[1]Supriya Nagarkar, [2]Minal D. Kalamkar , [3]Dr. Abhijit T. Parchure

Evolving New Educational Era with Machine Learning and artificial Intelligence: Future of E-Learning

[1]Supriya Nagarkar, [2]Minal D. Kalamkar , [3]Dr. Abhijit T. Parchure

[1]supriyanagarkar@gmail.com
Research Scholar
T.M.V., Pune
[2]minaldk@gmail.com
Research Scholar
T.M.V., Pune

[3]abhijitparchure@yahoo.com
Associate Professor
T.M.V., Pune

Abstract

Currently, rising technologies like machine learning and artificial intelligence support the process of e-learning scenarios in a positive manner. In modern teaching-learning approach and technology-based learning and teaching like; Machine Learning and artificial intelligence supports both teachers and students. With the evolution and adaptation of information and communication technology (ICT), multiple education applications have emerged in the current era. Hence, many institutes and universities have employed these systems to ensure better teaching and learning among students. In the performed scientific studies, many positive outcomes of machine learning-based e-learning support in the education field. As a result, one can predict that the future of e-learning will ultimately depend on artificial intelligence. Here, in this paper, the study aims to understand the importance of machine learning and the artificial intelligence-based future of e-learning.

Keywords: A*nalysis of data; Artificial intelligence; Machine learning; online education*

1. INTRODUCTION

Conventional learning and education work with the teacher-centric approach. Here, the process leads to frustration and lowers the students' interest; thus, students may decide to discontinue the course. Whereas the online learning system has caused a massive transformation in the sector of learning and education. Several modern teaching-learning systems like Machine Learning and artificial intelligence supports both teachers and students. With the rise of information and communication technology (ICT), multiple education applications have emerged in the current era. As a result, the concept of e-learning taken birth to set the new method of education. Here, e-learning is defined as the learning process conducted through software systems that works based on computer-mediated communications software and online methods to deliver the subject material. According to Al- Fadhli's (2008) study, "e-learning will be better and enjoyable option than the conventional method of teaching." [1]

Nowadays, huge investment is seen in web-based technology development due to its potential to improve learning and teaching. [2] Previous research study states that university students are open to accepting diverse e-learning system-based courses, and its demand increases day by day.[3] Also, the study states that students are approaching e-learning facilities as it allows them to learn from anywhere and anytime. [4]

Also, the focus of learning has been shifting from teacher-centric to student-centric to encourage independent learning. [5] Here, the researcher has observed one survey and observed that the development of an e-learning content of 1 hour requires 49 to 125-hour efforts. [6] Although many educational institutes are not investing in the development of the e-learning environment. So, it is essential to develop new ways to repurpose existing e-learning resources to match content development expense.

Technology is changing with enormous speed and constantly evolving boost work efficiency and making lives easier. Modern technology is enabling the connection among the globe and filling the gaps between user and technology. The progress in machine learning and artificial neural network are opening gateways to enhance the

effectiveness of learning. These technologies are shaping the future of e-learning. Based on the combined power of accurate prediction, algorithms, and analytics, these technologies are offering personalized e-learning experiences. In short, machine learning is related to development and study of systems that are capable to learn from available data. Hence, the researcher has tried to understand how these Machine learning and AI are the right tools to decide the future of e-learning.

The present research paper is organized in the following sequence: section 1 gives a brief introduction about the research topic and gives a clear understanding of research objectives, the purpose of the study, and related definitions and terminologies. Section 2 explains the review of the literature performed to attain the results; section 3 is about research methodology, and section 4 is about research findings and discussions. Then the last section is about conclusions and future work.

1.1 Objectives

- To evaluate the role of machine learning developments in e-learning
- To understand the role of artificial intelligence in learning
- To evaluate the future of e-learning

1.2   Purpose of the study

The fundamental aim of the present study is to understand how machine learning and artificial intelligence will support the future of e-learning. Also, the study aimed to perform an in-depth study to obtain more clarification on AI and machine learning in defining the future of learning.

1.3   Definitions

Definition of machine learning

- According to Arthur Samuel (1959), Machine learning is the method of study that gives learning abilities to computers without programming. [7]
- As mentioned in Machine Learning Algorithms and Applications publication, machine learning term is defined as the system that allows machines to learn without taking the help of programming languages. [8]
- According to Mohssen Mohammed Muhammad Badruddin Khan Eihab Bashier Mohammed Bashier, machine learning is a segment of artificial intelligence that enables machines to perform their jobs using their intelligent software. [9]

Definition of artificial intelligence

During the literature review, the research scholar observed that word, intelligence itself is difficult to define.

The researcher observed four different definitions of Artificial Intelligence as mentioned in "The New International Webster's Comprehensive Dictionary of the English Language, Encyclopaedia Edition" [10]

- Artificial Intelligence is an area of computer science concerned with the development of computers capable of engaging in human-like thinking such as learning, reasoning, and self-correction.
- Artificial Intelligence is the concept where machines are meant to boost the capabilities to work like human intelligence, such as learning, adapting, and self-correction.
- Machine learning is an extension of human-like intelligence implemented through computers. It works just like that of physical power extended through mechanical tools.
- It is the study of techniques to use computers more efficiently by using programming techniques.
- John McCarthy, first time defined Artificial Intelligence in 1956.
- According to Crevier 1993, Artificial Intelligence is "the science and engineering of making intelligent machines." [11]
- Poole et al 1988 suggests that prior AI textbooks, Artificial intelligence are the study and design of intelligent agents. [12]
- According to the definition given in quantum3, Artificial Intelligence is an ability of a machine to learn from experiences and act like human intelligence. Here, the machine can execute problem-solving, reasoning, understanding natural language, and logical reasoning. [13]

Definition of e-learning

- According to Rossi, 2009, e-learning is the fundamental concept involves a range of applications, learning methods and processes. [14]
- Based on the concept explained by European Commission (2001), e-Learning uses new multimedia technologies and the internet to enhance the quality of education by taking support of facilities and services. Also, it is the process of distant exchange and collaboration. [15]
- Abbad et al., 2009 explain that e-learning is any learning that is enabled through electronic media. [16]
- According to LaRose et al., 1998; Keller and Cernerud, 2002, e-learning is any learning that requires internet-based or web-based platforms. [17]

[1]Supriya Nagarkar, [2]Minal D. Kalamkar , [3]Dr. Abhijit T. Parchure

- According to the definition curated by Maltz et al. (2005), 'e-learning' is a term suitable to various aspects, including shared learning, online-distance learning, and hybrid learning. [18]
- OECD (2005), e-learning uses the information and communication technologies to conduct education processes to support and enhance learning in educational institutions. Further, e-learning uses information and communication technology to complement conventional classrooms by combining two modes.[19]

2   Review of literature

To attain the research objectives, the researcher has reviews available literature and mentioned it herewith. During the review, the researcher observed that machine learning is a sub-division of artificial intelligence and involves algorithms. These algorithms meant to predict possible results based on the user data. The modern machine learning system determines specific patterns, trends, understands that data, and offers personalized experiences. The entire system works automatically and conducts multiple tasks, including data extraction, evaluation till its representation. The autonomous system decides what to showcase to the online learner based on their previous performance. [20]

The researcher has observed that currently, educational studies are highly dependent on digital technology and improvements. In short, computer-oriented technologies are supporting the smooth functioning of education and ultimately enhancing teaching and learning experiences. According to previous research studies, e-learning is used to attain educational desires and goals in different educational conditions.[21] The recent revolutionary changes in artificial intelligence is supporting the growth and development of almost every field. Many digital technologies are stimulating human thinking as well as behaviours. Hence, artificial intelligence has been widely everywhere to obtain better solutions for certain concerns. During reviewing the literature, the researcher observed that artificial intelligence supports the development of effective, advanced e-learning systems. Further, the researcher observed that many scientific studies were performed to understand AI-related methods, approaches, and techniques to support education. [22]

From the previous studies, it is observed that implementing artificial intelligence in education offers many advantages to teachers and researchers. The previous studies have them resolve multiple teaching and learning issues using mathematically and logically advanced AI solutions. Further researcher has observed that many educational institutions prefer to design artificial intelligence-based e-learning methodologies to conduct educational activities. Here, AI-based solution improves teaching and learning experiences. The researcher has observed the study performed by Harley et al., 2015, which states that many people use emotion-aware intelligent approaches to carry out their tasks. [23] Here, it is the sign of future education will be entirely dependent on artificial intelligence.

Further, the researcher reviewed the literature to understand the importance of e-learning. Here, e-learning is the distance education method that offers synchronous and asynchronous exchange of educational information over a communication network. [24] It is a learning process that establishes synchronous relations between student and instructor. In e-learning, the education is completed remotely using electronic correspondence. [25] While reviewing, the researcher found that many institutes started using course management software to provide a positive experience of e-learning to overcome challenges in conventional learning. The learning sector is moving towards the electronic mode. This transition of the learning process from the traditional to the virtual one offers comfort to the users, besides enriches their knowledge. [26] Machine learning works in alliance with the learning models that work in alliance with the learner's information. The researcher observed that machine learning supports:

Supervised learning

It is a machine learning task that works using labeled training data. [27] Here, the researcher observed that supervised learning uses past experiences and the latest information sets to make predictions to showcase results. [28] Here, the system requires inputs and outputs from the programmer to train the software. With the passing time, the system is becoming autonomous and constructing outputs and targets for new data set.

Semi-supervised Learning

It doesn't involve classifications or labelling of data. Here, this machine learning system makes future predictions by evaluating data to define patterns and makes. The system detects more obscure trends or insights from the data and does not map the input to an output.

Reinforcement Learning

It is a sort of machine learning that covers specific tasks that the system must complete. While conducting the process, the system receives feedback to learn the target behaviors. The system deals with an error while working on the task. It is the most effective approach that offers reinforcement signals.

3. Research methodology

Research is a systematized effort to gain new knowledge, as stated by Redman and Mory. Research methodology is a process that the researcher follows to obtain information and research data from the selected users to support decision-making. In the current paper, the researcher has studied research publications, interviews, surveys, and research techniques of present and past events. For obtaining answers to research objectives, the researcher developed a specific research outline, including a review of literature, data collection, data analysis, and findings. Then performed data analysis to check the authenticity of obtained data to support research goals. Here, in the present study, the researcher has performed online and offline observations to understand the role of Machine Learning and Artificial Intelligence in defining the future of e-learning.

4. Findings

4.1 Role of machine learning developments in e-learning

After performing a thorough literature review, the researcher observed that machine learning developments play a crucial role in improving e-learning. Several machine learning techniques that aides in improving e-learning frameworks by increasing the student's interest. [29] Further, the researcher observed that machine learning development supports e-learning in many ways and holds many advantages. Many machine learning and AI platforms support the future of e-learning and institutes involved in modern digital learning platforms like algorithms and automated delivery of e-learning content.

- **Machine learning offers personalized e-learning content**

Machine Learning algorithms offer accurate results and support learners in obtaining specific e-learning content using previous performance and personal learning targets. Here, the researcher observed that machine learning works using online learners' history and automatically adjusts their learning course, including games and simulations. Also, it supports learners lacking the particular skill will receive system-generated suggestions to build their lacking skills and abilities. As a result, the learner can collect the essential skill set through a machine learning-based e-learning system. Additionally, the machine learning system delivers e-learning content in a personalized manner to ensure comprehensive learning.

- **Machine learning allows better allocations**

Every leaner or student holds different intellectual power and grasping capacity, although AI and machine learning works well to allow learning among every individual. The system works considering the needs of user and offer high-level of customization through learning management systems and other capabilities of machine learning system.

Machine learning system allows online learning in getting right online resource to fulfill their learning targets. It supports learners in getting required data quickly to support the e-learning process and saves time and energy. Additionally, the researcher has observed that machine learning-based e-learning improves the value of the outcome. Machine learning saves the time and effort to search for the desired information, ultimately increasing the profit ratio. Here, machine learning and artificial intelligence tools maintain a record of learners' online activity and provide results.

- **Machine learning aided e learning motivates learner**

Machine learning tools offer personalized experiences to the learner by eliminating irrelevant topics. Here, it prevents the learners from distractions and saves their time in finding relevant information online. Also, machine learning motivates students to stay on their content and attain their goals. Machine learning based e-learning tools allows students to learn and understand concepts in their own pace. AI based system offers immediate results and feedback on data submitted by students, hence it becomes easy for them to read topic again and resubmit the assessment.

4.2 Role of artificial intelligence in learning

Here, researchers have observed that rapid developments in technology such as artificial intelligence support various industrial sectors, including education. [30] Machine learning or artificial intelligence based learning involves use of computer and internet based technologies to produce learning, teaching content to regulate process of learning smoothly. Since the development of AI, it has received a valuable place in schools and educational institutes. AI offers multiple opportunities to the learner and improves their engagement which was absent in conventional document-based learning. Further, the researcher observed a study performed by eSchool News states that AI plays a crucial role in education, and its use is growing by 47.5% in 2021. [31] AI-based

[1]Supriya Nagarkar, [2]Minal D. Kalamkar , [3]Dr. Abhijit T. Parchure

learning supports everywhere from kinder garden to higher education. It creates multiple opportunities to the learner to enhance the learning experience.

- **AI based learning offers smart content**

AI system generates smart learning content from digital textbooks to customized learning interfaces. Also, it makes available smart content to learners of all grades from primary to corporate levels. Here, the system works in alliance with and considering the learning capacity of a learner; also, the system monitors the role and participation of students in offered content. AI platform customizes the feed of information based on learner behavior, requirements. The system generates content based on learner's choices and improves their engagement.

4.3 Evaluate the future of e-learning

E-learning holds the paramount importance of supporting the lifetime learning process, giving knowledge, and contributing to globalization and mobility. Well-crafted e-learning strategy and programs support in reaching success goals. During the review, the researcher has found that, according to Gartner Group or International Data Corporation, e-learning is a new buzz creating web-based educational option. It contributes to the growth of the digital economy. [32]

E-learning has been in existence for more than two decades, but now it is evolved into the mainstream. With the development of the internet of technologies, e-learning pedagogy techniques evolved. According to Downes, 2005, e-learning offers learner-oriented designs where students can control the virtual appearance and complete control the entire learning process. [33]

Further, e-learning has evolved a lot compared to its older version, and in the future, it will become more organic. According to Commission on Technology and Adult Learning; 2001:7, it is proved that e-learning is the form of instructional content or learning experiences delivered through electronic technology. As proof of this, it is possible to conduct e-learning through CD ROMs, videoconferencing, satellite-delivered learning, virtual educational networks, etc. In short, based on the previous studies, e-learning delivers improved and consistent lifelong learning, improves productivity, supports innovation, and brings a feeling of competitiveness. E-Learning is a simple process of delivering learning materials and examining proficiency and knowledge by electronic means. The development and flexibility of Information Technology open new approaches and new methods to enable learning. Here, technology is still evolving and offering certain practices and tools to support learning institutions and businesses.[34]

Conclusion

The researcher has observed that technology-based learning is essential, and it is growing with tremendous speed. In the present study, the research scholar has elaborated the role of machine earning and artificial intelligence to support e-learning briefly. Here, the researcher observed that an artificial intelligence-based e-learning suits well for students, teachers, and corporates. The growing e-learning technology has enabled the students to experience the improved learning and understanding of concepts deeply. In short, artificial intelligence-based developments are effective in obtaining positive changes in students' educational and personality development.

Nowadays, machine learning and AI-based e-learning engaging students in learning, allowing deep understanding and growing participation. With technology-based learning, students are actively collaborating with the teacher. Such collaboration is essential to experience the real potential of a student and e-learning systems. AI based learning system saves time for assignment submissions and its assessments. The advanced system offers quick insights and feedback on task submitted and fills the time lapses in learning. Machine learning and advanced AI allows students to experience personalized or one on one learning to receive best outcome. Further, intelligent-based learning offers the most suitable digital e-learning material to users based on their previous searches and learning capacities.

Here, the researcher suggests that it is essential to investigate the use of virtual and intelligent teaching techniques. Now the time has come for educational institutions to redesign and rethink the teaching style by considering machine learning and advanced AI tools. To attain sustainability in e-learning in the future, universities and learning institutions must consider the associated challenges and possibilities of advanced machine learning and AI technologies. Here, the researcher also suggests a need to focus on the role of teachers while working with the new models of e-learning. Apart from this, it is also necessary to limit AI and machine learning developments to highlight the richness of human knowledge and intelligence.

References

1. AL-Fadhli, S (2008). 'Students' Perceptions of E-learning in Arab Society: Kuwait University as a case study'. E-Learning 5 (4): 418 – 28

2. Jenkins, M., Browne, T., and Armitage, S. (2001). Management and implementation of Virtual Learning Environments. Report. UCISA. Available from https://www.ucisa.ac.uk/

3. Papp, 2000 & Volery; Lord, 2000 - https://core.ac.uk/download/pdf/132799025.pdf)

4. Palmer, S. R and Holt, D.M (2009). 'Examining student satisfaction with wholly online learning'. Journal of Computer Assisted Learning 25: 101– 113; Kerr, M. S., Rynearson, K and Kerr, M. C (2006). 'Student characteristics for online learning success. Internet and Higher Education 9: 91–105)

5. Pahl, C. (2003). Managing evolution and change in web-based teaching and learning environments. Computers in Education, 40.99-114. https://doi.org/10.1016/s0360-1315(02)00100-8

6. Chapman, B. (2010). How Long Does It Take to Create Learning? [Research Study]. Available from: www.chapmanalliance.com)

7. https://www.researchgate.net/publication/323108787_Introduction_to_Machine_Learning

8. Mohssen Mohammed Muhammad Badruddin Khan Eihab Bashier Mohammed Bashier, Machine Learning Algorithms and Applications, https://www.researchgate.net/publication/303806260_Machine_Learning_Algorithms_and_Applications

9. Mohssen Mohammed Muhammad Badruddin Khan Eihab Bashier Mohammed Bashier, Machine Learning Algorithms and Applications, https://www.researchgate.net/publication/303806260_Machine_Learning_Algorithms_and_Applications

10. http://www.eolss.net/sample-chapters/c15/e6-44.pdf

11. https://www.basic.ai/pdf/rpa_learn.pdf

12. Poole, Mackworth & Goebel 1998, p. 1 (who use the term "computational intelligence" as a synonym for artificial intelligence). Other textbooks that define AI this way include Nilsson (1998), and Russell & Norvig (2003) (who prefer the term "rational agent") and write "The whole-agent view is now widely accepted in the field" Template: Harvy. https://www.basic.ai/pdf/rpa_learn.pdf

13. www.quantum3.co.za) (https://www.basic.ai/pdf/rpa_learn.pdf

14. Rossi.P.G. (2009). Learning environment with artificial intelligence elements. Journal of e-learning and knowledge society, 5(1), 67-75.

15. European Commission (2001). The eLearning Action Plan: Designing tomorrow's education. http://www.elearningeuropa.info.

16. Abbad, M. M., Morris, D., & de Nahlik, C. (2009). Looking under the Bonnet: Factors Affecting Student Adoption of E-Learning Systems in Jordan. The International Review of Research in Open and Distance Learning

17. LaRose, R., Gregg, J., & Eastin, M. (1998). Audio graphic tele-courses for the Web: An experiment. Journal of Computer Mediated Communications, 4(2).

18. Maltz, L., Deblois, P. & The EDUCAUSE Current Issues Committee. (2005). Top Ten IT Issues. EDUCAUSE Review, 40 (1), 15-28.

19. OECD (2005). E-learning in tertiary education [Online]. Available at http://www.cumex.org. (Accessed 27 /02/ 2014)

20. https://elearningindustry.com/machine-learning-artificial-intelligence-future-elearning

21. Monahan, T., McArdle, G., & Bertolotto, M. (2008). Virtual reality for collaborative e-learning. Computers & Education, 50(4), 1339-1353.

22. Bulut Ozek, M., Akpolat, Z. H., & Orhan, A. (2013). A web-based intelligent tutoring system for a basic control course. Computer Applications in Engineering Education, 21(3), 561-571.) &(Conati, C., Heffernan, N., Mitrovic, A., & Verdejo, M. F. (Eds.). (2015). Artificial Intelligence in Education: 17th International Conference, AIED 2015, Madrid, Spain, June 22-26, 2015. Proceedings (Vol. 9112). Springer.

23. Harley, J. M., Lajoie, S. P., Frasson, C., & Hall, N. C. (2015). An Integrated Emotion-Aware Framework for Intelligent Tutoring Systems. In Artificial Intelligence in Education (pp. 616-619). Springer International Publishing.

24. Khan B.H. (1998). Web-based instruction (WBI): An Introduction. Educational Media International, 35(2):63-71. https://doi.org/10.1080/0952398980350202)

25. Clark, R. C., & Mayer, R. E. (2003). E-Learning and the science of education: Established strategies for consumers and designers of machine learning systems. San Francisco, CA: Jossey-Bass/Pfeiffe

26. Mark Nichols, (2003) "A theory for eLearning," Journal of Educational Technology & Society, Vol. 6, No. 2, pp. 1-10

27. Afshin Rostamizadeh and Ameet Talwalkar. 2012. Foundations of Machine Learning.MIT Press.

28. https://elearningindustry.com/machine-learning-artificial-intelligence-future-elearning

29. Mohri, M., Rostamizadeh, A., & Talwalkar, A. (2012). Basics of device learning. Cambridge, MA: MIT Press.

[1]Supriya Nagarkar, [2]Minal D. Kalamkar , [3]Dr. Abhijit T. Parchure

30. https://www.getsmarter.com/blog/market-trends/the-role-of-artificial-intelligence-in-the-future-of-education/

31. https://elearningindustry.com/artificial-intelligence-in-learning-role#:~:text=Artificial%20Intelligence%20(AI)%20makes%20it,also%20be%20applied%20to%20learning.

32. Georgescu Mircea, THE FUTURE OF E-LEARNING: DESIGNING TOMORROW'S EDUCATION, Iaşi, Romania

33. Downes, S. (2005). E-learning 2.0. eLearn, 4-7.

34. Tilak, G. (2020). Artificial intelligence: A Better and innovative technology for enhancement and sustainable evolution in education system.