WHAT ARTIFICIAL INTELLIGENCE CAN NEVER DO TO EDUCATION

Research Paper

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Abstract

Artificial Intelligence (AI) has emerged as a powerful tool in various industries and sectors; education is no exception. Infrastructure and technologies, especially AI have been transforming the way education is conducted across teaching, learning, researching for educators and students. Despite AI's potential to revolutionize educational industry, there are fundamental aspects of education that AI currently struggles, is unlikely to fully replicate in the foreseeable future and in certain areas it can never ever fully replace. This paper explores potentials and limits of artificial intelligence in education with a focus on what AI cannot ever do within the context of education. This highlights where students and educators can leverage artificial intelligence and where they need to embrace human intelligence and spotlights a potential roadmap for educational industry.

Keywords: Education, Artificial Intelligence, Transformative, Human Intelligence

1 Introduction

The rapid advancement of Artificial Intelligence (AI) has significantly impacted various industries and sectors, transforming how people work, interact, and access information. The education industry has also witnessed the rise of AI, with its applications spanning personalized learning, intelligent tutoring systems, and automated assessment. While AI holds immense potential to enhance learning experiences and address educational challenges, it is crucial to recognize its limitations and understand that it cannot entirely replicate the human element in education.

A systematic review paper summarizes that Artificial Intelligence in Education (AIEd) models knowledge, learner, and teaching, applies technologies like Machine Learning (ML), Image Recognition, Computer Vision, Face/ Speech Recognition, Virtual/ Augmented Reality, Analytics, Data Mining, and makes significant impact to the three areas of education:

administration, instructing or teaching and learning ([7]). Artificial Intelligence in Education (AIEd) has been undergoing paradigm shifts characterized into three paradigms: AI-directed, AI-supported, and AI-empowered to implement technologies, integrate pedagogical, social, cultural, and economic dimensions ([21]).

This paper highlights of what AI has done to education, what are the future potentials of AI in education, and what AI can never do to education. This paper delves into the limitations of AI in education, focusing on specific areas where AI currently struggles and is unlikely to fully replace the role of human educators in the future. By analyzing these limitations, the paper aims to contribute to a nuanced understanding of AI's role in education, promoting a future where AI complements and supports or substitute educators.

2 What has AI done to Education?

Artificial Intelligence (AI) evolved the landscape of education with personalized learning, intelligent teaching tools, assessment automation, gamification, and improved the learning and teaching experience.

2.1 Personalized Learning

There is clear shift from the traditional ‘one size fits all’ to personalized learning with a student-centered approach. EdTech systems powered by Big Data and Artificial Intelligence operate with in a diagnostic and predictive framework enabled augmented content that is interactive, engaging and motivating to the learners ([6]). AI backed with Big Data, analyzes a comprehensive student data including demographics, learning styles, past performance, and current progress and prepares personalized learning experiences with tailored curriculum, augmented content, and recommended resources to meet individual needs.

2.2 Intelligent Tutoring

Intelligent Tutoring Systems (ITS) are AI powered learning systems to provide personalized and adaptive instructions for students by modeling students' psychology, knowledge, skills, and preferences ([18]). These AI integrated ITS, utilizes Natural Language Processing (NLP) and Machine Learning (ML) techniques to evaluate student responses and gauge individual progress by analyzing learning behaviors. This helped bridge the gap between educators and students by providing an innovative platform that caters to flexible learning styles and paces.

2.3 Automated Assessment

AI powered feedback to students promotes educational assessments by selecting questions for online exams, arousing positive emotions, evaluating performances, and leading to self-assessment ([14]). Beyond scoring of quizzes in the exams, AI automates the grading of descriptive answers, essays, and other assessments, freeing up teachers' time to focus on more complex tasks such as providing human support to struggling students.

2.4 Availability and Accessibility

Digital technology-based learning tools like mobile devices, smartboards, Massive Open Online Courses (MOOCs), tablets, laptops, simulations, visualizations, virtual labs, social media, wikis, blogs, podcasts etc. made the education more available ([17]). AI techniques like OCR, NLP, translation, text to speech, etc. makes the learning more accessible to all including people with disabilities. AI-driven educational platforms have mitigated geographical constraints, granting access to superior education for students residing in underserved or remote locales. With round-the-clock availability of AI-driven chatbots, tailored learning resources, and online educational tools, these platforms advance educational equity by extending learning opportunities to all individuals.

2.5 Gamification

Gamification is education consists of incorporating a suitable combination of game elements within learning activities to enhance learning performance. A systematic review of adaptive gamification in e-learning reveals that employment of AI techniques with personalized gamification improves the learning results ([5]). AI brings limitless potential to gamification with personalized game-based learning based on students' profile, progress, and interactions.

3 What are the future potentials of AI in Education?

Looking ahead, Artificial Intelligence has the transformative potential in education with advanced immersive learning experiences, AI generated content, mentorship, and exploring neuro-adaptive learning with AI powered cognition.

3.1 Immersive Learning Experiences

Combining Artificial Intelligence (AI) and immersive technologies like Virtual Reality (VR) and Augmented Reality (AR) makes educational games and enables creation of new curriculum for game-based learning ([11]). Advancements in these immersive experiences have potential to bring abstract and complex concepts to life, allowing students to explore and learn in a more interactive and stimulating way in the future.

3.2 AI Generated Educational Content

AI-generated content can serve as a viable supplement or as an alternative to traditional learner sourcing techniques in certain learning contexts. The potential for Large Language Models (LLM) to improve the accessibility and scalability of high-quality educational content, while reducing the burden on educators ([8]). As Generative AI evolves, it will autonomously create educational content like textbooks, lectures, and interactive resources. Using natural language processing and machine learning, these materials will be personalized

to students' preferences and comprehension, providing adaptive and engaging learning experiences.

3.3 AI Powered Mentorship

Mentor-AI, a proposed AI powered mentorship platform presents compelling prospects for transforming professional development by surpassing conventional mentorship constraints. Leveraging sophisticated AI technologies, including machine learning and natural language processing, this platform provides tailored, inclusive, and scalable mentorship opportunities for a wide spectrum of professionals ([4]). Further research, implementation and improvements on AI powered mentorship has potential to transform education by making personalized digital mentors available any time to anyone.

3.4 Neuro-adaptive Learning and AI Powered Cognition

A deeper grasp of the brain's learning mechanisms is vital for education's future. Educators must adapt to the brain's dynamic response to stimuli, requiring exploration of its development, cognitive structures, and agility. AI integration in education, currently through simulations and feedback, could evolve to directly influence learning-related brain activity via Brain Computer Interface (BCI), fostering more effective learners. Traditional schooling might face a revamp, with proposals for shorter durations and earlier start ages. The concept of "decommodification" implies valuing knowledge beyond formal qualifications, prioritizing real-world application. This necessitates reevaluating traditional educational and ethical frameworks in this evolving landscape ([10]).

The intersection of neuro-adaptive learning and AI-powered cognition promise highly personalized education. By analyzing brain activity with BCIs and utilizing AI, learning content, pace, and difficulty will be tailored to individual strengths and weaknesses along with real-time feedback. Further advancements will integrate with VR/AR for personalized

experiences with custom generated content and develop adaptive platforms adjusting based on brain activity. AI-powered cognitive enhancement could extend beyond education, emphasizing responsible implementation and equitable access for transformative impact.

4 What can AI never do to Education and why?

While exploring the transformative potential of artificial intelligence (AI) in education, it is imperative to acknowledge the boundaries that delineate the capabilities of AI from the deeply human aspects of the educational experience. Four critical aspects of education, AI can never achieve are discussed along with the underlying reasons behind these limitations supporting why it can't achieve, namely 1. Emotional Intelligence and Empathy, 2. Motivation, Relationship, and Trust, 3. Security and Ethics, and 4. Consciousness, Existence, Passion, and Inspiration.

4.1 Emotional Intelligence and Empathy

The research article by Altavilla et al ([2]) highlights the interconnectedness of cognitive, motor, emotional, and social aspects of learning, emphasizing the teacher's role in fostering strong student performance. Empathy, a dimension of emotional intelligence is crucial in education, shaping positive learning environments and student development. By understanding students' emotions and perspectives through empathy, teachers can tailor educational approaches, build nuanced understanding, and promote social-emotional learning. The article emphasizes both cognitive and emotional aspects of empathy, outlining its importance in creating a safe and inclusive classroom environment where students can thrive. AI inherently lacks the emotional capacity for true empathy, concluding it both impossible and unethical, Montemayor et al ([19]) highlights in their research, pointing out AI's inability to emotionally resonate with patients hinders genuine connection in the healthcare industry. Furthermore, mimicking empathy through AI can deceive patients and erode the crucial role

of human empathy in fostering trust and providing effective care. AI, a powerful pre-trained algorithm, excels at solving problems but lacks the emotional intelligence to identify these obstacles or empathize at personal level.

Emotional intelligence and true empathy in education is crucial for navigating challenging subjects, understanding a student's emotional states like confusion, frustration, fear and adapting instruction accordingly. Drawing parallel from the healthcare research to education, features like empathy, compassion in AI tutors risk creating a false sense of comprehension, appearing to be fake as AI is not human and diminishing the value of human connection, a cornerstone for a supportive learning environment. Therefore, AI cannot achieve genuine empathy in education.

4.2 Motivation, Relationship and Trust

Motivation, the internal spark that ignites our desire to learn and act, is a complex interplay of personal needs, goals, and external factors influenced by our beliefs, interests, and the environment around us. Intrinsic motivation is driven by curiosity, desire, interest, and enjoyment the student feels in a task where extrinsic motivation is influenced by external stimulus such as instrumental, social and achievement. Explaining this, the author Filgona et al ([12]) presented 18 strategies to motivate the learners. Some of these strategies like arouse students' interest, constructive criticism, being a role model, treating learners special, involving ego are purely based on human connect.

The research findings ([3]) underscores that fostering strong teacher-student relationships in the early education enhances outcomes across all domains, highlighting their crucial role in students' long-term development. Emotional dimensions of student-teacher relationship in higher education plays a significant role in both student and teacher experience ([23]). The

relationship between educators and students operates on the trust factors and personal connect between them.

Researching the cognitive and emotional trust in virtual, embedded, and robotic form of AI, with the parameters of tangibility, transparency, reliability, tasking, immediacy, and anthropomorphism, the author debates that cognitive trust appears to be improving, but highlights emotional trust is impacted due to emotions like fear, anger, discomfort, distrust ([13]). Humanity thrives on genuine motivation, nurtured by emotional trust and personal connections inherent in human being. These intrinsic drivers that truly propel students and replicating them perfectly remains an elusive goal and subject to suspicion for Artificial Intelligence despite its ability to mimic some aspects of human behavior.

4.3 Security and Ethics

Applying AI in Education with systems that enable automated scoring, personalized learning, face recognition, recommendation, prediction bring different forms of security and ethical challenges: privacy, surveillance, autonomy, bias and discrimination ([1]). Security and ethical issues expand to systemic bias, discrimination and inequality for marginalized groups of students, xenophobia, privacy and bias in data collection and processing, widening gaps of inequalities among learners, commercialization of education and will continually evolve and move forward in the long run raising concerns for the adverse impacts on fundamental issues surrounding human rights ([20]). As technologies grow, the landscape of security concerns expands, and with AI's exponential growth in the recent times, security concerns also have grown exponentially, making the key stakeholders: educators, students, and parents of education more vulnerable.

Discussing the importance of teaching ethics in education, the author Gülcan ([16]) claims that education is an ethical effort to make human being more civilized individual, highlighting

paramount importance of ethical education. Artificial Intelligence in Education (AIEd) need ethical AI to achieve ethical education. However, In the research article, 'Why machines cannot be moral', the author Sparrow ([22]) highlights the profound challenges in building ethical AI. True ethical behavior is rooted in human capacities for remorse, nuanced moral reasoning, and social interaction. These intricate human traits, beyond the reach of AI technology, are essential for navigating complex ethical dilemmas and acting with genuine moral authority.

The persistent and escalating security challenges, along with ethical considerations that are impractical for AI, adjudicate the achievement of the moving security target and an ethically ideal standard logically unattainable.

4.4 Consciousness, Existence, Passion, and Inspiration

Passionate, encouraging, and enthusiastic teachers with their inspirational teaching can trigger aspirations of the learners to be transformative ([9]). Consciousness with self-awareness, emotions with the sense of existence in human enable base for being passionate on a subject inspire learners with experiences.

Can AI or robot become conscious, self-aware, and sentient to be passionate teacher? The Google engineer's claim on LaMDA being sentient traumatized the Internet ([24]) with a big debate sparking what if machine becomes sentient. While Griffiths ([15]) concludes LaMDA is not sentient, does not rule out the possibility of sentient machines with engineered sensors transforming environments factors to sensations. However, with the lack of self-awareness, consciousness, and non-existence, it cannot evolve into a passionate teacher who inspires with personal experiences. Attempting such things, for example bringing Albert Einstein live to teach physics, even if it becomes possible, will be termed as deepfake of multi-modal, and a fake cannot inspire.

AI not being human, does not have existence or biography or personal experiences, are not part of culture, and family, it cannot establish trustworthy relationship in educational context, cannot lead by example, cannot be genuinely passionate or inspire learners.

5 CONCLUSION

Artificial Intelligence (AI) has evolved the educational realm, introducing personalized learning experiences, intelligent tutoring systems, automated assessments, gamification, and improved accessibility. Additionally, AI holds promise for revolutionizing education through advanced immersive learning experiences, AI-generated content, mentorship, and the exploration of neuro-adaptive learning with AI-powered cognition.

Nevertheless, when considering the role of AI in education, it is essential to recognize its inherent limitations and the boundaries that distinguish its capabilities from the deeply human aspects of the educational experience. This paper has examined what AI cannot fully accomplish in education, investigating four crucial aspects: Emotional Intelligence and Empathy, Motivation, Relationship, and Trust, Security and Ethics, and Consciousness and Existence.

AI's deficiency in emotional empathy severely limits its ability to understand and respond effectively to the intricate emotional states of students. Furthermore, its struggle to cultivate intrinsic motivation, which is deeply rooted in emotional trust and personal connections, emphasizes a fundamental gap in its capacity to engage learners authentically. Moreover, the pervasive security and ethical challenges confronting AI in education, ranging from privacy breaches to biases and discrimination, stress the inherent risks associated with its implementation. AI's absence of consciousness, existence, and personal experiences prevents it from establishing trustworthy relationships, inspiring learners, or embodying genuine

passion in education. The need for human element in education is inevitable as the learner is human.

In conclusion, while AI offers significant enhancements to education, it cannot entirely supplant human educators. Recognizing its limitations, it's essential to utilize AI to complement and assist educators rather than seeking complete substitution. Embracing a balanced approach that values both AI and human intelligence ensures technology enriches the educational experience while maintaining human connection and inspiration.

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