Architectural Enhancement with Virtual Reality Infused Intelligent Hybrid Learning Approach for Elevated Students Performance-Take English Teaching as an Example

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Abstract. Visual Reality (VR) applications and technologies are imparted into teaching sessions to improve students' performance through real-time experiences. VR requires diverse modal data to validate the application's success. Therefore, screened data will be imported for training VR applications for precision-oriented results. This manuscript introduces a Multi-Instance Learning for Data Filtering (MIL-DF) for leveraging students' performance through VR applications. The first step is analyzing teaching accumulated data across different time instances. In this process, the data required for the VR system is determined using the trained teaching model. This enhances the filtering precision for delivering tailored training and visualization sessions. The training adapts the pre-filtered and filtered data from different instances for matching better outcomes. Therefore, the learning model is trained from session outputs, performance scale, and accumulated teaching data. This is tuned by reducing the impact of filtered data across consecutive training instances. The training Iterations are planned for giving rapid data validations after the reduction by the training. This enhances the performance-oriented analysis with less training complexity and achievable performance efficiency.

Keywords: hybrid learning, multi-modal data, students' performance, VR, Architectural Enhancement.
DOI: https://doi.org/10.14733/cadaps.2024.S17.15-36

1 INTRODUCTION

Virtual reality (VR) technology creates a simulated user environment using computer applications. VR creates a 360-degree virtual world for the users. VR applications and technologies are used in various fields [19]. VR application is also used in teaching, providing an effective student environment. VR creates interesting features during learning and teaching [9]. VR applications also provide creative ideas and professional development skills among students. The VR-based application enhances students' performance and efficiency range via proper teaching processes [19]. Various educational institutions use VR-based applications and techniques to provide feasible services for students. VR is implemented in computers during teaching, creating an environment to understand the exact content of the topics [1]. VR reduces the overall misunderstanding ratio of students over certain content. VR presents qualitative services to students that improve the performance range of students. VR reduces the traditional fear between teachers and students. VR provides direct interaction among the students, enhancing the efficiency level in learning subjects [25].

Student performance improvement is an important thing to perform in every educational institution. Various technologies and methods are used in student performance improvement systems. VR is widely applied to educational institutions that improve students' performance range [17]. VR helps students to gain more knowledge and skills in subjects. VR provides various platforms for studying and learning processes. VR-based teaching techniques are widely used in educational institutions that provide effective student learning methods [30]. VR-based applications are also used for student performance improvement systems. The VR-based application creates various functions and methods to build the skills and knowledge of students in particular subjects [21],[12]. VR applications reduce the complexity of learning, maximizing students' performance range. VR technologies with effective services increase the efficiency and feasibility of the learning process [5]. VR extracts the important phase and key values for teaching and learning processes. VR motivates students to learn new topics that improve their performance and knowledge set of students [16].

Hybrid learning or blended learning is a technology mostly used for educational purposes. The hybrid learning model is an education model in which students spend time learning things via an internet connection [2]. The hybrid learning model is also used in the resting period to reduce students' classroom stress and anxiety. Hybrid learning tunes the VR application in educational institutions [22]. The hybrid learning model identifies the drawbacks and issues in VR classrooms that reduce the learning process's latency. VR improves the engagement level of students in the learning process, which increases the performance range of students in particular fields [24]. A hybrid learning model tunes the VR application using certain schemes and functions. Blending learning combines the tools with VR applications that provide effective services and environments to the students [4]. Utilizing digital tools to blend learning with VR minimizes the complexity and challenges of the learning process. A blended learning model-based classroom is more effective than the traditional classroom, which provides various methods in the learning process [7]. However, the existing classroom techniques consume high training time to analyze the institutional educational data. Therefore, this study uses the Multi-Instance Learning for Data Filtering (MIL-DF) process to analyze student performance. The learning process reduces the impact of data training and the minimum training time. The overall contributions of this study are as follows: (1) To increase the student performance analysis rate by applying Multi-Instance Learning for Data Filtering (MIL-DF); (2) Primarily observing teaching accumulated data access at different time intervals to improve student learning rate; and (3) To evaluate the MIL-DF performance using different metrics to identify how the system effectively monitors student performance.

2 RELATED WORKS

Zhang et al. [31] developed a new virtual reality (VR) educational platform for college students. The proposed platform aims to improve students' quality and ability in colleges. VR technology provides various services to clarify the importance of studies among college students. VR analyzes the portion's exact content, producing optimal information for learning and studying processes. VR platforms provide quality-oriented learning to students. The developed platform maximizes the overall performance and efficiency level of students. Although the proposed platform offered insightful qualitative information, the work could not accurately reflect the learning results or the efficiency of VR technology in advancing key skills.

Kang et al. [14] proposed a virtual reality (VR) based application for multivariable calculus class. Multivariable calculus class requires accurate digits to calculate or evaluate certain things. Visualization technique is used in every calculus, providing three-dimensional surfaces to calculate variables. VR application reduces the complexity and latency in the multivariable calculus process. The VR-based application enhances the efficiency range of calculus classrooms. The major research gap is it did not cover the complete spectrum of learning objectives or give in-depth qualitative insights into how students engaged and interpreted the VR application.

Wee et al. [27] introduced a virtual reality (VR) based introductory programming learning (iProgVR). The actual goal of the introduced framework is to identify the issues of the nature of programming language. The identified issues produce relevant data for further processes in VR applications. The introduced framework reduces the energy-consumption ratio in the identification process. The introduced framework develops the understanding capabilities of students. However, the framework omitted a comparison against other available procedures, like interactive internet resources, coding challenges, or group learning settings.

Han et al. [11] designed an augmented reality (AR) based approach for mechanical assembly courses. The proposed approach is mainly used to improve the learning efficacy range among the students. AR analyses the important datasets which are required for the teaching process. AR reduces the difficulty range in understating certain concepts, improving the students' knowledge. Experimental results show that the proposed approach enhances the performance and effectiveness ratio in the learning process. The study's questionnaire evaluated several distinct learning elements, including academic success and learning interests. However, it might not fully account for elements like inspiration, self-esteem, or cognitive demands that could affect how well students learn. A more thorough assessment tool would enable researchers to grasp better how AR affects many areas of learning.

Wu et al. [28] proposed a virtual reality (VR) simulator for pediatric seizure management in nursing students. The proposed method is a quasi-experimental design mainly used to predict the effectiveness of VR in the nursing education system. The proposed VR design provides various methods to understand pediatric seizures for nursing students. VR reduces the latency in understating certain topics. The proposed design increases the accuracy in decision-making, enhancing nursing students' efficiency range. The consequences on clinical practice and retention of long-term memory were not assessed is identified as a major limitation. A complete evaluation of the VR simulator's efficacy would involve looking at the longevity and transferability of the abilities learned over time.

Yu et al. [29] introduced a new method to identify the effects of virtual reality (VR) simulation programs on nursing students. The main aim of the proposed method is to address the effects and advantages of VR in nursing institutions. Neonatal nursing students need intensive care during learning. VR provides effective care services to nursing students, reducing the learning process's complexity. The introduced method increases the accuracy ratio in the VR effects identification process, providing feasible data for further processes. The research article has limitations: Applying the idea of teacher-student interactions in VR programs has significant challenges. The short period of 20 minutes accessible to information exchange with no repeated practice may have impacted the study's outcomes. The VR simulation program could not be used with the control group due to time restrictions enforced by the university program.

Chien et al. [6] designed a spherical video-based virtual reality (SVVR) for English as a foreign language (EFL) student. The proposed SVVR method is mostly used for peer assessment (PA) evaluation. SVVR provides various services to gain more knowledge over certain skills and arts for the students. SVVR increases the English-speaking capabilities of students. The proposed SVVR method maximizes EFL students' performance and understanding range compared to other methods. The research gap in this work is limited time, resources, and various mobile specifications, or lack of mobile among students in the experiment scenario may affect the learning outcomes.

Feng et al. [8] developed a customization framework for immersive virtual reality (IVR) and serious games (SG). The developed framework is mostly used for earthquake emergency training. The customization framework trains the datasets which are necessary for training sessions. Adaptive game-based learning is implemented in the framework that reduces the problems during earthquake training. The developed framework reduces the training process's time and energy consumption range, improving the systems' performance. The major drawback is providing trainees with too numerous choices or complicated customizing tools could confuse them and hinder their learning.

Kelly et al. [15] proposed a virtual reality (VR) based cricket stimulator. The main aim of the VR stimulator is to identify the exact effects of pressure, anxiety, and competition on cricketers during batting performance. VR is used to address the actual abilities and performance range of cricketers. VR simulator detects the exact skillsets of cricketers during batting. The proposed VR stimulator provides important data and key values that improve the performance level of the cricketers. The study concentrated on particular batting performance indicators, including run rates and foot positions. The analysis did not cover additional batting performance facets like shot choices or decision-making. A more thorough evaluation might be possible with a wider range of performance metrics.

Ryan et al. [23] introduced a virtual reality (VR) midwifery education. VR provides effective ideas to discover and explore innovative topics for students. VR reduces the complexity range of anatomical relationships in the learning process. VR also creates a proper platform to learn important topics for midwifery students. Both qualitative and quantitative data are analyzed by VR, reducing the computation process's latency. The introduced VR method enhances the efficiency and performance range of students. Longer-term retention was not studied; it only evaluated knowledge retention after one week for the short term. It would be beneficial to evaluate knowledge retention throughout a longer period to ascertain the long-term efficiency of the VRLE intervention.

Haryana et al. [11] designed a new virtual reality (VR) learning media using cognitive load theory (CLT). Innovative learning materials are also used here that provide optimal information for further processes. Variance analysis is used here to analyze the necessary data for learning media. CLT is mainly used to reduce the computation cost and energy-consumption range in learning. The designed VR framework improves the efficiency and reliability ratio of the learning process. The study used an experimental approach; however, it did not look closely at student motivation, previous expertise, or personality traits, and these elements might have affected the outcome.

Brůža et al. [3] proposed a new virtual reality (VR) based tool, VRdeo, for asynchronous student-teacher exchange. VRdeo provides a virtual environment for the tutors to learn the actual concepts. Tutors learn the concept and teach the students based on VRdeo reference. VR also provides certain 3D models to the students that reduce the complexity of understanding the topics. The proposed tool improves teaching accuracy and increases student-teacher relationships compared with other methods. While 10 of the 17 participants said they would use VR to communicate with a larger group of students, the others expressed concern that not all participants have a VR headset. Although this is currently, without a doubt, a drawback of our technology, it won't be an issue in the future.

Torda et al. [26] developed a classic virtual reality (VR) teaching technique incorporating medical ethics. Interactive online learning modules are used here that provide appropriate information for teaching. Medical ethics also produce important data that provide relevant guidelines to the students. VR reduces the latency in teaching and increases the performance range of students. The developed technique increases the accuracy of the decision-making process using medical ethics. Urge all of our students to learn more deeply, but some are still pretty smart and may attempt to scan learning materials, especially those found online, quickly. The challenge of changing this method remains as such for medical educators.

Jong et al. [13] introduced a spherical video-based immersive virtual reality (SV-IVR) for flipped classrooms (FC). The main goal of SV-IVR is to motivate the students of FC in online pre-lecture tasks. SV-IVR also provides motivational affordances to the students that increase their confidence range. Motivational affordances such as attention, relevance, confidence, and satisfaction (ARCS) are improved among the students. Experimental results show that the introduced SV-IVR enhances the students' FC effectiveness and feasibility. The findings of this study won't be immediately relevant to other FC situations for different higher education fields. Identifying the precise benefits of SV-IVR over alternative approaches in assisting pre-lecture individual learning in FC is challenging without a comparison.

Zhao et al. [32] designed a virtual reality (VR) based technology for anatomy teaching. A meta-analysis is used here to analyze the data required for anatomy teaching. The Meta-analysis used randomized control studies to get information for the analysis process. The exact outcomes are evaluated by standardized mean difference (SMD), which identifies the actual teaching techniques of teachers. Compared with other methods, the proposed method increases satisfaction in anatomy teaching. There is a lack of information about pre-to-post-intervention alteration because the included studies primarily provided post-intervention data. The reliability of the various evaluations utilized in the included research could be biased.

Lin et al. [20] introduced a virtual reality (VR) based self-efficacy method for English foreign language (EFL) students. The main aim of the proposed method is to provide intrinsic motivation to EFL students to learn innovative topics in schools and colleges. VR addresses the preference and interests of students that produce relevant information for teaching processes. VR increases the overall performance and efficiency range of students. The introduced method improves the self-efficacy and creative thoughts of EFL learners. Individual learning styles, cultural variations, and prior knowledge of technology weren't specifically examined. These elements could offer a more complex picture of how VR technology affects EFL learning.

3 MULTI-INSTANCE LEARNING FOR TEACHING DATA FILTERING

Virtual Reality (VR) is used to experience pose tracking and near-eye displays, giving an immersive virtual world feel. VR can enhance education by delivering students with memorable and hypnotic experiences. VR is understandable to every student and can easily observe by teachers. By using VR in teaching, teachers can bring the conceptual subject to life by allowing the students to experience and explore more subjects. These are the things that are not possible with existing or traditional learning. The students can visualize the topic insisted on by the teacher and engage with the topics. VR improves teamwork and social skills through the excitement of innovating the associated learning environment. It allows the students to see it and interact with it. VR is used to understand the topic fully by immersive for the students. It also needs lesser physiological loads to process the information. Hybrid learning is also known as web-enhanced instruction, an approach to education that collages online educational apparatus and opportunities for online communication. Using hybrid learning, VR enhances student performance through real-time experiences. Multi-Instance Learning for Data Filtering (MIL-DE) is introduced to influence students' performance through VR applications. Figure 1 explains how the VR application is modeled using the learning paradigm.

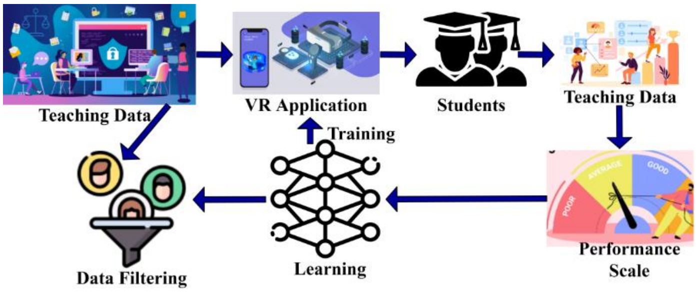

Figure 1: VR Application using multi-instance learning.

In this method, the teaching data is inputted for the VR applications. Primarily observing teaching accumulated data access at different time intervals should be done. Through VR applications, students can experience the visualization of audio or video. The data requested for the data application system is obtained using the trained teaching model. After the process of visualizing the multi-data to students, their performance is checked. By using the VR application in teaching the concept to the students, the performance is checked to determine whether it is improved. The output of the performance check process is used to verify the performance scale. After the performance check, the data filtering process is done. In that process, the data used to produce better performance is filtered for a better procedure. This improves the filtering process for executing tailored training and visualization sessions. Through this data filtering procedure, they could choose the desired data. Then the output of the filtering process is sent to the training procedure, which is done by hybrid learning. It is used to process the multi-model data as it is multi-instance learning. This training session takes the filtered data from different performances to produce a productive outcome. In this learning, multi-data from the filtering process and the performance output from the performance scale are analyzed. It is used to observe the loss and profit of the process. After analyzing the VR applications and training according to the output to provide prompt visualization to students. And also, the modification is done to enhance the performance of the VR applications. The process of acquiring the teaching data as the input to the VR applications is explained by the following equation (1) given below:

$$\begin{cases} X_s = a_1 * X_\alpha + b_1 * P_\beta \\ Y_s = a_2 * Y_\alpha + b_2 * Q_\beta \end{cases} \tag{1}$$

Where (X, Y) is denoted as the input teaching data, (a, b) is denoted as the process of VR applications, (α, β) is denoted as the time instances, (P, Q) and is denoted as the accumulated data. Now the input in the VR applications visualizes the concept in video or audio. It trains the students to engage in their studies and understand the concept with real-time experiences. The input is sent as video or audio to the VR applications. From this process, the performance of the students can be increased. Through this VR, the students' interest in studies can be increased, and their performance will be increased. By using VR, the teachers can teach the concept with the student's focus. They might like the way of teaching as it is a real-time experience. Teachers can easily engage the students while teaching the subjects. Students won't lose interest while studying through VR applications. From the input of the teachers, the VR applications utilize the multi-data to perform the concept well and enhance the sessions' efficiency.

The students acquire knowledge from the VR applications concepts and effectively ensure they understand them. This can be their hypnotic experience which does not make them divert from their studies. They can gain a memorable way of studying and easily understand the process through VR. Through this process, the students can perform well with good understanding ability. By improving the knowledge of this VR, their performance also can be increased automatically. They can easily understand the concept as it is near eye display experience. They can enhance their creative skills through this VR teaching method. They can broaden their thinking, making them perform better in any field. They can easily connect to the teacher's concept through VR applications. It is used to elaborately define the concept by visualization so that the students can gain the content of the concepts educated by the teachers. The better VR application process helps the students understand the topics well and perform better without lags. The process of understanding the concept by the students through VR applications is explained by the following equation (2) given below:

$$\begin{cases} X_\alpha = X_0\left[W_x\left(\frac{u}{u_0}\right)^2 + Z_x\left(\frac{u}{u_0}\right) + G_x\right] \\ Y_\alpha = Y_0\left[W_y\left(\frac{u}{u_0}\right)^2 + Z_y\left(\frac{u}{u_0}\right) + G_y\right] \end{cases} \quad (2)$$

Where $[W, Z]$ is denoted as the process of understandability, $\left(\frac{U}{U_0}\right)$ is denoted as the process of calculating students' skills, (G) and is denoted as the multi-data. The performance is checked on the student's understandability of the concepts. This process is used to verify whether their performance is improved from the previously denoted performance. From the output of the students, the performance is estimated whether it is improved compared with the previous performance. The trained VR applications can improve performance. The selected multi-data can help enhance the performance level of the students. By upgrading the VR applications, the students can understand the concept. By increasing the efficiency of the input and the process of VR applications, the performance ratio of the students can be increased. The performance will decrease if the VR application does not match the concepts up to the level. VR can improve its way of delivering the concepts of input given so that it will be helpful to booth up the performance level of the students. The data given at the input to the VR applications must have its upgraded understanding. Through the teacher's input, VR develops students' interaction and engaging quality in their studies. This is used to make them understand the concept through a simple way of teaching. The performance checking using G is illustrated in Figure 2.

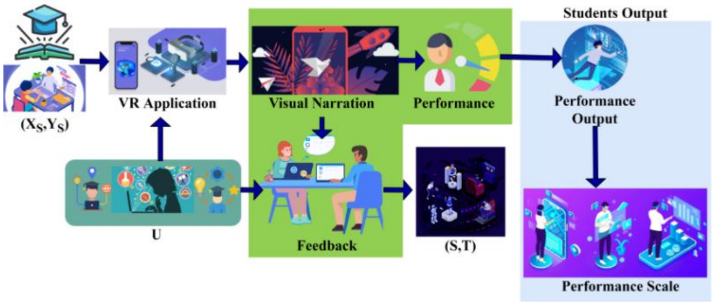

Figure 2: Performance checking using.

G Performance checking is the process of identifying the understanding capability of the students. This procedure also verifies whether the VR effortlessly conveyed the concepts to students. This also checks the data given as input to the VR applications. The performance level can be increased by ensuring the students understand the topic through VR. With the output, it is easy to identify the state of VR and its uses for students in their education. Thus, the lagging production level can be found by checking the students' performance. Then, further steps are taken to enhance the capability of performing better and improve the production rate. The student's performance can be identified through which they understand the concept of VR applications. The proper procedure of the VR and the input plays an important role in making the students perform efficiently without any barriers. The following equation (3) explains how to check the students' performance.

$$\begin{cases} \frac{dP'_d}{dt} = \frac{1}{P'}\left[P'_d + (A - A')I_y\right] - (w-1)P'y \\ \frac{dP'_y}{dt} = \frac{1}{P'}\left[P'_y + (A - A')I_d\right] + (w-1)P'd \\ \frac{dw}{dt} = \frac{1}{s}\left[T_0(Xw^2 + Y_w + Z + Gw^P) - \left(P'_d I_d + P'_q I_q\right)\right] \end{cases} \tag{3}$$

Where (P) is denoted as the process of checking the performance, (A, I) is denoted as the students' output, (S, T) and is represented as the process of checking the capability of the VR applications. Based on this output, the performance scale verification process is taking place. The performance scale estimates the students' performance with their output. The student's performance will be compared with the already stored performance data. This process is used to verify the efficiency of the process and further steps taken to improve the production of VR applications. The performance produced by the students is compared to the previous performance. This is the vital process of checking the efficiency of the students in their recognizing procedure. The outcome of the performance check process is used to verify the performance scale of the students. The student's ability to understand the concepts through the VR features is recognized in this process. It helps to improve the performance if there is any lag in the students. The data given as input to the VR application is checked, and its efficiency is verified through its operation.

The performance scale is used to enhance the productivity of the VR and the student's innovative thinking skills. The prior performance is checked with the obtained performance of the students. If there is any decrement ratio in the production of the students, then the training is given to the VR applications to improve its procedure. By this method, the performance level of the students can be identified. It also helps in enhancing the performance of VR applications. The improvement of the production can be processed in this performance scale procedure. The performance scale is used to identify the state of the student's performance level according to the VR applications. After understanding the concepts, they learned through VR utilization, it checks the students' production. It also helps improve performance if there is any procrastination in the studies. The verification operation is done with the previously noted performance of the students. The following equations (4) and (5) below explain verifying the performance scale.

$$\begin{cases} I_d = \frac{1}{L_H^2 + A}\left[L_H(V_d - P'_d) + A'\left(V_y - P'_y\right)\right] \\ I_y = \frac{1}{L_H^2 + A}\left[L_H\left(V_y - P'_d\right) - A'\left(V_d - P'_y\right)\right] \end{cases} \tag{4}$$

$$T_S = T_0(Xw^2 + Yw + Z + Gw^P) \tag{5}$$

Where (L, H) is denoted as the process of verifying the performance scale, (V) is denoted as the output of the performance check. The data filtering process occurs from the student's performance output. It is the process of filtering the needed data for better VR applications. It checks whether the data available for the process is needed. This filtering process is used for delivering suitable training and efficacious visualization sessions. The data filtering procedure is used to pick the necessary data, which will help produce better student performance. This identifies which data will be useful in producing the high performance of the students by using the VR applications. By utilizing the visual reality, the student's performance should be increased with effective multi-data as the input. The concepts must be understandable for the students while using VR utilization. The data filtering requirement based on the above representations is presented in Figure 3.

	Data		Student-Level		VR Process		
	(X_s, Y_s)	(P, Q)	U	$[W, Z]$	(A, I)	P	(S, T)
Skills	−	−	+	+	+	+	+
Understandability	+	+	−	+	?	?	+
Feedback	−	−	−	?	+	+	+
Performance	−	−	+	+	?	−	+
Modification	+	+	?	−	+	+	+

Figure 3: Data filtering requirement.

Data filtering most commonly helps identify the necessary and the unnecessary data for the process. The data with the high efficiency to produce the better outcome is selected for the training process for the VR applications. Thus, that data can add more efficiency for the entire process to produce efficacious performance. This helps increase the data efficiency, which will be given as the input to the VR utilization process, and improves the students' understandability level. Thus, this data can be sent to the further training process of the teaching procedure by using the VR to enhance the student's creative thinking and to establish the operation's production. The exact data can be found using the filtering process, and the unwanted data in the procedure can be eliminated. The process of data filtering is explained by the following equations (6-8) given below:

$$\frac{1}{n}\sum_{B=1}^{n} \sigma^2 B(\forall) = \frac{1}{n}\sum_{B=1}^{n} \left[(D_{Bm}(\sigma) - D_{BS}(\theta)) + E_{Bm}(\sigma) - E_{BS}(\theta))\right] \quad (6)$$

$$O_y = O_y \times \left(\frac{f_1-f_2}{f_n} - B\right) / \left(\frac{f_1-f_2}{f_n}\right)$$

$$O_m = O_m \times \left(\frac{f_1-f_2}{f_n} + B\right) / \left(\frac{f_1-f_2}{f_n}\right) \quad (7)$$

$$\begin{cases} R_y = R_y \times \left(\frac{f_1 - f_2}{f_n} - B\right)/B \\ R_m = R_m \times \left(\frac{f_1 - f_2}{f_n} + B\right)/B \end{cases} \tag{8}$$

Where (D, E) is the process of identifying the needed data (θ, σ) is denoted as the unwanted data verification, (O, R) is denoted as the process of data filtering, (n, m, f) is denoted as the outcome of the performance checking process, (γ) is denoted as the process of checking the improvement of the students. Now the output of the data filtering process and the performance scale verification process is sent to the training procedure, done by the hybrid learning technique. It is also known as multi-instance learning. In this training process, the filtered and previously filtered data from the different samples are adapted to match the effective outcomes. Therefore, this multi-instance learning technique is trained from the outputs of the VR application sessions, the outcome of the performance scale, and the conglomerated teaching input data. This reduces the filtered data's impact across the sequential training sessions. The learning for training VR applications is presented in Figure 4.

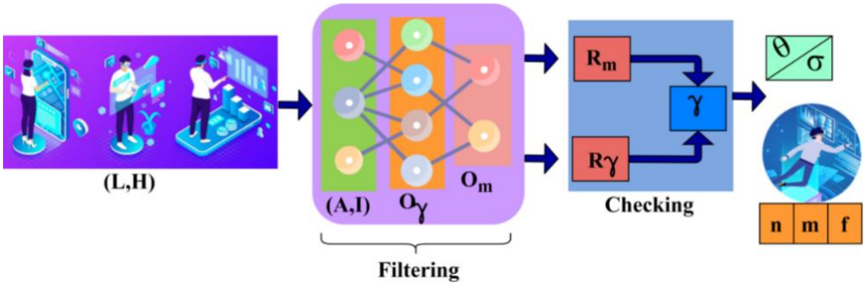

Figure 4: Learning for training VR applications using filtered data.

This learning in training is used to analyze both the data filtering output and the performance scale outcome to check whether the session results in profit or loss of the training. By using this learning technique, the VR applications help in improving the student's performance. This learning is used to influence the performance of the students through the utilization of visual reality. This technique is used to analyze the efficiency of the training through VR and the student's performance. If there are any lags in the performance, training is given to the VR applications to improve the sessions. Combining both outputs is used to determine the level of production by the students after the visual sessions. The input data efficiency also can determine by the learning technique. At the same time, both results are checked to provide effective training to the VR. The process done by hybrid learning is explained by the following equations (9-11) given below:

$$\eta^* = \eta \parallel \epsilon(\eta) \parallel \tag{9}$$

$$\eta_{i+1} = \eta_i + X_i S_i \tag{10}$$

$$X_i = \frac{1}{N} S^{-1} J^{\gamma} \epsilon \tag{11}$$

Where (η, J) is denoted as the process done by hybrid learning to analyze the output of the data filtering and the performance scale procedures. Now from the learning technique's output, the VR applications will be given training to improve their features. After the analysis process, the modifications are done to improve the performance. This improvement is done to provide clear decisions based on performance. This training and the modifications provide prompt visualization to the students and enhance their ability to improve their performance. After the impact reduction process of the filtered data, the training replications are explicit for the execution of the prompt data validations. This improves the analysis process based on the student's performance with fewer training complications and attainable performance efficiency. The training improves the VR process, which helps execute the input's perfect concepts. Training helps provide modifications to boost the students' performance toward their education. Students can get more innovative skills and connections toward education using VR applications. The process of giving training based on the analyzing process output to modify the VR applications to improve the student's performance is explained by the following equations (12) and (13) given below:

$$S = (J^{\gamma} J + X_i I) \tag{12}$$

$$F_S(\rho) = \frac{f_1(\varphi) - f(\sigma)}{\sum_b \epsilon \varphi\left(f_1(\varphi) - f(\beta)\right)} \tag{13}$$

Where $(F_S(\rho))$ is denoted as the process of giving the training to modify the VR applications to enhance the student's performance, (φ) is denoted as the output of analyzing the data filtering and the performance scale outcomes. The modifications through previous data filtering instances are presented in Figure 5.

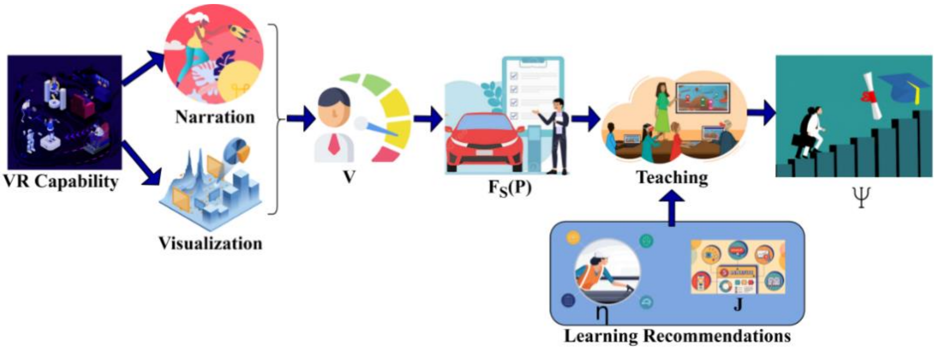

Figure 5: Modifications in VR application through the previous filtering.

In this process represented above, the efficiency of the student's performance is made high, reduces the training complexity, the precision of the analyzing process is less, and the analyzing time is low. The multi-instance learning technique improves the student's performance and enhances the modifications in the VR applications to execute the prompt visualization to the students. Here the data is sent as input to the VR, enhancing the connectivity of the students with education. VR helps to convey the concept through real-time experiences, which can be easy for the students to understand the concept in learning. It also helps in improving their performance in the process. If there are any lags in the production, further steps are taken to reduce the complexity, and training is given to the visual reality applications to produce better-featured decisions.

4 RESULTS AND ANALYSIS

The proposed method is applied to a VR dataset presented in [12]. This data set is used for English vocabulary teaching in 8 sessions for which five performance checks are performed. First, the performance before the vocabulary teaching is identified, and the assessment post the VR-based training is extracted. The VR-based assessment is of 3 levels-elementary, pre-intermediate, and intermediate for eight different learners. We consider proficiency, vocabulary pre, and post-test for performance assessment among the eight classifications. The Pre- and post-examination results are graphically presented in Figure 6.

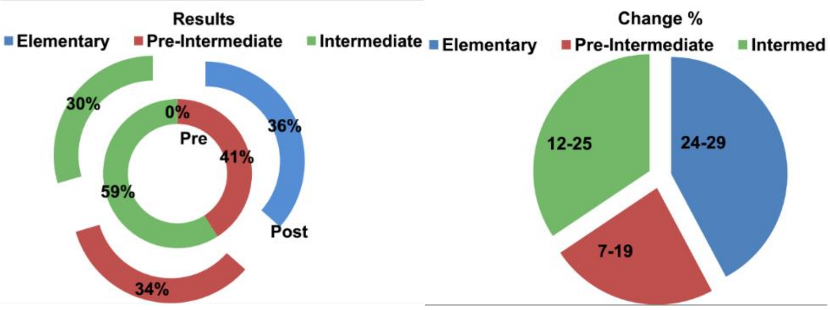

Figure 6: Pre- and post-examination results.

The examinations reflect the performance scale for identifying improvements in teaching. The VR models are implemented using audio and visual gadgets and wearables, as represented below. These gadgets are connected to visual and hearing multimedia sources for data accumulation. A voice input reads the visual texts for the students with lexical and pronounceable sentences. The pre-examination is the student's knowledge of identifying a sentence lexical. The knowledge level is improved by identifying the pre-examination results. Depending on the results, data filtering and training are induced to improve the post-examination. In the second analysis presented above (Figure 6), the change % represents the scale between two examinations (pre and post). If the scale is satisfactory for the performance, filtered data is retained for the next training session. Now, the VR application relies on filtered data from the previous post-examination results. The filtration is performed using the students' experience using VR teaching. The amendments for filtering are presented in Table 1.

Students	*Teaching Friendly*	*Comments*	*Narration*	*Virtual Environment*	*Content*
1	*Yes*	*No*	*3*	*2*	*4*
2	*No*	*No*	*1*	*1*	*5*
3	*No*	*Yes*	*2*	*2*	*1*
4	*Yes*	*Yes*	*5*	*3*	*2*
5	*No*	*No*	*1*	*1*	*4*
6	*No*	*Yes*	*1*	*1*	*2*
7	*No*	*Yes*	*1*	*2*	*1*
8	*Yes*	*No*	*2*	*4*	*3*
9	*No*	*Yes*	*1*	*1*	*1*
10	*Yes*	*No*	*3*	*4*	*4*
11	*Yes*	*Yes*	*5*	*5*	*2*

12	*No*	*No*	*1*	*1*	*5*

Table 1: Filtering amendments.

The amendments are pursued based on the ratings provided for the environment and the teaching content. These two possibilities require monotonous data for assessment and precise content delivery. A negative commented experience (out of 12 students) requires more precise teaching data for performance improvements. This analysis impacts the post-examination results, provided the model is revisited. In the machine learning training, the performance scale is used for categorizing suitable and unsuitable data based on Table 1 information. Therefore, negative feedback and low ratings associated with the filtering process are extracted. In this extraction, the unsuitable content analysis is presented in Figure 7 based on rating, comments, and irrelevance.

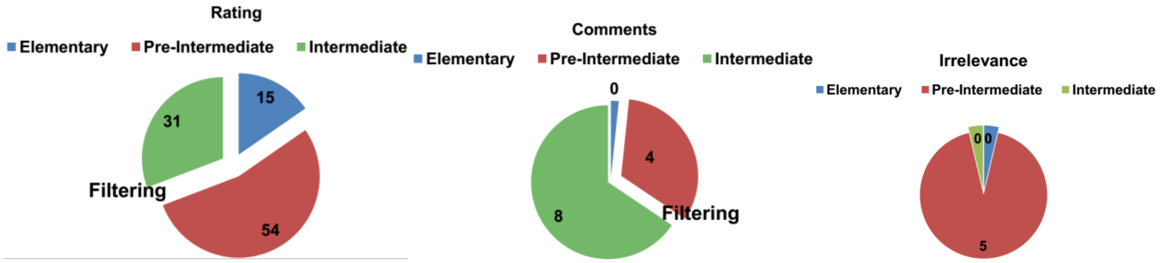

Figure 7: Content analysis.

The filtering relies on the above analysis for 12 students undergoing elementary, pre-intermediate, and intermediate. The cumulative observation above for the different examination levels posts the VR training. The VR application ensures a consecutive model for data filtering using the available information. Based on the available data and the requirement, as in Figure 8, the data required for the consecutive session is trained. The training is performed by identifying the following terms in the teaching curriculum. Here the vocabulary elements such as lexical, idioms, phrases, and pronunciation are considered alone.

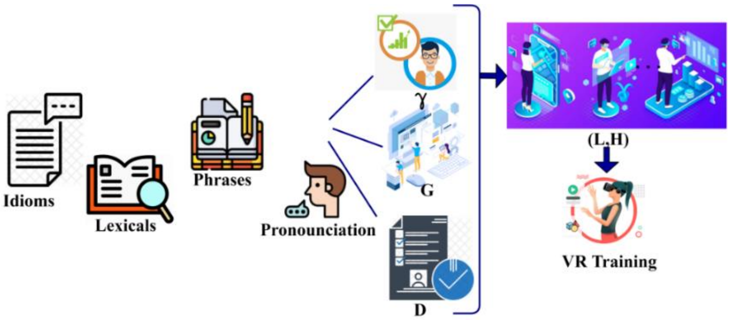

Figure 8: Data requirements.

The γ, G and D are assigned to different students based on the feedback and negative comments. Now, the VR applications are trained to adapt to the above changes to prevent understandability issues. The training for video changes and narration audio is performed for loading new experiences. Based on such experience, the performance improvements are tabulated in Table 2.

Level	*Modifications*	*(S, T) (12 Students)*	*Data Filtering (%)*	*Feedback*	*Previous Ratio*	*Improvements (%)*
Pre-Elementary	*10*	*7*	*1.12*	*-*	*31.3*	*12*
	20	*9*	*5.36*	*+*	*48.25*	*18*
	30	*8*	*3.65*	*-*	*42.36*	*15*
Elementary	*10*	*11*	*18.36*	*+*	*52.32*	*19*
	20	*12*	*23.47*	*+*	*69.4*	*21*
	30	*8*	*15.23*	*-*	*45.23*	*25*
Intermediate	*10*	*7*	*3.65*	*-*	*31.5*	*31*
	20	*9*	*18.36*	*+*	*48.39*	*35*
	30	*12*	*23.47*	*+*	*69.4*	*38*

Table 2: Performance improvement post modifications.

The performance variations are achieved using intense training across G, γ, and D. This is different for various teaching levels by extracting precise data through filtering. Therefore, as the filtering ratio increases, the negative feedback is suppressed to reduce improper/ unsatisfied student training. The G is exploited from U, U_0, and (S, T) filtering is performed to reduce the complexity. Therefore, hybrid learning is performed to modify VR scenario data for better performance (Table 2).

The relative analysis uses the following metrics: data filtering ratio, precision, training complexity, analysis time, and performance efficiency. The variables are data accumulation ratio and matching/ session. The considered methods are VRLE-MM [26], VR-CLT [27], and iProgVR [19].

The data filtering process is recommended high in this procedure by using the multi-instance data filtering technique. In this process, the necessary data are filtered for further training to improve the student's performance. Here the needed and the unnecessary data are determined within the time to precede the upcoming procedures. This output is used in the training process, done by hybrid learning, where the analysis occurs. The data filtering procedure is used to pick the necessary data, which will help produce better student performance. The filtered data is used in the training process to produce the prompt visualization of the concepts to the students. The process of data filtering is used to make alterations in the upcoming training for the execution of better performance of the students. By the high data filtering, efficient operations are done to explicit the connectivity between the students and their education. With all these steps, the data filtering is high in this process by using the learning technique (Table 3). For the varying data accumulation ratio and matching/ session, the proposed method improves data filtering by 11.52% and 11.09%, respectively.

Data Accumulation (%)	*VRLE-MM*	*VR-CLT*	*iProgVR*	*MIL-DF*
20	*2.53*	*7.91*	*11.66*	*18.21*

40	*4.49*	*8.31*	*10.59*	*15.163*
60	*2.68*	*11.12*	*14.23*	*20.651*
80	*3.11*	*8.92*	*11.95*	*17.363*
100	*5.57*	*11.91*	*18.17*	*23.405*

Table 3: Data filtering.

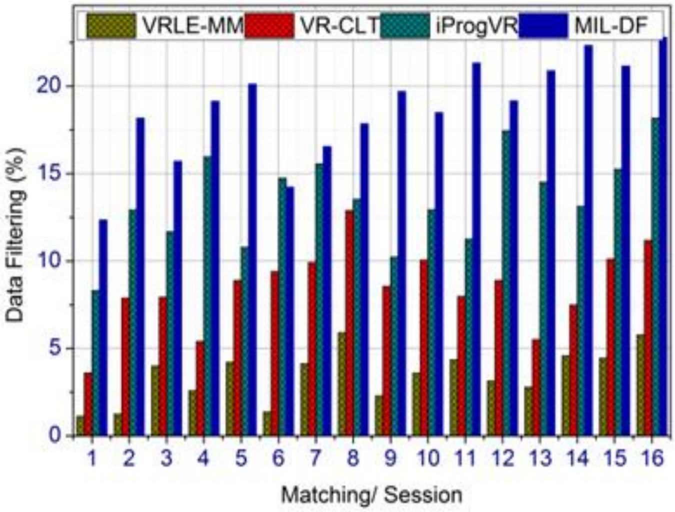

Figure 9: Data filtering analysis.

The precision of the analyzing process is high in this procedure using the hybrid learning technique. At the same time, the outcomes of the data filtering process outcomes and the performance scale outcomes are analyzed to give training to the VR applications (Refer figure 9). By analyzing the outcomes, modifications are done to the VR to provide the perfect visualization for the students. After this process, further steps are induced to improve the student's performance. This learning is used to influence the performance of the students through the utilization of visual reality. This technique analyzes the training efficiency through VR and the student's performance. The perfection of the analyzing process helps modify the students' further performance. If there are any procrastinates in the process, then the perfect alterations are done to enhance the visualization and establish the students' efficiency of performance (Table 4). For the varying data accumulation ratio and matching/ session, the proposed method improves prediction by 10.5% and 10.94%, respectively.

Data Accumulation (%)	VRLE-MM	VR-CLT	iProgVR	MIL-DF
20	*0.517*	*0.718*	*0.71*	*0.8269*
40	*0.604*	*0.692*	*0.77*	*0.9322*
60	*0.544*	*0.669*	*0.717*	*0.8897*
80	*0.564*	*0.72*	*0.751*	*0.8644*
100	*0.633*	*0.741*	*0.845*	*0.9497*

Table 4: Analysis precision.

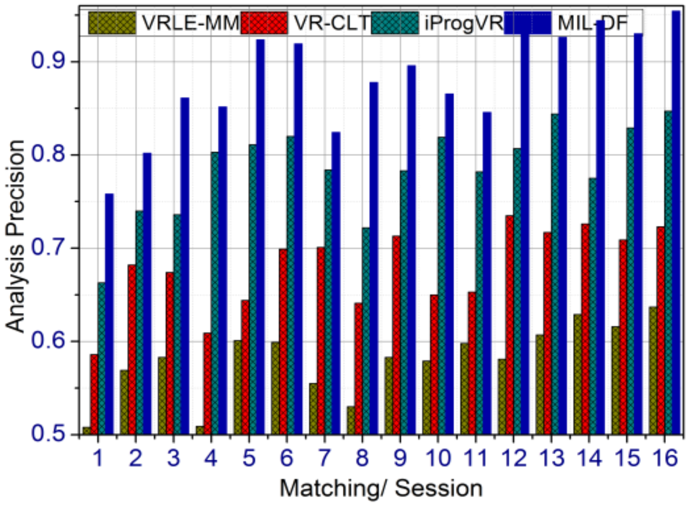

Figure 10: Precision analysis.

The complexity of the training is recommended less in this process with the help of the hybrid learning technique. As the training is done with the output of both the data filtering ad performance scale process, there are no difficulties in making the training. The analyzing process is done before the training is given to the VR applications. The perfect necessary things are taken to make the VR application training enhance the student's performance with a better visualization (Refer figure10). After the impact reduction process of the filtered data, the training replications are explicit for the execution of the prompt data validations. This training enhances the analysis process based on the student's performance with fewer training complications and attainable performance efficiency. Training given to the VR applications helps modify the students' performance towards their education. In these ways, the complexity of the training given to the VR to enhance the student's performance is reduced (Table 5). For the varying data accumulation ratio and matching/ session, the proposed method reduces training complexity by 10.67% and 10.95%, respectively (refer figure 11).

Data Accumulation (%)	*VRLE-MM*	*VR-CLT*	*iProgVR*	*MIL-DF*
20	*1.103*	*0.433*	*0.342*	*0.083*
40	*1.251*	*0.837*	*0.649*	*0.0769*
60	*1.157*	*0.832*	*0.584*	*0.0744*
80	*1.318*	*0.757*	*0.584*	*0.3208*
100	*1.373*	*1.004*	*0.684*	*0.3672*

Table 5: Training complexity.

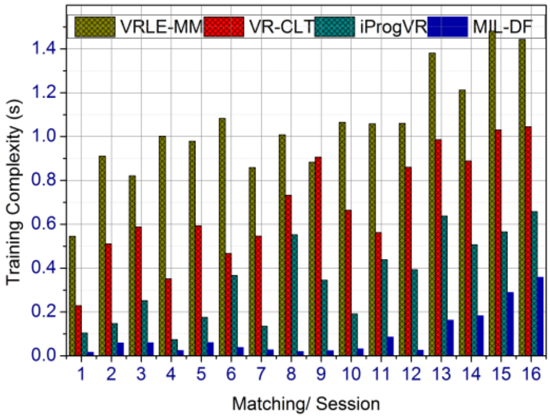

Figure 11: Training complexity analysis.

The time taken for the process of analyzing is less in this process. The analysis time is less as the output

from the filtering and performance scale process is obtained. The output of the performance check process is used to verify the performance scale. The time will not lead high for analyzing the procedure, which results in profit or loss for the VR sessions. Training provided for virtual reality applications aids in modifying how well students perform academically and analyze it based on the hybrid learning technique. These techniques lower the complexity of the VR training provided to students to improve their performance and show the advantages of the proposed work by reducing the training complexity. The students are trained to visualize teaching concepts appropriately using data filtering procedures in the training process. The learning model is well-trained from various session instances and teaching information to reduce the training complexity. The MIL-DF technique provides immediate evaluations and modifications in the training procedure because iterations are structured for quick data validation. This adaptability makes fast analysis possible, makes performance-oriented evaluations more effective, and improves the robustness of the work.

In this learning, multi-data from the filtering process and the performance output from the performance scale are analyzed. It is used to observe the loss and profit of the process after analyzing the VR applications and training according to the output to provide prompt visualization to students. The correct analyzing process helps make the perfect training for the VR applications, which helps enhance the connectivity between the students and their education. This improves the filtering process for executing tailored training and visualization sessions. By using all these ways, the time of the process of analyzing is proposed less (Table 6). For the varying data accumulation ratio and matching/ session, the proposed method reduces analysis time by 11.35% and 10.83%, respectively.

Data Accumulation (%)	*VRLE-MM*	*VR-CLT*	*iProgVR*	*MIL-DF*
20	*2.59*	*1.64*	*0.543*	*0.457*
40	*2.63*	*1.2*	*0.534*	*0.3454*
60	*2.61*	*1.87*	*0.712*	*0.6398*
80	*2.98*	*1.72*	*1.387*	*0.2794*
100	*3.51*	*2.47*	*1.514*	*0.7972*

Table 6: Analysis time.

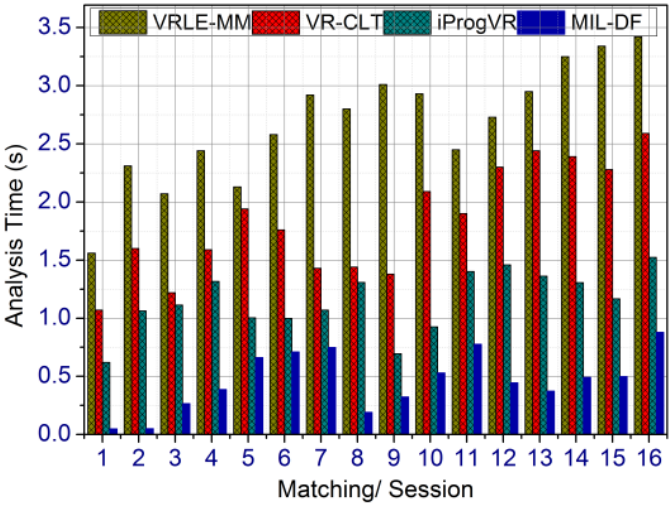

Figure 12: Time analysis.

The performance efficiency is recommended to be high by using VR applications. VR can enhance education by delivering students with memorable and hypnotic experiences. The students can visualize the topic insisted on by the teacher and engage with the topics. Through the excitement of innovating associated learning environments, VR improves students' performance. By using the performance check, the production of the students through the VR applications is verified. The trained VR applications can improve performance. The selected multi-data can help enhance the performance level of the students. By increasing the efficiency of the input and the process of VR applications, the performance ratio of the students can be increased. VR can improve its way of delivering the concepts of learning so that it will be helpful to boost the performance level of the students. By improving the student's performance, their interaction with education is improved through the real-time experiences of the VR applications (Table 7 & Figure 12).

Data Accumulation (%)	*VRLE-MM*	*VR-CLT*	*iProgVR*	*MIL-DF*
20	*0.623*	*0.64*	*0.747*	*0.7934*
40	*0.608*	*0.681*	*0.78*	*0.8071*
60	*0.637*	*0.689*	*0.768*	*0.8668*
80	*0.598*	*0.67*	*0.77*	*0.8731*
100	*0.628*	*0.743*	*0.821*	*0.8929*

Table 7: Performance efficiency.

VR applications receive training using the performance scale analysis and data filtering procedure findings. The findings make identifying pertinent data and scale performance indicators possible, leading to focused and customized training experiences concerning several matchings per session. The hybrid learning technique ensures high precision in the analysis process. Combining several learning strategies improves the analysis' accuracy and dependability, producing more successful training results. Any flaws or delays in the procedure can be found and fixed, ensuring that the visualization and training techniques are optimized for raising students' performance to their highest potential by the proposed work compared to existing algorithms VRLE-MM, VR-CLT, and iProgVR.

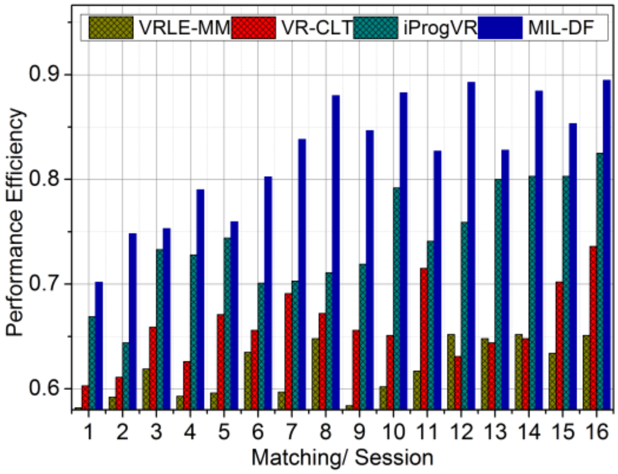

Figure 13: Efficiency analysis.

For the varying data accumulation ratio and matching/ session, the proposed method improves performance efficiency by 8.1% and 7.87%, respectively (Refer Figure 13).

5 CONCLUSION

Virtual reality paradigms assimilated with the learning and teaching courses improve the students' performance through interactive and real-time representations. The audio narration and video representations improve the concept's understandability without flaws. Therefore, the multi-instance learning for data filtering is augmented with this fact that strengthens the performance efficiency. In particular, this method addresses the unnecessary data associated with the teaching session that causes complexity in narrating or visualizing the precise teaching content. The multi-level data from previous teaching sessions, curriculum, students, and teachers are unified to reduce unnecessary data impact. The data utilization by the VR applications is tailored to different training and implementation instances. Based on the utilization and actual requirement, the consecutive sessions VRs are visualized. The VR input and application quality are improvised using the individual student feedback and performance scale. In the end, the advantage of the proposed work is discussed by using a hybrid learning approach to analyze and train VR applications has several benefits, including very precise analysis, customized training experiences, improved visualization, an impact on student performance, ongoing improvement, and considerable performance gains. The multiple training iterations rely on prompt data exploited through curriculum-centric performances. This reduces VR training complexity and leverages performance efficiency.

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