An Analysis of Artificial Intelligence in Education

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Abstract—The main aim of this research is to analyze how artificial intelligence (AI) is affecting in the field of education. According to the research, AI has been widely adopted and used in education, especially by educational institutions, in a variety of ways. In the beginning, artificial intelligence (AI) was represented by computers and computer-related technologies. It then evolved into web-based and online intelligent education systems, and finally, with the use of embedded computer systems and other technologies, humanoid robots and web-based chatbots were used to perform the duties and functions of instructors either alone or in collaboration with instructors. These platforms have helped teachers to improve the quality of their instructional activities and carry out various administrative tasks, such as reviewing and grading students' assignments, more quickly and effectively.

Index Terms—AI, Education

I. INTRODUCTION

The use of computers in various areas of the education sector, more specifically, various departments in educational institutions, has been made advancements in computers and related computing technologies, building on earlier research into programmed instructions from the mid-1900s [1]. One such area is the development of computer aided instruction and learning (CAI/L) in classroom interactions. The use of computers in education has increased in various ways, later developments in computer and computer-related technologies, such as networking, the internet, the world wide web, and increased processing, computing, and other capabilities, including different programmes and software packages that are task oriented.

The advancement of computer and information transmission technologies over time has facilitated the creation of artificial intelligence. According to Coppin, artificial intelligence is the capability of machines to adjust to new situations, deal with emerging situations, solve problems, provide answers, devise plans, and carry out a variety of other tasks that call for a level of intelligence usually displayed in humans [2].

Several departments in educational institutions or the education industry as a whole have adopted artificial intelligence. The use of artificial intelligence in education has had a significant impact in efficiency in education administration, global learning, personalized/customized learning, smarter content, and more [3]. As artificial intelligence continues to advance, new educational applications become possible.

II. ARTIFICIAL INTELLIGENCE IN EDUCATION

AI-aided education includes intelligent education, innovative virtual learning, and data analysis and prediction. For both teachers and students, intelligent education systems offer timely, personalized instruction and feedback. They are designed to increase the effectiveness and value of learning through the use of various computing technologies, particularly those connected to machine learning [4], which are strongly tied to statistical models and cognitive learning theory.

Data mining, machine learning, and learning analytics are all closely related educational technologies. Currently, two communities have developed based on learning analytics and educational data mining. The fundamental process of machine learning is knowledge discovery, which is the parsing of a sampling data set known as “training data” to produce organized knowledge and significant patterns. Additionally, this technology can assist teachers in better understanding how each concept is being absorbed by students [5]. This allows teachers to modify their teaching strategies based on cumulative student performance, which might improve learners' understanding of the content. When it comes to grading student assignments and tests, machine learning's image recognition and prediction capabilities can produce findings faster and more accurately than a human. The primary focus of learning analytics is on data from student characteristics and knowledge objects from learner models and knowledge field models. The idea of "learning analytics" introduces new technology, specifically "machine learning," which is used in the non-technical field of education. The purpose is to tailor educational method to the individual learner’s need and ability, such as intervening with students at risk or providing feedback and instructional content [6]. AI-based educational data mining attempts to create inbuilt association rules and provide students with knowledge items tailored to their individual needs. Data mining is becoming into a potent tool for enhancing learning and information mastering, which will help us better understand educational environments and learners. In other words, data mining can be understood as the application of pattern recognition and predictive modelling to uncover hidden knowledge, enabling educators to make changes to curriculum development.

III. METHODOLOGY

The online learning session [7] and the AI modelling [8] were the two main steps of the research procedure in this work, as illustrated in Figure 1. Six learning resources were provided to the students during the online learning session so they could
learn about the notion of numbers. After the lesson, the students were asked to rank their preferences for the six learning materials on a scale of 1 to 5. A ranking matrix was created using these ratings in order to train the AI. The next step was cleansing the data by deleting any incomplete information before the AI modelling process could begin. The cleansed data were then divided into training and test sets. The percentages were 80% and 20%, respectively, of the total data. We used the training set to do five-fold cross validation in an effort to find the hyperparameters value that was the most ideal. The three hyperparameters that were to be searched were $\alpha$, $\eta$, and $\lambda$. The range of possible values for $\alpha$ was 0.1, 0.15, 0.2, 0.25, and 0.3. The search space for both $\eta$ and $\lambda$ was 0.01, 0.005, 0.001, 0.0005, 0.0001. The main model was then trained using the entire training set using the optimal configuration. The Adam optimizer was employed in both the primary training stage and the cross-validation step of the training procedure [9]. The capacity of the resulting model to generalize was then evaluated using the test set. Root Mean Squared Error (RMSE), a standard statistic for assessing regression models, served as the test's metric. It is determined by taking the root of the outcome and raising the difference between the prediction and the actual data to the power of two.

IV. IMPACT OF AI IN EDUCATION

The actual consequences of AI on administration, instruction, and learning are addressed in more detail in this section.

The execution of administrative and management tasks in education has been significantly impacted by the application of AI in education, in its various forms and fulfilling distinct functions. It has made it possible for educators to carry out their administrative duties, such grading and giving feedback to pupils, more successfully. AI has simplified administrative procedures and increased teacher or instructor effectiveness and efficiency when instructing and guiding students. A wide range of features offered by intelligent tutoring systems enable teachers to carry out many administrative activities, such as grading and providing feedback [10].

This area of education has been significantly impacted by the use of AI in instruction or as a pedagogical aid. According to the various articles that have been evaluated and examined, it has enhanced the effectiveness, efficiency, and quality of the job done by teachers. Effectiveness is measured by the implied uptake and retention or the achievement of learning by the students or learners, while efficiency and quality are measured by the delivery of the pertinent content in accordance with the curriculum and in accordance with the learner's specific needs and capabilities. More so in online and web-based learning platforms, AI ensures improved course content dissemination starting with the curriculum building phase and continuing through real content or instruction delivery.
AI systems will be effective in reducing the workload on teachers as the number of pupils in educational institutions rises. AI algorithms assist teachers in analyzing the curriculum and course materials to provide personalized content [11]. These systems can also generate and grade exams after analyzing. Eventually, this would free up teachers to pay more attention to urgent problems like student performance. AI solutions can more effectively analyze study data in individualized teaching and autonomous learning, assisting teachers in developing individualized lesson plans for each student. Another developing problem for AI in education is human prejudice. To eliminate bias, AI solutions can assess essays and examinations using the current standards and benchmarks [12]. Computer vision-based AI systems that read and recognize photographs of handwritten documents can accomplish this. Such technologies not only lessen bias but also shield students from plagiarism and cheating.

V. CONCLUSION

Identifying the effect of AI on education was the goal of this research. The creation and use of computers and computer-related technologies paved the way for study and inventions that eventually led to the creation and application of AI in a variety of fields.

It has been demonstrated that the use of AI, which has been shown to have a significant impact on the sectors it permeates, has been stimulated in particular by the development of personal computers and later developments that have increased the processing and computing capabilities as well as the ability to integrate or embed computer technologies in different machines, equipment, and platforms. AI in education first appeared as machines and computer-related systems, then as web-based and online learning environments. In addition to using chatbots to perform teacher or instructor-like tasks, embedded systems have made it possible to use robots, such as cobots or humanoid robots, as autonomous instructors or teacher colleagues. In general, AI has had a significant effect on education, especially in the administration, teaching, and learning areas of the education sector or within the context of specific educational institutions.

REFERENCES