Paper reviewed

Label	Article	Common Themes	Variables impacted by AI	Trends And Key Findings	Challenges	Future Directions
A1	[10]	Education System Data a feedforward spike neural network	Predicting the Academic Performances	The findings demonstrate the benefits of integrating student grade data and course information data to predict actual students' grades using a feedforward spiking neural network model.	Because data sources and characteristics are few, prediction accuracy and interpretability remain difficult.	Timely intervention by instructors and student adjustment of learning statuses is crucial to the harmonious development of teaching and learning.
A2	[11]	ML Learning analytics Data mining adaptive learning technology systems (ALTS	Deep learning automated and systematic responses.	AI in education has tremendously enhanced educational administration and management. AI has greatly influenced students' educational experiences, which this research examines.	New teaching and learning opportunities and challenges in higher education might change the governance and internal architecture of higher education institutions.	Competency learning enabled by AI may help schools predict future student talents. This data helps them prepare pupils proactively. Learning analytics employ AI's varied learning abilities in addition to competency-based education.
A3	[12]	Artificial intelligence-based educational techniques	Students' skills	Small and varied student groups with similar ability, learning challenges, and psychosocial and cognitive profiles may arise with broad adoption of intelligent procedures like those utilized in this research.	The algorithm may be used in conventional classrooms and digital/e-learning programmes to improve education by addressing multicriteria grouping and differentiation difficulties across many subjects.	Using natural language processing (NLP) may help adapt to changing markets and education languages, enabling automated systems to accurately and efficiently model learning systems with larger dependencies.
A4	[13]	K-nearest neighbor (KNN) Random forest, Bagging, Artificial neural network (ANN), Bayesian neural network (BNN)	Academic forecasting	Educational institutions use ML algorithms to predict students' learning patterns and academic performance, allowing them to identify at-risk individuals and devise measures to assist them improve.	Despite its merits, the ML technique to anticipating academic events has certain drawbacks, such as error risk, data gathering, and time complexity.	Machine learning is a potential forecasting technology that might improve academic forecasting and help the education sector plan and make better choices to improve education.
A5	[14]	Analysis and Visualization of Data Providing Feedback for Supporting Instructors Recommendations for Students, Predicting Student's Performance, Student Modelling, and Social Network Analysis.	Student performance in a higher education online course	Results show that the prediction model meets the accuracy, precision, and recall requirements for predicting virtual education students' teaching and e-learning behaviors.	The fast digital transformation in education will affect city structure and social interactions. Remote learning, either individually or via "virtual courses," will reduce the need for central campuses and infrastructure.	Virtual education will be a major impact of digitalization in the future decades. Digitization will change course content and delivery. Given the rising digital awareness and competency of kids, even preschoolers, curricula must reflect this technologically competent society to keep children motivated in learning. Flexible, standardized, and globalized curricula may enhance equity and alternatives.
A6	[15]	Artificial intelligence and machine learning	Students' perceptions of AI	The future of medicine depends on AI, thus learn about it. Even with these sentiments, research participants' institutions in Canada lack educational possibilities.	Participating students in Canada reported a lack of AI education. Since AI tools are moving toward clinical deployment and there are few AI education possibilities, they should be included in formal curricula.	AI technologies are anticipated to become extensively employed in the future, therefore educating the next generation how AI will fit into clinical workflow will set them up for success, boosting medical practise and patient care.
A7	[16]	The multiagent system (MAS) Decision Tree (DT) Logistic Regression (LR) Random Forest (RF) Naive Bayes (NB) K-nearest neighbors' algorithm (KNN)	Enhance the e-learning process in the educational environment.	This paper proposed a developed multiagent e-learning system to examine the interactions between agents that impact on e-learning process in the educational environment.		
A8	[17]	Intelligent Virtual Educational System	Improve the Efficiency of	The intelligent virtual educational system's encouraging results allow us	Assessing teachers' digital abilities and pedagogical use	Assessing digital abilities and teachers' pedagogical use is

		Primary Education	to focus on novel interactions in teaching–learning.	is essential to educate them to provide high-quality education that addresses digital problems.	essential to educate them to provide high-quality education that addresses digital problems.
A9	[18]	Deep learning (DL) augmented reality (AR)	LAB Training	To automatically recognize objects in a game engine, we used Mobile Net-SSD v2 and an AR target database. Augmented tutorials with mobile game infrastructure were created in Unity3D. The equipment's virtual handbook projects holograms on things detected by the app using a smartphone camera for an immersive experience.	AR creates immersive experiences in many ways. Some drawbacks include its inability to distinguish many things at once. DL models do well at identifying many things simultaneously. Integrating AR applications with DL models would trigger particular AR scenarios depending on camera-aimed items and enable a single tracking without affecting mobile device performance.	The software will have a 3D interactive breadboard to teach electrical circuits. Remote learning might be added to the planned AR- and AI-based teaching tool so students can study lab equipment through AR streaming on their phones or laptops.
A10	[19]	AI	Students' perceptions and experience	HEI professors' enthusiasm to employ AI relies on its capabilities and difficulties, according to our research. Instructors embrace AI at HEIs because to its potential, not difficulties.	Many research avenues exist due to teaching, learning, student assistance, and creative or entrepreneurial institutions. Higher education institutions should lead digital innovation and stay up with emerging technologies and intelligent machine computing capabilities.	The Serbian and Romanian educational systems need clear ideas from future study. Efficiently deploying new technology in higher education institutions, addressing possible challenges, and ensuring their acceptability will provide significant advantages.
A11	[20]	Artificial Intelligence in Education (AIEd) social networking sites chatbots machine learning personalized educational systems virtual educational environments	Personalized learning systems for students	AIEd technology' main benefits enable instructors to create tailored learning paths for each student. Most participants said AIEd technology boosted their interest in learning, helped them customise instructional material, sped the learning process, and encouraged brain activity.	The researchers acknowledge that data privacy and secrecy, political and commercial micro-targeting, and technology firms' incapacity to govern the economy are the biggest AI issues.	The suggestions on how to utilise the specially created programme based on AI-powered tools may be applicable to other colleges.
A12	[21]	Generative adversarial network (GAN). The dataset analyzed, visualized, and fed to different machine learning algorithms such as logistic Regression (LR), linear discriminant analysis (LDA), K-nearest neighbors (KNN), classification and regression trees (CART), naive Bayes (NB), support vector machines (SVM), and finally random forest (RF) algorithm.	Augment Tutoring in Higher Education	It is necessary to create emotional artificially intelligent systems that can be modified by students to fit their own speed, time, and location. The systems also need to be strong enough to support those who have experienced emotional trauma.	The cost-driven methods have no guaranteed returns, but short-term returns are negative. Individual acceptance of such changes is likewise uncertain. Our student evaluation system use case uses AI modelling using GANs and machine learning techniques for predictive modelling. Using supervised learning methods, predictive modelling reached 58% accuracy.	This article uses artificial intelligence to anticipate higher education's future. This study examines the contemporary education system and the challenges encountered by faculty, students, and changing government laws.
A13	[22]	Artificial Intelligence and Machine Learning	Education platforms and applications are more closely aligned with learners' needs and knowledge, making the educational	The findings showed that AI and ML improve learning via students' talents, collaborative HEI learning, and accessible research.	AI is essential for continuous and accessible customer service. Its employment in healthcare, where ethics are vital, is limited by the challenge of maintaining human uniqueness before society or its black-box paradigm. However, inexpensive and accessible AI	Future research should propose real AI and ML platforms and initiatives for HEIs, particularly in low- and middle-income countries, and promote best practises that might assist HEIs solve their issues.

		process more efficient			offers promise. AI is now "smaller" than other AI. However, if done well, the impact and depth will expand.	
A14	[23]	Artificial intelligence (AI) systems	Online Exam Supervision Technologies	Educational institutions and instructors interested in online proctoring technology should consider the kind of inquiries and governance and review mechanisms they need to justify and maintain accountability.	Some believe that online proctoring (OP) services are invasive since they allow examinees to be filmed and reviewed live or afterwards. Proponents of OP technology might address this concern: Education requires students to give their privacy.	Finally, we expect theoretical and empirical studies address the consequences of OP technologies. Theory-wise, this might involve examining their effects on students, instructors, and institutions, including academic integrity, fairness, privacy, damage, openness, autonomy, and responsibility.
A15	[24]	Machin learning Naive Bayes Decision Tree Random Forest Neural Networks	Prediction of students' grades student performance early school failure and dropout	The findings show that these methods can predict grades. The research shows that AI can anticipate scenarios with higher than 96% accuracy.	Today, predicting student grades benefits students and universities greatly. We can forecast and infer future circumstances thanks to AI. We need order, data, technique, and instruments to forecast.	Expand parameterization of suggested algorithms, focusing on Random Forest. To test the model and methods, add additional years of data. To add student demographic data to expand the research and reach further conclusions,
A16	[25]	intelligent tutoring systems tracing and tutoring the deci- sion tree	Students' learning outcomes	Our case study suggests that non-programmers may develop tutors using Example-Tracing and DECI-SION TREE tutoring. In particular, the agent-based method was faster at producing the experimental design instructor.	It's unclear whether non-programming writers can handle the issues of verifying the model's accuracy and completeness using this technique.	This research examines teacher development using apprentice learning models, or computer models that learn from examples and feedback. To complement these findings, we presented the Apprentice Learner Architecture, discussed its use for creating a unique experimental design instructor, and examined its capacity to produce seven other tutors in various domains.
A17	[26]	intelligent multilevel item bank (i-mib) model	evaluation of undergraduates	A mean of 4.60 and a standard deviation of 0.58 indicated that the I-MIB model for evaluating national undergraduates was adequate at the highest level.	The item bank must be constructed according to the learning goals and be an automated system that can evaluate test responses to create exams with varied degrees of difficulty following the standards.	The system may also use data mining to evaluate and uncover links with other exam data to advise students on their flaws, strengths, and goals. Additionally, test results may be utilised to enhance curriculum, teaching, and learning to guarantee that graduates with the same certification level meet similar quality criteria at national and international levels.
A18	[27]	intelligent decision support systems, intelligent systems, machine learning and educational data mining	ubiquitous learning environments	Machine Learning research are popular and vary in intervention effects. Sample size and algorithm choice vary in machine learning experiments.	Intelligent systems and educational data mining are homogeneous, unlike intelligent decision support systems. Studies show that intelligent decision support systems have smaller datasets and use.	Future research in all branches of artificial intelligence has the potential to deliver solutions for various u-learning platforms and technologies.
A19	[28]	Artificial intelligence and data analysis of learning management systems	Improve learning outcome.	In general, monitoring activities and learning provide indications for each approach. Some people's standards determine educational quality and expertise. Based on granular analysis of a vast amount of student data, the suggested approach improves resources and activities, making online education better. model that can respond agilely before events like dropout.	Universities may rearrange these activities' personnel resources. In general, monitoring duties and educational quality rely on people's standards.	Future work suggests integrating two crucial technologies into this approach. Blockchain technology protects student and institution data and procedures. Internet of things will also be crucial. Devices that collect data to enhance the instructional model are desired in this modality.

A20	[29]	5G model in general is made up of three main blocks: Enhanced Mobile Broadband, Massive Machine Type Communication and Ultra Reliable and Low Latency Communication	Educational users as beneficiaries of 5G technologies	The introduction of 5G technology and IoT devices in education will transform student learning, teacher research, and content delivery.	The implementation of 5G networks will transform business and academia.	This essay examined the changes that 5G networks would mostly bring about in terms of enhancing the teaching and learning process.
A21	[30]	A Naïve Bayes approach for supervised machine-learning of the dataset, a semi-supervised Bayesian approach to machine-learn.	STEAM students' AI-Thinking skills	Applying AI to think discursively allows STEAM students to develop their AI literacy, which in turn empowers them to formulate better questions and find solutions.	Artificial Intelligence (AI) Analytics may teach students AI-Thinking skills using AI-assisted human-centric reasoning to gain knowledge and competences.	Specific hypothetical situations were utilised to demonstrate how STEAM educators may use these simulations to teach AI-Thinking to their students, possibly via group discussions and then allowing each group to share their AI-assisted human-centric thinking with the teacher and class.
A22	[31]	AI	Teaching and learning in higher education.	AI software based on complex algorithms designed by programmers who may express biases or agendas in operating systems will replace many higher education instructional activities. Universities must analyse and seek ways to preserve civilization, distribute information, and produce wisdom.	Universities should reassess their role, pedagogy, and relationship with AI solutions and their owners. Higher education institutions anticipate the many opportunities and difficulties of using AI into teaching and learning.	Study on the ethical implications of the existing restriction on AI development and the danger of monopolizing human knowledge and viewpoints is needed.