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Importance of Artificial Intelligence in Education

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Abstract

Computers have been employed in the field of education for many years. However, recent and current research within the field of artificial intelligence (Al) is having a positive impact on education. For example, there now exist ICAI (intelligent computer-assisted instruction) systems to teach or tutor many different subjects; several such systems are discussed herein. In addition to CA1 (computer-assisted instruction) systems, we discuss the development of learning environments that are designed to facilitate student-initiated learning. A third major application is the use of expert systems to assist with educational diagnosis and assessment. During the course of our discussion of these three major application areas, we indicate where AI has already played a major role in the development of such systems and where further research is required in order to overcome current limitations.

Keywords: Education, Artificial intelligence, computer-assisted instruction

Introduction

As illustrated by Henry Ford in the analogy, innovation does not mean working that the society should work only with what has been the norm, such as finding ways of making horses faster. Sometimes, it is necessary to search beyond the norm, develop new ways of doing things. Instead of making horses faster, build the automobile, which will be faster than the horse and take a person from Point A to Point B faster. These principles and approaches have driven the rapid developments in technology experienced over the years, particularly in the education sector. The introduction, advancements, and proliferation of technology, more particularly, artificial intelligence, has made it easier for instructors to dispense their duties more effectively and efficiently.

Prior to the introduction of computers and other related technologies, instructors and students, engaged in instructions and learning mechanically, or through the pure application of natural human effort. With the introduction of microcomputers, and by extension, personal computers in the 1970s, which according to Flamm, provided more computing power and marked an

important transition to electronic computers for the mass market [1]. In agreement, CampbellKelly opined that with developments of the electronic computers more particularly, and the availability of the same for different entities across different sectors of the economy, was precipitated by the developments of personal computers in the 1970s [2]. Personal computers development made it possible for individuals and other non-governmental entities to own and use computers for different reasons. These transitions harbingered the proliferation of computers in different sectors of the economy and society.

Computer and information communication technologies have over the years continued to evolve, leading to the development of artificial intelligence. Artificial intelligence, according to Coppin, is the ability of machines to adapt to new situations, deal with emerging situations, solve problems, answer questions, device plans, and perform various other functions that require some level of intelligence typically evident in human beings [4]. In another definition, Whitby defined artificial intelligence as the study of intelligence behavior in human beings, animals, and machines and endeavoring to engineer such behavior into an artifact, such as computers and computer-related technologies [5] . Drawing from these definitions, it is evident that artificial intelligence is the culmination of computers, computer-related technologies, machines, and information communication technology innovations and developments, giving computers the ability to perform near or human-like functions. In line with the adoption and use of new technologies in education, artificial intelligence has also been extensively leveraged in the education sector.[6]

A. Artificial Intelligence In Current Education- The mention of artificial intelligence brings to mind a supercomputer, a computer with immense processing capabilities, including adaptive behavior, such as inclusion of sensors, and other capabilities, that enable it to have human-like cognition and functional abilities, and indeed, which improve the supercomputers interaction with human beings. Indeed, different motion pictures have been made to showcase the abilities of AI, such as in smart buildings, such as the

ability to manage air quality in a building, temperatures, and or playing music depending on the sensed mood of the occupants of the space. Within the education sector, there has been increased application of artificial intelligence, going over and above the conventional understanding of AI as a supercomputer to include embedded computer systems. For example, embedded into robots, AI, or computers and supporting equipment enable the creation of robots that improve the learning experience of the student, from the most basic unit of education, early childhood education. Indeed, Timms posited that cobots or the application of robots, working together with teachers or colleague robots (cobots) are being applied to teach children routine tasks, including spelling and pronunciation and adjusting to the students' abilities [7]–[9]. Artificial intelligence in education, according to Chassignol et al. has been incorporated into administration, instruction or teaching, and learning[10]. These areas, which Chassignol et al. identify as the framework for analyzing and understanding artificial intelligence in education, will form the scope of this study.

B. Purpose Of the Study- This study seeks to assess how the use of AI, in its different forms, in education, has impacted or affected different aspects of education. More particularly, the study will seek to assess how AI has affect teaching, learning, and administration and management areas of education. It is anticipated that the study will ascertain that AI has foster effectiveness and efficiency in the performance of administrative tasks in education, and overall fostered improved instructional and learning effectiveness in education. Search strings will be used to search different databases, including EBSCOhost, ProQuest,Web of Science. In addition, the key words and search strings are used to search Google Scholar to identify articles from different journals that have focused on researching the impact of AI on education.[11]

C. Technical Aspects of AI in Education- AI-aided education includes intelligent education, innovative virtual learning, and data analysis and prediction. Major scenarios of AI in education and key technologies supporting are listed in Table 1. Note that AI-enable education is playing a more important role as learning requirements promotes [12]. Intelligent education systems provide timely and personalized instruction and feedback for both instructors and learners. They are designed to improve learning value and efficiency by multiple computing technologies, especially machine learning related technologies [13], which are closely related to statistics model.

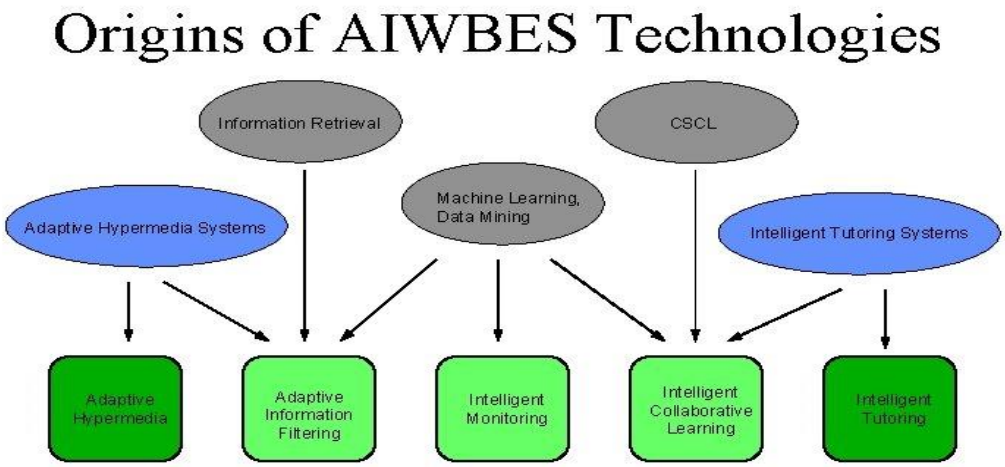
AI Education Model- In AI learning system, learner model is critical for improving independent learning capabilities. It is established based on behavior data of learners generated from the learning process. Learners' thinking and capability is analyzed to assess their learning abilities. Then knowledge analysis are mapped to obtain learners' knowledge mastery. Learner modeling establishes connections between learning results and various factors including learning materials, resources and teaching behaviors [14]. Knowledge model establishes knowledge structure map with detailed learning contents, usually including expert knowledge, rules of making mistakes often made by learners and misunderstanding [15]. Combining knowledge field model and learner model, teaching model determines the rules to access knowledge field, which enables instructors to tailor teaching strategies and actions. As education evolves, learners are likely to behavior positively, take actions or seek for help. AI system can always be prepared to offer aid from tutoring model's built-in teaching theories. User interface explains learners' performance

through multiple input media (voice, typing and click) and provides output (texts, figures, cartoons and agencies). The advanced humanmachine interface provides AI-related functions including natural language interaction, speech recognition and learners' emotion detection.[16]

Intelligent Education Technologies-Machine learning, learning analytics, and data mining are closely related technologies for education. At present, two communities have evolved based on learning analytics and educational data mining. They overlap in objectives and techniques and benefit from a variety of disciplines, including machine learning, data mining, psychometrics of statistics, and data modelling [17]. The field of learning analytics is more focused on learning content management systems and large-scale test results. Data mining originates from the community of intelligent tutoring systems, work on very small scale cognition.

A. Learning: Sharma et al. observed that AI in education has taken the form of adaptive learning systems, intelligent tutoring systems, and other systems that improve the quality of administrative processes, instructions, and learning [18]. In agreement, Pokrivcakova observed that in education, AI takes the form of intelligent systems with adaptive capabilities [19]. United Nations Education Scientific and Cultural Organization (UNESCO) observed, that AI has permeated various sectors of the society, more particularly, the education sector, as discussed for example, instructions or teaching methods, approaches, and tools [20]. From the analysis of the selected articles, another trend or application of AI in education is in the form of AI in web-based education. For example, Kahraman, Sagiroglu, and Colak, in their study, discussed the development and use of AI in education in the form of Adaptive and intelligent Web-based educational systems (AIWBES), which are fast replacing the simplistic leveraging and use of the Internet and the World Wide Web.[21]

AIWBES is the integration of AI principles and technology into web-based learning platforms, which improves the learners' experiences. Indeed, Peredo et al. also describe the integration of AI into web[22]



based platforms. They posited that intelligent web-based education (IWBE) has emerged as an important component of education, more so with the proliferation of online education. Rus et al. posited that intelligent tutoring systems (ITSs) perform a wide range of functions, including grading and providing students with feedback on their work [23]. Instructors, working with ITS achieve improved effi- ciencies in various administrative tasks, as well as their core responsibilities, providing guidance and instructions to help students excel in their studies.

B. Administration: AI has improved efficiencies in the performance of different administrative tasks that instructors, would require a lot of time to perform in the absence of AI.Other studies have also highlighted the integration of AI into machines or robots and creation of powerful instructional tools and improvement of the quality of the applied pedagogical strategies. Indeed, Timms highlights that another key form of application of AI in education as an instruction tool is the integration of AI in education principles in robots, the development and use of robots as teacher assistants and colleagues, cobots, which can be used to undertake basic and even advanced d teaching tasks, such as teaching students to read and pronounce words [24]. Indeed, Sharma et al. observed that the integration or the use of AI in education, more particularly, integration with other technologies and use as instructional tools, has resulted in the development and use of better teaching tools [25].

C. Instruction: An analysis of different articles showed rapid uptake and use of AI, in different forms for instructional purposes or as a pedagogical tool by instructors. The use of AI for instructional purposes or as a pedagogical tool has had a major impact on this aspect of education. It has improved effectiveness, efficiency, and quality of the work done by instructors as adduced from the different publications reviewed and analyzed. Efficiency and quality within

this context, is measured by the delivery of the relevant content in line with the curriculum and in line with the learner specific needs and capabilities, while effectiveness is assessed by the implied uptake and retention or the achievement of learning by the students or the learners. Considering these operational definitions and description of efficiency, quality, and effectiveness, the findings of the study therefore indicate AI has fostered the realization of quality, effectiveness, and efficiency in instruction or teaching.

From the analysis other important themes, or ways in which AI has affected the quality of instructors' works were also identified. Some studies highlighted the role of technology in more particularly, AI in fostering academic integrity, using plagiarism checkers and proctoring and online supervision of students' activities on platforms such as Grammarly, TurnItIn and White Smoke among others [26]–[28].

Result And Discussion:

From the different articles and studies reviewed, it is evident that with technological innovations and advancements, computers and computer related technologies, and other innovations have encouraged the development of artificial intelligence, which has permeated different sectors of the society, and will potentially have a major impact on different industries in which it is used. One of these areas in which AI has been applied, and is resulting in a major impact, is the education sector. As a foundation, and basis for understanding how AI has impacted education, a definition and description of AI was deemed essential. AI provides students with practical or experiential learning experiences, particularly when used together with other technologies, such as virtual reality, 3-D, gaming, and simulation, thereby improving the students' learning experiences. One study discussed or highlighted the adverse impact of AI, degradation of academic integrity and cheating using paper churning and paper mill services facilitated by AI. Most of the studies analyzed demonstrated and explained the different ways in which AI, including integration, benefits, and impact on administration, instruction, and learning when used in education. The positive effects, the pros, outweigh the cons, or the negative effects.

Conclusion

The objective or the purpose of this study was to assess the impact of AI on education. A qualitative research study, leveraging literature review as a research design and method was used. Journal articles, professional publications, and professional conference reports were identified and used in an analysis that facilitated the realization of the study purpose. The development and use of computers and computer related technologies harbingered research and innovations that have led to the development and use of AI in different sectors. Particularly, the development t of the personal computers, and later developments that have increasing the processing and computing capabilities, as well as the ability to integrate or embed computer technologies in different machines, equipment, and platforms, have encouraged the development and use of AI, which has been shown to have a major impact on the sectors it permeates. AI has

been extensively adopted and used in the education sector, particularly, in education institutions, which were the focus of this study. The analysis focused on evaluating the impact of AI on administrative, instruction, and learning aspect of education, with a focus on assessing how AI has been applied and the effects it has had. AI in education initially took the form of computers and computer-related systems, and later, the form of web-based and online education platform. Embedded systems have made it possible to use robots, in the form of cobots or humanoid robots as teacher colleagues or independent instructors, as well as chatbots to perform teacher or instructor-like functions. The use of these platforms and tools have enabled or improved teacher effectiveness and efficiency, resulting in richer or improved instructional quality. Similarly, AI has provided students with improved learning experiences because AI has enabled the customization and personalization of learning materials to the needs and capabilities of students. Overall, AI has had a major impact on education, particularly, on administration, instruction, and learning areas of the education sector or within the context of individual learning institutions.

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