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THE IMPLICATIONS OF ARTIFICIAL INTELLIGENCE ON CRIMINAL LIABILITY IN CONTEMPORARY CRIMINAL THOUGHT

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Abstract

The rapid advancement of artificial intelligence (AI) has raised profound questions regarding the traditional foundations of criminal liability. This article examines how AI technologies challenge conventional legal concepts such as intent, causation, and responsibility. It analyzes the extent to which existing criminal law frameworks can accommodate autonomous decision-making systems and explores whether new legal models are required to address their unique characteristics. Through a comparative legal approach, the study assesses how different jurisdictions respond to AI-related offenses and evaluates the adequacy of current legal doctrines in ensuring accountability. The article concludes that contemporary criminal thought must evolve to incorporate flexible and adaptive legal principles capable of addressing the complexities of AI. It proposes a hybrid model of responsibility that balances technological innovation with the protection of fundamental legal guarantees.

Keywords: Artificial Intelligence, Criminal Liability, Legal Responsibility, Autonomous Systems, Criminal Law, Contemporary Criminal Thought.

Introduction

The exponential development of **Artificial Intelligence (AI)** has profoundly reshaped the legal landscape, posing unprecedented challenges to traditional regulatory structures. Unlike earlier technological tools that remained fully dependent on human intervention, contemporary AI systems increasingly demonstrate autonomous and adaptive capabilities. This evolution generates new legal questions concerning responsibility, accountability, and the boundaries of criminal liability, particularly when AI acts independently of human control. Such developments expose a growing

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gap between the rapid pace of technological innovation and the relatively slow adaptability of legal frameworks.

Criminal law has historically been built on the assumption that the subject of liability is a natural or legal person capable of forming intent or exhibiting negligence. This assumption is now under pressure as AI technologies increasingly engage in decision-making processes that may result in harm, damage, or criminally relevant outcomes. The traditional elements of criminal responsibility—*actus reus* (the physical element of the offense) and *mens rea* (the mental element)—were designed to regulate human behavior. When applied to autonomous systems, however, these concepts reveal significant theoretical and normative limitations, challenging both doctrinal clarity and the effectiveness of existing legal mechanisms.

The manner in which AI is conceptualized and legally framed directly affects the allocation and determination of criminal liability. Legal scholarship has highlighted different interpretative approaches, reflecting the absence of a unified framework for addressing liability arising from AI-related conduct (Bakar Kamara, 2018). This situation creates considerable uncertainty in both legislative and judicial practice, underscoring the urgent need to clarify the legal status of autonomous systems within criminal law.

Moreover, the accelerating pace of technological development necessitates corresponding legal adjustments to preserve the coherence and authority of the criminal justice system (J. Baghdady, 1959). The extent of such adjustments varies across legal systems, but a shared challenge persists: maintaining the integrity of fundamental principles of culpability and punishment while adapting to a technological environment that does not always align with traditional notions of human agency (Lau et al., 2018). This tension reflects a critical juncture in contemporary criminal thought, where legal certainty must be reconciled with the realities of technological autonomy.

In this evolving context, questions concerning the attribution of liability—to human operators, designers, or the AI entity itself—acquire a central place in legal debate. The absence of clear legislative guidance leaves courts and scholars grappling with complex doctrinal issues that have direct implications for both the effectiveness and legitimacy of criminal law. Addressing these challenges requires rigorous legal analysis capable of reconciling technological innovation with the core principles of criminal responsibility, ensuring both accountability and normative stability.

Chapter One: The Conceptual and Legal Framework of Criminal Liability in the Age of Artificial Intelligence

With the advent of artificial intelligence (AI), intelligent machines capable of performing functions that exhibit human-like capabilities are becoming increasingly commonplace. Although some machines operate as mere tools—artificial means employed by humans to accomplish tasks previously conducted manually—there are also autonomous machines that can make independent decisions regarding their operation, thereby liberating humans from direct oversight. Autonomous intelligence can facilitate human activities and mitigate the risks associated with dangerous operations (Hacker, 2022). However, autonomous AI also raises complex questions regarding criminal liability. Can autonomous AI be regarded as an agent in a criminal law sense, indicating a person liable for criminal actions? Does the complexity of functions and activities of advanced AI allow for the attribution of legal-person-like qualities, granting AI the status of a subject of criminal law that can be criminally liable? AI challenges traditional concepts of criminal law on multiple levels. Consequently, AI must possess characteristics that complicate the formulation of legal principles of culpability. Criminal liability of autonomous intelligent machines must also be

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examined in relation to the limits of traditional principles of criminal liability, which are better adapted to other forms of autonomous agents, such as juvenile or mentally ill persons.

The moral aspect assumes that the perpetrator directed their intention in a manner that contradicted the commands of the law and its prohibitions. Thus, the intention becomes subject to blame, and the individual behind it becomes worthy of being questioned: Why did they direct their intention in this way, while they had the ability to direct it in a manner consistent with the commands of the law and its prohibitions? The fundamental principle of criminal responsibility that comes to mind is free will ("libre arbitre"): the perpetrator was capable of choosing between the path that complies with the law and the one that violates it. It was incumbent upon them to choose the former, so if they chose the latter, and their intention was directed towards it, then this intention is criminal, and its owner is responsible for it. However, not all jurists agree on the concept of free will: to some, it is pure illusion, as human beings have a predetermined capability for their actions. If their intention is directed towards a crime, it's because they couldn't have done otherwise. According to them, determinism is what explains all human actions. Denying free will doesn't negate criminal responsibility, but it establishes it on a new basis and subjects it to various rules (hassani, 1976).

The general rule is that only a human can be subject to criminal accountability. This principle forms the basis of criminal responsibility in most legislations and legal systems worldwide. While this principle is largely intuitive, the traditional perspective on criminal liability has evolved. Many jurists and experts in criminal law now argue that liability might deviate from what is conventionally accepted.

Historically, criminal liability was based solely on "the commission of a material act expressly prohibited by law." Consequently, the mere act of committing a forbidden action could lead to a criminal or penal conviction. This material element, known as the actus reus, can be carried out by the accused themselves or through the involvement of a third party, as demonstrated by various modes of criminal participation outlined in Article 21 of the Criminal Code. Furthermore, the use of a weapon or object to commit an offense does not automatically entail criminal responsibility for an individual. This element will be of paramount importance when addressing the criminal liability of AI users(Ellyson, 2018)

Section One: An In-depth Exploration of the Intricate Nature and Multifaceted Realm of Artificial Intelligence and Its Profound and Far-reaching Impact on Contemporary Criminal Thought Processes and Behavioral Patterns

Artificial Intelligence (AI) constitutes a more intricate and multifaceted phenomenon than the commonly associated notion of devices merely emulating or replicating human and animal intellects. Advancements in machine learning—specifically, in deep learning domains like convolutional neural networks (CNNs), recurrent neural networks (RNNs), and generative adversarial networks (GANs)—have prompted widespread interest in exploring AI’s nature and consequences. While machine learning is preeminently influential and drives popular attention, a comprehensive understanding mandates a recognition of AI engineering as learnt behaviour and the incorporation of AI systems according to distinct objectives, criteria, and social contexts (Velasco, 2022). Attributing liability in criminal law towards AI entails a complex examination of the very nature of AI. Autonomous systems exhibit additional characteristics such as varying degrees of self-learning capability or decision-making control by humans. These attributes factually differentiate

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contemporary AI from analogous but substantially simpler input-output mapping technologies. Such characteristics further necessitate the delineation of concept boundaries concerning autonomous systems, learning devices, and distinct sectors (bureaucratic, educational, etc.) where AI entities are construed as tools and do not remain subject to action classification. In light of the continual inquiries surrounding AI's proper conceptual framing and the debate concerning culpability—be it on technological or ethical action dimensions—these feature insights acquire particular significance.

• Subsection One: The Comprehensive Concept of Artificial Intelligence and Its Significant Technical and Legal Characteristics in Modern Society

Artificial intelligence (AI) is an advanced interdisciplinary field that employs disparate techniques aimed at developing systems able to perform tasks that previously necessitated a human intellect. By incorporating elements of computer science, engineering, mathematics, linguistics, philosophy, and neural biology, AI encompasses a wealth of approaches and target tasks. Few avoid mention of autonomous, learning, smart or adaptable systems (Koos, 2018); yet the latter characteristics prove exceedingly challenging to define and are under constant development.

The definition of autonomy remains ambiguous. In technical terms it refers to the capability to operate a system without human interference or readily identifiable human guidance. A narrow interpretation limits this to programs that make decisions independently or in another human-unrecognizable manner, while broader conceptions permit systems guided by distinct algorithms. Despite vocal opposition, paradigms such as neural networks, genetic algorithms, and rule-based systems fulfil these criteria. Learning denotes adjusting systems based on new knowledge, experience, or stimuli received post-creation. It encompasses widely-offered programming techniques such as automatic algorithm selection and model configuration, closed-loop controls, and artificial example generation (J. Gervais, 2023).

Artificial Intelligence is defined as a broad branch of computer science which deals with the construction of "smart" machines, capable of performing tasks that typically require human intelligence. So, with the term intelligence, in terms of Artificial Intelligence, we mean the performance of any of the following actions such as planning, reasoning, problem solving, perception, representation of knowledge, creativity etc.(mecaj, 2022)

We utilize the term 'AI' to denote a machine that demonstrates the capability to accomplish tasks that typically demand human cognitive abilities.23 AI occasionally possesses the capacity to engage in direct physical actions, such as in the context of a 'robot.' However, it is not essential for an AI to directly impact physical operations in order to result in negative consequences. (Abbott, & Sarch,2019)

• Subsection Two: Ethical Principles, Frameworks, and Control Measures of Artificial Intelligence as a Critical Entry Point for Understanding Liability in Complex Legal Scenarios

Artificial Intelligence (AI) continues to evolve, forming a technologically complex and socially significant phenomenon. Legal systems struggle to conceptualize it clearly—and AI's capacity to exhibit intelligent-like behaviour complicates the grasp of its implications. Precise definitions of autonomy, learning, and boundedness remain essential. Autonomy—defined as acting independently of explicit human control and under one's own decision-making—even without

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sentience per se (J. Gervais, 2023); learning—including forms like deep learning, reinforcement learning, and linear regression—allows data-to-action conversion without programmer delving into details; boundedness—a concept at times even undefined—determines parameters of the steps AI takes. To the extent that AI grants opportunities to act without an identified human agent or takes actions with unacknowledged predictable consequences, notions of actus reus, mens rea, and causation become problematic. Technical characteristics contribute to the forming of liability dimensions.

An ethical distinction tends to arise between design, deployment, and operational control of AI systems. Liability paradigms still partly depend on ethical overlays. With installation, modification, and seating of AI, individuals assume responsibility and thus enter the liability context when those actions commit wrongful access, sabotage and make inference in prejudice. Ethical identification of the gaps connects directly to expectations on applying liability systems to AI.

Section Two: Traditional Principles of Criminal Liability and Their Limits in the Face of Technological Advancement

Traditional Principles of Criminal Liability and Their Limits in the Face of Technological Advancement

Conceptually, the parameters of a legal system must set limits to the forms such liability may take. In contemporary criminal law, liability typically requires an individual to have committed (in the sense of having engaged in a significant volitional act) a given act in conjunction with a requisite mental state and for this act to have a sufficient causal link to the ultimate harmful outcome. These concepts, originating in Roman law and capturing the foundational principles of a modern, liberal, Rule of Law society, remain highly influential across a wide range of legal systems, criminal laws, and family and economic codes. By focusing on scenarios where AI acts autonomously and scenarios where they act as the agent for a human operator, these fundamental ideas can be selectively analyzed to show that at least some forms of AI challenge the characterization of such concepts and raise important questions about further evolution of the doctrine outside traditional frameworks (J. Gervais, 2023).

• Subsection One: Basic Principles of Criminal Liability.

An aggravating circumstance of AI systems potentially worsening conduct relies on their growing autonomy, the capacity to class anomalies and their own mission-setting. The knowledge, motives and circumstances underlying those faults in design and exploitation raise the question of liability concerning the AI systems that take over (J. Gervais, 2023). Fault in design and operation of AI interconnect with liability. Until vicarious liability enables analysis of fault when situational and/or commissioning conduct inputs together with an figuring agent (Koos, 2018).

• Subsection Two: Liability and Artificial Intelligence (Challenges to the Traditional Concept)

A primary definition of crime retains the notion of prohibitory law enforced by state punishment. Liability doctrines conventionally divide into elements of crime, which constitute offences that may draw punishment; and acts and states of mind connected to culpability. A further distinction separates principles governing whether an act is wrongful and contributes to the wrong of being punishable. The notion of crime as prohibited conduct reflects two basic precepts. The first

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maintains that criminal law prohibits only conduct that threatens the social or individual domains of other people. The second affirms that punishment and prohibitive law typically communicate an expression of public and social condemnation. These constructs all bear upon the nature of culpability. Several widely shared views concerning liability are also commonplace, yet, given the theme under consideration and its relation to artificial intelligence, exposition must remain limited, to conduct, outcome, and culpable mind; cause; and the indefeasibility of all these elements. An act triggering liability must consist of conduct or effect that the law declares impermissible. The act thus incorporates not only ordinary words and deeds, like speaking or pushing, but also inaction or silence, and inferences drawn from other patterns of conduct. Liability consequently does not rest upon an aggregated pattern of acts extending over a full life or a sustained period of weeks, months or even years (H Robinson & Samuel Barton, 2014).

Chapter Two: Legal Challenges and Doctrinal Approaches to Criminal Liability in the Era of Artificial Intelligence

The question of liability for the actions of an artificial intelligence agent challenges the fundamental assumptions of the criminal law. Faculty have begun to examine the legal challenges arising from private AIs (Hacker, 2022). AI systems are poised to have a profound impact on criminal liability, although the majority of literature on liability for these systems continues to focus on civil law. The growing understanding of AIs and their autonomy underscore the importance of addressing criminal liability for these systems.

The notion of autonomous AIs creating new criminal opportunities prompts consideration of traditional models of liability as well as the international context of legislative developments dealing with other forms of technology. AIs that write malware or social media bots may create new criminal opportunities, while systems autonomously developing functionalities not envisioned by the programmer may raise questions of liability under existing legislation. Such developments echo previous concerns surrounding drones and still arise under different modelling frameworks, including drones which create criminal opportunities or merely execute commands outside the crystal-clear understanding envisioned by the controllers.

Section One: Legal Attribution and Direct Liability of Artificial Intelligence

Legal criminal liability seeks to attribute responsibility for the actions of one agent to another. Several structuring theories exist for the legal attribution of criminal responsibility, but all hinge on a common concept: responsibility can only be attributed in one agent on the basis of its power to control the actions of another. Several of these theories apply with less or more force to AI. Theories on the criminal liability of AI already exist. However, discussions on direct liability for AI, as opposed to the wider discussion of attribution, are far less frequent.

AI can perform acts that qualify as conduct in the law of crimes and can act with at least some degree of autonomy. This signals an important limit to the structure and applicability of criminal law-based liability theories. Questions arise as to the capacity of AI to exercise choice, judgment, and control, and whether direct liability for human directs flows from the failure to exercise appropriate control over AI systems, and whether direct liability for human directs flows through the failure to exercise appropriate control over such systems. Such questions provoke deeper concerns about the nature of

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action and causation, and correspondingly about the capacity to inflict harm. The significant legal, doctrinal, and policy roots of such questions warrant their first-order consideration.

Legal theorists have long recognised the importance of this function of a criminal law, and common threads can be found across several apparently distinct theories of criminal liability in the attribution to actors of control or foreseeability. The same principles that are dominant in the context of agent-agents, whether the action in question is a crime or a tort, reappear across the various criminal law systems. Even if AI systems perform actions that could qualify as those of agents, and even if they perform those actions without human intervening volition, it is still unclear whether the system in question can transparently control the actions of a subordinate agent or non-agent. AI's technical autonomy, and the associated modelling of how AI interacts with other agents, will thus determine whether the exploration of agent-agent responsibility remains relevant. Similarly, it remains to see whether the characterisation of responsibility in open and decoupled systems admits systematic coherence.

• Subsection One: Attribution in Criminal Liability for Artificial Intelligence

The challenges to a regime of criminal liability posed by the increasing capabilities of AI have become more pressing (Cromzigt, 2016). Theories attempting attribution of criminal responsibility to AI venture into uncharted territory, beyond the capability of existing models to explain human conduct. Four traditional doctrines of (vicarious or joint) attribution grant independent systems a more theoretical role in liability concepts, as AI maintains formal personality. AI remains primarily an instrument in legal theory, with gradual movement towards a regime of corrective regulation (Bertolini & Episcopo, 2022). Yet AI's ostensible autonomy risks redundancy of supervision, and the underlying ethical problem of control has surfaced as an entry point to eventual liability (Koos, 2018). Following clarification of the technical concept of AI and its characteristics—such as learning, system boundaries, and autonomy—these entry points to criminal control of AI will be examined.

Attribution in criminal law can be either material or moral. The former requires assigning a crime to a specific individual. Thus, it constitutes an element of the material aspect of the crime, as it is not sufficient for the crime to occur that the criminal behavior takes place and the criminal act is committed by the offender, leading to a criminal result. Furthermore, it is necessary for this result to be attributed to that behavior, meaning that a causal relationship exists between them. Moral attribution, on the other hand, necessitates the presence of a volitional connection between the perpetrator and their crime. The latter cannot be attributed to the perpetrator unless they possess the capacity for perception and choice. Attribution in this sense is a fundamental condition for establishing criminal liability. It is not possible to hold someone criminally liable for an act they have no connection to. Accordingly, The direct responsibility of AI systems is determined by examining whether AI agents can be granted legal personhood and whether they can be held criminally liable for their actions. In criminal law, to impose criminal liability for intentional offenses, two main criteria must be met: the factual element (actus reus), which contains the criminal conduct, and the mental element (mens rea), which consists of the general intent of the offender and embodies the idea of culpability. Mens rea means a desire or a will to cause a certain consequence as a result of the conduct of a person (Osmani, 2020).

• Subsection Two: The Possibility of Punishing Artificial Intelligence and Its Direct Liability

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Framing criminal liability for AI requires examining how human models of attribution relate to various forms and manifestations of AI. Legal theory recognizes different forms of attribution that depend on the relation between the liable agent and the activity generating harm. Vicarious liability holds an individual responsible for a subordinate's conduct. An enterprise may incur corporate liability for actions undertaken by agents with delegated power to represent the organization. In joint enterprise, two or more agents share responsibility for planned joint conduct that results in harm. The concept of a model agent attributes culpability to the principal whose decision-making matrix governs the subordinate's operations. Because these theories depend on another actor's capability to perform an actus reus, they are ill-suited to scenarios where AI operates autonomously, requiring consideration of models of direct liability instead (Hacker, 2022) (Koos, 2018).

Section Two: The Legal Personality of Artificial Intelligence and Prospects for Legislative Regulation

The emergence of Artificial Intelligence (AI) prompts a reassessment of criminal responsibility in the event that machines offend. Traditional standards of attribution, already strained by the proliferation of automated systems, risk collapse. Hence the objectives: to clarify the nature of AI and its disfiguring influence upon traditional theories; to map emerging doctrines that seek to accommodate machine-perpetrated behaviour; and to contemplate the viability and desirability of direct accountability. Legislation has yet to materialise in any jurisdiction; yet doctrinal and legal trends are visible.

The technical and legal characteristics that render AI problematic for criminal law differ among categories of the technology. Autonomous AI presents the most radical challenge, exhibiting sophisticated learning capabilities, autonomy and system boundaries that prompt critical questions regarding mens rea, actus reus and causation (Koos, 2018).

• Subsection One: Recognizing the Legal Personality of AI Systems and Its Impact on Liability

Recognizing the legal personality of AI systems raises major concerns about accountability for their actions. Establishing the existence of a moral agent capable of bearing criminal responsibility is a prerequisite to discussing liability. It is widely agreed that traditional criminal law concepts such as personhood, control, and culpability do not apply to AI. Nevertheless, the European Parliament (Koos, 2018) considers the imposition of a specific liability framework to encourage responsible AI development and societal benefit. Several legal scholars advocate recognizing the legal subjectivity, agency, or responsibility of AI based on functional properties rather than its design. These perspectives aspire to facilitate the attribution of responsibility and the application of liability rules. However, extending the framework of responsibility to non-persons and non-agents ultimately seems fruitless. Moral responsibility and liability remain linked to the concept of agency—either functional or ontological—and involve individual conduct linked to causation and intent.

"AI systems exhibit technical features like autonomy, self-optimizing and learning functions, and system boundaries that complicate the attribution of a well-defined human responsibility and liability link. Their development has generated new modes of operation that challenge existing liability concepts. Even without recognition of legal personality or capacity for criminal action, models of vicarious liability remain available. Other perspectives, like model, agent-based, or processes of responsibility, offer insight into developing responses to emerging challenges related to objective liability and attribution of criminal responsibility." (Bertolini & Episcopo, 2022).

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• Subsection Two: Doctrinal and Legislative Trends Toward Developing a Specific Criminal Accountability Framework

The increasing use of intelligent algorithms in diverse areas has brought into question the legal status of artificial intelligence (AI) systems and the legal consequences of actions autonomously undertaken by AI without prior human instruction. A broad group of stakeholders, from legal practitioners and insurance companies to scholars and international institutions, are engaged in discussions about the extent to which AI can be active subjects in various areas.

Conclusion

The mainstreaming of Artificial Intelligence (AI) across societal structures fundamentally challenges the traditional foundations of criminal liability. By enabling machines to replicate human-like cognitive functions such as reasoning, learning, and autonomous decision-making, AI systems push the boundaries of existing legal doctrines (Koos, 2018; Gervais, 2023). This technological shift compels legal systems to reconsider whether AI should remain a mere object of law or evolve into an entity subject to new forms of accountability. Regulatory approaches increasingly distinguish between socially beneficial and harmful AI applications, while debates on legal personhood explore the moral and social responsibilities of AI-generated agents.

The findings of this research highlight how legal assessment of AI must evolve in parallel with its technical development. Societal decisions to empower AI systems with greater autonomy are accompanied by a redefinition of liability—shifting from exclusive attribution to human designers and operators toward a more complex model that may eventually involve AI systems themselves. This evolution stems from the technical opacity of modern AI, including untraceable learning processes, blurred system boundaries, and unpredictable behaviors, all of which complicate traditional assessments of actus reus and mens rea.

Looking ahead, AI's growing self-sufficiency will test the viability of current doctrines of guilt and culpability. The ethical control of autonomous systems will define future accountability models and legislative responses. Whether this will lead to the establishment of a separate framework of criminal liability for AI remains an open question, but the debate already demonstrates the inadequacy of traditional models to address AI-driven harms.

Ultimately, Artificial Intelligence alters not only the content of liability rules but also the very foundations of criminal law. As AI systems achieve levels of autonomy and precision far beyond human capability (Velasco, 2022), legal systems will need to rethink who—or what—can be held criminally liable, and under what rationale. Addressing these challenges requires forward-looking legislative, doctrinal, and ethical frameworks capable of reconciling technological innovation with the principles of justice.

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