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The Role of Artificial Intelligence (AI) in Education and Its Use in Combating Misinformation

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Abstract

Artificial intelligence (AI) has emerged as a transformative force, permeating various aspects of human society, including education. The use of AI in the field of education has extraordinary potential benefits including improve efficiency, maximize time and energy and increase the general performance of students as well as mitigation of misinformation. Diffusion of misinformation is multifaceted in nature with political, social, and cognitive dimensions. Misinformation however, has the potential to severely influence educational programs, practices, and policies since education is related to wide-ranging implications for students' learning, achievement, and general well-being. AI models for the recognition, filtering, and counteracting of misinformation utilize deep machine learning algorithms, natural language processing, and data analytics to identify patterns of false information across platforms. The filtering techniques employ algorithms to flag and suppress the spread of misinformation. The application of artificial intelligence has been met with a number of challenges including data privacy concerns as well as algorithmic biases and inaccuracies, over-reliance on artificial intelligence, etc. regardless of these challenges, AI technologies have proven to be highly beneficial in the field of education in many ways including combating misinformation.

Keywords: Artificial intelligence, Education, Misinformation, Combat, Educational technology

1. Introduction

The idea of artificial intelligence (AI) is related to the applications of algorithm production, machine learning, natural language processing as well as deep learning (Akgun & Greenhow, 2022). Artificial intelligence is useful to both individuals and organizations as its capabilities in increasing productivity and efficiency, saving energy and time as well as improving general performance cannot be overemphasized (Flavián & Casaló, 2021; Ali et al., 2023). Generally, AI is increasingly penetrating every aspect of our everyday lives, and is being used more and more in professional contexts including marketing (Vlačić et al., 2021), healthcare delivery (Matheny et al., 2020); and education (Chen et al., 2020; Hwang et al., 2020). AI has become one of the fundamental trends and technological drivers in the twenty first century. The application of AI in the field of education has notable potential benefits. These include personalized learning, which can result to higher performance by students since it allows each student to study in the best way suitable for them in terms of time and pace (Shrivastava et al., 2023). Automated assessment and grading, intelligent tutoring systems and chatbots help teachers to maximize time, provide more precise and timely feedback and increase efficiency. Nevertheless, there are a number of challenges associated with the application of artificial intelligence in Education. These challenges include cost, potential bias, lack of trust, and security and privacy issues (Kamalov et al., 2023). While applying AI in the field of education, ethical considerations like fairness, transparency and accessibility should also be taken note of (Tariq et al., 2022). This study aims to identify the applications of artificial intelligence in the field of education as well as its use in mitigating misinformation.

2. Methodology

This review presents a structured and systematic approach to the selection, analysis, and formation of literature on the role of AI in education and its ability in combating misinformation. The selection started with a thorough search of the following academic databases: Google Scholar, IEEE Xplore, ScienceDirect, and SpringerLink, using key terms for the literature search like "Artificial Intelligence in education," "AI combating misinformation," and "AI-driven misinformation detection."

Also, a list of inclusion and exclusion criteria was developed to ensure the high quality and relevance of the research. The selection criteria have identified papers between 2010 and 2023 in order for the review to capture the recent development of AI technology. Only peer-reviewed journal articles and conference proceedings considered reputable reports were included, while keeping studies published in the English language. This paper needed to focus exclusively on AI in educational contexts and the contribution this technology can make in solving the problem of misinformation. Conversely, all those studies whose focus is purely technical in regard to AI, without any relevant applications in education or to misinformation, and then also those which are not peer reviewed, have been excluded from this review.

The initial search identified approximately 100 studies. After initial screening of titles and abstracts, only those clearly meeting the stated inclusion criteria were selected, leaving about 60 relevant articles. These were then further screened based on a full-text reading of each

article. Finally, about 45 studies were selected that met the full inclusion criteria for this review. This process of selection was validated by relevance to the topic, and the capacity of the studies to offer significant insights related to AI contributions to education and misinformation.

The key data extracted for the set of final studies included methodologies adopted for research, key findings, applications of AI in educational settings, and strategies adopted for the detection of misinformation. A structured analysis was performed, which identified common patterns across the literature on challenges and innovative uses of AI. The approach followed will ensure clarity and rigor, hence a sound basis of knowing the benefits of AI in an educational setting and its full potential in combating misinformation.

3. AI in Education: Overview

3.1 Evolution of AI in the Educational Sector

Artificial intelligence is becoming more and more popular in the field of education. According to Long and Magerko (2020), the concept was originally known as ‘artificial literacy’ a term which refers to the ability to comprehend, apply, monitor, and critically reflect on the application of AI without essentially being able to build artificial intelligence models themselves. The first use of the term artificial intelligence was in a 2015 article (Konishi, 2015). The term combines a wide array of suggested educations aimed to indicate the understanding of a specific technological construct such as data literacy or media literacy (Wolff et al., 2016). AI literacy entails the artificial intelligence skills that the general populace should have and thus focuses primarily on learners who do not have any computer science background (non-professionals). Long and Magerko (2020) developed a commonly cited definition of AI education. They defined the term as an array of skills that equips people to critically appraise AI technologies, effectively interact and collaborate with AI, and utilize AI as a tool at home, online, and in the office.

The application of AI in the field of education dates back to the 1970s when Turtle robots and LOGO programming were initiated by young students. These tools however focused mainly on programming ideas or computational thinking rather than artificial intelligence. A book titled “Artificial Intelligence: A Modern Approach” which is considered by many as the most standard text book in the field of artificial intelligence for university students was published in 1995 (Chassignol et al., 2018). Thus, computer science undergraduates could learn how artificial intelligence can learn, think, take decisions, perceive, act, communicate and provide solution to problems (Chassignol et al., 2018). The concept, which was initially limited to the field of computer science only, later evolved as the incorporation of AI into the management systems of education to aid learning, instruction and decision making and to also provide virtual assistance to personalized learning (Hwang et al., 2020). Today, the role of artificial intelligence in education has become more evident through global initiatives such as DigComp, ISTE and UNESCO, which began to conceptualize artificial intelligence literacy based on the most recent educational standards and design frameworks to address the levels of digital education throughout the world (Miao & Shiohira, 2022; ITSE, 2022; DigComp. 2022). These guidelines represent various aspects of one of the concepts of AI in education.

Miao and Shiohira (2022), for instance, reported that 11 countries across the globe have integrated AI into their STEM/computing curricula to encourage competitiveness as well as furnish young people with adequate shills for the future workplace. Today, artificial intelligence is generally becoming the next big trend in the field of education at every level.

3.2 AI Tools and Applications in Education (e.g., Adaptive Learning, Grading, Virtual Tutors)

Chat bots or Visual Tutors: These are computer programs developed to mimic human interaction, allowing them to communicate with people via voice or text interfaces (Sreenivasu et al., 2023). Chat bots have become more popular in education in recent years, offering personalized assistance to students, administrative tasks automation as well as providing novel opportunities for engagement (Yeruva et al., 2022). One of the foremost advantages of the application of chatbots in education is that they can provide individualized assistance to students. They can act as virtual tutors, offering instant spontaneous feedback, answering questions, as well as guiding learners through their academic pursuit (Sridhar et al., 2022). In addition, chatbots can provide individualize suggestions for study materials, recommend areas that need to be improved on, track growth while providing higher personalized academic experience. Another advantage of chatbots in education is their ability to automate management tasks (Mohammed et al., 2022). Furthermore, chatbots can manage routine activities like frequently asked questions, scheduling and grading, helping teachers to maximize time and allowing them to attend to high-value tasks like mentoring and teaching (Gningue et al., 2022). Automating such tasks can aid the reduction of administrative inconsistencies and errors, making sure that tasks are accurately and efficiently executed.

Personalized or adaptive Learning: The application of AI in the field of education has paved way for personalized learning, altering learning pattern of students (Rana et al., 2022). Samad et al. (2022) define personalized learning as a method of teaching that adapts learning experiences to individual strengths, interests, weaknesses, and needs each student. According to Zarei et al. (2022), personalized learning makes use of technology to modify instruction to each learner's level and speed of learning. Artificial intelligence plays a significant role in personalized learning by making use of machine learning algorithms to evaluate data and spot patterns in students' learning preferences, behaviors, and achievements (Samad et al., 2022). Then artificial intelligence can use the data to provide adapted learning experiences that certify the specific needs of individual student (Samudrala et al., 2022). AI for instance, can suggest suitable learning assets, recommend areas that need to be improved on, and regulate the intricacy level of learning tasks. One of the principal advantages of personalized learning is that it helps to guarantee that each student gets the guidance and assistance they require to attain their optimum potential. Personalized learning is capable of assisting weak students draw level, while sophisticated learners can be challenged at their level (Gningue et al., 2022).

Grading and Assessment Process: Assessment and grading processes can be automated by artificial intelligence, thus, providing students with spontaneous feedback and helping teachers to maximize effort and time (AlAli et al., 2023). Artificial intelligence algorithms can evaluate learners work and return feedback according to pre-defined criteria, allowing

learners to get spontaneous feedback on their performance (Li et al., 2022). The automated essay grading systems is an example of artificial intelligence powered automated grading (Stoica & Wardat, 2021). They use machine learning and natural language processing algorithms to evaluate learners' essays and give immediate scoring and feedback.

3.3 Potential Benefits of Artificial Intelligence in Education

The primary benefit of artificial intelligence in education is that it aids learning with higher convenience and flexibility as students are able to learn in their own space and time, making use of AI-related infrastructure (Tahiru, 2021). Additionally, artificial intelligence can as well improve accessibility to education as increasing number of students now have access to quality academic resources irrespective of their geographical location or financial background. This makes it much easier to provide a global access to education (Baidoo-Anu & Ansah, 2023). Furthermore, artificial intelligence helps to save cost incurred by academic institutions as it eliminates unnecessary workload by automating processes which lower the resources required (Tahiru, 2021). Another benefit of AI in education is that it enables automated grading system which gives teachers more time to perform other tasks like lesson preparation and planning (Baidoo-Anu & Ansah, 2023). Automated grading system is rapidly changing the role of teachers from teaching to facilitating (Holmes & Tuomi, 2022). Teachers can incorporate artificial intelligence lessons as supplementary materials to help weak learner as well as give practical experiences in the form of human interaction for learners. Artificial intelligence systems also provide learners with a learning environment that is judgment-free and is capable of suggesting ways to enhance learners' performance. In addition, AI help teachers to equip their students with important skills such as attitudes, competences, ability to interact with other students, innovatively develop theories, ideas and solutions as well as solving problems authentically (ISTE, 2022), thus resulting in the general enhancement of the performance of the students. Generally, the use of AI in education is beneficial to teachers, education institutions as well as students in terms of increased efficiency, flexibility, increased learning as well as time and cost effectiveness.

4. Misinformation: Definition and Relevance in Educational Settings

Misinformation refers to incorrect, inaccurate or false information that is created deliberately and is intentionally or unintentionally disseminated but without the intention to be deceptive. Misinformation may take the form of fake news, spam rumor troll, urban legends, etc. (Liang et al., 2019). Osborne and Pimentel (2023) noted that misinformation refers to the communication of information that is false, wrong, or untrustworthy without the aspect of intentional deceit involved. It is different from disinformation, where the information has been intentionally made false in an attempt to destabilize or mislead individuals. Misinformation in educational contexts can take several forms, from outdated and erroneous texts to instructor error and social media, where information may be posted and then spread with remarkable speed without scrutiny. This issue is more prevalent due to increase in the number of digital platforms as information spreads so fast without being checked to ascertain its authenticity (Scheufele & Krause, 2019).

Diffusion of misinformation is complex in nature with cognitive, social, and political

dimensions. However, misinformation has the potential to deeply influence education policy, programs, and practices since education is related to wide-ranging implications for student learning, achievement, and well-being. Osborne and Pimentel (2023) indicated that misinformation operates at various levels in the education system such as the individual, community, and system levels. It is on the individual level that students internalize certain information as fact, often due to reasons related to cognitive biases, a lack of sufficient availability to critical thinking, or perhaps even due to exposure to undependable sources.

At the community level, misinformation occurs when a group of educators, parents, students, and other stakeholders within a school harbour flawed beliefs or misconceptions. Communities in this regard are usually made up of people bound together by common interests in education, like issues associated with access, equity, or disability advocacy, and might therefore foster misinformation (Cook et al., 2017). However, at the system level policies are introduced by the best available professional consensus that they will be effective, evidence-based, and suitable for the populations and conditions for which they are targeted.

Misinformation within an educational setting is relevant to the quality of education and the learning outcomes for students. Every time misinformation occurs-whether it be for the student or educator, critical thinking is hindered, false beliefs are created, and credible sources are less trusted. It now becomes a job for the educator to check and correct misinformation in order to create an atmosphere of correct knowledge or where valid information is accessible to students (Blankenship, 2021). Also, misinformation in educational settings has implications for long-term learning and knowledge retention. When students are exposed to incorrect information in their formative stages, such information may shape their understanding and set patterns that are hard to correct later on. This is particularly problematic in subjects like science, history, and social studies, where foundational knowledge builds upon previous understanding. Myths and misconceptions, and even bias is likely to occur when this goes on unverified or students are misinformed (Osborne & Pimentel, 2023)

4.1 AI Strategies to Detect, Counter and Filter Misinformation

AI mechanisms for the detection, filtering, and countering of misinformation employ deep machine learning algorithms, NLP, and data analytics to identify patterns of false information across platforms. Such systems are trained on large datasets to identify linguistic markers, anomalies in content, and fact-checking discrepancies as potential red flags of misinformation. Detection methods range from automated fact-checking techniques-which actualize claims against verified databases-to sentiment analysis, which measures misleading narratives (Zhang et al., 2019). The filtering techniques employ algorithms to flag and suppress the spread of misinformation, while counter-measures utilize an automated debunking system and adjustments in recommendations to foster the visibility of credible information.

4.1.1 Machine Learning Models for Content Verification

Machine learning models play a great role in content verification to automate identification processes in case of false or misleading information. Such models, in general, are trained

using methods of supervised learning where large datasets with verified factual information are required to train them for distinguishing between accurate and inaccurate content (Fan et al., 2023). Nie (2023) noted that text classification is important or essential for this process, whereby the system uses machine learning algorithms to label portions of text, whether it's factual or something that would need additional verification. Also, neural networks and ensemble methods-most notably random forests and gradient boosting-can be used to create predictive models (Fan et al., 2023). Deep learning models, especially those based on transformer architectures such as BERT and GPT, have also seen great success in understanding contextual and semantic features of text, thus improving the accuracy of their verification of contents. These models capture the subtlety and linguistic patterns that in many cases are indicative of misinformation. Once trained, machine learning models can be integrated into a real-time application to flag potentially misleading claims for fact-checkers and other stakeholders who may work toward making the information across digital platforms credible.

4.1.2 Natural Language Processing for Fact-Checking

Natural language processing (NLP) algorithms are used to analyse textual data, identify the claims needing verification, and cross-check them with trusted sources and databases. These tools have hugely eased the working mechanism of fact-checkers, as this process makes it quicker to identify potentially misleading statements, allowing them to focus on critical information for deeper analysis (Johnson, 2023). The integration of this technology into fact-checking processes is making it faster and more accurate, because it's a sub-segment of Artificial Intelligence. NLP lets computers understand, interpret, and generate human language in such a way that it becomes an indispensable tool in processing reams of text data in order to locate factual inaccuracies or false claims.

Guo et al. (2022) noted that one major focus of fact-checking NLP is the technical framework responsible for the detection and extraction of claims involved in the process, which encompass a lot of tasks in AI and especially in NLP algorithms. The framework consists of several stages that start with information extraction, and include the transformation of unstructured text into structured data (Johnson, 2023).

4.2 Integrating AI-Powered Fact-Checking Tools in Educational Platforms

The proliferation of misinformation through digital spaces, raising many concerns about the veracity and reliability of information that students receive (Rasheed et al., 2020). As educational institutions grapple with these challenges, there is a growing need for solutions that enhance credibility of the information students access online. In modern education with increased technological usages, the use of AI-powered fact-check tools offer a new intervention in the battle against misinformation. AI-powered fact-checking has the potential to dramatically improve the quality of information at the disposal of students via educational platforms. These tools apply procedures or natural language processes with machine learning algorithms by which information is cross-referenced against already verified databases and highlights any content that seems misleading or false. Such automated verifications help in ensuring that the students are exposed to accurate and reliable data, thereby limiting the

impact of misinformation on learning (Rasheed et al., 2020).

Also, AI fact-checkers can help them by freeing up the teacher's time from going through each learning material content, and this makes the process of evaluation much more efficient. Teachers can spend more time on teaching or personalized learning, knowing that the AI is providing assurance that all the resources are correct, especially in areas where the information may change rapidly, such as in current events or scientific discovery where dated or even incorrect data may still be in circulation.

5. Challenges and Ethical Consideration

5.1 Limitations of AI in Education and Misinformation Detection

Despite the promising potential for use in education and the detection of misinformation, several limitations hinder the effectiveness of Artificial intelligence. AI systems often cannot fully understand the context, nuance, and subjectivity of complex educational materials, especially in fields relating to humanities and social sciences (Miao et al., 2021). Also, with overdependence on AI systems for misinformation investigations, there will also be inhibition of critical thinking among students and educators because of the possibility of overdependence on technology as opposed to developing independent verification skills (Press, 2024)

5.1.1 Algorithmic Biases and Inaccuracies

According to Babaei et al. (2021), algorithmic biases and inaccuracies, widely stemming from the limited datasets used for training AI models and without representative diversity within the datasets, remain among the critical impediments toward the adoption of AI in education and misinformation detection. Additionally, inaccuracies in algorithms emanate from the inability of machine learning models to understand context and subtlety. AI fact-checking tools will generally cross-reference information against their databases of verified information but fail when the information involve more complex contextual manipulation or some sort of interpretative claim, which is pretty common in the humanities or social sciences (Ecker et al., 2022).

5.1.2 Data Privacy Concerns

Another limitation of AI in education and misinformation detection relates to the concerns of data privacy. For AI technologies to work effectively, they require lots of data that often needs access to sensitive information from students, educators, and educational platforms. This may cover personal data, browsing history, learning behaviour, and interactions on online forums or social media, hence raising consent issues of personal information (Khurshid, 2020). In turn, AI systems can analyse great volumes of content to identify the false information. However, this often involves tracking and storing a large volume of user-generated data, which substantially raises concerns about surveillance and personal information misuse. In a situation where the data protection policies are not strict enough, unauthorized access may easily disclose student or educator data for commercial use or make such data open in the event of breaches (Murdoch, 2021).

5.2 Ethical Consideration in AI Deployment

The use of AI to detect misinformation raises a number of important ethical issues, especially in educational contexts. As the systems become more integral to the processes of filtering and verification, one must increasingly raise questions about the design of these technologies (Konidena et al., 2024). Such ethical concerns include, but are certainly not limited to, possible censorship due to algorithms that make some decisions about which information should be suppressed, biases in algorithmic decision-making, and impacts on free expression.

5.2.1 Over-Reliance on AI Technology

One of the most important ethical considerations related to the use of AI in the detection of misinformation involves over-reliance, especially in educational contexts. Kaledio et al. (2024) indicated that AI systems continue to evolve and independently execute increasingly more complex tasks, educators and students will rely too heavily on those tools at the expense of critical thinking and independent judgment. While AI systems are indeed very efficient, they are also limited to their training data, algorithmic design, and contextual understanding. When students start to rely wholly on AI to validate information, they might explicitly lose skills in critical judgments that would have been helpful in identifying sources of misinformation (Malik et al., 2023). AI fact-checking is designed to help students verify information, but when over utilized it creates passivity in learning. This might give way to a very passive approach whereby learners don't experiment, question, or cross-refer information since AI output is considered absolutely correct.

5.2.2 Transparency, Accountability and Data Usage

The issues of transparency, accountability, and data usage lie at the very core of ethical considerations with regard to AI deployment in misinformation detection within educational contexts. According to Verma et al. (2022), transparency shows the extent to which disclosure is made regarding a decision-making process on the part of AI systems-an overview of algorithms and data used for arriving at a particular decision. The lack of transparency raises a very fundamental ethical problem whereby users will not be afforded the opportunity to practice critical use of the tools, be aware of their limitations, or even examining their result or outcome.

Also, accountability is directly linked to transparency and associates with responsibility for errors, biases, or other harm caused through AI systems. Considering the educational sector, as well as the detection of misinformation, for example, it raises the question on who should be responsible when an AI tool mistakenly flags valid information as false or does not flag misleading content (Agarwal & Mishra, 2021). The responsibility of the developers, platform administrators, or indeed educational institutions for clear-cut liability is complicated by the misinterpretation of these AI systems. There are ethical concerns in this context as to who corrects these mistakes and who is responsible for the consequences of such mistakes whenever the students are subjected to misinformation or legitimate information is censored. That is made sure of only with clear governance structures in place, where human oversight too forms part of AI systems to catch and address mistakes.

Furthermore, another major ethical issue involves personal data usage in AI-driven detection of misinformation. Most AI systems use a lot of user data in concert with algorithm improvement to perform pattern detection in content, thus raising privacy and data security concerns (Konidena et al., 2024). This involves personal information of students, learning behaviours, and digital interactions collected perhaps without informed consent or understanding of how that data will be used in educational platforms. Ethical usage of data should involve a guarantee that personal data is handled as confidential, assurance of users being fully informed on what data are being collected for what purpose, and that student data is not exploited for commercial gain (Agarwal & Mishra, 2021).

6. Conclusion

Artificial intelligence is currently being widely adopted and applied in the field of education as it has proven to be a potent tool due to its capabilities to improve efficiency, maximize time and energy and increase the general performance of students. AI technologies have found a wide range of applications in education. Such applications include grading and assessment, lecture delivery, administrative tasks and curtailing misinformation. AI models for identifying, filtering and controlling of misinformation use natural language processing, machine algorithms and data analytics to detect patterns of inaccurate information across various platforms. There are a number of challenges in the application of AI in combating misinformation in education. These challenges include data privacy concerns as well as algorithmic biases and inaccuracies, over-reliance on artificial intelligence, etc. Due to the potential damage that could stem from misinformation within the educational ecosystem, all hand should be on deck to ensure that no stone is left unturned in mitigating it. Hence Artificial intelligence, with its robust potentials comes handy.

7. Future Trends and Implications

Artificial intelligent based systems will play a significant role in the field of education. Hence, future researchers can put more focus particularly on the role of artificial intelligence in education. In like manner, hybrid artificial intelligence, which is a joint intelligence from algorithms and human, is a future prospect. Currently, hybrid artificial intelligence has gained very little attention and is being applied to a number of realistic applications like administrative tasks. Most of them however are simply a combination of artificial and human decision. Thus, there is need to explore ways to take better advantage of hybrid artificial intelligence (Raisch & Fomina, 2024).

The World Economic Forum projected that in the near future, AI technologies such as machine learning will be adopted by a large ratio of institutions. Thus, the forum strongly encourages educational institutions and governments to focus on swiftly building skills and education, with particular focus on each science, technology, engineering and mathematics (STEM) as well as non-mental soft skills in order to be able to accomplish this near future need. In addition, a recent survey by Microsoft reveals that by the year 2030, learners may be required to either understand how to work with a team to efficiently solve problems or have knowledge of how to use evolving technologies like artificial intelligence to their benefit (Kandula, 2020). In the future, preparing learners to hop aboard artificial intelligence will

start early. As a large number of young people are already used to digital technology by the time they attain college age, it is important to teach them the capabilities they will possess to be able to do well during a digital work. The inclusion of artificial intelligence in education will better prepare students for the unknown challenges of the future workspace.

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