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ARTIFICIAL INTELLIGENCE: ETHICAL CHALLENGES IN DEVELOPMENT AND DEPLOYMENT

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ABSTRACT

There is a prevalent assumption that discussions of ethical concerns surrounding AI inherently involve immoral aspects. Understandably, much of the discourse on AI centers on these ethically problematic consequences, which necessitate careful attention. Nonetheless, AI-based technologies have accomplished remarkable feats, including self-driving cars, facial recognition, and medical diagnostics. Artificial Intelligence holds immense potential for advancing economic and societal progress, as well as enhancing human welfare and safety. However, there are significant risks for users, developers, civilization, and society stemming from AI-based technology's lack of explainability, data biases, data security, data privacy, and ethical issues. This research examines the ethical challenges that emerge in the development of AI and explores best practices to drive progress toward ethical excellence.

KEYWORDS: Artificial Intelligence (AI), Ethics, Ethical Challenges, Robotics, Image morphing, Ontology.

INTRODUCTION

The broad term artificial intelligence (AI) draws from a variety of scientific fields, including computer science, business, engineering, biology, psychology, mathematics, statistics, logic,

philosophy, and linguistics. In contrast to the natural intelligence exhibited by humans, artificial intelligence (AI) is often characterized as an autonomous, self-learning entity that can carry out intelligent tasks including problem solving, reasoning, and experience-based learning (Zhou & Chen, 2023). Given the ambitious claims made by artificial intelligence and its potential to cause harm to humans and society, AI development must address a range of ethical issues. These include matters of data governance, encompassing concerns over permission, ownership, and privacy, as well as broader questions of justice and accountability (Wang & Siau, 2018). Three critical ethical concerns surrounding AI that warrant thorough examination include the need for interpretability, mechanisms for accountability, and the mitigation of prejudicial biases. Recent research has underscored the necessity for a more profound understanding of machine learning algorithms and their predictive outputs. This necessitates clearly delineating the role of AI in decision-making processes, fostering transparency, reducing algorithmic bias, and cultivating trust among stakeholders (Mohammad Amini et al., 2023).

AI design and application in healthcare systems also necessitate a comprehensive approach. AI can be integrated in a way that respects both socio-technical elements and the needs of the local community by using human-centered design concepts. Artificial intelligence (AI) should be used to democratize, not dominate, the delivery of healthcare, particularly in developing nations like the Global South. Long-term structural changes are necessary to address the possible bias in AI, which is fueled by limited measurements and unrepresentative data. Medical AI education should incorporate social, cultural, and ethical judgments (Mohammad Amini et al., 2023). We now live in the age of algorithms due to the ongoing and rapid development of artificial intelligence. The tension between human and machine, as well as the applicability of traditional moral and ethical frameworks, will become evident. Consequently, there is a burgeoning scholarly interest in the study of artificial intelligence ethics at present (Chao, 2019).

Literature review

Robotic ethics and AI

In 2002, Gianmarco Veruggio, who chaired an Atelier financed by the European Robotics Research Network, created the term "Robo-ethics" to describe the domains that might require further research (Zhou & Chen, 2022). Experts from a variety of fields were invited to the first International Symposium on Robo-ethics, which took place in Italy in 2004, to

contribute and build the groundwork for the ethics of creating and developing robots (Chao, 2019). Machine ethics was the first ethical problem associated with artificial intelligence. Artificial intelligence is said to be developing in a way that not only completely accomplishes its intended tasks but also complies with human moral subjects' moral standards and value systems within the bounds of the law and morality. In the architecture, engineering, and construction (AEC) sector, study and application of artificial intelligence (AI) and robotics have emerged to positively impact project efficiency and effectiveness problems like safety, productivity, and quality. However, because of the possible harm that AI and robotics adoption could cause to areas like job security, safety, and privacy, this change justifies the necessity for ethical concerns in these areas. However, this was not given enough attention, especially in the scholarly community (Liang et al., 2023).

Role of Ontology in artificial intelligence

The rapid advancement of artificial intelligence has led to the application of ontology and metaphysical philosophy in knowledge representation and real-world smart machine modeling by researchers. In information science, the term "Ontology" refers to a model that characterizes the universe of all possible objects and connection types (Chao, 2019). Smart homes, smart farms, smart power grids, and other Cyber-Physical Systems (CPS) ecosystems have been modeled using ontological systems. Security, artificial intelligence, and rule-based systems are just a few of the technologies that have employed ontologies for knowledge representation (Chukkapalli et al., 2020). Ontology enhances AI performance in a number of ways.

First, ontology concepts can be used to achieve consistent annotation of data and metadata, improving the quality of the data. Based on this, the semantic relation in ontology may be used to effectively analyze data in conjunction with other techniques to improve machine learning performance (Yang et al., 2019). Second, ontology can facilitate semantic data integration, increasing the applications of artificial intelligence. Third, ontology contributes to the production of precise logical representations of natural language. The majority of the human knowledge that has been amassed thus far is expressed in natural language. The widespread use of this form will be much aided by its conversion into a computer-readable format. Fourth, a significant step toward general artificial intelligence is the fusion of machine learning with ontology manipulation. Deep learning and ontology are currently being coupled in numerous local and international studies for knowledge inference, with

results that outperform logical reasoning. On the other hand, using ontology also makes machine learning (deep learning) outcomes easier to understand (Yang et al., 2019). Since concerns about AI are inevitably linked to problems about humanity, it's possible that AI isn't a discrete idea that can be clearly separated from humans and that a more comprehensive discussion of human-computer interaction might be a more productive path (Hawley, 2019).

AI and Data Ethics

When a scientific area discovers a field that affects people's lives to such an extent, it becomes necessary to uphold certain ethical principles in its work. This also applies to artificial intelligence, where ethics is crucial in establishing the norms and values that direct the creation and application of AI-powered systems (González et al., 2024). The rationale is that examinable data is required to construct the artificial intelligence model. The problems with artificial intelligence can be divided into two categories: data collection and analysis. The General Data Protection Regulation (GDPR), which prioritizes data privacy, may be cited in a standard code of ethics. Any unlawful use of data will be punished harshly in accordance with GDPR.

It involves assessing the purposes for which data is used, figuring out who should and does not have access to it, and forecasting potential misuses of the information. It entails determining whether data should be linked to other data and why, as well as how to handle, transport, and store it safely. Considerations related to ethical use include legally required and restricted information, privacy, bias, access, personally identifiable information, encryption, and potential problems (Berkowitz, 2020). The three ethical principles of upholding participant autonomy, attaining equity, and safeguarding privacy are the ones that use of big data is most likely to undermine. All Institutional Review Boards (IRBs) that work to safeguard participants from the predictable risks associated with research have these objectives in common. Every risk needs to be carefully examined before being compared to the expected benefits of big data for people's health and welfare (Elenberg & Howe III, 2020). It is now commonly acknowledged that search engines present racially and gender-biased results, and that these biases have practical consequences (Goltz & Dowdeswell, 2023).

Ethics of AI algorithm

The "ethically acceptable" algorithms, which greatly increase the security and dependability of autonomous systems' decision-making, are the focus of research on artificial intelligence ethical algorithms. Ethical algorithms will operate on "pre-loaded" artificial intelligence-equipped computers or gadgets (Chao, 2019). The fundamental components of the infrastructures and critical services of information societies are now algorithms. Every day, people use recommender systems, algorithmic systems that offer content based on user preferences to select music, movies, products, or even friends (Tsamados et al., 2022). We must first define artificial intelligence's morality in order to understand how it makes moral decisions and how it can develop into a trustworthy and safe moral subject that is capable of making moral decisions more sensibly than humans. The problems with the reasoning mechanism and ethical algorithm surface.

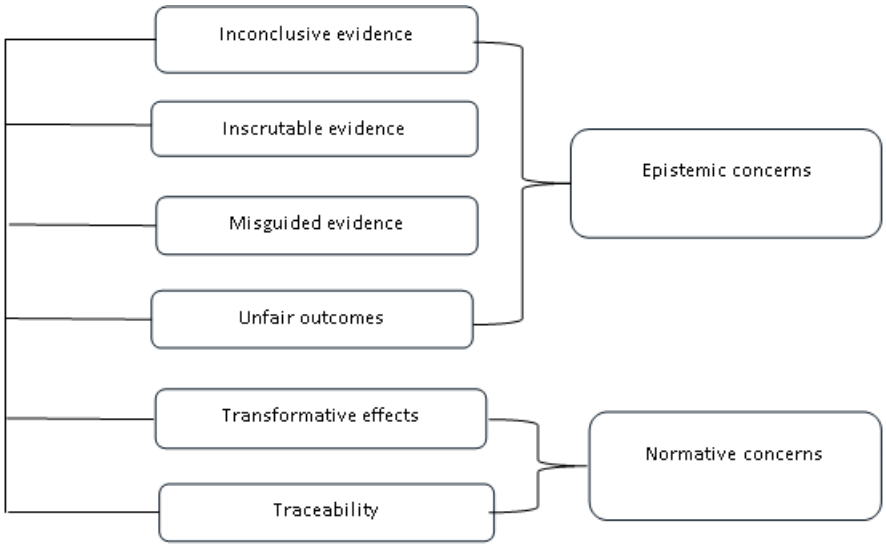

Figure 1: Six types of ethical concerns raised by algorithms (Mittelstadt et al., 2016)

Various categories of issues such as Inconclusive evidence, Inscrutable evidence, Misguided evidence, Unfair outcomes, Transformative effects, Traceability that, taken together, are adequate for a morally sound field organization and suggest that this enables a more thorough diagnosis of ethical problems associated with the application of algorithms (Cook, 2023). The issues are meant to serve as a prescribed framework for the different kinds of ethical dilemmas that arise from algorithms, rather than being based on any specific theoretical or methodological approach to ethics (Mittelstadt et al., 2016).

The literature that specifically discusses the ethical dimensions of algorithms treats various ethical questions and concepts in the ways that are described below (Mittelstadt et al., 2016)(Goltz & Dowdeswell, 2023),

- Inconclusive evidence leading to unjustified actions
- Inscrutable evidence leading to opacity
- Misguided evidence leading to bias
- Unfair outcomes leading to discrimination
- Transformative effects leading to challenges for autonomy
- Traceability leading to challenges for informational privacy

AI ethics in Image Morphing

In the current era of rapid technological advancements, artificial intelligence (AI) has demonstrated its revolutionary capacity across diverse domains. One fascinating and occasionally contentious application of AI is image morphing. With the use of this technology, two photos can be seamlessly blended to create a whole new visual experience. Even if AI-based image morphing has a lot of potential applications, it's important to comprehend both its ethical and creative aspects. Numerous identity documents, such as our passports and licenses, feature our faces. Identity fraud is still a major problem even though there are numerous security measures in place to stop such documents from being manufactured fraudulently (Heyer et al., 2019). These techniques include image morphing, which is the process of combining two or more faces (constituents) to produce an individual face or morph. In more complex identity fraud circumstances, these morphs can be employed to build a whole new persona or applied to only one identity document (Heyer et al., 2019).

AI image morphing brings ethical questions even if it gives unparalleled creative freedom. There are concerns about false information and identity theft because of how simple it is to generate realistic-looking fake photos and videos. In recent years, there has been a great deal of concern over deepfakes, a word used to describe AI-generated videos that alter appearances and sounds. Deepfake technology is developing at a rapid pace. Many ethical, social, and legal concerns have been brought up by the democratization of deepfakes through widely accessible apps (Meskys et al., 2020). China's iOS Store launched ZaoApp on Thursday, September 29, 2019, an application called Zao allows users to swap faces. The largest online payments company, Alipay, which has over 1 billion active users, issued a

warning shortly after the launch of ZaoApp assuring its consumers that their payment apps cannot be tricked by advanced facial swapping technology (Meskys et al., 2020).

Analysis and Discussion

Ethical Absurdity

While contentious topics like race, gender, and class continue to plague humans in the twenty-first century, a non-human movement has been rapidly expanding in recent years, leading us to reevaluate our relationship with artificial intelligence in many different of ways (Chang, 2023). This was not an issue in the past since robots were formerly thought of as replacement workers created to ensure human comfort as human labor became more and more scarce. However, the seeds of humanized robots have crept into our daily lives, and its telling influence is anticipated along with a growing robot-phobia (Chang, 2023). This is despite the shock that lifelike robots like Sophia, Hanson Robotics' most advanced robot, which was activated in February of 2016.

The Three Laws of Robotics were initially put forth by Isaac Asimov in his 1942 short story "I, Robot." *'1 - A robot may not injure a human being, or through inaction allow a human being to come to harm. 2- A robot must obey the orders given it by human beings except where such orders would conflict with the First Law. 3 - A robot must protect its own existence as long as such protection does not conflict with the First or Second Law'* (Harding, 2018). According to Asimov's law, there is a hierarchy wherein the first principle comes before the second, and the second principle comes before the third. Asimov provided a solid foundation for the robot's moral code in the narrative (Chao, 2019).

We have to be careful not to place too much faith in artificial intelligence algorithms, but also not too little (Von Braun et al., 2021). A variety of moral principles hold significance, including the deontology and accountability of designers, freedom of users, the assessment, transparency, equivalency, and loyalty of systems, as well as the research on the coadaptation between humans and machines. Numerous moral, legal, and societal concerns are brought up by social and emotional robots (Dubuisson et al., 2015). Some problems, like the creation of AI-enabled weapons such Autonomous Weapons Systems and the paradoxical problem of AI creating AI, are matters that humans will eventually need to take very seriously. Regarding the matter, there is a debate over whether or not AMAs ought to have the same rights as people. For instance, should a human have precedence to use the elevator if they and an AMA (Artificial Moral Agent) are waiting for it on different floors? It appears that people are

still unable to recognize that machines are created with human needs in mind. There's still a clear boundary you can't cross (Chao, 2019).

The best practices

The cornerstone of AI is data. Even while it is getting easier and less expensive to generate and collect ever-more data, poor data cannot be used to develop mathematical models that are accurate. Furthermore, models built with low-quality data may not be instantly identified as flawed, which could result in costly errors (Makarov et al., 2021). AI is a field that is always changing. This section examines the optimal practices for AI implementation, focusing on optimizing AI systems to enhance decision-making and mitigate potential risks through staying current with the latest advancements and implementing industry best practices,

Understanding the right AI application landscape: Understanding the advantages of AI technology and the differences across technologies is becoming more and more important for making informed business decisions and navigating the quickly changing digital world as artificial intelligence (AI) continues to alter sectors (Gill, 2023). The field of artificial intelligence (AI) covers a wide range of innovative tools that are revolutionizing the way businesses interact with intelligent systems. These tools range from the fundamentals of machine learning and deep learning to the intricacies of natural language processing (Anderson, 2023). In order to understand how the technology of interest might help with response right away, how it might aid later in the evolution of the current difficulties, and how it can be utilized to combat future challenges, it is imperative to define a research road map and funnel for AI applications (Bullock et al., 2020).

Invest in the domain knowledge needed to properly analyze data in highly specialized areas: Understanding the specifics of experimental setups and study designs is a crucial ability for computational modelers as well as bench scientists. Recognize the characteristics of the data set and any inconsistencies that could render the study incorrect (Makarov et al., 2021).

Use only quality data for training of models: The data files need to be "fit for purpose." Avoiding data sets with incomplete information (metadata) makes sense. While defining perfection is challenging, defining what constitutes truly terrible data is simpler. Among the frequently cited issues include tautomerism, incomplete data, unit confusion, poor

nomenclature, lack of experimental context (metadata), and improper use of automated structure recognition techniques (Waldman et al., 2015).

Use a model management system AI: Models for AI and ML are dynamic and often change over time. Thus, mathematical models have life cycles, just like software, infrastructure, and data do. Inadequate model management can result in hidden model failures, regressive performance, and enormous model reconstruction requirements. These factors, which do not stem from inadequate modeling, frequently contribute to the disappointment observed in the adoption of new technologies. Systems for model management, deployment, testing, versioning, metadata collection, and provenance must be set up in order to lessen these issues (Sculley et al., 2015).

Set reasonable expectations: On the positive side of the technology curve, managers of commercial businesses often anticipate technological marvels from emerging fields in which they lack extensive knowledge. This results in poor financial decisions and unfulfilled promises. As a practitioner, you should first establish appropriate expectations and inform your colleagues on the differences between AI and ML (Makarov et al., 2021).

Combine AI models with human insight: Combining AI models with human decision-making yields a profitable business model since mathematical models support human decision-making while also helping it generate data-driven insights. An organization's future technology-organization interaction should be envisioned in a Chief Data Officer's (CDO) AI and ML roadmap, in addition to outlining the requirements for organizational change (Green et al., 2020).

The Way to Excellence

Developing a suitable policy infrastructure is made more difficult by the fact that Al lacks a stable, widely accepted definition or instantiation. When discussing societal initiatives to direct Al toward the public benefit, we could wonder if the phrase "policy" itself is even useful. Of course, studying and applying ethics is crucial, and AI raises significant and distinctive ethical issues. To sort out the ethics of AI, a number of initiatives are being undertaken by industry, academia, and other organizations (Calo, 2018).

It is essential that we first comprehend the legal obligations and constraints within which we operate, in order to effectively shape the ethical governance of artificial intelligence. Smith

proposed that an ethical approach to AI should be compliant with the law (Chao, 2019). This part's main goal is to provide those who are new to the field of AI policy whether they come from academia, industry, government, or the media with an overview of the questions that the community is posing and their motivations. The inventory aims to give people and organizations a road map to the different policy issues that presumably need their attention (Calo, 2018). It will alter both our lifestyle and manner of working. What laws, rules, and governance should be in place for AI? How might the negative effects of AI advancement be lessened and mitigated by AI governance, rules, and regulations? What is the potential influence of AI governance, rules, and regulations on the future of labor and humanity (Siau & Wang, 2018)? We are still in the early stages of comprehending and dealing with AI-related governance, policy, and regulatory concerns. However, because AI is developing quickly, it is important to address the governance, policy, and regulatory challenges right away (Buiten, 2019) (Siau & Wang, 2018).

Next, a brief discussion of AI's legal implications for data protection, agency, agreements, tort law, and intellectual property rights pertaining to data and software is given. This section examines the regulatory and policy environment surrounding artificial intelligence in two different regions: the EU, which was very active in 2020; the US, which appears reluctant to regulate too quickly and thus opposes the EU's approach (Calo, 2018).

The EU- moving toward comprehensive regulation:

The Regulation 2024/1689 of June 2024, commonly known as the Artificial Intelligence Act, establishes a harmonized regulatory framework across the European Union for the development, commercialization, and utilization of AI systems. Its primary goals are to foster the creation of safe, secure, and trustworthy AI while safeguarding fundamental rights and ensuring legal consistency throughout the EU. The regulation covers AI systems available in the EU market, ensuring their development adheres to core EU principles such as human dignity, privacy, and non-discrimination. Additionally, it addresses potential risks associated with AI, including threats to public safety and fundamental rights, while simultaneously promoting innovation and competitiveness within the AI industry (European Union, 2024).

Risk-Based Approach: The regulation adopts a multilayered approach predicated on the potential risks that AI systems pose to health, safety, and fundamental rights. It categorizes AI systems as high-risk, limited-risk, or low-risk, with more stringent regulations imposed on those deemed high-risk (European Union, 2024).

High-Risk AI Systems: These AI systems are subject to rigorous standards concerning transparency, accountability, and safety, particularly in critical domains such as healthcare, law enforcement, and public infrastructure. The high-risk category encompasses AI applications employed in biometric identification, recruitment processes, and access to essential services (European Union, 2024).

Prohibited AI Practices: The regulation prohibits AI practices that employ subliminal techniques to manipulate behavior or exploit vulnerable individuals. Additionally, it restricts the use of social scoring systems by public authorities and AI-enabled mass surveillance, subject to specific conditions (European Union, 2024).

Transparency and Oversight: AI developers, they must provide clear documentation about their systems' functionality, decision-making processes, and potential risks. Additionally, real-time biometric identification systems for law enforcement are heavily regulated to prevent misuse (European Union, 2024).

Innovation Support: The regulation fosters AI innovation by enabling testing of AI systems in a controlled regulatory environment. Additionally, it seeks to support small and medium-sized enterprises engaged in AI development through the provision of targeted assistance measures (European Union, 2024).

Global Impact: The regulation extends its scope to encompass non-EU entities offering AI services or products within the European Union, thereby ensuring a harmonized legal framework for AI that transcends the EU's geographical boundaries (European Union, 2024).

The EU's regulation on artificial intelligence establishes the region as a pioneer in the responsible governance of this emerging technology, striking a balance between enabling technological progress and safeguarding the fundamental rights of its citizens.

The US reluctant to burden US enterprise:

The Executive Order on the Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence delineates the U.S. federal government's comprehensive approach to regulating and advancing the development of artificial intelligence in a secure, safe, and ethical manner. Artificial intelligence possesses immense potential for innovative applications, yet it also poses significant risks such as bias, disinformation, job displacement, and national security threats. The executive order underscores the necessity for a coordinated

federal approach to mitigating these risks while simultaneously harnessing the benefits that AI can provide.

Policy and Principles: The executive order establishes eight guiding principles to direct the federal government's approach to AI development and deployment. These principles emphasize the importance of AI safety and security, responsible innovation, support for workers, advancement of equity and civil rights, consumer protection, and data privacy safeguards.

KeyActions

- Formulate comprehensive AI safety guidelines and standards, with a particular focus on dual-use technologies and generative AI applications.
- The executive order seeks to bolster the United States' position as a leader in AI innovation by cultivating education, training, and collaborative efforts, while also addressing competitive dynamics and intellectual property concerns.
- The executive order seeks to safeguard the quality of work and protect workers from harmful impacts that may arise from the integration of artificial intelligence technologies.
- The executive order seeks to safeguard civil rights by ensuring artificial intelligence does not perpetuate or amplify discrimination and bias.
- The executive order seeks to mitigate security risks, with a particular focus on safeguarding critical infrastructure and national security domains.
- The order calls for the promotion of ethical utilization of AI-generated content and the assurance of transparency in AI-powered systems.

International Collaboration: The United States will collaborate with international partners to develop global governance frameworks for artificial intelligence, with the objective of ensuring that the technology benefits all stakeholders and does not exacerbate existing inequalities.

Innovation and Competition: The government seeks to cultivate AI talent and drive innovation, particularly by supporting small enterprises and nascent ventures in the AI industry, thereby fostering a competitive landscape free from monopolistic tendencies.

This executive order seeks to establish the United States as a preeminent authority in the ethical and secure development and deployment of artificial intelligence. It aims to safeguard

citizens from potential risks while simultaneously cultivating innovation within the AI domain.

CONCLUSION

Determining the ethics of artificial intelligence is a challenging and multifaceted undertaking that encompasses various disciplines such as philosophy, ethics, psychology, computers, mathematics, and cognitive science. As a result, there has been a "Principle proliferation" for artificial intelligence (AI), with many ethical frameworks, standards, and recommendations being developed in recent years. The practical implementation of ethics in AI remains a challenge nevertheless. The behavioral effects of machines on both human users and other machines are the main focus of artificial intelligence ethics. Adopting best practices is essential for organizations to get favorable returns on their investments in AI and ML, as not doing so could limit their potential and make them less competitive in the industrial revolution.

We are still in the early stages of comprehending and dealing with AI-related governance, policy, and regulatory concerns. However, as AI is developing rapidly, it is important to talk about the governance, policy, and regulatory challenges. In this article, it highlights, how vital it is that different government officials give these challenges their full attention. The implications of AI for law and policy, as well as the requisite technical, legal, and regulatory frameworks, are causing policy makers and regulators to wrestle.

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