Intelligent Multilevel Fusion System for Wireless Sensor Network Virtualization Using Deep Reinforcement Learning in Education

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Abstract

wireless sensor networks (WSN) in ubiquitous learning environments to enhance teaching and learning quality. WSNs can serve as a learner-to-context interface, enabling learners to interact with the learning environment while collecting contextual information. With the help of WSN virtualization technology, learners can leverage different virtualized characteristics of the state-of-the-art WSN and engage with the ubiquitous learning paradigm to gain knowledge and skills. The report examines the current state of WSN virtualization and its potential for sharing in this context. Research concerns are discussed in-depth, and an in-depth overview of the current state of the art is provided. This paper presents the fundamentals of WSN virtualization and argues for its usefulness. By allowing learners to learn while on the go in an environment that interests them, gadgets and embedded computers work together to keep students connected to their learning environment. Recent years have seen an increase in interest in deep reinforcement learning technologies. Despite the availability of several internet resources for researching this field, it might be challenging for those just getting started to design effective teaching systems for autonomous vehicles. This article offers a model for a highly effective and interactive ubiquitous learning environment system based on ubiquitous computing technology. An educational system based on deep reinforcement learning and system development is developed in this project using the

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WSNV-ES method. The web-based system that has been designed can do the following: settings for reinforcing student success, learning scripts to run, and the learning state to monitor are described.

Keywords: Education; Intelligent Multilevel Fusion System; WSN, DRL; Students; Technology.

1. **Introduction**

As information science and technology have progressed, they have gradually permeated all spheres of business and society, bringing several technical innovations and advancements [1]. The same is true of learning and teaching. Modern educational technology and multimedia are frequently used in classroom instruction [2]. It's critical to comprehend how students, teachers, and technology interact in modern classrooms [3]. Since the advent of the Internet as a medium for education, numerous specialists have investigated various online teaching strategies. The platform offers college students the most virtual classrooms possible [4]. When primary education homework is taught utilizing assignments and a web-based platform, students' interest in learning, learning excitement, and academic accomplishment all rise [5,6]. This study considers the use of WSN in the classroom, evaluates its benefits, and proposes a teaching strategy. This study evaluates the drawbacks of the traditional wireless sensor network, provides an optimization technique and develops an online teaching platform [7]. Since this directly affects how well and how much information students learn, effective teachers in the classroom are accountable for assessing whether or not students are engaged in the subject being delivered [8]. Teachers now have a new tool for gauging student participation in addition to their visual and auditory evaluations of the classroom atmosphere, thanks to real-time estimates [9].

The IoT allows for gathering enormous amounts of data from sensor components. The application of IoT for wireless technology-based educational monitoring has been studied [10][32]. Students in this course employ Internet of Things (IoT)-connected devices, such as smartwatches, glasses, and hats that, among other things, track their heart rate, body temperature, hand motions, and brain activity [10]. Students in this course employ Internet of Things (IoT)-connected devices, such as smartwatches, glasses, and hats that, among other things, track their heart rate, body temperature, hand motions, and brain activity [10]. The devices transmit real-time data to a data-gathering and processing system. Teachers can access aggregated estimates and real-time forecasts of student participation using the analytical system [11]. Students may become increasingly aware that they are being watched thanks to IoT sensors. When students use digital resources to gather information, privacy concerns may grow if the data is sent outside the school [12]. Motion sensors track students' movements, their body temperatures are measured remotely by temperature sensors, and their surroundings are captured on camera by cameras. Any unobtrusive sensors that can offer helpful data on student involvement include orientation sensors to assess student chair angle, pressure sensors to assess student chair and desk weight distribution, and others [13,14]. Deep learning can be used to evaluate and categorize this data to evaluate each student's and the class's degree of participation [15][31]. All of the sensors are directly connected by wireless internet devices[33][34]. Students' real-time data can be recorded by the sensors and uploaded to a server for subsequent analysis [16]. WiFi offers a wide-ranging wireless network in most classes on college and university campuses. Separate, secure wireless networks that are simple to set up may be required for this system [17].

The IoT sensor platform has to be charged. The lithium-polymer (LiPo) rechargeable battery is used for this, but a wide range of different battery types are available [18]. LiPo is selected for its high energy density and wide availability, and safe usage necessitates using a particular charging circuit. The battery's energy capacity can be achieved by adjusting the system's needs [19]. More specifically, this has to do frequently, for how long, and for how many hours per day, that gadget is expected to monitor data [20]. The data gathering and analysis server can utilize this information to determine which platform needs to be recharged, informing the user accordingly [21]. The user can determine which battery needs to be changed by using the server's ability to evaluate the battery's health and calculate and transmit this information [22]. If no changes are detected from linked sensors, set the application to communicate limited data or none to reduce the quantity of data sent [23]. The IoT platform can enter a low-power sleep mode and wake up, read the sensor data, connect to WiFi, and broadcast the data after a predetermined time [24].

The main contribution of this study are:

- Proposes using IoT-based wireless sensors integrated into the environment to prevent the identified issue.
- A model for an interactive and highly successful ubiquitous learning environment system based on ubiquitous computing technology is presented in this paper to allow learning to occur everywhere and at any time.
- The web-based system designed can reinforce student success settings, perform learning scripts, and monitor the learning status.

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2. Related work

To increase the effectiveness of 5G network communication, Alam T. et al. [25] showed that developing a blockchain-based educational platform would be a viable solution. The primary focus of the research was wireless networking. It was developed at the outset of the Internet by retrieving web pages. High-speed, intelligent, powerful networks with many contemporary technologies, including low power consumption, appear to exist in the present world. One of the most challenging issues in mobile communications is designing the new virtualization framework based on blockchain throughout the Internet of Things architecture. It was being investigated to integrate a Blockchain-based educational system with the Internet of Things while maintaining its cryptography security. With improved blockchain and IoT, interactions between educators, employers, developers, facilitators, and accreditors would be simple.

González-Zamar, M. et al. [26] evaluated the application of immersive technologies, which provide students with an educational and inventive framework, which had shown to be a challenge for university learning environments due to technological breakthroughs. The scientific production of journals, authors, organizations, and nations contributing to this study was measured using a bibliometric analysis of academic journals. The data shows increased support for studying virtual reality's use in higher education during the previous three years. The growing interest in developing components of virtual reality's usage in arts education in higher education could be shown in the expanding international trend of scientific production. This research adds to an existing academic, scientific, and institutional debate on making better decisions with the available information.

UntungRahardja, S. et al. [27] introduced a diploma as academic legality received following completing education. Some people searching for an occupation due to a lack of education would break the law by faking a certificate. This paper will demonstrate how blockchain technology would eliminate diploma fraud and the advantages of blockchain in education. The Blockchain Approach (BA) describes and establishes the facts concerning diploma fraud to acquire respectable work. There is a 25% level of diploma faking, causing an increase in less qualified workers in their fields. This paper contributes to the field of education, which deals with credential fraud. This study contributes to education by establishing the authenticity of credentials using blockchain technology. The outcomes of this study could show that implementing blockchain in education can reduce diploma fraud.

Priatna, T. et al. [28] determined the E-learning implementation has been evaluated for its key success factors and that it could perform properly and deliver maximum advantages for learning activities in higher education. Due to literature reviews and survey methods, this study investigates the determining variables. The elements were then weighted based on the Multi-Attribute Utility Theory (MAUT) for a more in-depth evaluation. According to the results, administrative considerations, technology, and human resources should all be considered when implementing e-learning in higher education. Creating a work culture and regulations that force the academic community to implement e-learning is the most important component that could be addressed to achieve its implementation in higher education.

Universities, like many other higher education institutions worldwide, have been working hard to build and execute their information systems, according to Almigheerbi, T. et al. [29]. (IS). This study presented a novel paradigm for application in higher education termed Collaboratively-Developed Enterprise Resource Planning (CD-ERP) (HE). The model has two main components: ERP packages and community-sourced. The CD-ERP model was the subject of a series of studies, the last of which was this one. Following an assessment of the model's suitability in this situation, a CD-ERP model for higher education was offered. The transfer from the current systems to the CD-ERP paradigm, as well as the consortium's business model and cloud architecture, is suggested in this article.

TONG, K. et al. [30] suggested that international education programs prepare students for life and employment. This research aims to analyze the higher education curriculum by surveying students, employers, and teachers in social and natural sciences. The relative weights of each parameter were calculated using the Fuzzy Extent Analysis Method (F-EAM). Given the predicted employment market demand, curriculum development prioritized input with a focus on language skills. Second and third place went to objective and learning results and educational activities. This advanced curriculum maintains the usual triangle of teaching topic, technique and evaluation, and assessment. The undergraduate quality gap between workforce supply and demand, the results help education management effectively use precious resources to improve the curriculum.

3. Proposed method

In web-based instruction, a wireless sensor network based on student engagement and real-time analysis is utilized to increase students' capacity for innovation, effective learning, and collaborative learning via wireless devices. There are PCs and projectors available in the space. Teachers are permitted to use laptops in a classroom setting. A smart device with an Internet connection is required if a classroom computer cannot connect. Using WSN in education disrupts the traditional teacher-student relationship while increasing environmental engagement. Networks, both wired and wireless, are utilized in the information environment to gather resources for human contact, human and resource interaction, and resource-to-resource communication.

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Teachers can use the Internet to access the Web as part of their lesson plans, giving pupils wireless Internet access to acquire the necessary information and incorporating network information into their lesson plans. The suggested approach can significantly boost students' interest in studying and children's engagement in classroom learning activities. Since students bring their smartphones to class, the traditional rule forbidding them from using technology devices falls apart, fostering more teacher-student rapport and a higher level of independent learning among students. Teachers can utilize the full potential of formative assessment by using a wireless sensor network in the classroom. A research question is developed during teaching. Students and teachers study in groups. Students work on their projects while being guided by their teachers. Students give an update on their findings in real time. Using a wireless network can monitor the present state of their study in real time. Each response represents students' independent thinking and unique personal ideas. Network multimedia technology shared by educators and students worldwide is available. With WSN in the classroom, teachers can fully integrate information technology into their lesson plans while sharing visual features with their students.

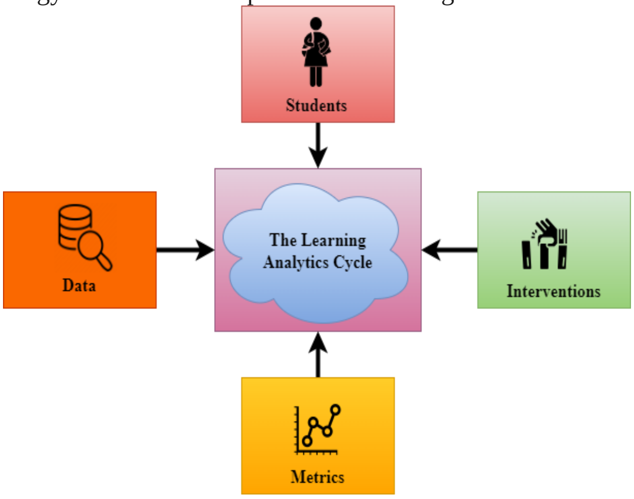

Figure1: The cycle of analytics for learning

Analytical learning has become an important part of the learning process. It can help identify student disengagement and increase student engagement simultaneously to help students achieve better academic results. Learning analytics (LA) can be defined as the process of collecting, analyzing, and reporting data about students and their settings to understand better and improve learning. A wealth of information regarding student behavior and learning requirements is available to teachers and education designers due to this innovative, practical source of information. Learning analytics is utilizing data to enhance teaching and learning (LA). Moodle integrates with several systems to provide LA information, and this document can find several online platforms, including virtual learning environments. When understanding student involvement, LA has a lot to offer. Modern wireless sensor technology creates new possibilities for reviving traditional courses and raising student engagement. Due to these technologies' massive volume of data, we must classify it using deep learning. This paper explores WSN, a field of study at the intersection of cognitive science and DRL.

Everyone can benefit specifically from deploying wireless sensors in a traditional classroom where face-to-face instruction occurs between students and teachers. This paper explains that the proposed system's solution is based on wireless communications and IoT technology, which collect real-time data. The process provides a track of how students engage, how much time has passed, and how far students have advanced. Over a school year, this paper can use this technology to collect data and characterize student performance. Data analysis was initially used to evaluate student involvement and disengagement in learning activities, followed by deep learning. As a result, this paper can provide the teacher with data on student engagement using characteristics such as students' focus, interest, control, and purpose. A proposal exhibiting student involvement and disengagement in the classroom resulted from these systems and approaches. The instructor can take action to enhance student learning and engagement, educational quality, etc., by making real-time decisions and knowing more about the students, their behavior, and how they learn. This type of study results is important data for teachers since they show how each student develops, conducts, and makes educational progress. Students can identify disengagement, find solutions, and make decisions. Instructors can restructure the teaching technique to support these particular students' engagement if this diagnosis is made on time. Monitoring students in the classroom can help teachers encourage, motivate, tutor, and change curriculum and activities. LA is used to improve computational activities, including programming. When solving tasks, teachers search for patterns in students' behavior. To determine whether log file data analysis can evaluate a learner's motivation. Wireless sensors allow for accurate monitoring of students' behavior in educational systems. These can be used for data

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mining and machine learning to improve learning. According to the findings, reading time is effectively implemented.

Additionally, test outcomes are a reliable indicator of desire. This article outlines a technique for using and monitoring virtual learning environments (VLE). The purpose of data collecting is not to develop and monitor a set of pre-established metrics from the digital data included in the VLE by subtly inducing an evaluation regime. The essay assesses students' motivation concerning a certain task, subject, and day.

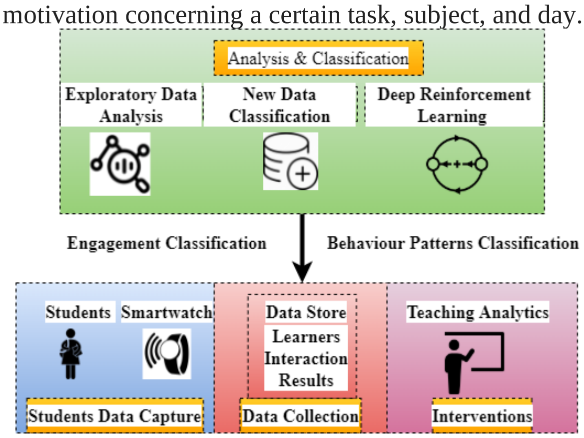

Figure 2: Intelligent Multilevel Fusion System for WSN-IoT education system for learning analytics

This section demonstrates how the wireless sensor network IoT education system is used to collect, analyze, classify, and apply multimodal learning analytics. The two main goals of this approach are as follows: 1) To assess the WSN-IoT education system throughout a school year, collect relevant data, and provide suitable tools and approaches to increase student engagement in the classroom. Four levels of data collecting and automated analytical development with the appropriate technical systems and architectures can be divided to apply this method in a genuine educational setting. Stage one involves creating the hardware and software infrastructure needed to record students' interactions with the educational system (Data Capture). Another web service is established to accept, classify and store data (Data Collection). Three stages later, this paper has identified student activity patterns and proposed an innovative classification of student involvement that considers the information this paper has collected so far (analysis & classification). For this particular step, students can use the system continuously for a whole academic year. The teacher described the assignment, and the students performed it using the IoT education system. The technology captured student interactions throughout the data collection stage, while teachers used the direct observation approach to observe students' progress and collect data during class. This widely used approach collected data enabling the evaluation to analyze people without changing the surroundings. The system's data can be compared to teachers' comments after the session. This diagram categorized interaction behaviors in these ways. It helps teachers make choices in the classroom by visualizing student behavior and participation (teacher analytics). In the first step of data acquisition, the wearable device's software helps detect the interaction and transmits it to the second stage; otherwise, it removes it. These deletions are vitally important to prevent overloading the system with useless data. When a student interacts with an intelligent educational device, the environment creates internal messages with accompanying information. This data includes the task results (right, incorrect, duplicate), the chosen item, the student, time, etc.

The second stage creates a log of events using a web service to gather and store classroom activity. This system employed WebSockets, JavaScript, and MySQL to exchange information between the interaction capture model and the stored learning record. WSN-IoT saves all interaction-generated data in a database that may be utilized for analytics. The input used in data collection and analysis is the second variable. Two-way examination of saved learning records is made possible at this level. First, this paper can classify the students' behavior patterns when using the IoT education system and describe the key characteristics of the variables using exploratory data analysis (EDA). Second, this study uses DL to identify student involvement in educational activities.

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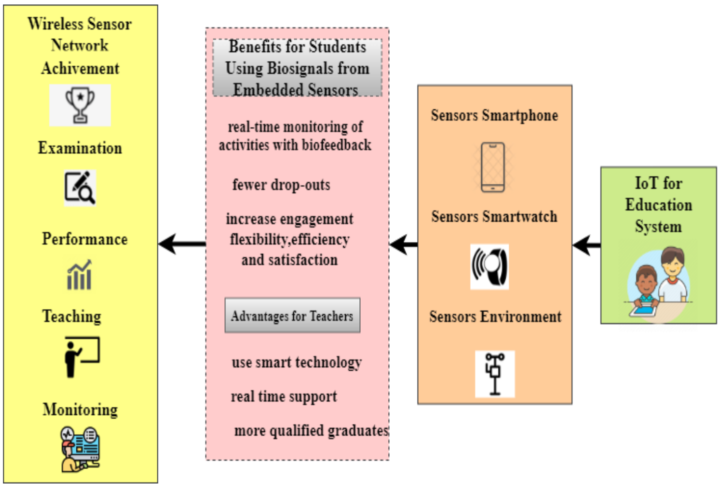

Figure 3: Wearable device data assisted DL in higher education

The major purpose is to maximize student achievement and hence reduce dropout rates. Noninvasive, low-cost intelligent sensors allow a more accurate assessment of the supportive learning environment. It improves student health and cognitive stress. The Internet of Things (IoT) framework combines things, the Internet, and semantic visions. Additional research revealed three IoT phases: social objects, the cloud of things, semantic data representation, networked things via web technologies, and tagged objects. Using data mining techniques, we proposed a system architecture for the Internet of Things (IoT) for educational data collecting, storage, and deep learning analysis. The system design uses real-time data from embedded sensors from smartphones, wearables, and environs. The system uses wireless sensors to gather data. The system may be modular, easy to use, and customizable. Heart rate, movements, pedometer, gyroscope, and accelerometer are all measured via sensors. Online courses, activities, and noninvasive physiological signal monitoring are all part of education. In the future, this study may incorporate embedded sensor data from wearables and ambient sensor data. GrovePi is a low-cost platform for Raspberry Pi IoT testing and development. An IoT system connects, configures, and manages sensors.

Users can connect smart sensors and actuators with GrovePi and program them in Python. This system uses GrovePi sensors to communicate with the outside environment. Sometimes, a temperature sensor can teach students about sound, light, and humidity. Motion sensors that sense the need for movement (gyroscope, accelerometer) announce it after a certain time and provide activities that operate as a teacher. Measures basal metabolic rate (BMR), measures BMI and continuously monitors pulse (HR) to improve overall health. Inspires and successfully maintains messages at the appropriate time. The measurements of body mass index (BMI), body mass ratio (BMR), and total daily energy expenditure (TDEE) are employed to track daily steps, heartbeats, calorie consumption, floor ascents, and water consumption. The measurements improve students' impressions of their health and track their whereabouts in real time so they won't miss any crucial events or activities. Teachers' curriculum is encouraged to be reviewed, and technology requirements are placed on teaching methods.

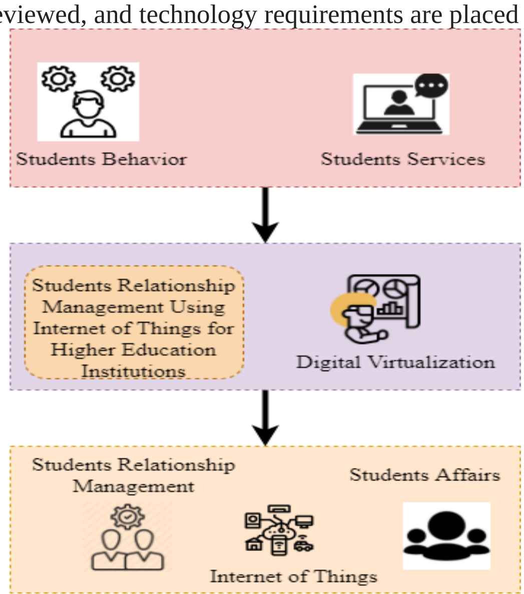

Figure 4: Student relationship management system analyzes higher education digital footprints using IoT

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Personal attention and communication, together with the development of long-term relationships, are relationship marketing techniques that can transform how higher education institutions approach their students. Building long-term connections with students are important to higher education's sustainability. Programs that aim to build connections with students to promote retention are referred to as Student relationship management (SRM). Others maintain that SRM is more than a retention tool; it is a theory based on a marketing notion that encourages college administrators to view the institution's relationships with students from a better perspective. Professionals in higher education's student affairs help students develop academically and personally. Those in the area help students with various issues related to post-secondary education. Within the discipline, there are administration and hands-on responsibilities. These higher education specialists can help students and what it takes to become a professional in this field. Student affairs are the department and division providing services and assistance for student achievement at higher education institutions. Challenges for students, institutions, and employment range from campus safety to student mental well-being to budget cuts and decreasing participation, creating an operational definition of student behavior. Factors including classroom volume and seating layouts can affect learning. Teacher behavior concerns such as boring and disorganized classes, overreaction to misbehavior, and over on punishment are examples of classroom management problems. As students are the focus of higher education institutions, there is huge competition among them to provide quality services. Thus, students can be well in all respects in school.

Various information systems and technologies are available to help students study, become competent, provide service, and manage their time. Innovative student service techniques have to be quickly available. Using the Internet of Things (IoT), data can be collected, monitored, and managed quickly, connecting people and objects. Using the Internet of Things (IoT) to monitor people's movements is popular and effective. When information has been placed on the Internet, it can represent the identity of the individual who left it and the student's activities and interests. Many studies have been done to analyze the data and determine its advantages in this approach. An important and interesting issue is monitoring student movements using their web presence. Using WSN technology, their movements are tracked, and data is collected, processed, analyzed, and summarised for use by higher education institutions.

Described a conceptual framework for collecting education system online identity using the Internet of Things (IoT). Input, process, and output comprise a large portion of the design. The input is the first and most important step. Student relationship management, the Internet of Things, and student affairs are all included. Students' services and behavior are depicted in figure5 as part of the output of the process, which incorporates WSN and the Internet of Things (IoT). When students enter the service station, a system using Internet of Things (IoT) technology can monitor their movements. This system can save virtualization for processing and provide reports.

$$L_j = [T_1, .., T_n, C_1 .., C_m, R_1, .., R_m] \quad (1)$$

This equation evaluated several state-space architectures. This paper explored vectorized state spaces to provide the RL agent with a learner's current scores and activity completions. The simulations demonstrated that this vast state space rendered RL training too sample inefficient for active learning. Instead, this paper discovered that a compact state space that ignored prior operations is substantially quicker and still effective. It contains the student state L at step j pre-test scores T, a vector showing which of the m educational activities have been performed so far c, and a vector containing the grade for each of the m activities once completed r. In courses with a fixed post-test, the environmental state changes between the penultimate step and the conclusion of an episode in the post-test results. The time spent on each activity had been removed since time spent on a page is a weak proxy for time spent on a task. This paper felt that counting the instructional activities is a good estimate since they all consume the same time.

$$G_j = \sum_{q=1}^{N} \left[max\left(0, o_q + t_q\right) + (1 + \varphi) \right] \times E \quad (2)$$

A reward system that prioritizes student test performance increases and punishes additional activities is created to correspond with our high-level design objectives. It is the aggregate of these individual actions that determine the student episode reward G. There is a punishment φ based on the number of educational activities in the episode E and the pre-test scores. An appropriate approach for simulated students is to learn quickly and consistently using G. This paper discovered that longer and more varied course pathways are explored by deferring the penalty for all educational activities. The penalty compensates for this. Determining the post-test t assignment incentive reduced the RL agent's favored activity assignment by 1. An agent can discard incorrect guesses by eliminating occasions when a student accurately predicted how to solve a problem on the original test and tripped up on the post-test. This reward system increased the RL agent's learning speed and consistency.

$$p_\theta = A(k_t, a_t) = R(k_t, a_t) + \delta U_\theta(k_{t+1}) - U_\theta(k_t) \quad (3)$$

$$L_\theta = \frac{1}{2} \sum U_\theta(k_t) - R(k_t, a_t) + \delta U_\theta(k_{t+1}) \quad (4)$$

Assume p_θ Increases the probability of actions that increase the anticipated cumulative discounted reward U_θ. The agent network with weights gives the probability of acting in a given state. An important sampling correction is performed on the agent who picks the activity to compensate for this. This correction decreases data

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biases by prioritizing activities with low probability δ simultaneously. To reduce gradient changes, the significance sampling ratio is reduced to 1. To find the relative advantage of doing the activity, use $A(k_t, a_t)$. Assume $U_\theta(k_{t+1})$ is the predicted cumulative discounted rewards from states. The critic system gave weights. While the critic network L_θ uses a recursive formulation to reduce the mean squared error, the actual value supplied by rewards $R(k_t, a_t)$ Build RL agents with modular computation graphs using this framework. When interacting with the environment serves as the loss function. Using u-learning for activity scheduling takes tens of thousands of time steps for our agent to improve decision-making.

4. Results and discussions

4.1 Interaction Ratio (%)

An intelligent system can become interactive by continuously interacting with students and developing teachers. With technology, students and teachers can interact with learning more effectively. Personalization of information using deep learning algorithms improves the system's prediction abilities. Thus, programs record the contextual effects and student-teacher interactions. Video, websites, classes, and new technology can help teachers improve student challenges and interaction. Social interaction is defined as student engagement in learning discussions and academic engagement activities. Social interaction between teachers and students benefits academic success, human-computer interaction, cognitive abilities, and motivation.

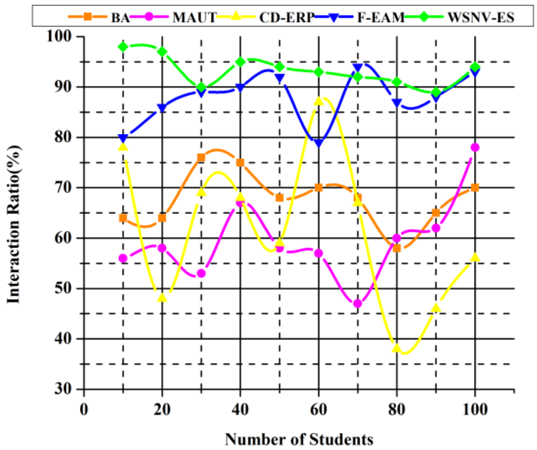

Figure 5: Interaction Ratio (%)

Student class interactions and engagement are evaluated using learning and teaching descriptions. Students develop learning activities, learning ideas, and interaction with time. Sample and regression analyses are performed on each outcome and factor. It records student interaction, educational background, and student development, plotted in figure 5. It is based on teacher, college, and class interactions with active learning, education level, and student interaction. The findings show that optimization can improve student engagement and technology interactions. This paradigm states that highly motivated students' interactions with other students and teachers are influenced by their desire to learn and improve.

4.2 Feedback Ratio (%)

Devices enable customized learning opportunities for students and provide instructors with continuous student performance information. This feedback ratio is becoming increasingly popular for conducting tests using current question banks to correct responses and generate feedback to improve the educational system's adaptive development evaluations. Teachers can customize the feedback and offer appropriate evaluation materials for each student by understanding their limitations and frequent errors. As a result of real-time feedback provided by modern technologies such as sensor technology and image analysis, teachers can improve their teaching methods. A higher level of teacher participation is possible because intelligence systems can effectively identify students' emotional responses through verbal and nonverbal communication.

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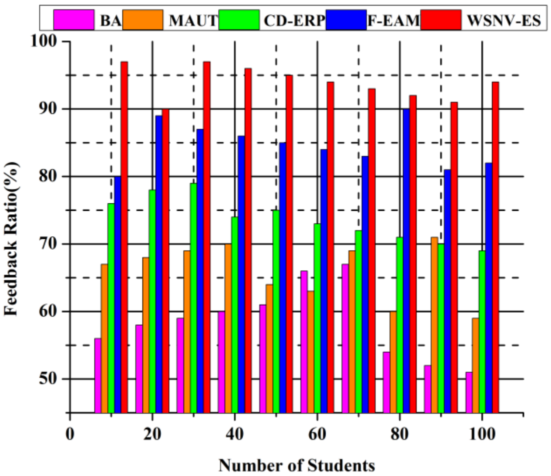

Figure 6: Feedback Ratio (%)

The study reveals that web education personalizes learning by providing students with feedback and recommendations customized to their needs. Students can converse and make suggestions in the learning course discussion section, which the teacher can respond to and provide feedback. Figure 6 includes the feedback ratio. This ratio involves teaching objectives, information, resources, teaching methods and activities, assessment, and feedback. The teacher effectively teaches students, helps them solve problems in real time, motivates them to complete tasks on time, and receives feedback on their personal choice. The teacher gives comments on survey items to improve learning. This research looked at the process of learning that requires accurate calculations and quick feedback from the participants.

4.3 Curriculum Development Ratio (%) and performance Ratio (%)

Increase the usage of the standard learning technique and the guidelines for developing the whole curriculum. The current global framework and systemic conflict provide a realistic analysis that aims to support students' confidence in creating student curriculum analyses of the relevance of curriculum development and cultural learning. With this curriculum development reformation, this paper attempts to break the initial restriction pattern while improving the circumstances for the curriculum content. This ratio is a key strategy for enhancing students' sense of security and supporting curriculum development to meet the problems of the educational and student learning systems. The location of students in various collaborative learning activities may impact their creative performance, according to the online learning pattern.

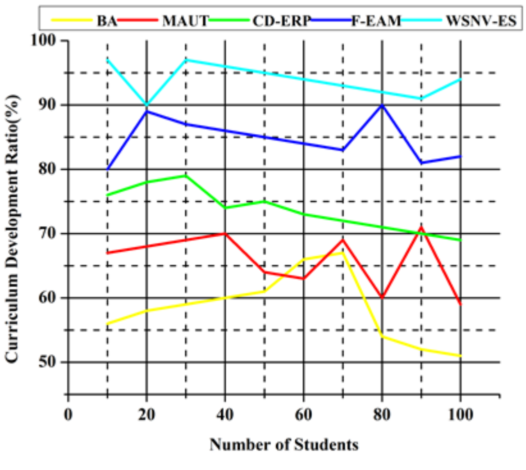

Figure 7: Curriculum Development Ratio (%)

Each student completes the assignments and uploads them with feedback regarding their academic achievement in the class and their learning progress about the group's creation. The learning activities module on the online learning platform can assist in assessing student performance when a learning pattern module raises a student's learning level while they view a video. Figure 7 depicts the curriculum development ratio. The results show that after being assigned the team leader job, students in the experimental group showed enhanced learning outcomes, creativity, and problem-solving skills. Future research can examine how successfully students collaborate in online learning environments. The performance of the predictions is heavily reliant on student engagement data. To effectively use learning analytics, accurate data can be collected and analyzed. Aim for

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accuracy while implementing educational initiatives to improve student's learning process, time, and participation. The supervised learning algorithm significantly improved interaction performance. Domain information is important in achieving highly accurate development predictions. This paper analyzes multiple deep learning approach learning algorithms for classifying and regression activities to determine how each input parameter impacts student engagement.

4.4 Learning Outcome Ratio (%)

Students can acquire reliable inputs directly related to their digital performance through mobile devices, making it a significant way to increase information education control and better understand the learning pattern. Interactive learning analysis can give students with knowledge-based learning. Many criteria for choosing pupils who can advance academically may be provided via learning processes. A wide range of skills and fields are calculated and evaluated using the virtual technique. In a setting where educational activities are frequent, it may be challenging for a student to slow down. By quickly developing a web-based learning pattern, students can receive fast feedback on their performance.

Table1: Learning Outcome Ratio (%)

Number of Students	SNAM	SCL	FLA	ABA	DLP
10	58.7	78.3	50.2	68.8	88.1
20	59.5	79.4	51.1	69.7	89.2
30	60.8	80.9	52.1	70.4	89.9
40	61.2	81.2	53.1	71.5	90.7
50	62.4	82.8	53.2	72.7	90.5
60	63.2	83.5	55.4	73.2	91.9
70	64.6	84.2	55.6	74.3	92.6
80	65.4	85.7	56.3	75.6	93.2
90	66.5	86.5	57.5	76.8	93.7
100	67.1	87.7	58.6	77.1	95.1

This ratio is a crucial tool for improving knowledge training, control, and an awareness of the learning environment. Knowledge-based learning could be offered to students through online class analysis. Table 1's learning outcome ratio demonstrates the proposed system's noteworthy accomplishment. Students can thus pick and choose their online learning strategies. When picking pupils who can finish the expansion of their educational performance, learning patterns might take into account a variety of needs. Calculating and measuring learning outcomes for a wide range of talents and arts might become significantly more complicated due to the online pattern.

4.5 Learning Rate (%)

The engagement of students in educational activities is connected to classroom discussion. These activities improve education, learning effectiveness, and the ability for higher education. Supporting the development of successful learning activities is one of the most important provisions in educational settings such as colleges. Student engagement and meaning are improved by learning analysis. Students can gain important information from learning knowledge using a powerful deep learning model that analyses student learning knowledge. Thus it enables access to information that can increase student learning, particularly in higher education.

Table 2: Learning Ratio (%)

Number of Students	SNAM	SCL	FLA	ABA	DLP
10	64.5	80.3	56.1	73.4	89.1
20	65.6	81.2	57.2	73.9	89.3
30	67.8	82.3	57.5	74.2	90.3
40	68.9	83.5	58.3	74.7	90.5
50	69.1	84.1	58.9	75.2	91.3
60	69.5	85.5	60.1	75.5	92.5

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70	70.5	86.2	60.2	76.4	92.7
80	70.3	87.3	61.4	77.6	93.4
90	71.3	88.5	62.4	77.9	95.7
100	72.3	88.9	63.9	80.1	96.3

Learning analysis becomes important due to improved active learning and educational success. Higher education institutions can use deep learning methods to learn about student engagement, educational risk, and student success. Active learning is considered important in successful education since it promotes greater and more effective learning. This study explores the correlation between social involvement, educational participation, and educational effectiveness in higher education. Table 2 results in the observed learning rate. The outcome shows appropriate approaches to improve student engagement and performance.

5. Conclusion

Improve the standard of education with WSNs embedded in pervasive learning environments. To help students connect with and learn from their surrounding context, WSNs can operate as an interface between the two. WSN virtualization technology allows students to take use of many virtualized features of a cutting-edge WSN while participating in the pervasive learning paradigm. This research takes a look at where we are with WSN virtualization and where it may go in terms of collaboration. Detailed discussions of research issues and an in-depth summary of the present state of the art are included. This paper explains what WSN virtualization is and why it's important. Gadgets and embedded computers work together to keep students linked to their learning environment, allowing them to learn while on the go in a setting that interests them. The use of deep reinforcement learning systems has become increasingly popular in recent years. Newcomers to the industry may find it difficult to create efficient training systems for autonomous cars despite the abundance of online materials available to them. This study proposes a framework for an efficient and engaging learning environment that makes use of ubiquitous computing technologies. In this project, we use the WSNV-ES methodology to create a learning system that combines deep reinforcement learning with system building. Settings for encouraging student success, learning scripts to execute, and the learning status to monitor are all defined in the web-based system that has been developed.

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