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An Effective Method for Creating a Learning Management Systems (LMS) Prediction Model using Deep Learning Methods

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Abstract
This study explores the improvement of a learning management system (LMS) prediction model utilizing deep learning methods to improve educational outcomes in numerous learning environments. Transitioning from traditional to digital learning has posed challenges, inclusive of decreased flexibility and student engagement. Our research delves into those transitions' impacts on student success, focusing on customized learning studies, effective resource provisioning, and predictive analysis the usage of advanced computational methods. We employed deep learning techniques to analyze data from different learning modalities, together with cloud-based platforms and blended learning contexts, to expect pupil performance and resource desires appropriately. The evaluation involved neural networks and machine learning algorithms like Random forest, implemented to datasets from instructional settings to identify at-risk students and optimize learning management structures for better instructional consequences.

Keywords—*LMS, deep learning methods, education system, e-learning, recommender system.*

Introduction

Course delivery has changed as a result of the incorporation of e-learning tools with conventional classroom techniques. Online learning technologies called learning management systems, or LMSs, are used to create, organise, and deliver course materials. By facilitating the distribution of instructions and electronic resources, improving student learning, and freeing up instructors to concentrate on important pedagogical duties, learning management systems (LMSs) improve teaching and learning. Since Chinese students account for a sizable share of the international student market, LMSs are essential in China's and Australia's post-secondary education systems. The growing significance of Learning Management Systems (LMSs) has stimulated interest in empirical research studies that examine their influence on institutional stakeholders [1]. Versatile IT tool referred to as a learning management structures (LMS) is used to create and manipulate route internet pages for blended learning. It helps college students acquire, create, and disseminate expertise. LMS technologies are used to control learning materials and academic facts from a scholar-centered technique. Computer systems that create, distribute, and manipulate instructional statistics are referred to as learning management systems (LMS) from a holistic organisational perspective. LMS is critical for instructional, professional, and commercial enterprise instructional

programmes due to its particular technical features and substantial software, which have made it a unique area of studies and application [2].The successful implementation of Learning Management Systems (LMS) in education relies on factors such as instructor and student behavioral attitudes, university support, and information technologies as shown in Fig.1. The adoption of technology is crucial for successful implementation, especially in higher education.

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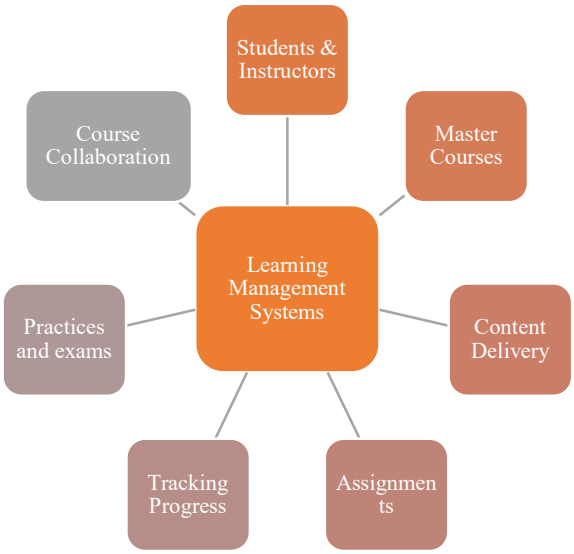

Fig. 1 Schematic representation of LMS

In order to address the needs of e-learning and facilitate course management for college students with-out tremendous technological capabilities, a research investigation carried out in [3] sought to discover the crucial aspects influencing students' behavioural motivation regarding NET-ClassR. The 3 primary customers of NET-ClassR are educators, scholars, and supervisors. Each player type has access to unique capabilities and graphical person interfaces. A internet site's dashboard is used by customers to monitor and administer at the website, asynchronous academic programmes. This study investigated in [4] shows the impact of a learning management system (LMS) affected the performance of students at Imo country university in Nigeria who were enrolled in a course on academic evaluation and assessment. A nonequivalent institution quasi-experimental technique was used in the study, which involved dividing 232 undergraduate college students into gender-primarily based groups. Utilizing the "measurement and evaluation achievement test (MEAT)", records were collected with a Pearson correlation of 0.89 and a Kuder-Richardson method reliability of 0.88. The ANCOVA, imply, and general deviation have been used in the analysis. The findings confirmed that scholars making use of the LMS (Moodle) scored higher than those the use of the conventional CAI4ME bundle. In each methods, female college students outperformed their male opposite numbers, albeit male students had extra gain scores.

II IMPLEMENTING DEEP LEARNING METHODS IN LMS

The transition from in-person to virtual or online learning environments has had a substantial impact on student achievement. This change has resulted in a lack of flexibility and a loss of interest, which have an immediate impact on learning. Teachers are supposed to be the primary agents of learning in traditional education, but this change has created issues. It is critical to provide the ideal learning environment where students can access the materials they need and have continual performance monitoring in order to address these problems. Systems for assigning activities that are customised to each student's unique features should also be provided. It is anticipated that this change in the educational approach will improve learning outcomes for both students and the whole class [5]. Higher education has seen a rise in the use of e-learning courses because of its adaptability, flexibility, and availability from any location at any time on any device. But students' learning experiences are frequently devoid of fulfilment and personalisation. Combining online and offline learning, blended learning has benefits including activity tracking, extra materials, individual ability consideration, and

usability. The deployment of e-learning depends heavily on its efficacy. Higher education institutions can implement adaptive learning, a process that determines students' knowledge levels and learning styles [6]. With the help of adaptive learning solutions offered by LMS Moodle, educators and administrators may customise every step of the learning process, from content delivery to assessment. Because of the move to cloud-based service infrastructure, e-learning technologies are being used more and more frequently. Although effective resource provisioning is essential for these platforms, the methods now in use are not tailored to the unique needs of e-learning. A neural network-based approach for forecasting the amount of computational resources used by e-learning platforms is presented in [7]. The model predicts variables like RAM and CPU use through a network of interconnected neural networks. Both the model's training and validation processes used data from an actual high school setting. Because of the model's great accuracy, software solutions for supplying computing resources to e-learning platforms on demand have been developed. The outcomes show promise and may open the door for new software solutions. The purpose of [8] was to evaluate the effects of three different teaching modalities—flipped classroom, online project-based learning, virtual laboratory, and intelligent personal assistant—on Moodle behaviour and student performance while taking the covariate "collaborative group" into account. There was use of both qualitative and quantitative research approaches. The collaborative group's behaviour and learning outcomes differed from those of the OPBL and Flipped Classroom modalities, according to the results. The study also examined the behaviour patterns inside each collaborative group, discovering that while learning outcomes are homogenised within the group, individual member behaviour patterns are not. Web and mobile applications are essential components of online learning platforms, particularly in light of the COVID-19 pandemic. The benefits of online learning are increasing due to the rapid advancement of learning technologies. Predicting student attendance and performance in Learning Management Systems (LMS) is difficult, though. [9] Makes use of log files and a Deep Neural Network (DNN) to forecast learner performance. The model uses online tests to enhance knowledge. By utilising technological mode, attendance analysis, and log files, the suggested strategy forecasts learner outcomes. The suggested method's implementation and analysis demonstrate that the DNN performs better than 90% in learner performance prediction. Through the analysis of data gathered from student interactions with learning management systems (LMSs), [10] seeks to identify prospective students who may be at risk of failing in blended learning contexts. The method makes use of machine learning models on a dataset of student attrition that is accessible to the public. Data created by students interacting with LMSs in their BL environments is included in the data. According to the study, this novel strategy can encourage prompt learning process intervention, enhancing students' academic development. The accuracy of the suggested strategy is contrasted with various representational machine learning techniques. With an accuracy rate of 85%, the best machine learning algorithm, random forest, is chosen to assist teachers in putting different pedagogical strategies into practice to enhance students' learning. These days, a lot of organisations and businesses are curious to know what the public thinks and desires. Numerous investigations are carried out to address these queries, and the comparative assessment was presented in Table 1. People's emotions are important in instructional design because of this. Processing and analysing the thoughts and feelings of a large number of individuals is a difficult undertaking, though. This is where machine learning approaches for "sentiment analysis" come into play. There has been a noticeable rapid digitalization process lately.

Table 1 Comparative Analysis of deep learning techniques in LMS

Study Ref.	Learning Environment	Key Features	Methodology	Impact on Student Performance
[5]	Transition to virtual/online	Loss of flexibility and interest, performance monitoring, custom assignments	Not specified	Anticipated improvement in outcomes
[6]	E-learning in higher education	Adaptability, flexibility, availability, lack of fulfillment, and personalisation	Adaptive learning via LMS Moodle	Customised learning experiences based on student needs
[7]	E-learning platforms (cloud-based)	Resource provisioning essential, unique e-learning requirements	Neural network-based approach for resource prediction	High accuracy in prediction leading to on-demand resource provisioning

[8]	Different teaching modalities on Moodle	Flipped classroom, online project-based learning, virtual laboratory, intelligent personal assistant	Qualitative and quantitative research	Differentiated behaviour and learning outcomes, with variance within collaborative groups
[9]	Online learning platforms	Rapid advancement of learning technologies, difficulty in predicting student performance	Deep Neural Network (DNN) using log files and online tests	Over 90% accuracy in predicting learner performance
[10]	Blended learning contexts	Risk identification, attrition data, intervention in learning process	Machine learning models on public dataset	85% accuracy with random forest algorithm in identifying at-risk students

III DEEP LEARNING TECHNIQUES IN ACADEMIC ENVIRONMENTS

The phrase "deep learning" has various definitions and applications in the field of education. Two conceptualizations, meaningful learning and transfer of learning, are revealed by a systematic mapping evaluation of 71 research publications from 1970 to 2018. Both conceptualizations are founded on cognitive learning views. Students between the ages of 13 and 16 mostly study science, languages, and mathematics through deep learning. It is a widely used word in curriculum reform and worldwide education policy. In order to enhance deep learning's adaption to general education practice, future research should concentrate on embodied, affective, and social perspectives, as there aren't many studies examining the subject from these angles [11]. E-learning is a self-paced online learning method that has grown rapidly due to technological advancements. It enables students to use computers and mobile devices to look for instructional materials, goods, and services. Conventional search engines find it difficult to satisfy the demands of online searches. Problems with information overload occur when students have trouble locating relevant course materials. Resource Sharing Systems (RSs) are intelligent systems that locate and suggest valuable products using a variety of ways, thereby solving these difficulties. Recommender systems (RSs) are subclasses of information filtering systems that generate lists of pertinent things for suggestions and anticipate learner preferences [12]. They encompass a wide range of technology-enhanced learning domains, such as formal, informal, mobile, and traditional/modern learning approaches. Nearly every aspect of technology-enhanced learning is covered by RSs, including formal, informal, mobile, and traditional/modern learning methodologies.

The COVID-19 pandemic is still overwhelming the world's education systems, endangering the advancements made in the past several years towards inclusive and equitable education. Prior to COVID-19, many educational institutions used systematic manual continuous evaluation methods. Because of this, it is increasingly difficult to quickly identify students who are performing below expectations and those who are at danger of dropping out, as well as to give timely, adequate rehabilitative treatment that is customised to meet the needs of each individual student [13]. To address this issue, early student performance prediction utilising deep learning techniques and data from smart learning environments becomes crucial. Opinion mining, or sentiment analysis, is a popular natural language processing (NLP) tool used in education to extract human intentions from student feedback. By detecting emotion alignments absent the need for human involvement, it improves learning procedures. The importance of sentiment analysis in education is examined in [14], which also covers sentiment annotation methods and the use of AI in sentiment analysis. It also emphasises how analysis of emotions affects teaching, decision-making, assessment, and processes in education. Evaluation of sentiment presents several challenges, such as detecting opinion unwanted content, multifaceted phrases, multiple polarities, and affirmation terms. There is also discussion about sentiment analysis's potential use in schooling. Understanding students' emotional states during their educational experience is essential to enhancing the quality of education.

Thermography is one non-invasive technique for detecting emotion variance that uses facial temperature distributions to identify emotion variance. Thermograms can be automatically interpreted using convolutional neural networks (CNNs) to classify them into different emotional states, such as fear, rage, sadness, and happiness [15]. CNNs have not been applied extensively in emotion recognition, despite their potential; this emphasises the necessity for safe, harmless, and illumination-independent imaging techniques. Learning is a sophisticated mental process that is impacted by the learner's emotional states and inclinations and involves social interaction as well as cognitive processing. Content, social contact, and rewards are all components of personal learning processes, and each is related to a specific dimension. The goal is to produce high-quality, long-lasting, individually meaningful, cognitively integrated, and situationally suitable work [16]. The idea of deep and meaningful learning (DML), which calls for rich, polymorphic, and multileveled instruction,

encapsulates this. Learning that is high-quality, long-lasting, and personally relevant is produced when these dimensions are enhanced and utilised in a variety of settings. Finding specific data has become more difficult due to the growing usage of online learning tools, which has also resulted in an abundance of information. In an effort to lessen this, e-learning recommendation systems, or RS, have been created to make appropriate learning resource recommendations based on completed activities. However, the current E-Learning system is made more difficult by widespread internet usage [17]. Even with the use of Deep Learning techniques, e-learning RS still has issues with cold start, accuracy, time consumption, scalability, and data scarcity.

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IV. CONCLUSION

The study confirms the considerable ability of deep learning techniques in improving learning management systems (LMS) to improve student overall performance and engagement in numerous instructional environments. By transitioning from traditional in-person to online and mixed learning methods, it is crucial to deal with demanding situations like flexibility, pupil interest, and personalised learning experiences. Our findings imply that adaptive learning, facilitated by tools inclusive of Moodle, and predictive models the usage of deep neural networks can significantly enhance mastering stories and results. Moreover, the application of neural network-based processes for resource provisioning in e-learning platforms shows promising results in creating efficient, demand-responsive systems. The examine advocates for the mixing of deep learning strategies in educational settings to provide extra adaptive, personalised, and efficient learning reviews. Future research should consciousness on increasing these models to various educational contexts and exploring new deep learning methodologies to similarly enhance LMS performance and effectiveness in assembly learners' and educators' desires.

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