or recommend the hand by developers' AI system guidelines to create concomitant rules.

Other proactive guidelines with demonstrable technological values may also illustrate a positive turn in tech-love, focusing contract law insight on buying parties for AI products. This approach might both scare down evaluation and provide market benefits, such as

cheaply conforming to agreed-upon safety norms, to compliant buyers. Models concerning regulatory specifics and considerations, as well as international agreement instruments, may also steer towards a liability focus with a more future-tech emphasis than models considering conventional particulars and aspirations. The overall tech-valuative or strategic consensus in these rules can be reflected in what new categories of risks are considered, or liability insurance or dispute settlement solutions.

Several proposed models contemplate a wide variety of considerations and takeaways in order to consider how and why AI ethics and law should play out. These include considerations about the value of AI operators' risk management strategies, in the context of safety, and both AI manufacturers' and users' liability insurance. These models account for variations between the two actors: multinational AI manufacturers and users, as well as the trend of internationally mobile tortfeasors or claimants in globalized AI industries. The form of relevant legal and regulatory instruments is rich and diverse in the consideration of possible implementation frameworks as well. Domestic-focused models call for stronger liability directives, like mandatory limits and compulsory dispute settlement protections, as well as globally harmonized product liability standards and dispute settlement mechanisms, possibly provided by the influence of a new AI regulatory agency. Such standards are in various proposals at least partly offset by proactive developer or AI user guidelines, such as codes of conduct, terms of service warranties, and international negotiation under which governments could harmonize developer liability-exemption criteria, such as what would count as reasonable AI researcher care as set against AI user precautions (Cervantes *et al.*, 2020).

6.1 STRICT LIABILITY REGIMES

In principle, the scope for legal innovation could also be justified under civil liability laws. The principle of strict liability asserts that liability lies not in the fault of an actor or agent—then accepted as a way to limit damages ex post—from a principled point of view but instead in legal space for considering ex ante how funds might substitute liability for or mitigation of precaution. The concept of strict liability has not been explicitly formulated within extant laws as a potential recourse to harm caused by AI-driven machine guards. However, the doctrinal concept of strict liability accords with judgments on, for example, guarantees and omissions of consent within the civil and criminal legal fields where machine activity is not restricted to the AI context of this paper but might be instructive (Wendehorst, 2020).

In this manner, a strict liability regime would refocus the legal lens from the debate about fault and impermissible risk to the causation and certainty of the damage, thus upending foundational components of the legal calculus about negligence, reasonable precautions, and risks of AI. While strict liability does not solve problems of causation, its adoption would simplify the question about verification of the claimant's damage, and at times the extent. Although such a scheme is more direct, a persistent challenge with it is the articulation of certain types of damage and their instantiation with existing mode data. However, one of the potentials of this regime is that when it is obvious that the claimant has suffered a harmonized damage that AI has clearly caused, linked to matters such as perception in decision making, doubt about the existence of damage is remarkably reduced (Godi, 2024).

7 CASE STUDIES AND LEGAL PRECEDENTS

This section analyzes in detail real-world scenarios and cases that may be considered legal precedents. These cases may have been of great relevance to the legal outcomes that were rendered and their consequences. After an analysis of the various cases, the section also highlights the decisions, the principles of law at stake, and their influence on ongoing discussions over liability and machine guard. A number of principles are or could be latent in the case law. One principle acknowledged in case law regards the claim that AI may lack consciousness and thus cannot be held accountable for its actions. This section has shown the reader that some of the case law involving the liability of AI and robots and machine guard offers substantial insights. These cases show that courts, as they begin to assess hypostatic liability, will look at a number of principles of law. Other elements can be highlighted when considering recent trends in the state of the art of legal studies that have been presented. Moreover, the same approach has been carried out in different jurisdictions. This would serve as a guide for lawyers and scholars, who can analyze these previous consultations when preparing similar jurisdictions for consultations in other courts. In addition, the same philosophical and legal principles used in these cases may also be applied in the examination of the proposal. In this way, scholars may be able to reveal existing case law trends and integrate them into their theoretical research. Thus, the engagement with the case law in the field can provide a valuable mirror on the state of the law in a field that is of increasing importance, due to the fast advancements of AI and robotics and machine guard (Novelli; Taddeo; Floridi, 2024).

7.1 AUTONOMOUS VEHICLE ACCIDENTS

Google car accidents. Few of these self-driving vehicle accidents make major news as, although they occur with regularity, they almost always result in minor fender benders. However, two accidents do qualify, in that both resulted in minor injuries to the passengers of the self-driving vehicles. On February 14, 2016, in Mountain View, California, a Lexus SUV sport utility vehicle operating in autonomous mode struck a bus while attempting to drive around a sandbag obstruction in its lane. The vehicle was traveling at approximately 2 miles per hour in a 35 mile per hour zone in the moments leading up to the collision. The car accident was reported to the California Department of Motor Vehicles until May 2018 (Ghorai *et al.*, 2024).

The first fatality involving a self-driving car occurred in the state of Florida, in the United States, on May 7, 2016. In the 2016 incident, an installed advanced driver-assistance program that included brake support was active, but the program required both the driver and the software to agree to initiate braking. Neither performed this task before the car ran into the side of a transport truck. The truck and car traveled perpendicular to each other at the same speed, indicating that the car's sensors detected the truck in a way that the car should have been able to avoid. It is not clear why the car did not brake, and the accident is subject to an ongoing investigation. Courts have struggled with assigning liability in these instances of human-robot interaction in the world. Right now, the general legal status is that the operator of the robot, the one that interacts with the system while it is functioning, maintains the same liability as they would always have, as if the full suite of autonomous systems had not been functioning as designed at the moment of the accident, except for the car manufacturers that have stated that they will be responsible for any accidents that their cars cause while in fully autonomous driving mode. Cheaper insurance prices are predicted to result, as attempts to limit the risk by training and qualifying operators and imposing minimum safety standards. In connection with the development of autonomous or unmanned traffic systems, the expectations for future technological improvements of AIS are that AIS will reduce wildlife-vehicle conflicts, reduce loss of human life, speed up vehicle traffic, and ensure personnel safety (Chougule *et al.,* 2023).

8 ETHICAL CONSIDERATIONS IN AI AND CIVIL LIABILITY

Machines and, by implication, AI cannot make moral decisions, but they can cause harm because we designed them and accepted the risk of their limitations. Therefore, entities involved in the business chain, such as developers, trainers, producers, and users, cannot

close their eyes to the unfair outcomes of machines' decisions. The question here is not who is at fault, because machines must not harm anybody due to the risks their design entails. Thus, instead of focusing on felons, the emphasis might be on the ethical organization of product design. The premise is a kind of "social organization" in the development of responsibility-aware systems, which, given the specifics of AI, might be based on society's or certain sector stakeholders' consensus (Cervantes *et al.*, 2020).

The key point here might be to indicate the factor of culpability and to define the correlative limits of civil liability. However, we are still faced with an open question of how one could design and develop the rules for AI from the very beginning to work in an integrated, "responsibility-aware" manner. It should be indicated that "ethical" discussions take place also on a higher level of principles such as fairness, equality, and justice. It concerns the rebuttal of decision-making systems towards breaches of discrimination, privacy, or security levels—even though such aspects are not explicitly regulated and the liability in defective products and AI rules are the last resort to prevent AI harm. These issues, alongside others such as control, risk assessment, and liability, are the ones that might integrate into an "ethical AI framework" for the industry. In light of the above, it appears to be impossible to introduce ethical issues merely at the level of responsibility. Equally needed are ex ante ethical frameworks to direct the development of AI technologies. Those standards can be included in self-regulation, establish normative standards, or, ultimately, be integrated into positive law. Uniformity appears to play a special role in this respect, as twisting the level of AI according to unstandardized ethical values might undermine the functioning of the internal market and harm harmonized consumer safety. Furthermore, such preconditions cannot be regulated as "pure" technical abilities of AI, but rather, ethical considerations must coexist with the necessity for the technical system's conformity to the law. Properly designed mandatory ADRs for AI cannot exclude the development of advanced AI safety systems (Yu; Yu, 2023).

8.1 TRANSPARENCY AND ACCOUNTABILITY

Transparency and accountability are key elements when AI and civil liability in direct as well as in product liability are discussed and affected. Transparency of AI gives insight into the functioning of AI, AI bias, AI functionality, AI policies, AI data, and the systems AI uses. Explainability is a component of transparency and includes information and explanations about the functioning of machine reasoning and machine behavior. It is a characteristic of the interaction between man and the machine. In its purpose to foster public trust and responsible AI development and use, transparency thus also has different dimensions and

encompasses societal and individual aspects, as well as economic functions. If something seems biased or unfair in the functioning of machines, it retreats the individual and retards social trust in general. Public trust is one of the core components of a comprehensive AI strategy. It is often voiced that without public trust, AI will not receive the 'social license' to be widely adopted. Trust in AI can be fostered by ensuring the overall accountability of the system's use, by clarifying and explicating for different stakeholders some of the key elements of the AI system, and by taking appropriate safeguards. To this end, enhancing transparency is essential. The current body of laws, policy, and standardization activities are concerned with legal aspects of machines. There is no technical verification available to check the conformance of AI when purchased. The laws on product safety presuppose that machine construction is sound to begin with. The most recent initiative on transparency of AI is concerned with operational aspects. If the laws do not incorporate transparency, one must address liability. It is then that a need for standards arises and the technical verification of the conformity of AI can be prepared (Cheong, 2024).

9 FUTURE TRENDS AND RECOMMENDATIONS

In the future, the use of artificial intelligence will face important inventions regarding its characteristics, such as control, guided active learning, more advanced ethics, security, and compliance, in order to increase the level of naturalness that makes it closer to humans. In addition, AI will be equipped with the power to make decisions and carry them out to reduce human labor; however, these deductions may pose many defects that trigger severe accidents. In light of that, what has been discussed can contribute to the following (Javaid *et al.,* 2023):

a) key stakeholders: Heavy participation of people with backgrounds in computer science, ethics, law, and other fields is necessary to address the difficulties that may arise from the use of AI. The increased use of technology requires diverse knowledge to ensure its effectiveness and minimize the risks associated with its use in all segments in general and in the legal requirements in particular;
b) international collaboration: Important discussions between different countries regarding the extensive use of AI are essential, as many applications are cross-border services aimed at clarifying the international rules of liability when AI makers are from another country. There is a need for deep cooperation, first between technical authorities in establishing approved procedures for AI, and second regarding responsible civil liability;
c) legal background: The occurrence of issues arises from advancements in technology, research, and application across all fields, particularly within the legal

framework. Every country should provide accurate and comprehensive legal guidance for any activities, including AI use. However, the legal approach must evolve to encompass general principles that are resilient to technological changes, as the rapid pace of technology complicates extensive regulation;

d) recognizing renovation: In addition to maintaining continuity, current systems also need to be modified to adapt to new breakthroughs, as there are obstacles in the law due to the absence of necessary controls. Consequently, to achieve uniformity in dealing with the advancements of AI, technology will inevitably intersect with a range of existing legal frameworks;
e) liability approach: There must be a full guarantee that making technology more authentic is viewed in a balanced manner. Traditionally, technology must be continuously developed to produce genuine works; for example, the legal framework for liability should enforce AI manufacturers to reasonably prevent the development of unreasonable risks while ensuring the generation of authentic works from products manufactured by AI (Zhang; Zhang, 2023).

9.1 REGULATORY UPDATES

There is an increasing interest from the legal communities worldwide, as well as from policymakers, in AI and its possible effects on the rules of civil liability. Indeed, several attempts have been made to identify the aforementioned regulatory effects in various jurisdictions. This text takes into account the latest regulatory updates that major policymakers have undertaken to specifically regulate AI after 2021 and aims to illustrate—aside from the main requirements and limitations imposed—from a critical evaluation perspective—to what extent these latest regulatory acts have also determined noteworthy innovations concerning the rules of AI/PPP. The analysis first considers two recent legislative interventions, namely the proposal for a Regulation laying down harmonized rules on Artificial Intelligence, which is subject to an interinstitutional legislative process, and the proposal for a Regulation on machinery products, which has the main purpose of modernizing the regime on placing goods on the market and related procedures (Zaidan; Ibrahim2024).

Both proposals also contain significant developments relating to the attribution or exclusion of corporate liability for the damages caused by AI system-run machinery, either according to a strict corporate concept or an autonomous conceptualization of AI systems. As far as the US is concerned, another quite remarkable contribution was recently offered by the Biden-Harris Administration, whose Executive Order on the Use of Artificial Intelligence

contains not only provisions concerning the guiding principles for AI development and use by federal agencies, but also principles aimed at protecting privacy and civil liberties, as well as establishing a surveillance of AI-related technical and ethical standards that are developed in the private sector nationally and internationally (Dotan, 2024).

Indeed, some articles are of interest in the field of corporate responsibility for the damages caused by AI systems, as they provide for the establishment of an "AI Safety and Governance Interagency Working Group," which is required to be established within 180 days, and the conduction of regular technology safety reviews through the "Senior Agency Officials for Technology Safety and Ethical Use." Not only is AI regulatory innovation continuously ongoing, but legal scholars, grounded in their peculiar expertise, are encouraged to actively participate in the design of these new tools, offering critical evaluations of the new measures adopted and, wherever deemed necessary, suggesting recommendations to adjust them (Biden, 2023).

10 CONCLUSION

This essay offers a first comprehensive examination of the impact of AI in the domain of civil liability as to machine guards. An already discussed tool, such as rules that refer to manufacturers' strict liability, allowed me to apply the proposed model of rules' demarcation in order to locate interference between AI and civil legal framework – rules subject to contraction. Subsequently, constructing an interdisciplinary approach, I formalised the list of special conditions of liability, relating to the incorporation of AI into machines' functioning, in a manner that is not based on too detailed substantive regulations. Issues related to risk assessment and adaptation of the special conditions of liability to modern technologies were checked (Al Ayed; Dajeh, 2023).

The application of AI technology in hard law as a consensus-building tool gives a substantial argument for the necessity of proposing a legal form of AI for the demarcation of rules of law which are to be preserved as standards and those ones that should be elided. In my opinion, a necessary condition for the integration of AI enables a-entity to participate in the process of setting applicable standards which might be referred to as the rules' adaptive demarcation. We are witnesses to technological revolution – a frequently applied slogan. Be that as it may, for a legal perspective, some topics have not been cognitivised yet. One of those issues is subject to making available machines operating in a way based on the AI as supplying normative information to adapt rules of the current law to be valid. This essay aimed at the adaptation of law to the technological progress, rather than shaping and verifying the foundational concepts of objectivity and norms (Gürkan, 2024).

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