Artificial Intelligence and Education

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ABSTRACT
Currently the importance of artificial intelligence in education worldwide is recognized. In this paper the general objective was determine the situation of artificial intelligence and education. Methodology, in this research, 57 documents have been selected, carried out in the period 2018 - 2023; including: scientific articles, review articles and information from websites of recognized organizations. The keywords used in the searches were: Artificial intelligence and education. Results, Artificial intelligence will have a greater impact on education every day, according to what has been appreciated so far. An important example today is ChatGPT, which shows us the benefits and challenges of AI in education. Conclusions, Artificial intelligence continues to evolve and day by day has more applications in the various fields of human activity. An important example today is ChatGPT, which shows us the benefits and challenges of AI in education. It is important that governments can invest more economic resources in education and in strengthening the domain of ICT by teachers and students. It is necessary to invest in financing research that supports the creative and innovative use of AI in education worldwide and especially at the Latin American level.

Keywords: chinese universities, COVID-19.

1 INTRODUCTION

Currently the importance of artificial intelligence in education worldwide is recognized and the following authors highlight it.

Artificial Intelligence (AI) has the potential to address some of the biggest challenges in education today, innovate teaching and learning practices, and accelerate progress towards SDG 4 (UNESCO, 2019).

Artificial intelligence (Al) is increasingly having an impact on education, bringing opportunities as well as numerous challenges (COE, 2022).

Today, the Commission published Ethical Guidelines on the Use of Artificial Intelligence (AI) and data in teaching and learning for teachers. The Guidelines address how AI is used in schools, to support teachers and students in their teaching and learning, and to support administrative tasks in educational settings (European Commission, 2022).

Like previous educational technologies, artificial intelligence in education (AIEd) threatens to disrupt the status quo, with proponents highlighting the potential for efficiency and democratization, and skeptics warning of industrialization and alienation (Schiff, 2021).

Research on Artificial Intelligence in Education (AIED) has increased rapidly in recent years, so efforts are needed to understand the status of trends and their development to support and focus these trends (Prahani, Rizki, Jatmiko, Suprapto & Tan, 2022).

The study ascertained that AI has extensively been adopted and used in education, particularly by education institutions, in different forms (Chen, Chen & Lin, 2020)

Education is helped by AI in at least two ways: (1) the educational process – assistance and modifications to pedagogy and educator's routine function; and (2) the educational ambit and content – what kind of education is needed (Alam, 2021).

AIED refers to the use of AI (Artificial Intelligence) technologies or application programs in educational settings to facilitate teaching, learning, or decision making (Hwang, Xie, Wah, Gašević, 2020)

The main research topics include intelligent tutoring systems for special education; natural language processing for language education; educational robots for AI education; educational data mining for performance prediction; discourse analysis in computer-supported collaborative learning; neural networks for teaching evaluation; affective computing for learner emotion detection; and recommender systems for personalized learning (Chen, Zou, Xie, Cheng & Liu, 2022).

However, within the limits that we describe in this paper, it offers the potential to transform education in ways that—counterintuitively perhaps—make education more human, not less (Cope, Kalantzis & Searsmith, 2021).

In particular, we consider a case of recent attempts from data scientists to add AI elements to a handful of online learning environments, such as Khan Academy and the ASSISTments intelligent tutoring system (Perrotta & Selwyn, 2020).

This review aims to provide a concise overview of four distinct research fields: Artificial Intelligence and EDucation (AIED), Computer-Supported Collaborative Learning (CSCL), Educational Data Mining (EDM), and Learning Analytics (LA)…With the rise and availability of big data in education and AI, substantial leaps in the conceptual, theoretical, and evidence-based understanding of learning and teaching have been made in the four fields discussed (Rienties, Simonsen & Herodotou, 2020).

It is necessary to invest in financing research that supports the creative and innovative use of AI in education worldwide and especially at the Latin American level.

2 METHODOLOGY

The research presents a qualitative-interpretative design, of a documentary type, which specified the selection procedure and the data recording (Barrero y Rosero, 2018).

In this research, 57 documents have been selected, carried out in the period 2018 - 2023; including: scientific articles, review articles and information from websites of recognized organizations. The keywords used in the searches were: Artificial intelligence and education. For the selection of the documents, the following criteria were used: the year of publication, belonging to the research and being a reliable source. After reading each document, the data was entered into the bibliographic matrix, which

is used to catalog the documents according to categories, which are presented in Table 1.

Table 1. Bibliographic matrix

Name	Type	Objectives	Conclusions

Source: Adapted from Barrero & Rosero (2018).

3 RESULTS

3.1 ARTIFICIAL INTELLIGENCE

Artificial intelligence (AI) is an important technology that supports daily social life and economic activities… In recent years, AI has attracted attention as a key for growth in developed countries such as Europe and the United States and developing countries such as China and India (Lu, H., Li, Y., Chen, M. et al., 2018).

History of artificial intelligence: Key dates and names (IBM, 2020)

- 1950: Alan Turing publishes *Computing Machinery and Intelligence.* In the paper, Turing—famous for breaking the Nazi's ENIGMA code during WWII—proposes to answer the question 'can machines think?' and introduces the Turing Test to determine if a computer can demonstrate the same intelligence (or the results of the same intelligence) as a human. The value of the Turing test has been debated ever since.
- 1956: John McCarthy coins the term 'artificial intelligence' at the first-ever AI conference at Dartmouth College. (McCarthy would go on to invent the Lisp language.) Later that year, Allen Newell, J.C. Shaw, and Herbert Simon create the Logic Theorist, the first-ever running AI software program.
- 1967: Frank Rosenblatt builds the Mark 1 Perceptron, the first computer based on a neural network that 'learned' though trial and error. Just a year later, Marvin Minsky and Seymour Papert publish a book titled *Perceptrons*, which becomes both the landmark work on neural networks and, at least for a while, an argument against future neural network research projects.
- 1980s: Neural networks which use a backpropagation algorithm to train itself become widely used in AI applications.
- 1997: IBM's Deep Blue beats then world chess champion Garry Kasparov, in a chess match (and rematch).
- 2011: IBM Watson beats champions Ken Jennings and Brad Rutter at *Jeopardy!*
- 2015: Baidu's Minwa supercomputer uses a special kind of deep neural network called a convolutional neural network to identify and categorize images with a higher rate of accuracy than the average human.

- 2016: DeepMind's AlphaGo program, powered by a deep neural network, beats Lee Sodol, the world champion Go player, in a five-game match. The victory is significant given the huge number of possible moves as the game progresses (over 14.5 trillion after just four moves!). Later, Google purchased DeepMind for a reported USD 400 million.

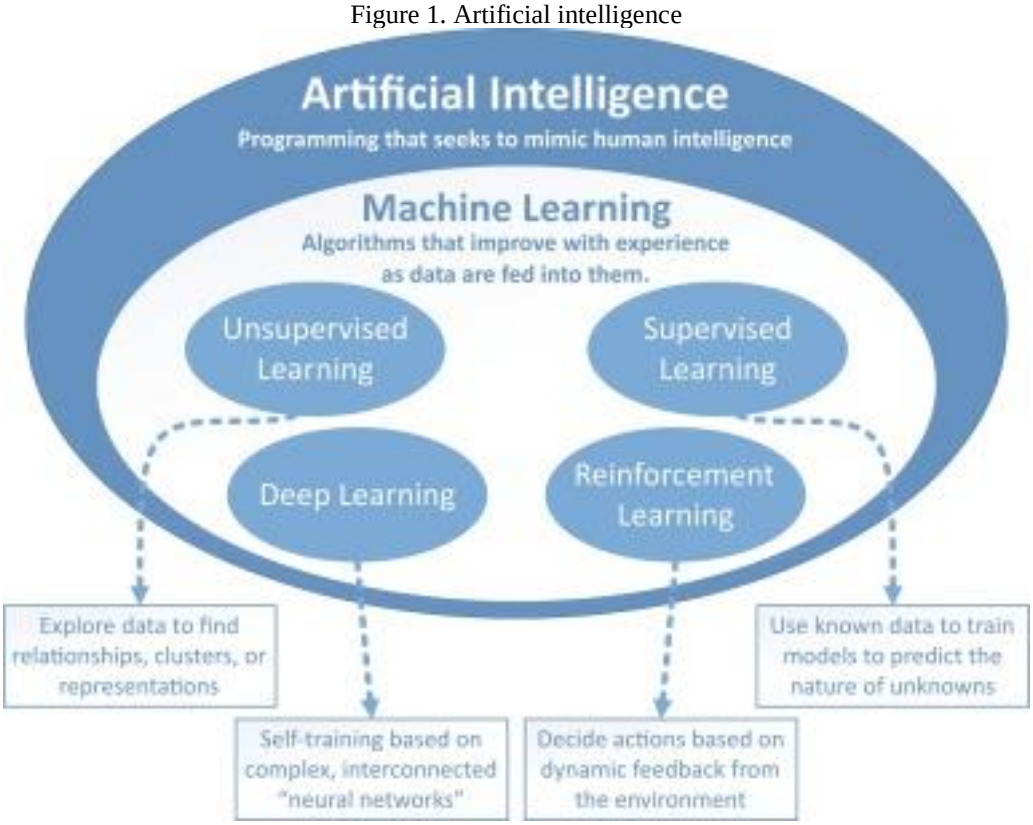
There have been two competing paradigms in artificial intelligence (AI) development ever since its birth in 1956, i.e., symbolism and connectionism (or sub-symbolism). While symbolism dominated AI research by the end of 1980s, connectionism gained momentum in the 1990s and is gradually displacing symbolism (Zhang, Zhu & Su, 2023).

As AI stimulated, many new logics and method were invented and discovered which makes the process of problem- solving more simple. Such methods are listed below. 1. Fuzzy logic, 2. Artificial neural networks (ANN), 3. Neuro-fuzzy logic, 4. Expert systems. Among all of these, the most widely used and constantly applied method for research purposes is ANN (Jha, Doshi, Patel, Shah, 2019).

Thanks to the exponential growth in computing power and vast amounts of data, artificial intelligence (AI) has witnessed remarkable developments in recent years, enabling it to be ubiquitously adopted in our daily lives (Minh, Wang, Li et al., 2022).

The figure 1 show the artificial intelligence and machine learning.

Figure 1. Artificial intelligence



Source: Karyn G. Robinson, Robert E. Akins (2021)

Artificial intelligence is an interdisciplinary subject that involves information, logic, cognition,

thinking, systems, and biology. It has been used for knowledge processing, pattern recognition, machine learning, and natural language processing. Applications have…(Zhang, C. & Lu, Y. (2021).

Artificial intelligence (AI), commonly defined as "a system's ability to interpret external data correctly, to learn from such data, and to use those learnings to achieve specific goals and tasks through flexible adaptation" (Haenlein & Kaplan, 2019).

The emergence of artificial intelligence (AI) and its progressively wider impact on many sectors requires an assessment of its effect on the achievement of the Sustainable Development Goals (Vinuesa, Azizpour, Leite et al., 2020).

Artificial Intelligence (AI) reshapes companies and how innovation management is organized. Consistent with rapid technological development and the replacement of human organization, AI may indeed compel management to rethink a company's entire innovation process (Haefner, Wincent, Parida & Gassmann, 2021).

Artificial Intelligence (AI) are a wide-ranging set of technologies that promise several advantages for organizations in terms off added business value. Over the past few years, organizations are increasingly turning to AI in order to gain business value following a deluge of data and a strong increase in computational capacity (Enholm, Papagiannidis, Mikalef. et al., 2022).

Trustworthy AI (TAI) bases on the idea that trust builds the foundation of societies, economies, and sustainable development, and that individuals, organizations, and societies will therefore only ever be able to realize the full potential of AI, if trust can be established in its development, deployment, and use (Thiebes, Lins & Sunyaev, 2021).

Meanwhile, the artificial intelligence (AI) applications are thriving with the breakthroughs in deep learning and the many improvements in hardware architectures. Billions of data bytes, generated at the network edge, put massive demands on data processing and structural optimization (Deng, Zhao, Fang, Yin, Dustdar and Zomaya, 2020).

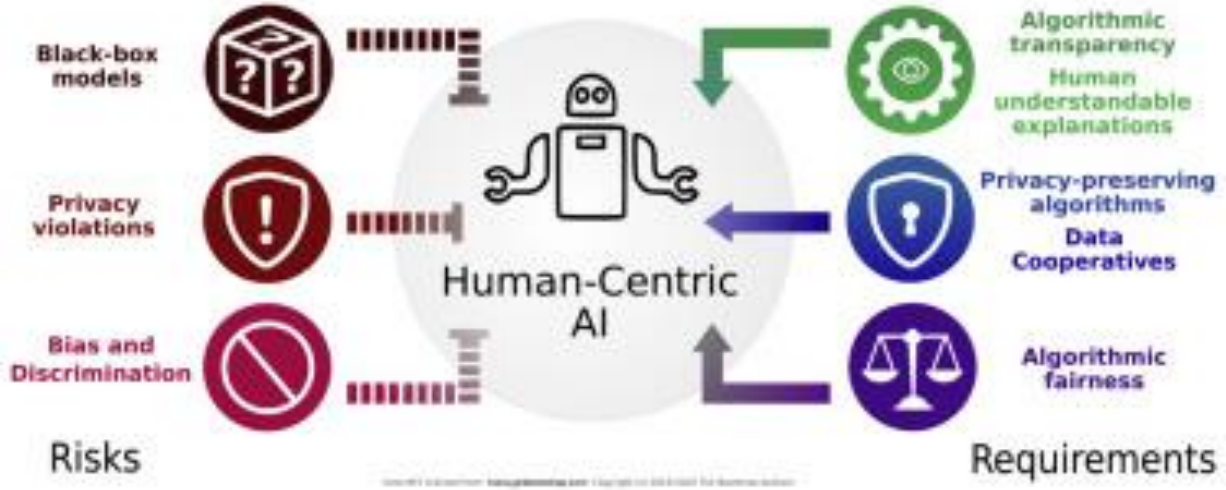
The intelligence of machines and robotics with deep learning capabilities have created profound disrupting and enabling impacts on business, governments, and society (Goralski & Keong, 2020).

The current field of AI is actually a mixture of multiple research fields, each with its own goal, methods, applicable situations, etc., and they are all called "AI" mainly for historical, rather than theoretical, reasons (Wang, 2019).

In recent years, machine learning (ML) has become a key enabling technology for the sciences and industry…today's ML algorithms are able to achieve excellent performance (at times even exceeding the human level) on an increasing number of complex tasks (Samek, Müller, 2019).

The figure 2 show the risks and requirements of ethical machines.

Figure 2. Ethical machines: The human-centric use of artificial intelligence



Source: Lepri, B., Oliver, N. & Pentland, A. (2021)

We've trained a model called ChatGPT which interacts in a conversational way. The dialogue format makes it possible for ChatGPT to answer followup questions, admit its mistakes, challenge incorrect premises, and reject inappropriate requests (OpenAI, 2022).

Artificial intelligence continues to evolve and day by day has more applications in the various fields of human activity.

3.2 EDUCATION

Sustainable Development Goal 4 (SDG4) aims to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all" and is made up of 10 targets (AONTAS, 2020).

Figure 3. United Nations Sustainability Agenda.

Source: AONTAS (2020).

The Education 2030 Framework for Action puts it clearly: Governments must allocate 4-6% of their gross domestic product and/or 15-20% of total public expenditure to education, ensuring efficient spending and prioritizing the most marginalized groups (SDG-Ed2030 SC, 2017).

The COVID-19 pandemic is a huge challenge to education systems… Finally, this Viewpoint suggests flexible ways to repair the damage to students' learning trajectories once the pandemic is over and gives a list of resources (Daniel, 2020).

Though COVID-19 has had a severe impact on normal educational progress, universities may take this unforeseen opportunity to detect deficiencies and speed up reform of online education through innovative course content, state-of-the-art technology and efficient management (Sun, Tang & Zuo, 2020).

According to the report, a key step to addressing the learning crisis is for governments to provide equitable financing and prioritize public education resources, including increasingly focusing on foundational learning. This entails securing public funding for pre-primary and primary education for all and targeting the poor and marginalized at higher levels of education (UNICEF, 2023).

The widespread introduction of new pedagogical technologies in teaching students of higher educational institutions and the effective use of innovative technologies are the main support for improving the quality of education (Urinov Bakhrom Jamoliddinovich, 2022).

The effectiveness of innovative activities in improving the quality of the education system is high innovative goals and opportunities of the educational system, employees depends on innovative thinking skills (Tuychieva, 2022).

The review indicates that most university students and teachers have a basic level of digital competence. Besides, the institutions of higher education are encouraged to focus on the development students and teachers' digital competence, create relevant learning strategies and use appropriate tools to improve the quality of education (Zhao, Pinto & Sánchez, 2021).

It is vital to enforce the distinguished assimilation of sustainability entities in higher education (HE) and establish an academia-wide collective curriculum on sustainability in an efficient manner, in order to disseminate and stimulate thoughts with forthcoming generations (Lim, Haufiku, Tan, Farid & Ng, 2022).

It is important that governments can invest more economic resources in education and in strengthening the domain of ICT by teachers and students.

3.3 ARTIFICIAL INTELLIGENCE AND EDUCATION

AI has the potential to educate, train, and improve the performance of humans, making them better at their tasks and activities (Stephen, Hiroaki, Tatsunori, Nian-Shing, 2021).

We advocate an in-depth dialog between supporters of "cold" technology and "warm" humanity so that it can lead to greater understanding among teachers and students about how technology, and specifically, the big data explosion and AI revolution can bring new opportunities (and challenges) that can be best leveraged for pedagogical practices and learning (Luan, Lai, Gobert, Yang, Ogata, Baltes, Guerra, Li and Tsai, 2020).

We conclude that (1) simulations are among the most effective means to facilitate learning of complex skills across domains and (2) different scaffolding types can facilitate simulation-based learning during different phases of the development of knowledge and skills (Chernikova, Heitzmann, Stadler, Holzberger, Seidel & Fischer, 2020).

This systematic review proposes the following theoretical, technological, and practical implications: (1) the integration of educational and learning theories into AI-enabled online learning; (2) the adoption of advanced AI technologies to collect and analyze real-time process data; and (3) the implementation of more empirical research to test actual effects of AI applications in online higher education (Ouyang, Zheng & Jiao, 2022).

Artificial Intelligence Applications (AIA) are not only assisting education academically and administratively but also enhance their effectiveness. AIA provides help to teachers in various types of tasks in the shape of Learning Analytics (LA), Virtual Reality (VR), Grading/Assessments (G/A), and Admissions (Ahmad, Alam, Rahmat, Mohd, Mubarik, & Hyder, 2022).

The study proposes a framework and strategy for directing future research initiatives in AIEd-Eng. In addition, the study intends to assess the influence of AI on different educational processes, including instruction, learning, management, and decision-making practices, in engineering education (Megahed, Abdel-Kader, Soliman, 2022).

In general, the application of artificial intelligence in the field of education is constantly expanding and deepening, and the emergence of new concepts, new methods, and new ideas is bound to have a profound impact on the reform of the education industry (Liang, 2020).

We found that the use of a social robot as a learning companion and programmable artifact was effective in helping young children grasp AI concepts. We also identified teaching approaches that had the greatest impact on student's learning. Based on these, we make recommendations for future modules and iterations for the PopBots platform (Williams, Park, Oh & Breazeal, 2019).

The results suggest the decline in conventional tech-enabled instructional design research and the flourishing of student profiling models and learning analytics. Furthermore, this paper serves to raise awareness on the opportunities and challenges behind AI and DL for pedagogical adaptation and initiate a dialogue (Guan, Mou & Jiang, 2020).

This paper examines the political economy of artificial intelligence (AI) and education in China,

through an analysis of government policy and private sector enterprise… concludes with the suggestion that while central government policy reserves a significant role for education in the national AI strategy, the private sector is utilising favourable political conditions to rapidly develop educational applications and markets (Knox, 2020).

We position ChatGPT in the context of current Artificial Intelligence in Education (AIEd) research, discuss student-facing, teacher-facing and system-facing applications, and analyse opportunities and threats (Rudolph, Tan & Tan, 2023).

ChatGPT's irruption shook the world's educational systems once again. The query that remains is what consequences this new technology will have for teachers' working practices and students' knowledge acquisition (Morduchowicz & Suasnábar, 2023).

Most agreed that ChatGPT represents a "sea change" for education—an opportunity for educators to reexamine fundamental questions about their profession: Why do we teach what we teach?, What does it mean to learn?, What do educators mean by terms like 'rigor' and 'assessment'? (Myers, 2023).

Future research directions could focus on conducting one step forward by implementing ChatGPT within teaching practices and investigating how human tutors and machines (ChatGPT) could work together to achieve an educational objective, as well as the changes and outcomes brought to the education field (e.g., evolutionary or revolutionary) (Tlili, Shehata, Adarkwah et al., 2023).

Several faculty members have incorporated ChatGTP into assignments, primarily as a means of exposing the AI chatbot's limitations (Mandelaro, 2023).

Artificial intelligence will have a greater impact on education every day, according to what has been appreciated so far.

An important example today is ChatGPT, which shows us the benefits and challenges of AI in education.

4 DISCUSSION

As the authors Luan, Lai, Gobert, Yang, Ogata, Baltes, Guerra, Li and Tsai (2020) mention "AI has the potential to educate, train, and improve the performance of humans…", which coincides with Yang, Ogata, Matsui & Chen (2021) "the use of AI can enhance human welfare in numerous respects, such as through improving the productivity of food, health, water, education, and energy services…".

Regarding the application of ChatGPT in education, the results coincide with the following authors, Villasenor (2023) "this semester, I am telling the students in my class at the UCLA School of Law that they are free to use ChatGPT in their writing assignments" and Tlili, Shehata, Adarkwah .et al. (2023) "this study provided a solid ground for revealing the concerns about using chatbots, specifically ChatGPT, in education, among early adopters".

5 CONCLUSIONS

Artificial intelligence continues to evolve and day by day has more applications in the various fields of human activity.

An important example today is ChatGPT, which shows us the benefits and challenges of AI in education.

It is important that governments can invest more economic resources in education and in strengthening the domain of ICT by teachers and students.

It is necessary to invest in financing research that supports the creative and innovative use of AI in education worldwide and especially at the Latin American level.

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