ROLE OF ARTIFICIAL INTELLIGENCE (AI) IN EDUCATION: RECENT TRENDS AND CHALLENGES

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ABSTRACT

The increase in mobile internet and cloud computing helped the artificial intelligence in transforming the education in the recent past. Post pandemic, the education system has been changed drastically as more ICT tools have been used in teaching learning process. Though these modern teaching learning educational platforms meet the expectations of the education system but there are lots of concerns need to be addressed as both the teachers and students are facing many problems during the teaching learning process. This has helped in emergence of Artificial Intelligence in the education. This research paper addresses the role of AI in education, the AI technologies used in education, its applications and the potential benefits of AI in education. The paper also discusses the practical challenges in implementing AI in education.

Keywords: AI, AIEd, ICT

INTRODUCTION

Since its 'birth' at the 1956 Dartmouth Conference, the field of artificial intelligence (AI) has continued garnering the interest of industries alike. Few technological developments in recent history have been as polarizing as AI. While AI has been around for nearly 60 years, it nevertheless remained a fringe technology until only recently because of sweeping changes in recent years (referred to as "the big leap"), entailing the abundance of data (big data), economic access to computing power and advances in Machine Learning. The present paper uses terms such as AI and Big Data, the two main technology buzzwords of the current decade, and other concepts such as machine learning, learning analytics, etc. as technologies that work well together. It should be borne in mind that these terms are sometimes used interchangeably in the news and articles, thus creating confusion. With a view to avoiding such confusion, this subsection contains a brief explanation of these concepts, clarifying their differences and how they work together (there is also a complementary definition in the annex hereto). While there is no straightforward and consensual definition of AI, several classic definitions of AI are nevertheless provided from the different literature, including McCarthy (2006), Zhong (2006), ITU (2018).

AI IN EDUCATION

Luckin et al. describe Artificial Intelligence in Education (AIEd) as investigating learning wherever it occurs, in traditional classrooms or in workplaces, in order to support formal education as well as lifelong learning. It brings together AI, which is itself interdisciplinary, and the learning sciences (education, psychology, neuroscience, linguistics, sociology, and anthropology) to promote the development of adaptive learning environments and other AIEd tools that are flexible, inclusive, personalized, engaging, and effective. At the heart of AIEd is the scientific goal to "make computationally precise and explicit forms of educational, psychological and social knowledge which are often left implicit".

In the last decade, artificial intelligence and adaptive technologies have matured, making both mastery learning and one-on-one instructional methods more scalable than Bloom ever could have imagined. However, these technologies have yet to coalesce into widely adopted systems to facilitate teaching. To a large extent, this is because our existing educational models and systems are still stuck in their traditional forms, hindering the true adoption of AI systems. There have however been major strides in technologies to help teachers currently teaching in traditional models, particularly in freeing up their time so that they can tend to tasks for which human intelligence is still required. AIEd is well placed to take on some of the tasks that we currently expect teachers to

do – marking and record keeping, for example. In my research area of computer science education, I have personally witnessed an increasing interest in AI in recent years, particularly to gain insight from the vast amounts of data that students are producing during their learning, and to automate educator tasks. As a specific example, Korn10 reported on the work of Ashok Goel, a professor of computer science at Georgia Tech who last year used an AI program as one of the teaching assistants in his Artificial Intelligence class. The program replied to students' email queries regarding assignments. The program was given the moniker Jill Watson – a nod to the fact that 'she' runs on IBM's Watson AI platform.11 Georgia Tech researchers began creating Jill using nearly 40,000 postings on a discussion forum, training her to reply to similar questions based on prior responses. Most students were surprised when they were told that Jill was a computer program. Goel explained that Jill only replies when she has a confidence level of 97%, which distinguishes her from customer-service chatbots used by airlines and other industries. He said "Most chatbots operate at the level of a novice… Jill operates at the level of an expert". Goel estimates that within a year, Jill will be able to answer 40% of all the students' questions, freeing his human teaching assistants to tackle more complex technical or philosophical inquiries.

This is an example of AIEd that does not necessarily replace the teacher, but frees up time for those in teaching roles, akin to what Luckin et al. foresee: "Crucially we do not see a future in which AIEd replaces teachers. What we do see is a future in which the role of the teacher continues to evolve and is eventually transformed; one where their time is used more effectively and efficiently, and where their expertise is better deployed, leveraged, and augmented"

FUTURE OF AI IN EDUCATION

As for the future of AIEd, some see AI technology not just augmenting the roles of teachers as Jill Watson does at Georgia Tech and asLuckin et al. foresee, but replacing at least some of their traditional roles altogether. Sir Anthony Seldon, vice-chancellor of the University of Buckingham, former master of Wellington College, historian, and well-known political commentator, sees intelligent machines taking over the inspirational role of teachers completely.13 Certainly, in order for this to be the case, strong (general) AI must become a reality, and whether or not this will ever happen is debated. Keeping within the confines of narrow (domain specific or weak) AI, Luckin et al. offer several predictions for the next phase of AIEd, noting that it will soon: help learners gain 21st century skills, support a renaissance in assessment, embody new insights from the learning sciences, and give us lifelong learning partners. Luckin et al. see AIEd helping learners gain 21st century skills by helping us develop reliable and valid indicators that will allow us to track learner progress on the skills and capabilities needed to thrive in the coming decades, including characteristics such as creativity and curiosity that are notoriously difficult to measure. It will also help us develop a better understanding of the learning contexts and teaching approaches that allow for these skills to be developed. They also see AIEd techniques complementing existing learning analytics by providing just-in-time information about learners' successes, challenges, and needs which can be used to shape their learning experiences. For example, AIEd combined with learning analytics will allow us to identify changes in learner confidence and motivation while learning foreign languages, or complex mathematical concepts. This information could then be used to provide timely interventions to help students, perhaps in the form of individual attention from a teacher, technology-assisted support, or some combination of the two.

Luckin et al., also see data gleaned from digital teaching and learning experiences providing new insights that are difficult or impossible to ascertain from traditional assessments. For example, datasets could be analysed to help teachers understand how the learner arrived at their answer, not just if they selected the correct one. This data could also help us understand more fully the cognitive processes such as remembering and forgetting, and

the key roles that these have on learning. AIEd analysis might also identify if and when students become bored, confused, or frustrated, to help teachers adapt to and enhance learners' emotional readiness for learning. AIEd will help us do away with the stop-and-test approach that pervades assessment today. As described by Luckin et al, instead of traditional assessments which rely upon testing small samples of what students have been taught, AIEd-driven assessments will be built into meaningful learning activities, such as games and collaborative projects, and will assess all of the learning taking place, as it happens.

AIEd will also embody new insights from the learning sciences to allow us to better understand the learning process and build more accurate models that can predict and influence learner progress, motivation, and persistence. Luckin et al. highlight the work of Paul Howard-Jones, Professor of Neuroscience and Education at the University of Bristol whose work suggests that learning can be improved when it is linked to uncertain rewards, differing from traditional models that apply rewards consistently.14 AIEd techniques could, for example, tailor the provision of uncertain rewards, calibrating them to a learner's individual reactions and behaviors, and increasing the effectiveness of such techniques even more. Finally, Luckin et al. claim that AIEd will provide learners with lifelong learning partners. Although the concept of computer-based 'learning companions' is not new, the next generation of learning companions should offer much greater potential. These cloud-based systems will benefit from learner information gleaned not only from educational contexts but from all contexts: social, recreational, etc. Rather than specialist AIEd systems or subject-specific expertise from humans where required. In addition, such systems could focus on helping learners to become better at learning through developing a growth mindset 15 or an impressive array of 21st century skills. Because of the adaptability of these systems, learning companions can be as suitable for struggling learners as they are for the most accelerated and high-achieving learners.

The examples given here are only a small subset of the many ways that AIEd could transform the future of education. In this section, guided by Luckin et al. – which is highly recommended for more information –I have focused on those that are quite feasible in the next decade or so. It promises to be an important decade according to Sir Anthony Seldon, who said: "Within a decade, AI will have transformed school and university life and given the biggest boost to social mobility our society has ever seen". Beyond this,

AIEd does have the potential to tackle some of the biggest challenges we have in education today, such as addressing achievement gaps, enhancing teacher expertise, as well as addressing teacher retention and teacher shortages. Eventually AIEd may lead to a complete reform of, perhaps even a revolution in, our educational systems. Fullan & Donnelly describe three forces that must be combined if we are to deliver on the promise of technology to catapult learning dramatically forward: pedagogy, technology itself, and system change. It is hard to resist the conclusion of Luckin et al.: The future ability of AIEd to tackle real-life challenges in education depends on how we attend to each of these three dimensions. That is, we need intelligent technologies that embody what we know about great teaching and learning in enticing consumer-grade products, which are then used effectively in real-life settings that combine the best of human and machine. Ultimately, combining the best of human and machine for the benefit of the learner is the true goal of artificial intelligence in education.

REFERENCES

[1] CNN.com, "AI Set To Exceed Human Brain Power," 9 August 2009. [Online]. Available: http://edition. cnn.com/2006/TECH/science/07/24/ai.bostrom/. [Accessed 6 October 2017].

[2] Howard-Jones, W. Holmes, S. Demetriou, C. Jones, E. Tanimoto, O. Morgan and N. Davies, "Neuroeducational Research in the Design and Use of a Learning Technology," Learning, Media and Technology, vol. 40, no. 2, pp. 1-20, 2014

[3] J. Kennedy, "Why Ireland is the AI Island," 3 October 2017. [Online]. Available: https://www. siliconrepublic.com/machines/ai-island-ireland-ida-infographic. [Accessed 17 October 2017].

[4] J. Rose, "How to Break Free of Our 19th-Century Factory-Model Education System," 9 May 2012. [Online]. Available: https://www.theatlantic.com/business/archive/2012/05/how-to-break-free-ofour- 19th-century-factory-model-education-system/256881/. [Accessed 3 October 2017].

[5] J. Self, "The Defining Characteristics of Intelligent Tutoring Systems Research: ITSs Care, Precisely," International Journal of Artificial Intelligence in Education (IJAIED), vol. 10, pp. 350-364, 1998

[6] "Machines Will Replace Teachers in Inspiring Pupils, Public School Head Predicts," 11 September 2017. [Online]. Available: http://www.belfasttelegraph.co.uk/news/uk/machines-will-replaceteachers- in-inspiring-pupils-public-school-head-predicts-36119386.html. [Accessed 11 October 2017].

[7] R. Luckin, W. Holmes, M. Griffiths and L. B. Forcier, "Intelligence Unleashed: An Argument For AI In Education," 2016. [Online]. Available: https://www.pearson.com/corporate/about-pearson/ innovation/smarter-digital-tools/intelligence-unleashed.html. [Accessed 3 October 2017].

[8] Roll and R. Wylie, "Evolution and Revolution in Artificial Intelligence in Education," International Journal of Artificial Intelligence in Education, vol. 26, no. 2, pp. 582-599, 2016.