Blockchain Frontier Technology (B-Front)
Vol. 4, No. 1, 2024, pp. 63∼71
E-ISSN: 2808-0009 P-ISSN: 2808-0831, DOI:10.34306

Implementation of Ethics of Using Artificial Intelligence in the Education System in Indonesia

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Article Info

Article history:

Received month dd, 2024-06-10
Revised month dd, 2024-07-05
Accepted month dd, 2024-07-30

Keywords:

Artificial Intelligence
Smart Contracts
Education, and Ethics of AI

ABSTRACT

The use of Artificial Intelligence (AI) in education is a rapidly evolving field with the potential to transform teaching and learning. However, its implementation brings various ethical and practical challenges that must be carefully considered. Key aspects include ensuring student data privacy, promoting fairness and inclusivity in access to technology, maintaining transparency in AI algorithms and decision-making processes, and determining the appropriate levels of human control. Furthermore, accessibility for all students, including those with special needs, must be prioritized, alongside evaluating the potential long-term effects on cognitive, social, and emotional development. Given the complexity of these issues, a thoughtful and ethical approach to integrating AI into education requires ongoing collaboration among various stakeholders, including educators, AI developers, policymakers, students, and the broader community. The goal of this collaboration is to ensure that AI is used in ways that not only improve educational outcomes but also uphold fairness, equity, and transparency. It is crucial to address concerns such as data privacy, algorithmic bias, and the potential negative effects of AI on vulnerable groups to ensure the technology serves as an inclusive tool for education. This research adopts a qualitative approach to explore the different aspects of AI in education, aiming to identify and analyze its potential benefits. By examining the implications of AI integration, the study seeks to provide valuable insights into how AI can be effectively and ethically applied in education, ensuring it enhances learning while respecting core educational values and human dignity.

DOI: http//10.34306/bfront.v4i1.571

1. INTRODUCTION

The rapid development of computer technology has significantly influenced modern society. Initially designed as tools for data processing and production, computers have evolved into crucial components for decision-making processes [1]. Experts have further advanced this technology to emulate human cognitive abilities, leading to the concept of intelligent systems or ”smart computers.” Artificial Intelligence (AI), as a breakthrough in information and communication technology over the past decade, exemplifies this advancement [2]. In Industry 4.0, AI and machine learning have taken over tasks traditionally managed by humans, enabling systems to interpret external data, process it, and utilize the outcomes to achieve specific goals [3].

However, alongside these technological advancements, the ethical implications of AI in information technology have become increasingly important. Ethics, as a branch of philosophy that examines moral principles and values, provides the framework to ensure that AI is developed and applied responsibly while respecting societal norms and values [4].

This **research aims** to analyze the ethical implications of artificial intelligence in information technology by exploring its positive and negative impacts. Furthermore, it seeks to develop ethical guidelines to facilitate responsible decision-making processes in AI deployment. The study focuses on understanding the role of ethics in the development and implementation of AI systems, emphasizing the balance between innovation and ethical considerations[5].

While prior research has extensively focused on the technical and innovative aspects of AI, there is a notable lack of studies that delve into its ethical dimensions, particularly within the IT domain. Existing literature often overlooks the critical role of ethics in guiding the responsible development and use of AI systems. This study addresses this gap by providing a comprehensive exploration of ethical issues, thereby contributing to the growing body of knowledge on this subject[6]. While prior studies have extensively examined the technical and functional benefits of AI, there is a significant GAP in research addressing the ethical dimensions of AI applications within the context of information technology [7]. Most existing research lacks empirical validation through quantitative approaches, particularly in integrating ethics into the AI lifecycle. This research fills the GAP by combining theoretical analysis with empirical data to provide a comprehensive understanding of the ethical challenges in AI [8].While prior research has extensively focused on the technical and innovative aspects of AI, there is a notable lack of studies that delve into its ethical dimensions, particularly within the IT domain. Existing literature often overlooks the critical role of ethics in guiding the responsible development and use of AI systems. This study addresses this gap by providing a comprehensive exploration of ethical issues, thereby contributing to the growing body of knowledge on this subject.

The novelty of this research lies in its in-depth analysis of the ethical implications of AI within IT, offering not only a critique of the challenges but also practical perspectives for ethical frameworks [9]. By adopting a qualitative descriptive approach, this study investigates real world applications of AI and their societal impact, highlighting the importance of embedding ethical considerations into technological innovations [10]. The findings aim to guide policymakers and developers in creating ethical AI solutions while fostering a broader understanding of the role of ethics in shaping the future of information technology [11].

2. LITERATURE REVIEW

Research on Artificial Intelligence (AI) has been extensively conducted across various disciplines, including information technology, ethics, and philosophy [12]. The relevant literature for this study encompasses fundamental concepts of AI, the ethical challenges arising from its implementation, and ethical frameworks for responsible technological development.

2.1. Artificial Intelligence and Its Role in Information Technology

Artificial Intelligence is defined as the capability of computer systems to process, analyze, and utilize data intelligently to achieve specific objectives. In the context of information technology, AI has been applied in various fields such as natural language processing, image recognition, and data-driven decision-making systems [13] . However, the increasing complexity of AI systems has introduced new challenges, including algorithmic bias, privacy concerns, and data transparency [14].

2.2. Ethical Implications in Artificial Intelligence Implementation

Several studies have highlighted significant ethical implications of AI, particularly related to algorithmic bias and its impact on marginalized communities. Eubanks (2018) demonstrated how AI systems, when not inclusively designed, could exacerbate social inequalities. Meanwhile, Floridi and Cowls (2019) proposed the ”Ethics of AI Guidelines,” which include principles such as transparency, fairness, and accountability to ensure ethical and equitable use of AI. However, these studies often lack a specific focus on the implementation of these principles in the field of information technology.

2.3. Ethical Frameworks for AI Technologies

Various models have been proposed to address ethical challenges in AI. For instance, Binns (2018) suggested a value-based approach involving all stakeholders in the technology development process. Similarly,

Moor (2006) emphasized the importance of "proactive ethical technology," designed to prevent potential ethical violations. Nonetheless, these frameworks are often conceptual and provide limited practical guidance for applying AI in information technology[15].

The education system is a complex and organized structure designed to provide education to individuals, starting from early childhood to higher education. This system encompasses various institutions, curricula, teaching methods, and policies aimed at developing students' knowledge, skills, and attitudes. Education plays a crucial role in shaping individuals and society, as it not only serves to transfer knowledge but also fosters character, values, and social abilities. The education system is typically divided into several levels: primary education, secondary education, and higher education. Primary education is the initial stage, usually starting at the age of six and lasting for six years. At this level, students are introduced to basic subjects such as reading, writing, mathematics, and science. The primary goal of primary education is to provide a strong foundation for students, enabling them to progress to higher levels of education.

After completing primary education, students advance to secondary education, which usually lasts three to six years, depending on the education system in each country. Secondary education is divided into two stages: lower secondary and upper secondary education. At this stage, students begin to study more specific and in-depth subjects, while also having the opportunity to choose educational pathways that align with their interests and talents, such as academic, vocational, or technical tracks. The objective of secondary education is to prepare students for higher education or entry into the workforce. Higher education is the final stage of the education system, comprising universities, colleges, and other institutions of higher learning. At this stage, students can select specialized study programs that align with their interests and career aspirations. Higher education not only provides deeper knowledge and skills but also cultivates critical, analytical, and creative thinking abilities. Graduates of higher education are expected to make significant contributions to society and the workforce.

The education system also includes various teaching and learning methods. Traditional teaching methods often focus on direct instruction from teachers to students, with teachers serving as the primary source of knowledge. However, with advancements in technology and a better understanding of how students learn, teaching methods have evolved to become more interactive and student-centered. Modern approaches such as project-based learning, collaborative learning, and problem-based learning encourage students to actively engage in the learning process.

In addition, the education system is influenced by government policies and educational institutions. Education policies cover various aspects, including curricula, educational standards, teacher training, and funding. These policies are designed to ensure that the education provided is of high quality and accessible to all segments of society. In many countries, efforts are being made to enhance inclusivity in education, ensuring that children from diverse backgrounds, including those with special needs, receive appropriate education. The education system also plays a vital role in a country's social and economic development. Quality education can enhance the skills of the workforce, which in turn drives economic growth. Furthermore, education contributes to poverty reduction and inequality by providing individuals with opportunities to improve their quality of life through the knowledge and skills they acquire.

However, the education system faces numerous challenges. One of the primary challenges is educational inequality, where access to and quality of education vary across regions and social groups. In many countries, children from low-income families or remote areas often have limited access to quality education. Additionally, rapid changes in technology and labor market demands require the education system to adapt and update its curricula to remain relevant in a constantly evolving world. Another challenge is the need to train and support teachers. Teachers are the cornerstone of the education system, and the quality of teaching heavily depends on their competence and skills. Therefore, it is essential to provide adequate training and ongoing support to teachers so they can teach effectively and meet student needs. In the era of globalization, the education system must also consider international dimensions. Global education encourages students to understand and appreciate cultural diversity while preparing them to participate in a global society. Many educational institutions now offer student exchange programs, international collaborations, and curricula that incorporate global perspectives.

3. RESEARCH METHODS

The research employs a descriptive qualitative method using secondary data as its primary reference. Descriptive qualitative research is an approach aimed at describing, explaining, and interpreting phenomena, situations, or experiences in a comprehensive and holistic manner [16]. This approach does not focus on numerical measurement or statistical analysis but rather emphasizes a deeper understanding of the context and meaning of the phenomena under study [17], [18]. In the descriptive qualitative method, this study collects detailed data, which is then analyzed to identify patterns, themes, and emerging insights.

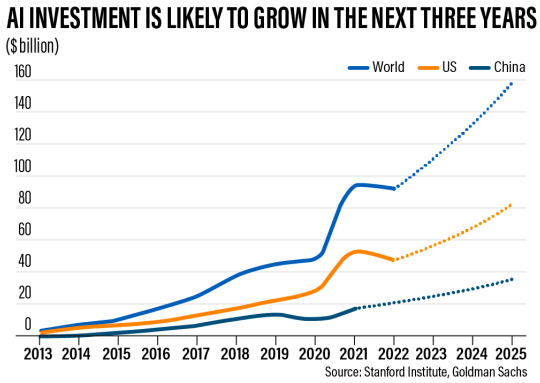

Figure 1. SWOT Analysis
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As shown in Fig 1 the chart displays the projected growth in artificial intelligence (AI) investment over the next three years, comparing global, U.S, and Chinese investments from 2013 to 2025. The blue line represents worldwide AI investment, while the orange and dotted yellow lines represent the U.S. and China, respectively [19]. The graph shows that AI investments globally, as well as in both the U.S. and China, are expected to increase significantly in the coming years. The U.S. and China are projected to dominate investment in AI, with China showing an especially sharp increase in investment starting in 2023 [20]. The overall trend highlights a rapid and growing global interest in AI technology, with significant contributions from these two leading countries [21].

This method is highly useful for the researcher to understand a problem or situation from the perspective of participants or subjects involved in the study. The use of secondary data as the research reference indicates that the researcher does not directly collect primary or new data for this study. Instead, the research relies on existing data, or data that has been previously collected by others for purposes that may differ from this study. Secondary data can include documents, reports, journal articles, books, published statistics, or other sources relevant to the research topic. The expected outcome of this research is to make a significant contribution to our understanding of AI's role in shaping the future of education, as well as to provide a foundation for developing more informed and ethical policies and practices in integrating AI technology into educational systems.

4. RESULT AND DISCUSSION

implement ethical considerations into the development and use of AI in education. One of the most critical aspects is ensuring that AI systems are designed to be fair and inclusive, taking into account the diversity of students in Indonesia. This includes addressing potential biases in AI algorithms, which can arise from the data used to train these systems. For example, if the data used does not represent the diverse cultural, social, and economic backgrounds of students, the AI system may generate outputs that unfairly disadvantage certain groups. Therefore, it is essential for developers and educators to ensure that AI models are continuously evaluated and refined to prevent discrimination and promote equity in educational opportunities.

Furthermore, transparency and accountability are key ethical issues in the implementation of AI in education. Stakeholders, including students, parents, and educators, must be informed about how AI systems are being used, what data is being collected, and how it is being processed. This transparency helps build

trust in the technology and ensures that AI is used responsibly. Educational institutions should also be held accountable for any negative outcomes resulting from the use of AI, such as the invasion of privacy or discriminatory practices, and they must be prepared to take corrective actions when necessary[22]. The integrity of blockchain data is maintained by storing information in interconnected blocks and using encryption to ensure privacy, making the data immutable and tamper-proof by unauthorized parties. This technology can help prevent fraud and data breaches, which is crucial in the financial industry. Additionally, blockchain's transparency allows customers to easily track their transaction history, thus increasing their trust in the financial system. By combining strong cryptography, decentralization, and transparency, blockchain provides a secure and reliable foundation for various applications, ranging from finance to supply chain management.

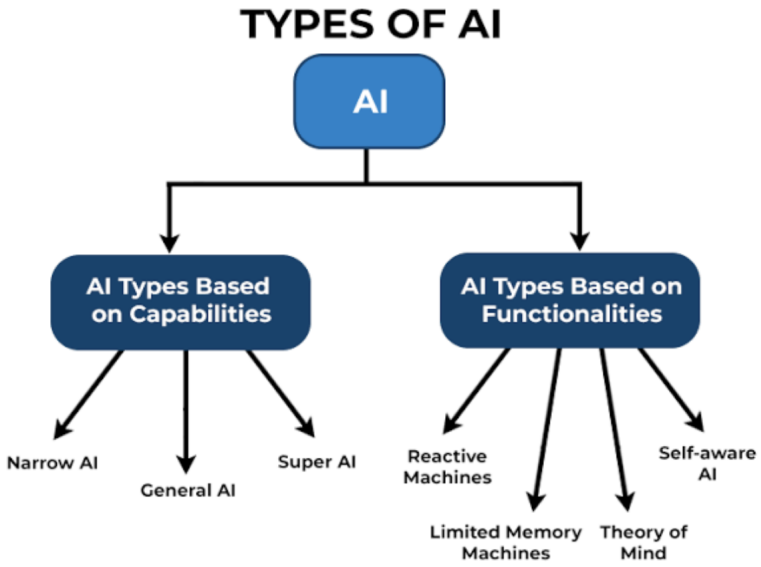

Figure 2. Types of AI

The figure 2 categorizes artificial intelligence (AI) into two primary groups: Types of AI Based on Capabilities and Types of AI Based on Functionalities.

4.1. AI Types Based on Capabilities

Narrow AI: Also known as Weak AI, this type of AI is designed to perform a specific task or a narrow range of tasks. It is the most common form of AI currently in use, such as in virtual assistants or recommendation systems. General AI: This AI has the capability to understand, learn, and apply intelligence in a manner similar to humans. It can perform a wide range of tasks and reason about problems in different domains, much like a human brain. Super AI: This represents the theoretical next level of AI, surpassing human intelligence across all areas. Super AI would have the potential to outperform humans in every cognitive task. AI Types Based on Functionalities:

4.2. Reactive Machines

These machines respond to specific stimuli and do not store memory or learn from past experiences. They can perform simple tasks but lack the ability to make decisions based on previous interactions. Limited Memory Machines: AI systems that can store and use past experiences to improve their decision-making process. These machines learn from data and can make predictions based on past events.

4.3. Theory of Mind

A future AI development where machines would be able to understand and model human emotions, beliefs, and thoughts to interact with humans in a more natural and empathetic manner. Self-aware AI: This represents a highly advanced stage where AI systems possess their own consciousness and self-awareness. It can recognize its own state and make decisions based on an understanding of its existence and environment.

Artificial Intelligence (AI) has undergone rapid and significant development since its inception. Initially based on concepts introduced in the 1950s, AI has evolved into one of the most influential and transfor-

mative technologies of the modern era. In its early stages, AI research focused on solving logic problems and symbolic reasoning. Pioneers such as Alan Turing, John McCarthy, Marvin Minsky, and others laid the theoretical and practical foundations for creating machines that could "think." A major milestone was the development of the LISP programming language by McCarthy, which became a key tool in AI research for several decades [23].

In the 1960s and 1970s, AI experienced a period of high optimism, often referred to as the "AI summer." Many ambitious predictions were made about the future capabilities of AI. However, limitations in computing power and the complexity of the problems being addressed slowed progress, leading to a decline in interest and funding, known as the "AI winter." Despite these challenges, AI research continued. In the 1980s, rule-based approaches and expert systems gained popularity. These systems were capable of performing specific tasks with expertise that equaled or even surpassed human capabilities in certain domains. However, limitations in handling uncertainty and adaptive learning led to the search for new approaches [24].

A major turning point occurred in the 1990s and 2000s with the rise of machine learning as the dominant paradigm in AI. Methods such as artificial neural networks, which had existed since the 1950s, saw a resurgence due to increased computing power and greater availability of data. Learning algorithms like support vector machines and random forests began to show success in various practical applications [25].

The next big revolution came with advances in deep learning, particularly since the 2010s. Deep neural network architectures such as convolutional neural networks (CNN) and recurrent neural networks (RNN) enabled AI to achieve exceptional performance in tasks like image recognition, natural language processing, and speech recognition. Achievements such as AlphaGo's victory over the world champion in Go in 2016 marked a significant milestone in AI's ability to solve complex problems.

Recent advancements in AI include progress in transfer learning, where models trained for one task can be adapted to other tasks more efficiently [26]. Techniques like few-shot learning and zero shot learning allow AI to learn from smaller amounts of data. Large language models like GPT (Generative Pre-trained Transformer) have demonstrated remarkable capabilities in understanding and generating text, opening the door to new applications in human-computer interaction [27].

Furthermore, research in AI is also progressing toward more explainable and ethical systems. Explainable AI (XAI) aims to make AI decision-making more transparent and understandable to humans, while ethical AI focuses on developing systems that are fair, unbiased, and respect privacy and human values. AI applications have permeated various sectors, from virtual assistants in smartphones to recommendation systems in e-commerce platforms, from medical diagnosis to autonomous vehicles. AI also plays a critical role in scientific research, assisting in drug discovery, astronomical data analysis, and climate change modeling [28].

However, the rapid advancement of AI brings with it significant challenges and ethical questions. Issues such as data privacy, cybersecurity, the impact of automation on jobs, and the potential misuse of AI for information manipulation or autonomous weapons are serious concerns. Global discussions about AI regulation and ethical principles in the development and application of AI continue to unfold. Looking ahead, the future of AI will likely include areas such as Artificial General Intelligence (AGI) that can handle a wide range of tasks like humans, better integration of machine learning with symbolic reasoning, and the development of more energy-efficient and environmentally friendly AI systems [29].

The development of artificial intelligence has and will continue to reshape how we live, work, and interact with technology. Despite the substantial challenges, AI's potential to solve complex problems and enhance human quality of life remains a key driver of innovation and research in this field. Over time, collaboration between humans and AI is expected to become increasingly important, ushering in a new era where AI is not just a tool but a partner in the advancement of human civilization.

The ethics of AI usage in education is a critical and complex topic. While AI technology offers many potential benefits, it also raises various ethical considerations that must be carefully addressed.

One of the primary ethical principles to be considered is privacy and data security. AI systems in education often collect and analyze vast amounts of student data, including sensitive information such as demographic data, academic performance, and even insights into learning difficulties. Therefore, it is crucial to ensure that students' personal data is well-protected and not misused. Educational institutions and AI developers must comply with privacy regulations and implement strict security measures to safeguard student data. Transparency in data collection and usage is equally important; students and parents must be clearly informed about how their data is collected, stored, and used by AI systems.

Crucial ethical principle is fairness and equality. The use of AI in education should aim to enhance

access and equality, not exacerbate existing disparities. AI algorithms must be designed and implemented carefully to avoid bias that could disadvantage certain groups of students. For example, if AI systems are used to make important decisions such as student admissions or scholarship allocations, it must be ensured that the algorithms do not discriminate based on race, gender, socioeconomic status, or other irrelevant factors. AI developers and educational institutions should actively work to identify and eliminate biases in their systems.

Transparency is the third vital ethical principle. Students, parents, and educators must understand how AI is being used in their educational processes. This includes explaining how AI systems make decisions or recommendations, as well as the limitations and potential errors of the technology. Transparency is essential to building trust and allowing users to make informed decisions about the use of AI in their education.

Principle is maintaining human oversight and control. While AI can provide valuable insights and recommendations, critical decisions affecting students should not be entirely left to automated systems. Teachers, administrators, and other education professionals should continue to play an active role in overseeing and validating the decisions made by AI. This is important to ensure that ethical and contextual considerations, which AI may not fully comprehend, remain part of the decision-making process.

Accessibility is another important ethical consideration. AI technology in education should be designed to be accessible to all students, including those with special needs or disabilities. This may require specific adaptations in interface design, providing alternatives for voice or visual input, and other considerations to ensure that all students can equally benefit from AI technology. The ethical use of AI in education requires a delicate balance of ensuring privacy, fairness, transparency, human oversight, and accessibility. As AI becomes more integrated into educational systems, it is essential to continue addressing these ethical challenges to create an equitable and responsible educational environment for all students [30].

5. CONCLUSION

The utilization of artificial intelligence (AI) in education presents numerous opportunities to enhance the quality, efficiency, and accessibility of learning. AI can support personalized learning experiences by adapting educational content to the needs of individual students, allowing them to learn at their own pace and in ways that suit their learning styles. Furthermore, AI can help automate administrative tasks, freeing up educators to focus more on direct interaction with students. This combination of AI-driven insights and human interaction can create a more effective and supportive learning environment.

However, it is essential that AI in education is implemented thoughtfully and ethically. While AI offers powerful tools to support learning, it should not replace the human aspects of teaching. The role of educators in fostering emotional and social development, providing mentorship, and creating meaningful human connections remains irreplaceable. AI should be seen as a tool to augment, rather than replace, the teacher-student relationship, ensuring that the human touch in education is preserved.

Moreover, the integration of AI must be done with careful consideration of equity and inclusivity. Technology should be used to bridge gaps in educational access, not exacerbate them. It is crucial to design AI systems that are accessible to all students, including those with disabilities or from marginalized communities. By ensuring that AI tools are inclusive and equitable, we can pave the way for a more inclusive educational landscape that benefits all students, regardless of their background.

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