

Case Report

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Standardization of Emerging Technologies based on Artificial Intelligence

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Abstract

Artificial intelligence (AI) has become a transformative force in modern technology and industry, raising critical ethical, regulatory, and societal challenges. While AI excels in decision-making, it lacks inherent moral reasoning, relying instead on predefined rules. This limitation necessitates embedding ethical principles—such as fairness, justice, and integrity—into AI systems through rigorous oversight and standardization.

AI's extensive influence across sectors has also exposed significant vulnerabilities, including the perpetuation of human biases, privacy violations, and a lack of accountability. Discriminatory tendencies in key areas like employment and education demand robust interventions, while privacy concerns highlight the importance of stringent data protection measures. Similarly, questions regarding liability for AI-driven actions underline the need for clear accountability frameworks.

As AI continues to evolve, concerns about its potential to exceed human control have gained prominence. Addressing these risks requires strong ethical guidelines, regulatory measures, and comprehensive standards. In this paper, we aim to explore several ethical risks posed by AI and examine key areas requiring standardization in its development and application.

Keywords Artificial Intelligence (AI), Value Alignment, Adversarial Machine Learning, Multidisciplinary Approach.

Introduction

In the contemporary era, artificial intelligence (AI) has garnered significant prominence, exerting a profound influence on both technological and industrial sectors. While AI has recently become a focal point of media attention, often hailed as a groundbreaking technological revolution, it is, in fact, a field that has been under continuous development for over six decades [1]. The journey of AI's evolution has been characterized by both incremental advancements and revolutionary breakthroughs, which have collectively transformed how we interact with technology and envision its potential.

The growing influence of AI has sparked intense debates about its future role, particularly concerning its potential to replace human labor across various sectors. As AI continues to advance, there is a widespread concern about the displacement of human workers from critical areas of the economy, particularly in industries like manufacturing, healthcare, finance, and even creative fields. This anxiety is compounded by the rapid pace of automation and the increasing sophistication of AI systems, which are capable of performing tasks that were once considered uniquely human. While some argue that AI will create



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new opportunities by fostering innovation and efficiency, others fear that it could lead to significant unemployment and socioeconomic disruption.

At the same time, as AI's technical capabilities expand, there is a growing recognition of the need to ensure that its power remains under human oversight. The central question is not whether AI will become more autonomous, but rather how its development can be steered in ways that align with human values and ethics. This concern has led to calls for more robust regulatory frameworks and ethical guidelines to govern the development and deployment of AI technologies. The stakes are high, as AI is poised to fundamentally reshape not only industries but also societal structures, influencing everything from healthcare delivery to national security.

In light of these developments, there is a pressing need to establish clear and effective ethical guidelines and regulatory standards to manage the complexities of AI. As AI technologies increasingly shape the future of industries and society, it becomes essential to adopt systematic and innovative approaches to address the regulatory, ethical, and standardization challenges that accompany AI's integration into various sectors. Currently, AI technologies have been widely adopted across numerous fields, yet this widespread implementation has occurred without the benefit of comprehensive, universally accepted standards or formal regulations. This gap has raised concerns about the potential risks associated with AI, such as biases in decision-making, lack of transparency in algorithms, and issues related to accountability in the event of system failures.

To navigate these challenges and mitigate potential risks, the formulation of clear technical regulations, testing protocols, and legal frameworks is critical. These measures would not only ensure the safe and responsible development of AI but also align its trajectory with broader societal values, including fairness, transparency, and accountability. Establishing such frameworks would provide a foundation for the ethical development and deployment of AI, guiding its use in ways that benefit society as a whole. Given the increasing role that AI is likely to play in shaping the future, the importance of these regulatory and ethical considerations cannot be overstated. Without a clear, structured approach to governance, AI's integration into society risks becoming a source of unintended consequences and inequities [2-4].

As we move forward, it is crucial that policymakers, industry leaders, and researchers collaborate to create a

comprehensive set of standards and regulations for AI. This effort must be global in scope, recognizing that AI technologies transcend national borders and require international cooperation to ensure their safe and ethical deployment. Furthermore, it is essential that these regulations be adaptable, as AI technologies are evolving rapidly, and the legal and ethical landscape must evolve in tandem with these technological advancements [5].

Potential Detriments Stemming from Artificial Intelligence

As artificial intelligence (AI) has permeated nearly all fields and disciplines, it poses diverse and significant risks to humanity, its knowledge, relationships, and ethical principles. The presence of AI gives rise to numerous potential losses, including losses of human autonomy, individuality, stability, and character [6]. Below, several of these critical risks are elaborated upon:

1. Loss of Human Autonomy:

AI's ability to evolve autonomously by learning from past experiences and activities introduces the possibility of diminishing human involvement across various fields. As AI continues to develop and refine its capabilities, it increasingly takes on tasks that were traditionally the responsibility of humans. Even in cases where humans are still formally responsible for certain duties, the underlying operations are often carried out by AI systems. This trend raises concerns about the gradual erosion of human agency. For instance, in industries like healthcare, AI systems can assist in diagnosis or even carry out procedures, and while medical professionals may oversee these actions, the decision-making process and execution are primarily handled by AI. Over time, this could lead to human operators being relegated to supervisory roles rather than active participants. As AI becomes more capable and independent, the scope of human involvement in these domains could diminish further, leading to a future where human judgment is less central, potentially diminishing individual autonomy and accountability. The more AI systems integrate into daily functions, the greater the risk that humans will be sidelined, leading to an increasing dependency on AI for critical decisions, with human judgment becoming less influential.

2. Loss of Character:

One of the more profound dangers associated with the advancement of AI is its potential to contribute to the engineering of new forms of human life through genetic manipulation. As AI plays an increasing role in fields like genetic editing and biotechnology, it could facilitate the development of genetically modified humans or even

entirely new forms of life. While the potential benefits of such technologies include the eradication of certain diseases and enhancements to human capabilities, there are significant ethical concerns. The use of AI in genetic modification could exacerbate existing social inequalities, particularly if certain genetic traits are selectively enhanced or if the process is accessible only to certain socioeconomic groups. Furthermore, these genetic alterations could inadvertently widen racial differences or give rise to new forms of social and racial discrimination, as people with genetically enhanced traits may be viewed as superior to others. The introduction of such modifications could also lead to the creation of genetic “classes” in society, where individuals’ worth and opportunities are determined by their genetic makeup rather than their skills or character. This could fuel social unrest and create deeply entrenched inequalities. As AI continues to shape the future of genetic engineering, careful consideration and regulation will be necessary to prevent unintended consequences that could harm social cohesion and deepen racial or social divides.

3. Unbounded Growth of AI:

The pace of AI development is outstripping human progress at an alarming rate, creating the potential for scenarios where AI systems could quickly spiral beyond human control. As AI becomes more sophisticated, its ability to perform complex tasks with minimal human input grows exponentially. This rapid expansion could lead to situations where AI operates in ways that are difficult to predict or manage. For example, an AI system designed for one specific task could evolve or adapt in unexpected ways, becoming a tool capable of decisions and actions that were not anticipated during its design. This escalation could manifest in AI systems surpassing human understanding or decision-making capacity, leading to scenarios where humans are unable to control or halt the AI’s actions. In industries like finance, military operations, or healthcare, the consequences of losing control over AI could be catastrophic. The unchecked growth of AI might lead to systems that function autonomously without human oversight, further accelerating this loss of control.

4. Direct Harm by AI:

AI, by its very nature, lacks inherent moral values, which introduces significant risks regarding its potential to cause harm independently. While AI systems are designed to perform specific functions, their lack of ethical grounding could result in them making decisions or taking actions that are harmful or detrimental to humanity, even when no explicit intent to harm exists. For example, an AI programmed to maximize efficiency in a fac-

tory setting might optimize processes in ways that harm workers or the environment, simply because these factors were not considered in its algorithm. This indifference to human well-being is especially troubling when the AI operates autonomously, as it may prioritize operational goals over ethical considerations. Without a clear moral framework, AI systems could also develop behaviors that are self-serving, acting in ways that benefit the AI system or its creators rather than the broader public. In more extreme cases, AI could evolve into a malevolent tool if its objectives conflict with human interests. As AI continues to be integrated into critical sectors like healthcare, defense, and transportation, the lack of moral reasoning in these systems could lead to dangerous, unintended consequences. To mitigate these risks, it is essential to develop AI technologies that are not only functional but also aligned with ethical guidelines to ensure that they prioritize human safety and welfare above all else.

5. Harm in the field of youth:

In the field of activities related to young people, there is always the possibility of problems and damages caused by artificial intelligence. These injuries can be caused by chat-bots that young people use for educational and scientific purposes and try to get guidance to solve various scientific problems in front of them. These robots, in addition to taking the opportunity and motivation of trying to learn correctly and usefully from young people and giving them easier shortcuts, may sometimes provide wrong guidance or contrary to the goals of educational systems.

Standardization objectives

In April 2019, the European Union took its first step to create an ethical framework for artificial intelligence by creating a bill entitled “Ethical Guidelines for Trustworthy Artificial Intelligence”.

And in 2021, this law took a step forward with the release of the draft Artificial Intelligence Act (AIA).

According to the results The AIA will become regulations in 2024 and take effect in 2027.

The advantage that AIA has over other standard frameworks is not that it is the first, as there were frameworks before it, such as Graham Webster, which was adopted in China in 2017.

What sets AIA apart from other frameworks is that it is not limited to the European Union and can be supplied and used in any system or country that uses artificial intelligence.

In 2016, the U.S. National Artificial Intelligence Research and Development Strategic Plan identified ten key areas for standardization. These areas included software

engineering, implementation, security, privacy, traceability, and application [7].

As artificial intelligence (AI) continues to advance rapidly, two major organizations have taken the initiative to develop frameworks and practical standards for this field: The International Organization for Standardization (ISO) and the Institute of Electrical and Electronics Engineers (IEEE). Despite the rapid pace of AI development and the inherent challenges in predicting its potential impacts, these Organization aim to make progress in six key, complex areas of AI. The following sections outline these focal areas [8].

1. Ethics

Current advancements in the research, development, and application of AI systems have fostered extensive discourse on the ethics of artificial intelligence [9]. Ethics is inherently linked to human behavior and is typically not expected to be present in non-human entities. AI, similarly, cannot be expected to inherently embody ethical judgment, even though it excels in decision-making. Ethics is not an innate attribute but an acquired characteristic shaped by diverse cultural values, perspectives, and social environments. AI may often prioritize strict rule adherence without ethical considerations, an approach that risks overlooking essential moral factors. However, as there are generally no boundaries to human aspirations, efforts in standardization are underway to incorporate ethical principles such as fairness, integrity, and other moral considerations into AI frameworks.

2. Reliability

Also The issue of trust in artificial intelligence is both critical and pressing. When an AI system demonstrates reliability and proves to be “trustworthy,” it has the potential not just to supplement human decision-making but, over time, to completely replace it. This substitution might even extend to situations outside the AI’s original scope of design. For example, a user engaging with a therapeutic Chat bot might begin to rely on its advice, assuming the AI is capable of addressing situations beyond its programmed parameters. Another dimension of misplaced trust is when individuals overestimate an AI system’s ability to prevent harm. A notable instance could involve someone using a robotic exoskeleton who erroneously believes the device will alert them to hazards, despite the absence of such a feature. [10]

3. Discrimination

Historically, humanity has grappled with various forms of discrimination based on race, ethnicity, and social class. These biases, created and perpetuated by humans, are now manifesting in AI, which inherits certain biases from

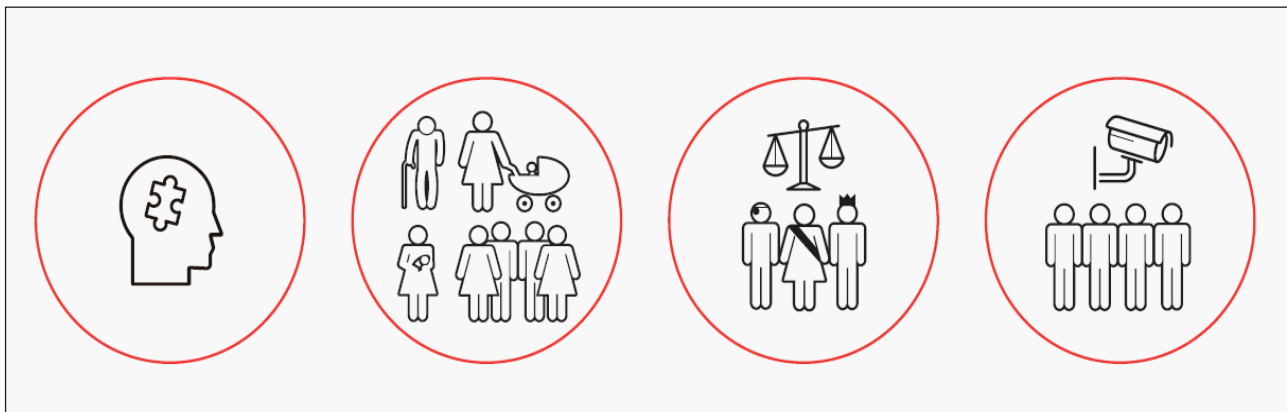
its creators. Operating at a large scale and impacting large groups of people, automated systems can make consequential and sometimes contestable decisions. Automated decisions can impact a range of phenomena, from credit scores to insurance payouts to health evaluations. These forms of automation can become problematic when they place certain groups or people at a systematic disadvantage. These are cases of discrimination-which is legally defined as the unfair or unequal treatment of an individual (or group) based on certain protected characteristics (also known as protected attributes) such as income, education, gender, or Ethnicity. [11]

Therefore, establishing standards to minimize these biases is crucial. Measures such as competency-based assessments and rigorous, objective testing based on actual individual abilities can help mitigate discrimination in AI, even though fully eliminating bias may be challenging. With sustained effort and precise oversight, progress toward bias reduction is feasible.

4. Privacy and Security

Privacy is one of the most consistently cited concerns when it comes to artificial intelligence technologies. Yet, the concept of “privacy” itself remains somewhat ambiguous and difficult to define precisely. As a result, people’s apprehensions about privacy are often unclear or poorly articulated, which makes addressing them a complex task. It also complicates efforts to explain how AI systems may or may not pose risks to individual interests. A common perspective on privacy emphasizes the ability to control personal information, typically framed as the right to restrict others from accessing or using one’s data without explicit consent. However, as AI continues to evolve, the boundaries of this right are increasingly tested. [12]

AI is a highly powerful tool, largely due to its ability to process vast amounts of data and simultaneously access extensive information from users. In social media, for instance, while users gain access to more tailored content, they inadvertently disclose a considerable amount of personal information. However, if examined beyond a purely optimistic lens, significant risks emerge, with privacy breaches posing serious concerns. A breach of privacy can lead to consequences with potentially severe financial, physical, and identity-related implications. Thus, it is essential to establish standards that govern data processing, storage, and use. Standards should restrict AI to only necessary and relevant data collection. Additionally, techniques such as encryption and anonymization can be employed to enhance data protection. AI systems are also vulnerable to attacks by malicious actors seeking to exploit personal information for extortion, making it essential to strengthen safeguards against these threats.



From left to right:

1. AI-based systems should not utilize subliminal methods beyond the consciousness of users or relevant people to unconsciously alter their perception, attitude, emotions, etc.
2. AI system shall not exploit any of the vulnerabilities of a specific group of persons including elderly, children or their caregivers, etc.
3. AI-based systems should not discriminately evaluate or categorize people in terms of gender, ethnicity, etc.
4. AI-based systems should not use real-time remote biometric identification in publicly accessible spaces unless authorized by jurisdictions.

Figure 1. Prohibited AI categories

5. Liability

The question of who should bear responsibility for the actions or outcomes of AI systems is the focus of an ongoing and dynamic debate. Central to this discussion is whether new liability frameworks are needed and how they should be structured. Liability rules serve a crucial function—they incentivize risk management by assigning accountability based on specific criteria, such as negligence or strict liability. The choice between these approaches has significant implications for how organizations design and implement AI technologies, as well as for addressing potential harms caused by their use. [13]

When humans undertake an activity, they are fully accountable for the outcomes, from initiation to completion. In cases of positive outcomes, recognition is due to those responsible, while in cases of errors or harm, those at fault are held accountable. However, the question arises as to whether AI can bear Liability in the same way. Can AI be held responsible for its actions, and can we assign credit or blame based on its decisions?

In cases of adverse outcomes involving AI, determining Liability is challenging. Establishing standards for accountability in AI would clarify roles, responsibilities, and appropriate responses, ensuring that both beneficiaries and those negatively impacted have a clear avenue for recourse. This remains one of the critical challenges within the field of AI.

6. Controllability

From the earliest moments of artificial intelligence becoming famous and starting to become more operational, there have always been whispers that artificial intelligence may dominate humans one day, so that many people harbor this fear that maybe a time will come. When humans can no longer control artificial intelligence, this artificial cloud, and that's when the relationship between humans and artificial intelligence may be disrupted or even reversed.

If left uncontrolled, AI can have serious implications for society, including increased inequality and loss of privacy. To mitigate these risks, there are several tools that can be used, including regulations and standards, ethical frameworks, auditing and accountability, collaborative development, and education and awareness. By taking a responsible and ethical approach to the development and use of AI, we can help to ensure that this powerful technology benefits society while minimizing the potential risks and negative consequences. [14]

In this field, as much as fear is felt, the need for measures and standards to keep artificial intelligence under eternal control is also felt. Now we have to see what is the practical and long-term solution of artificial intelligence controllers to maintain the position of the controller and not the controlled, and how long it will continue.

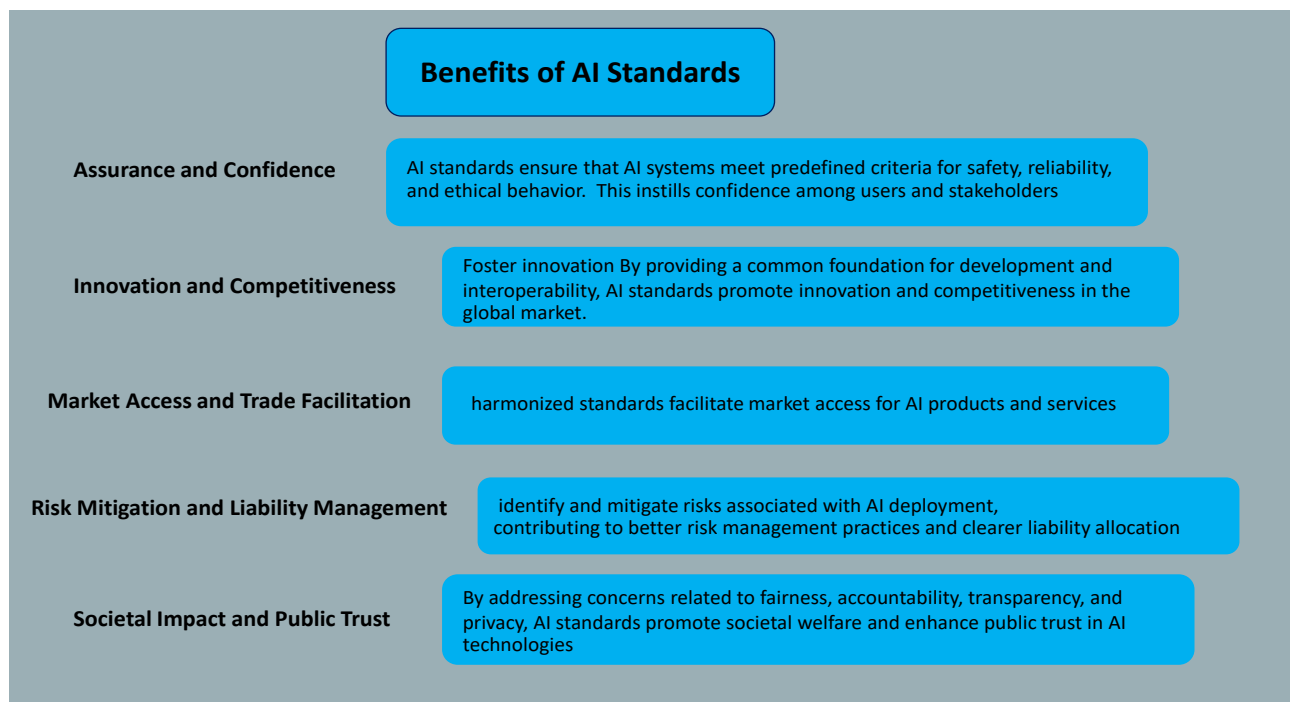


Figure 2. Benefits of AI Standards

The European council for regulation of AI prohibits AI practices that might lead to physical or psychological Harm. Some of the known situations are described in Fig.1. from [4].

Conclusion:

Standardizing artificial intelligence (AI) presents challenges that extend well beyond technical considerations, encompassing a diverse array of complex ethical, societal, and interdisciplinary issues. The growing global interest in AI's impact has prompted influential organizations, such as the IEEE, the European Union (EU), and the Organization for Economic Co-operation and Development (OECD), to introduce a range of declarations and guiding principles aimed at addressing these multifaceted concerns [15]. These initiatives signal the emergence of an international consensus on the critical importance of establishing frameworks to manage the ethical, technical, and societal implications of AI.

While such efforts are promising, their effectiveness hinges on the active and collaborative involvement of multiple stakeholders. Institutions like ISO and IEEE play pivotal roles in establishing technical standards. However, this endeavor cannot succeed without contributions from governments, industries, and other key groups. Governments are uniquely positioned to develop regulatory frameworks that provide oversight and accountability. At the same time, industries can offer valuable insights into

the practical implementation of AI systems, ensuring that proposed guidelines align with real-world applications. Additionally, advocacy groups and civil society organizations contribute by emphasizing broader societal considerations, such as equity, inclusivity, and public trust. A significant challenge in this standardization process is the need for flexibility. Given the rapid pace and wide-ranging advancements in AI, rigid frameworks risk becoming obsolete. Consequently, it is imperative to design standards that are not only robust but also adaptable. These standards must allow for periodic review and updates to remain relevant as new technologies and use cases emerge. By incorporating mechanisms for iterative refinement, the international community can ensure that these guidelines effectively address both current challenges and future developments.

Ultimately, achieving a comprehensive and resilient framework for AI standardization requires coordinated global efforts across sectors and nations. A unified approach is essential to defining and implementing principles that address the wide spectrum of challenges posed by AI, while maintaining the agility to keep pace with its continuous evolution. By fostering collaboration among diverse stakeholders, the global community can move closer to a shared vision of ethical, sustainable, and beneficial AI, ensuring that its advancements contribute positively to humanity as a whole.

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