

NAVIGATING THE FUTURE : UNVEILING THE DYNAMICS OF INDUSTRY 5.0

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THE DYNAMICS OF INDUSTRY 5.0

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PREFACE

In an era marked by technological revolutions, the concept of Industry 5.0 stands at the forefront, promising a paradigm shift in the way industries operate. As we navigate the ever-evolving landscape unravel the intricacies and possibilities that Industry 5.0 holds. “Navigating the Future” invites all attendees to be active contributors to the ongoing dialogue that shapes the future on industries, fostering a community of forward – thinkers and innovators who are well – equipped to drive positive change in the world of Industry 5.0

Industry 5.0 is regarded as a fifth industrial revolution in which consumers could satisfy their individual requirements as per the tastes and expectations. Although the repetitive tasks are done by robots in Industry 4.0 which is at the mass customization level, Industry 5.0 aims to perform mass personalization with help of Artificial Intelligence.

Industry 5.0 is expected to revolutionize the production process with higher autonomy to collaborative robots. Industry 5.0 is the futuristic industrial revolution which is expected to bring in more creativity and innovation in the products by allowing robots to perform repetitive tasks. It is expected to utilize the creative intellectual capability of human optimally. Moving from mass production to custom manufacturing techniques and production system digitization and intelligentization.

In the lines if above, the PG & Research Department of Commerce has organized two days Conference on the theme “Navigating the Future: Unveiling the Dynamics of Industry 5.0” with the following objectives, to understand and gain knowledge on the functional areas of Industry 5.0; to provide a holistic understanding of the multifaceted dynamics of Industry 5.0 and to enhance the research aptitude among the academicians, scholars towards dynamic changing environment.

To get more insights on the above theme, research articles were invited for presentation and publication. The Department has received fifty (50) articles on various sub-themes from Professors and research scholars of various colleges in Tamil Nadu, Kerala and Karnataka. The Editorial Board has reviewed and edited all the papers scrupulously and meticulously with plagiarism check.

The Editorial Board has recommended and forwarded all the articles in the form of Edited Book with ISBN Publication Number for disseminating the knowledge to all the stakeholders of Higher Education Institutions and Industry concerned.

This book is a comprehensive guide for understanding and utilizing on various themes to generate indepth knowledge on it and suitable for research scholars as well as corporates. We hope that you will find this book informative and inquisitive as much as we learnt it.

Editorial Board.

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A STUDY ON THE IMPACT OF ARTIFICIAL INTELLIGENCE IN EDUCATION AND TEACHING

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Abstract

This study explored the possible research directions and obstacles around Artificial Intelligence (AI) in education by doing a content analysis of publications that sought to reveal how AI has been used in the field. The research topics fell into three categories, according to the subject matter analysis: integration layer, application layer, and development layer. In addition, an evaluation of AI in education and four academic themes -Internet of Things, swarm intelligence, deep learning, and neuroscience were recommended for more study. However, the study hypothesized that problems in education could be brought on by AI in terms of improper application of AI methods, shifting teacher and student roles, and social and ethical concerns. The outcomes shed light on an overview of the AI that was employed.

Keywords : AI (Artificial Intelligence), ML (Machine Learning), Education, Pedagogy, Big data, Cloud Computing, Educator, Learning, Algorithms.

Introduction

Artificial neural networks, also known cloud computing, machine learning, big data, and machine learning have made it possible for engineers to build a machine that can mimic human intellect. Building on recent technological advancements, this study defines artificial intelligence as the ability of machines to detect, recognize, learn, react, and solve problems. Many people now believe that artificial intelligence (AI) will play a key role in the fourth industrial revolution and could even spark a fourth revolution in education.

Additionally, AI education is also being included in educational curricula. But just as the invention of computers and televisions was previously heralded as a revolution in education, so too have these technologies been demonstrated to improve information availability without significantly altering fundamental teaching methods. Teachers still have a responsibility to assess the capabilities of AI today and pinpoint potential avenues for improving student learning. Reviewing contemporary AI research in education is timely given the growing interest and will give teachers a current understanding of the topic in advance of any potential changes. The idea that AI has strategic value for education has gained traction.

The role of teachers will probably change as more ITSs are developed for more disciplines and themes; as a result, education may need to be rethought. Teachers are quite concerned about whether AI may make their jobs more difficult. Simultaneously, researchers and educational practitioners are currently debating issues like what is being

learned and how AI is being used. Researchers questioned if, given the rate at which automation is replacing many other vocations, advances in AI might pose a threat to or potentially replace the role of teachers. The necessity for teachers' professional roles to change as AI develops is becoming increasingly apparent, and this will lead to the emergence of new organizational structures.

Objectives

- To view the various dimensions of AI implementation in Education.
- To analyse the Research Trends of AI in Education.
- To discuss the evaluation and challenges faced while confronting AI in Education.

Dimensions of AI implementation in Education

Dimension of Development

Generally, three elements frequently constitute the construction of an instructional system: the data dimension, the logical modelling, and the presentations. One plausible explanation could be that modelling approaches served as the cornerstone of artificial intelligence techniques and permeated every step of the system development process. In this dimension, the majority of the research was carried out in the fields of computer science and information science, and very few pedagogical designs were documented. The domain knowledge was imported into the algorithm frame as the source material.

Furthermore, educators face challenges in successfully analyzing qualitative data due to the expanding amount of data. Natural language processing (NLP) expedited and simplified the process of discovering what was contained in the data, thereby offering a way to diagnose the issue and offer a remedy. Nevertheless, a deeper level of information retrieval is needed for the evaluation of a complicated educational system. In order to model more intelligent computer-aided systems where agents may be educated automatically, it was suggested to integrate several methodologies, such as the benchmark in the field of NLP/Semantic Web.

Teachers are starting to investigate appropriate uses of AI methods in their instruction. As of right now, a few AI applications have successfully integrated pedagogical design, domain knowledge, and technique. This review identified three categories of AI-based pedagogical applications: reasoning, adaptive learning, and feedback.

Inappropriate content sequencing is one of the issues affecting individualized learning. The goal of reorganizing presentation sequences is to redefine the way knowledge is organized based on the responses of the students. Feedback is a crucial strategy in this case to satisfy students' proximal learning habits. The system makes use of an artificial neural network to give students rapid feedback based on their input, assisting them in progressively grasping the abstract ideas and carrying out practical activities.

The intelligent system's generation of hierarchical reasoning benefited students' learning. First of all, it may assist students in best understanding the connections between the many parts of a given subject. In exchange, the student's ability to comprehend adequate concepts for the assigned topic can be evaluated using the intelligent reasoning system. Secondly, the system has the potential to facilitate contentious interactions, which are crucial for creating a collaborative learning environment. It's because students often

externalize their arguments and strengthen their premises as a result of the thinking of their peers.

Secondly, massive information gives the adaptive system more power. Since personalization is the primary function of an adaptive learning system, intelligent personalization requires the collection of large amounts of data, including a wide range of individual attributes, learning preferences, and styles. Nevertheless, the features of users that are connected to domain knowledge are the only ones covered by research on personalization in the context of adaptive systems. Less attention was paid to and research was done on the deeper internal characteristics, such as human mental health and creativity.

Dimension of Application

The application component emphasizes how crucial it is to incorporate human affection while using AI in teaching. According to the most recent studies, attachment has been shown to have a major impact on perception, learning, and decision-making. Four different types of learning models—biofeedback, role-playing, immersive learning, and gamification—were created using attachment analysis and AI techniques.

In order to optimize the efficacy of the affection computing technique, two key elements are required: first, teachers must adapt their lessons in a timely manner based on the affective status of their students; second, a single source is unlikely to provide an accurate analysis of affection when it comes to the comprehensive operation of multimode affection sources.

Through an assortment of roles, role-playing is an instructional strategy that encourages students to consider issues related to affections. In certain algorithms, role-playing is incorporated into the pedagogical design and students are taught by an intelligent agent instead of the learning system. Additionally, the politeness presentation mode was used in the intelligent tutoring systems to encourage students to act as a companion to an intelligent agent, which was seen to help the less fortunate students.

Through the implementation of immersive learning, students can personalize scenarios featuring characters in full-view learning environments. Improvements in XR, 3D graphics, and wearable technology have the potential to improve learning outcomes. These are closely linked to immersive affection, which in turn produced good perceptions in students as well as positive academic outcomes and feelings of excitement, passion, and inventiveness. Above all, a lot of immersive learning resources support students' desire to design and alter their surroundings, which may stimulate creativity.

The concept of gamification has become a significant theoretical idea in the field of education. The instructional design, domain knowledge, and affection features of the best educational games are strongly integrated with the gameplay. The game and knowledge domain have been better integrated thanks to AI, and there is still room for the game to dynamically adjust to the preferences and behaviours of its users.

The Research Trends of AI in Education

Technology Adoption of Internet of Things

Research to this point has primarily been focused on virtual online systems; the Internet of Things (IoT) has received less attention. Further studies on teaching must examine learners' biofeedback. The majority of AI technology in education, according to the evaluated papers, concentrated on online information technology or systems, such as intelligent virtual laboratories, intelligent tutoring systems, and assessment systems. Nonetheless, the Internet of Things has a lot of potential to support a variety of learning materials and learning styles. In science classes, it might improve the mechanical and spatial comprehension of physical construction processes among pupils. According to two qualitative investigations, the use of IoT technology to imitate brain functions in a physical setting and sense and comprehend human cognitive behaviours appears to improve human cognition and performance.

Swarm Intelligence in Education

The development of swarm intelligence has emerged as a key area for AI, one that will fundamentally alter the roles of educators and learners. The chosen papers state that swarm intelligence was introduced into education in 2012, after the decentralized theory was initially examined in education in 2011. Nevertheless, no empirical research has looked at how educators and learners respond to swarm intelligence's problems. Given the characteristics of swarm intelligence, it is anticipated that the next two subjects will likely become the main areas of research.

First of all, centralized control over individual behaviours is not a prerequisite for swarm intelligence. In this setting, students transition from being knowledge consumers to producers. Through many context-based interfaces with the system, they actively constructed knowledge. A group of seasoned professionals, including engineers and farmers, might question the "authorities" of teachers, and a swarm intelligence system would build a joint curriculum. Furthermore, the role of teachers may shift from knowledge transmission to knowledge organization as a result of swarm intelligence.

Deep Learning and Neurocomputation

Future interactions between humans and machines will be reshaped by machine learning and deep learning. The idea that a human operates a machine will no longer drive trends in human-computer interaction. Rather than requiring special programming, the machine can learn from large data sets to enhance its predictions. Pearson and IBM have suggested looking into brain-based educational systems based on neuroscientific understanding of the brain. It will have an impact on how AI is used and integrated into educational programs like role-playing and adaptive learning.

Evaluation and challenges of AI in Education

Evaluation of AI in Education

To assess the efficacy of AI in education, a comprehensive evaluation standard must be developed. Adopting a multidimensional model that incorporates technology, instructional design, domain knowledge, and human aspects will assure the validity and reliability of the evaluation. According to Woolf's Roadmap for Education Technology, it will be possible to track the success and failure of teaching tactics in addition to continuously assessing students' knowledge, progress, and learning settings in the age of AI Educational Data Mining. Additionally, the majority of researchers focused on physics, humanity, and social science as subjects, while paying less attention to sports, the arts, and special education. Meanwhile, professors and teachers received less attention.

Challenges in AI Confronted in Education

While AI is a promising issue, there are a lot of technological hurdles. The difficulties would be more complicated and multifaceted, particularly if they had an educational application. Three categories might be used to group the difficulties this review points out: social ethics, teachers and students, and technique. While AI techniques have demonstrated and anticipated intelligent computation in the field of education, they typically fall short of providing large-scale students with "added-value" because to cost concerns, with "basic value" still holding sway in the mainstream.

The reconsideration of the purpose of education is another significant challenge mentioned in the 2018 Horizon report. The success of integrating AI in education is significantly impacted by teachers' views regarding the technology. Instructors might range from utter opposition to excessive dependence. Inadequate, unsuitable, out-of-date, or irrelevant professional development may be the cause of the former. The latter could result from instructors' exaggerated expectations. These educators can place too much emphasis on the newest AI tools rather than the process of learning. Furthermore, from the standpoint of the students, artificial intelligence techniques have the potential to offer clever and effective tools that deter students from performing the knowledge processing tasks that professors have assigned.

Researchers and educators alike find the ethical problems raised by AI to be difficult. It was evident that AI has advanced significantly in recent years, primarily due to data availability and less expensive processing; yet, student data may be misused, shared, or exposed. Teachers and AI engineers will always have to be cognizant of the difficulty of deciding how to acquire, assess, and disseminate massive data and data analysis findings. Gamification has given rise to a noticeable ethical debate: should learning take precedence over enjoyment in games, or should gaming "suck out the learning"?

Conclusion

Rapid advancement of AI, it is critical to comprehend how teachers might best apply AI strategies to support students' academic performance. This study examined AI in research on education from 2010 to 2020. It is discovered that the existing research can be divided into three categories: the development category, which includes deep learning, matching, recommendation, and classification; the extraction category, which includes reasoning, feedback, and adaptive learning; and the application category, which includes gamification, role-playing, immersive learning, and affection computing. In addition, several research areas were found based on the relevant AI methods. These include deep learning, swarm intelligence, Internet of Things, neuroscience, and an evaluation of AI's impact on education. The difficulties posed by AI in education were also clearly visible in terms of the technique viewpoint, the responsibilities of instructors and students, and social and ethical concerns. For educational academics, students, and AI developers who intend to contribute to related studies, these findings may serve as invaluable references. Moreover, it is evident that in order to bridge the gaps between method and pedagogy, educators must collaborate with AI engineers.

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