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ORIGINAL

TRAINING ON THE INCIDENCE OF NEEDLE INJURY AND PREVENTIVE MEASURES FOR FITNESS NURSES AT DIFFERENT STAGES OF CLINICAL PRACTICE

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ABSTRACT

Medical training for fitness nurses accommodates theoretical and practical sessions for understanding real-time patient care and handling. Some common errors such as needle injury, improper tool handling, etc. occur due to novice fitness nursing students. For preventing such errors and improving the training quality, this article introduces an Artificial Intelligence assimilated Preventive Training Measure (AI-PTM). The proposed method observes the different training sessions of fitness nursing students for error detection and training qualification. In this method, classification with recurrent learning is induced for identifying the error-causing feature in the mid of the training session. This error-causing feature is classified based on student characteristics (such as mishandling, lack of concentration, etc.) and objects (new equipment, precision handling, etc.). Based on the classification, the instance is modified in the recurrent training session, improving the student's concentration. The identified error-causing features are stored, congruently matched, and used for training further nursing sessions. This method improves training accuracy, and precision handling, and reduces error.

KEYWORDS: Artificial Intelligence, Classification Learning, Clinical Practice, Needle Injury, Nursing

1. INTRODUCTION

Fitness Nursing students need more clinical practices while studying the courses. Clinical practices are practiced by the students by providing certain training sessions. Clinical practices provide better knowledge of patients with some set of rules and guidance (Maquibar, Estalella, Vives-Cases, Hurtig, & Goicolea, 2019). Clinical practices such as checking patients' health conditions, feeding, changing clothes, bathing patients, and providing necessary services. Lectures and rules are also available in clinical practice training sessions that improve the performance rate of students during the training period (Bullington et al., 2019; Pitts, 2017). Clinical practices provide both educational and administrative skills for the students that ensure the safety of patients. The major role of fitness nursing students is to take care of the patients with full patience and kindness (Martin-Ibañez et al., 2021). Clinical practice is the ability to solve problems and provide high-quality healthcare services to patients. Certain methods and techniques are used for the clinical practices training session that reduces stress factors for fitness nursing students. Clinical practices provide practical experience to the students that are given from the classroom. Clinical practices allow the students to learn more about the basic component that improves the effectiveness rate in managing healthcare (Li, Kong, Sun, Zhu, & Li, 2021; Liang, Wu, & Wang, 2020).

Injury prevention is a complicated task to perform for every fitness nursing student. Treating patient injuries need various steps and procedures for students. Steps such as cleaning hands, safe needle handling, analyzing the patient's health condition, identifying the cause of the injury, and knowing basic first aid actions (Haesler et al., 2022). Injury prevention training provides necessary services such as mobility, treating the patient, reducing the condition of the wound, and prevent causing severe damage to the body (Cederström, Granér, Nilsson, & Ageberg, 2021). A fitness nursing student learns injury prevention by participating in training sessions that improve the efficiency of healthcare centers. Injury prevention plays a vital role in preventing patients from dying and reducing severe damage by providing necessary services (Huang et al., 2022). The main aim of injury prevention training for fitness nursing students is to keep the patient healthy and stable. The injury prevention method also avoids unwanted stress on patients that maintain a stable mental state of the patient (Schmitz, Figueira, & Lampron, 2019). Fitness Nursing students are exposed to various injury prevention training by providing guidelines and advice. Injury prevention is a major problem in the healthcare system; fitness nursing students reduce the complexity rate of injury prevention in healthcare centers. Injury prevention training improves the attitude of the student toward patients which enhances the reliability and efficiency of the fitness nursing field (Pérez-López, López-Franco, Comino-Sanz, & Pancorbo-Hidalgo, 2021; Sönmez, Taşdemir, & Ören, 2021).

Artificial intelligence (AI) is a subset of the machine learning (ML) approach that uses human-based skills to perform a particular task. AI is mostly used to recognize, detect and analyze the data that are necessary to perform tasks in computer-based applications (Ma, Shi, Zhang, & Zhang, 2021). AI is also used in the teaching field that provides effective teaching sessions for students. Nursing systems use AI techniques to provide certain training sessions for the students. AI is used in fitness nursing to improve the clinical decision-making process which increases the accuracy rate in providing services (FRICKE & DURVILLE, 2021; Yilmaz & Sari, 2021). AI-based training provides an effective communication process among fitness fitness nursing students and patients that reduce the complexity rate in providing healthcare services. AI-based training is both cost-effective and time-effective that provides necessary guidelines for fitness nursing students (Palominos, Levett-Jones, Power, Alcorn, & Martinez-Maldonado, 2021). AI provides uninterrupted training sessions to the fitness nursing student without any delay and energy consumption rate. AI platform improves the skills and knowledge of students by providing understandable learning modules that enhance the clinical practices of students. Various AI-based gadgets are available for fitness nursing students that provide necessary suggestions for the student during the training period (Hart, Bird, & Farmer, 2019; Tran et al., 2022).

2. RELATED WORKS

Meadows et al. proposed a new method to identify the knowledge and skills of fitness nursing students. The main aim of the survey is to assess the knowledge, skills, attitudes, and demographics regarding opioids and the opioid epidemic. The proposed method finds out the patience rate of fitness nursing students. Opioids are identified based on a certain set of detection process that provides necessary information for fitness nursing students. It also provides guidelines to treat the patients that reduce the pain and disorders (Meadows, Martin, & LeBaron, 2021).

Calloway et al. introduced a new method to identify fitness nurses' attitudes towards disabled nursing students. The proposed method first analyses the civil law over disabled people and provides important rules to fitness nurses. Disabled nursing students face more issues and problems from senior nurses during the training period. The proposed method finds out the actual attitudes of nurses and provides an appropriate set of data for the data analysis process. The proposed method reduces the problem rate of fitness students (Calloway & Copeland, 2021).

Ziam et al. proposed a musculoskeletal disorder (MSD) prevention practice for fitness nursing students in healthcare centers. The proposed method provides necessary details about MSD to the fitness nursing students and staff that provide appropriate services to the patients. A nurse's position, attitude, condition, and degree are first identified and then allocate to MSD patients for training. The proposed method enhances the performance and significance of fitness nursing students among MSD patients (Ziam, Laroche, Lakhal, Alderson, & Gagne, 2020).

Cukljek et al. introduced a new cross-sectional process to find out the knowledge of fitness nursing students over pressure injury (PI) prevention. The classification method is used here to identify the difference between major and minor injuries of patients. The proposed approach reduces the complexity rate in the identification process that provides necessary information for PI prevention. The proposed method increases the accuracy rate in PI prevention which improves the efficiency of the system (Cukljek et al., 2022).

Jeong et al. proposed a situation background assessment recommendation (SBAR) program for fitness nursing students. Fall simulation is used in SBAR that identify the skills and interests of nursing students. SBAR is an improved fall-related skill program that improves the communication and attitude abilities of students. The proposed SBAR increases the effectiveness and reliability rate of healthcare centers that provide appropriate services to patients (Jeong & Kim, 2020).

Yang et al. (Yang & Zang, 2022) introduced a new method to find out the relationship between professional self-concept and professional competence of nursing students. The proposed method is mainly used during the clinical practice period that needs more understanding among the students. The proposed method increases the number of both professional self-content and competence levels of fitness nursing students. The proposal also provides necessary guidelines to the students to improve their clinical practice skills and abilities during the training period.

Olaussen et al. proposed integrating simulating training for fitness nursing students during clinical practices. The proposed method identifies the abilities, knowledge, skills, and self-efficacy of nursing students. The self-efficacy scale is used here to measure the student's outcomes from clinical practices. When compared with other methods, the proposed approach increases the accuracy rate in the identification process which improves the feasibility of the system (Olaussen et al., 2022).

Hustad et al. introduced a new approach to studying nursing students' transfer of learning during the clinical practice period. The simulation-based training program is provided to fitness nursing students to improve their confidence level and communication skills among the patients. It also improves the decision-making skills of students which increases the performance rate of healthcare centers. The transfer of learning skills of students is improved during clinical practices (Hustad, Johannesen, Fossum, & Hovland, 2019).

Al-Moteri et al. proposed an active clinical training approach (ACTA) for fitness nursing students in the clinical practice period. ACTA provides necessary guidelines for the students to identify a patient's disorder. ACTA also provides self-directed learning skills to students that enhance the performance rate during the clinical practice period. Learning skills and needs are identified by ACTA which provides appropriate advice and practices to the students. The proposed approach improves the ability and efficiency rate of fitness nursing students which increases the accuracy rate in solving problems (Al-Moteri, 2020).

Reavey et al. introduced a primary residency training program for fitness nursing students. Clinical details are collected from surgery logs that provide necessary information for the students. Certificate-based courses are offered to the students by hand surgeons which improves their confidence level of students. A certificate of added qualification (CAQ) is also available for fitness nursing students to improve their skills and knowledge during clinical practices.

Chan et al. proposed a new prevention and management approach to identify extravasation injuries during clinical practices. Neonatal intensive care mostly used the prevention approach to find out extravasation injuries. The proposed method develops certain guidelines to identify the patients. The proposed approach improves the performance rate and knowledge level of fitness nursing students. The proposed method increases the accuracy rate in the identification process which reduces the complexity rate for the students.

Siva et al. introduced a new practice method for periodic patient injury prevention. The proposed method is mainly used by fitness nursing students to find out the cause and source of injuries. The proposed method also provides safety precaution measures to patients' families and people that improve the significance level in clinical practices. Nursing students play a major role in explaining certain rules and guidelines to families.

Walker et al. proposed a three-phase model to identify injuries during the clinical training period for fitness nursing students. Various neurocognitive challenges are faced by students that increase the complexity rate in providing services. The proposed method also provides certain recommendations based on the clinical experience of fitness nurses that enhance the performance of injuring prevention process. The proposed model reduces the latency rate in the identification process that provides appropriate services to the patients at the needed time.

Artificial Intelligence assimilated Preventive Training Measure (AI-PTM) for Nursing Students

The rapid growth of the population, vulnerability and changes in food habits and environment to different health disorders lead to an increase in the number of patients needing medical services and healthcare centers. Fitness Nurses are a member of the healthcare services; they are responsible for taking care of elderly people/patients. The design goal of the AI-PTM method is to monitor the error detection and training qualification of fitness nursing students through clinical practices. The proposed different stages of clinical practices based on real-time patient care and handling for fitness nursing are designed to improve training accuracy and precision handling of the fitness nursing students provided for the patient. Early observation of device handling, theoretical and practical sessions, and patient handling through clinical practices based on medical training sessions in a consecutive manner for better error identification for checking the student's concentration in the theoretical and practical sessions. In fitness nursing, the causing errors such as the improper tool handling, needle injury observation, wearing the same pair of gloves for more than one patient, cleaning the medical instruments like a thermometer, suction device (to suck up blood or secretions), sphygmomanometer, etc. before utilization, this error occurs due to novice fitness nursing students. In this error detection process, the identification of needle injury and improper tool handling is computed through training sessions and previously-stored feature is deciding factor for which the training accuracy is to be thwarted through theoretical and practical sessions. APTM is one method that makes use of identifying mistakes made by fitness nurses and training qualifications for the fitness nursing students. In this proposed method, the patient care and handling of the different training sessions and observations are considered to improve the error detection in training the fitness nursing students. From different stages of clinical practices, the needle injury and preventive measures for the pursuing fitness nurses based on the training sessions are unavailable. The proposed method is portrayed in Figure 1.

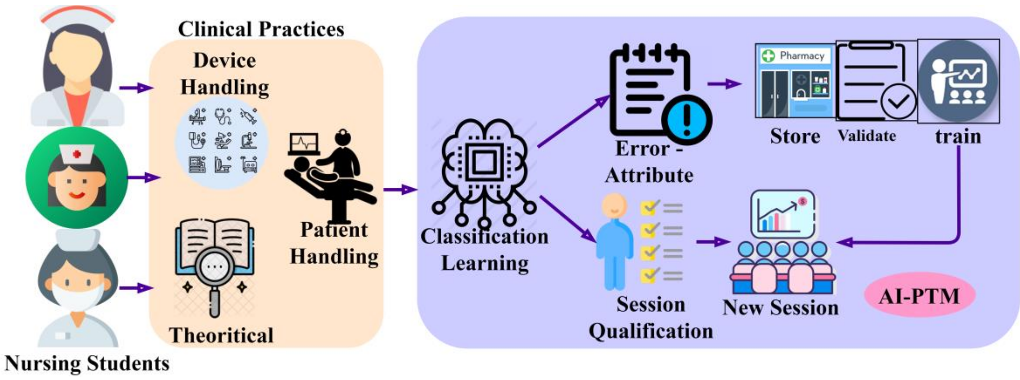

Figure 1 Proposed Method

Identifying mistakes based on fitness nursing students' concentration and attending training sessions improves fitness patient care and tools handling for the students' experiences at different stages of clinical practices observation that is to be identified and detected for preventing such errors and training quality. This error that occurs in the training session for the fitness nurses is referred to as an error-causing feature in clinical practices. In particular, the clinical practice through the device and patient handling is prevented from errors at different training session instances to improve the precision handling based training accuracy. However, to retain the mistakes or errors by providing additional training sessions to the fitness nursing students for better patient care and handling, the proposed method provides a classification process based on error attributes and session qualification is addressed. The function of preventive training measure observation is to identify mistakes through classification learning, based on the recurrent training session and clinical practices observation of the fitness nursing students is analyzed and monitored through theoretical and practical sessions. The training sessions of nursing students are observed for error detection and training qualification is administered to prevent mistakes in the above metrics with the identification of error attributes based on fitness nurses for determining clinical practices depends on the fitness students' concentration in training.

The objective of this incident of needle injury and preventive training measures is to maximize clinical practices for fitness nursing students. The collaborative and probabilistic clinical practices for fitness nurses results in error-causing feature of reducing error detection and training qualification and the time of clinical practices respectively, then

$$\max \prod_{i=s} \prod_{j=q} \rho(N_{Sd} \times C_{Pr})^{x}, \forall\, s \in q \quad (1a)$$

Such that,

$$\sum_{i=s}(C_{Pr}) = \sum_{j=q}(C_{Pr})_{sq} - 1 - \left[\frac{(C_{Pr})_s}{\sum(C_{Pr}+T_s)}\right] \quad (1b)$$

As per the equation (1a) and (1b), the variables N_{Sd} and C_{Pr} is used to denote the probability of medical training for fitness nurses and their clinical practices through a session s and quality q based on the training T. The maximum probability of $x = 1$ achieves high clinical practices for nursing students. Similarly, the variables i and j are the random integers for patient care and handling whereas s and q are not constant due to error occurrence as $x \in [0,1]$ is the fluctuating constraint. Therefore $x = 1$ is not analyzed at different stages of clinical practices, resulting in error detection and training qualification. This problem is referred to as an error-causing feature in the medical training sessions. The assisting artificial intelligence and classification learning are jointly used in the proposed error detection method for clinical practice maximization for nursing students.

In an Artificial Intelligence-assisted needle injury and preventive measures of the training based on nursing students, the training sessions are satisfied by providing clinical practices to the fitness nurses. The error that occurred in the clinical practices is identified by the staff. Artificial intelligence consists of different stages of device handling, theoretical and patient handling to monitor the error occurrence in the training sessions and quality as in equation (1). The probability of providing better clinical practices successfully through training T without errors (i.e.) $\rho(C_{Pr})$ is given as

$$\rho(C_{Pr}) = \frac{\sum_{i \in s} T_i^q}{\sum_{j \in q} T_j^q} E^{-\frac{C_{Pr}}{t} * i} \quad (2)$$

In equation (2), the variables T_i^q and T_j^q represents the quality of the training sessions at different time intervals t and the actual training quality instance, respectively. In particular, the needle injury and preventive measure identification based on $\left[1 - \frac{C_{Pr}}{\sum(C_{Pr}+T)}\right]$ is illustrated using series computation. The clinical practice estimation based on session and quality is presented in Figure 2.

Figure 2 Session and Practice Estimation

The allocated sessions are observed for their performance and errors. This is cumulatively observed for the nursing student's post in which the classification is performed. The classification performs either a new session is needed or not. The new session requires repeated training for improving the performance. Contrarily, new practices are assured for non-allocating sessions for further observations (Figure 2). The first condition for maximizing clinical practices of nursing students is $x = 1$ as per the training quality, this is the continuous factor for all the fitness nurses and the real-time medical training for fitness nurses is computed based on the $T_q, i \in t$. The utilization of training sessions in t helps to compute a decision for both error detection and training quality in C_{Pr} based on nursing students' performance and concentration. This needle injury N_i detection occurs due to novice nursing students is estimated using equation (3)

$$T_q \; \forall \, i \; \in t = [(1 - N_i) \; \frac{C_{Pr}}{T_s} * (-x) * \frac{C_{Pr}}{s} - \left(T_q - T_q^{N_i}\right), j \in s \quad (3)$$

In the above equation (3), the training quality of the available sessions is identified in different clinical practices instance. If this $T_q \; \forall \, i \in t$ exceeds, then needle injury is identified. A failure in clinical practices maximizes training, continuously testing the performance of the nursing students to handle the device and patients. The artificial intelligence holds the available clinical practices and stores the status of training sessions as $\{x, T_q, T_s, \rho(C_{Pr})\}$ after the clinical practices or T at different stages. The decisions for the training quality of T and $T_q \; \forall \, j \; \in s$ is made by artificial intelligence and is stored with the available networks. The errors are identified by providing additional training for patient care and handling. In this method, the errors are detected using classification learning, and it depends on error attributes and session qualifications for fitness nurses $\sum_{i \in E}(C_{Pr})_i = C_{Pr}$ and x and $\rho(C_{Pr})$ based on the condition in equation (1). Let $E_{attribute}$ and $S_{qualification}$ represent the error detection in C_{Pr} for both instances in equation (1). This process refers to the recurrent analysis induced for identifying the error-causing feature in the mean of the training session. Therefore, the total clinical practices $(\exists_{C_{Pr}})$ is computed as

$$\exists_{C_{Pr}} = \left(E_{attribute} + S_{qualification}\right) \quad (4)$$

Such that,

$$\left.\begin{array}{c} E_{attribute} = \left[\left(x \times \sum_{i \in s} \frac{(C_{Pr})}{T_s}\right) + \left(x \times \sum_{j \in q} T_q\right)\right] \\ and \\ S_{qualification} = \sum_{i \in E}\left(T_s - T_q^{N_i}\right)(C_{Pr})_i \end{array}\right\} \quad (5)$$

Based on the equation (4) and (5), $\exists_{C_{Pr}}$ is calculated as a factor of clinical practices and training with N_i detection to compute the better theoretical and practical sessions. Therefore, the error attributes rely on T and x whereas the session qualification relies on T_q and $\rho(C_{Pr})$. In this case, the error attributes and the maximum clinical practice achieve either one or $zero$ provided training to the nursing students can be achieved successfully. In the above equation, if $\exists_{C_{Pr}} = S_{qualification}$, then theoretical training session does not provide for that students whereas the additional practical session provided for the nursing students based on the equation (1), in this consecutive process does not occur error detection. This $\exists_{C_{Pr}}$ relies on $x = 1$ and $T_i \; \forall \, i \in s = T_j \forall \, j \in q$ conditions for which the different stages of clinical practices allocate independent T for each student. Figure 3 presents the error attribute and qualification classification process.

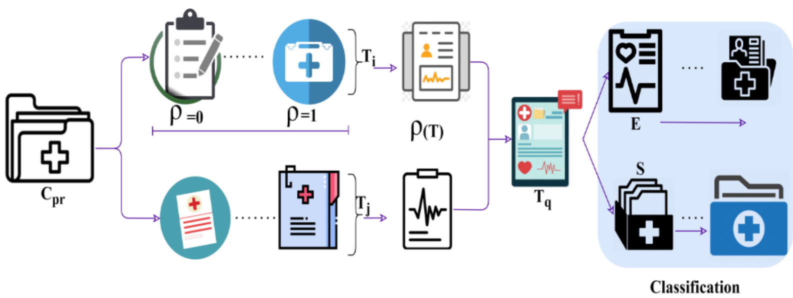

Figure 3 Error Attribute and Qualification Classification

The C_{pr} input is processed for $\rho = 0\ to\ 1$ variation T_i and T_j independently (Refer to Figure 3). This variation estimates a common $\rho(T) \forall T_q$ classified as T_i and T_j. The variation is provided for further classification of E and $S \forall \rho = 0$ to 1. The observation is cumulatively varied for $\rho(T)$ until $E < S$ is achieved. The intermediate T_i and $T_j \forall \rho(T)$ is alone interrupted for a new practice augmentation. The needle injury and preventive measure problems of $0 < x < 1$ are accurate for the precision handling of $\exists_{C_{Pr}} = (E_{attribute} + S_{qualification})$ that is classified as student characteristics and objects based on the error-causing feature of $\exists_{C_{Pr}}(T) = E_{attribute}\left(T - \frac{T_i^q}{T_j^q}\right) + S_{qualification}(T) \forall i \in s$ and $j \in q$, respectively. The error-causing feature is stored and continuously matched with the previous clinical practice and then used for training further nursing sessions and thwarting needle injury and preventive measures in $\left(t - \frac{T_i^q}{T_j^q}\right)$ as this is the training instance where $T_i^q \neq T_j^q$. At the new sessions based on $T, \rho(C_{Pr})$ is calculated through the above conditions based on x. This student's concentration is modeled using the recurrent training session R_{T_s} is estimated as

$$R_{T_s} = x * \left[\frac{\left(\frac{\min(C_{Pr})}{\max(C_{Pr})}\right)}{D_T - D_O}\right]^S \left(t - \frac{T_i^q}{T_j^q}\right) + \left[\frac{\max(C_{Pr}) - \min(C_{Pr})}{\max(C_{Pr})} . \rho(C_{Pr})\right] \quad (6)$$

In equation (6), the further new sessions provide the output of one as $x = 1, \min(C_{Pr}) = \max(C_{Pr})$ and $T = 0$, and then $C_{Pr} = \min(C_{Pr})\ or \max(C_{Pr})$. Hence, it is regarded as $\exists_{C_{Pr}} = \sum_{i \in s}(C_{Pr})_i$ until $\left[1 < t - \frac{T_i^q}{T_j^q} < q\right]$ is addressed. Instead, the consecutive clinical practices of N_{Sd} based on the training session is observed between $\left[t - \frac{T_i^q}{T_j^q}, q\right]$ where the probabilistic classification learning and appropriate clinical practices are explained in a detailed manner.

New Session Initialization

The existing probability clinical practice is based on N_{Sd} and x influences the error detection and training qualification factors in the artificial intelligence-based medical training for fitness nurses. In particular, the real-time patient care and handling of equation (1) are analyzed in the theoretical and practical sessions to maximize training. The probability of T based on the error-causing feature is competed as

$$\rho(T) = \frac{\rho(C_{Pr} \cup T)}{\rho(T)} \quad (7)$$

Where,

$$\rho(\exists_{C_{Pr}}) = \frac{\max(T) - \min(T)}{\max(T)} . \rho(C_{Pr}) \quad (8)$$

As per the equation (7) and (8), the calculation of $\rho(T)$ and $\rho(\exists_{C_{Pr}})$ relies on the theoretical and practical sessions for understanding the real-time patient care and handling based on the above equation (1) and in the probability of clinical practices instance of the equation (6). In any instance of providing training, if $C_{Pr} < T$, then needle injury occurs, which again results in an error. The likelihood L^H for both $\rho(T)$ and $\rho(C_{Pr})$ is computed in a consecutive manner of training sessions to ensure $C_{Pr} > T$ as in equation (9)

$$L^H[\rho(C_{Pr}|T) = \begin{cases} \frac{1}{\sqrt{2\pi x}}\left[\frac{(C_{Pr})}{x^2}\right], \forall\, i \in s\; in\; T \\ \frac{1}{\sqrt{2\pi N_i}}\left[\frac{(C_{Pr}-N_i)^2}{2N_i}\right], \forall\, i \in q\; in\; T \end{cases} \quad (9)$$

From the computation of $\exists_{C_{Pr}}$ as a new session for T and $\left[t - \frac{T_i^q}{T_j^q}\right]$ sequences, the above probability of likelihood is calculated for the training instance. Hence, the error detection and training qualification in both the instance is used for improving the student's concentration at the different stages of clinical practices in considerable for maximizing $\exists_{C_{Pr}}$. For the above likelihood estimation based on clinical practices and training, further new sessions are provided for the nursing students, respectively.

This consecutive process helps to reduce the additional training sessions and precision handling based on the student characteristics and objects remaining clinical practices to maximize T. The computation of the likelihood for all the sequences, the classification learning differentiates from error attributes and session qualification ensuring. The new session is available for all T during the clinical practices. In Figure 4, the new session initialization post the error mitigation is depicted.

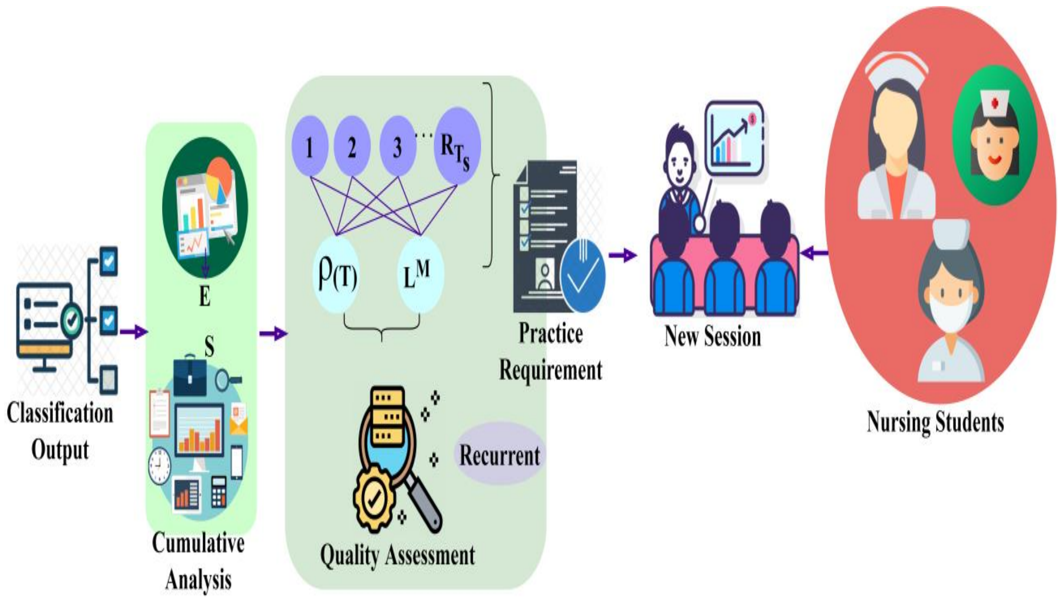

Figure 4 New Session Initialization Process

The classification outputs are cumulatively analyzed $\forall$ E and S such that $\rho = 0\; to\; \rho = 1$ is estimated. In the estimation process the recurrent process is validated for $\rho(L)$ and L^H in identifying T_q and practice requirements. The recurrent is available for classification output n_o such that a new session is generated. The nursing students are assigned to the new sessions demanding requirements (Refer to Figure 4). Therefore, the clinical practices of a nursing student based on the training qualification and error detection increase training accuracy and precision handling. This nursing session as mentioned above depends on available training sessions and the qualification of the students without requiring additional training sessions relies on students' concentration based on classification learning. The clinical practices for fitness nurses trained under the previous training knowledge. The device and patient handling follow the condition $0 < C_{Pr} < 1$ and $x = 1$ of T instances such that the error detection and training qualification analysis are computed. Here, the training accuracy of clinical practices does not augment $T \in N_{Sd}$. Therefore, the error reduction is performed between conditions $0 < C_{Pr} < 1$ and $x = 1$ without increasing the needle injury preventive measures other than training further new sessions for nursing. The clinical practices and training sessions are served in this consecutive manner, reducing the error detection.

DISCUSSION

This section discusses the performance of the proposed method using the data available in [23]. The representation from the original data reference is different from the one used here. The nursing student's related data are alone extracted and the assessment is performed. In this extraction, the simulated and clinical practice session data are used. In Table 1, the simulated and clinical practice data is represented.

Table 1 Simulated and Clinical Practice Data

Features	Simulated		Clinical	
	Mean	Deviation	Mean	Deviation
Communication Skill	3.3-3.8	± 0.5	3.2-3.7	± 0.9
Training Process	3.4-3.9	± 0.3	3.1-3.9	± 0.7
Adaptive Thinking	3.5-4.5	± 0.6	3.3-4.2	± 0.6
Response	3.7-4.5	± 0.6	3.3-4.4	± 0.4
Efficacy	3.4-4.6	± 0.3	3.1-4.5	± 0.4
Knowledge Gain	3.8-4.7	± 0.6	3.6-4.6	± 0.3

Features / Classification	Communication Skill	Training	Thinking	Response	Efficiency	Knowledge Gain
Session 1-4	✓	✓	✓	✓	✓	✓
Session 5-8	-	✓	✓	✓	✓	✓
Session 9-12	-	-	✓	✓	✓	✓
Practice 1-5	✓	✓	✓	✓	✓	✓
Practice 6-10	✓	✓	✓	✓	✓	✓
Practice 11-18	-	-	✓	✓	✓	✓
Practice 19-26	-	-	✓	✓	✓	-

Figure 5 Data Classification

In Table 1, the simulated and clinical observation range for the nursing students' performance assessment is presented. These values are extracted from the data source, for providing a difference between both representations. Based on the extracted data, the classification is performed. Before the classification process, the classification data is segregated based on 26 practices and 12 sessions. Figure 5 presents the data classification based on practices and sessions.

In the classification, sessions are distinguished as $(1-4)$, (5-8), and (9-12) based on which the feature requirements are decided. The practice is distinguished by 4 classification pairs (1-5), (6-10), (11-18), and (19-26). Its demand and requirement are highlighted in the above Figure using √ the symbol. As mentioned earlier, the cumulative assessment for a nursing student based on the above classification is prototyped as in Figure 6.

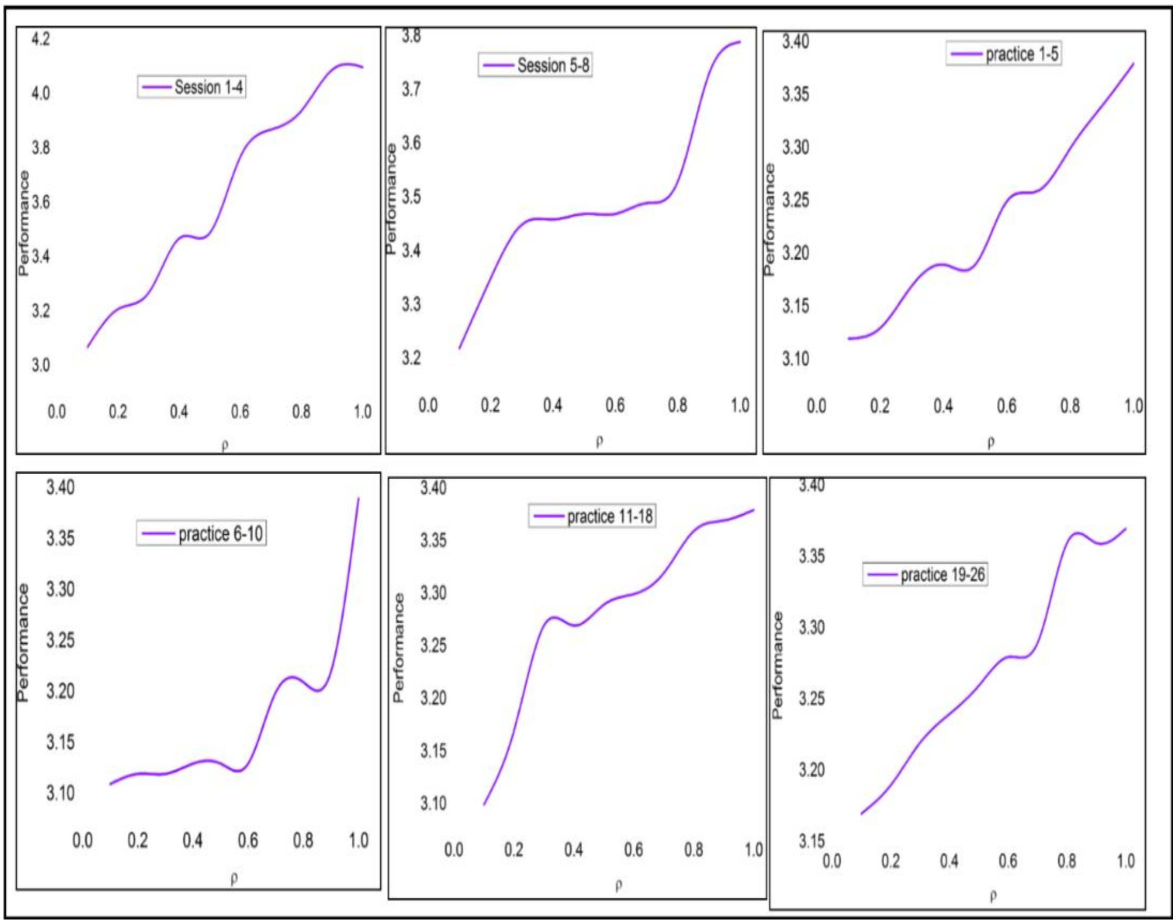

Figure 6 Sample Illustrations (Cumulative)

The above illustration is required for identifying error points between $\rho = 0$ and $\rho = 1$. This is achieved from the classification learning pursued in an R_{T_S}. Therefore, the consecutive change in sessions and practices are formulated. This reduces the training and performance analyzing sessions due to time complexity. Depending on the inconsistent raise in performance curves, the next session (new) or new practice is decided. The classification process performs this function using $\rho(T)$ and L^H for providing better precision. In the following section, the comparative analysis is presented for the metrics training accuracy, precision error, and time complexity is discussed. For the comparative study, the existing STCP [24], ACTA [25], and PIP [20] are used.

Training Accuracy

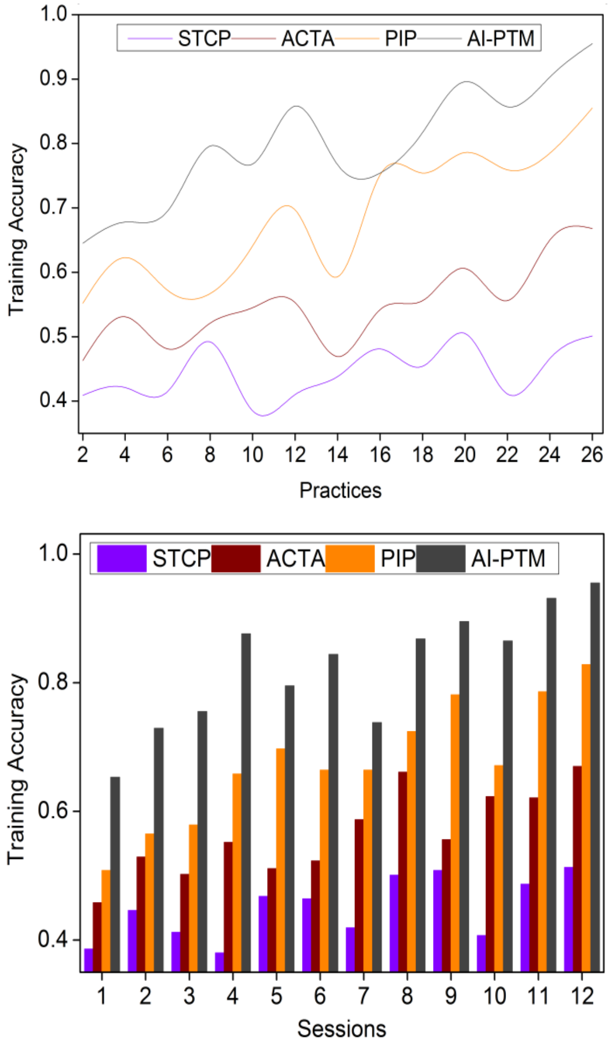

Figure 7 Training Accuracy Analyses

This proposed method satisfies high training accuracy for fitness nurses and accommodates theoretical and practical sessions (Refer to Figure 7). The error detection and training qualification is mitigated based on $1-\left[\frac{(C_{Pr})_S}{\sum(C_{Pr}+T_S)}\right]$ condition for clinical practices is indefinite due to error-causing features in the mid of the training sessions through classification learning. The C_{Pr} and T based on different stages of training using error attributes and session qualifications from the previous training instance classification process $x \in [0,1]$ is fluctuating conditions of the error occurs in both the instances of medical training for fitness nurses. Instead, the real-time patient care and handling are computed for maximizing the training sessions beyond the exceeding time complexity and therefore the student's concentration is augmented. In different stages of clinical practices, classification learning is performed for identifying time complexity and needle injury. Hence, the training quality and sessions can be analyzed depending on $i \in s$, this training quality has to be achieved for retaining the training accuracy. In the proposed method, the determined clinical practice is used for training further sessions for maximizing the training accuracy.

Precision Handling

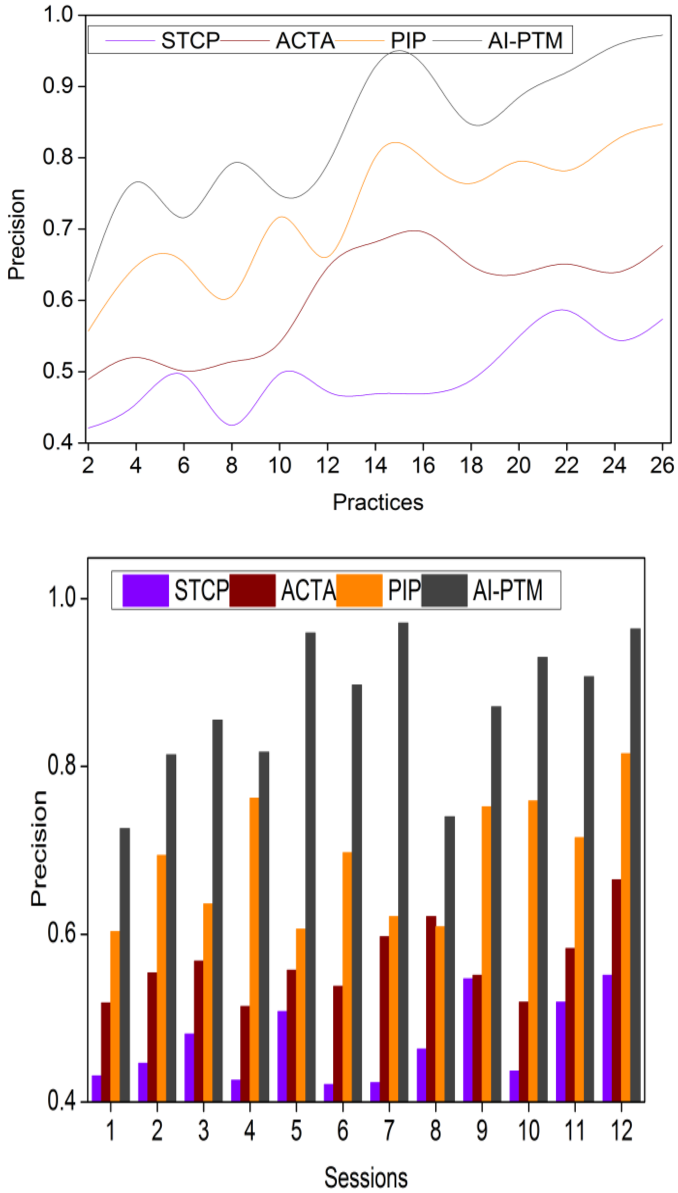

Figure 8 Precision Analyses

The precision handling is high in this proposed method to augment other factors compared to the real-time patient care and handling (Refer to Figure 8). In this method, N_{Sd}, C_{Pr} and T is used to serve the input for clinical practices at different stages of theoretical and practical sessions for identifying the needle injury and preventive measures. If condition 1 takes place for increasing precision handling based on $T_q, i \in t$ [as in equation (2)], and then T and $T_q \; \forall \; j \; \in s$ are satisfied with training accuracy. Based on this proposed method, the maximum clinical practices are defined. The maximum $\sum_{i \in E}(C_{Pr})_i = C_{Pr}$ and x due to error occurrence in the training sessions are considered. This deciding factor requires maximum training accuracy, consecutively preventing the errors. Therefore, the different training quality based on the nursing students is administered as defined in equation (3) with

$\rho(C_{Pr})$ consideration. The training for further new sessions is computed, increasing the precision handling. In this proposed method, the precision handling depends on the theoretical, device, and patient handling, and therefore based on the sessions time complexities are considerably less.

Error

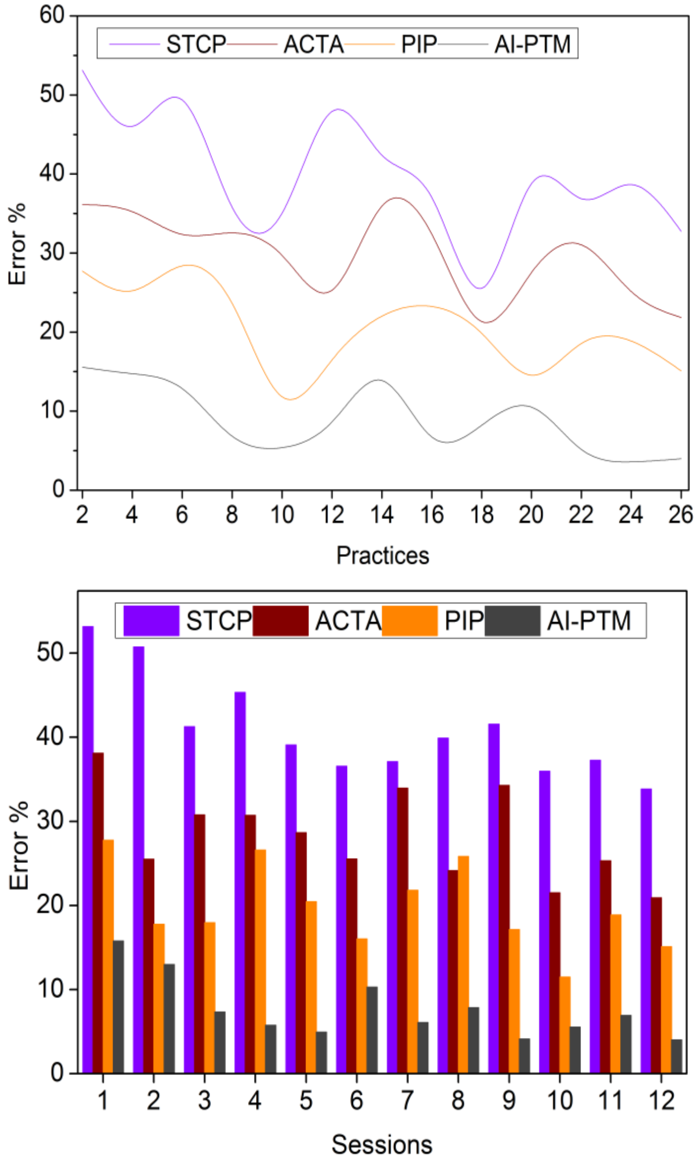

Figure 9 Error % Analyses

In this proposed method error less and training quality as it must not provide incidents of needle injury and preventive measures through artificial intelligence. The previous to the current knowledge about clinical practices are the different training sessions for fitness nursing students $(\exists_{C_{Pr}})$ is computed for error detection at different time intervals. This error-causing feature is addressed using precise computing of the medical training for fitness nurses, preventing time complexities. Both the instance of patient care and handling is performed without increasing the training sessions. Similarly, the new sessions rely on error attribute evaluation and analysis for providing additional training and practical sessions. The error attributes instance can be stored and then matched for different verifications, preventing additional sessions. Then finally training will be provided for the fitness nursing students and their clinical practices are determined for further training at a different interval, preventing errors. This proposed method computes further error attribute and session qualification based on medical training for which the different training session is provided. This is common for both instances for which the proposed method satisfies less error as presented in Figure 9.

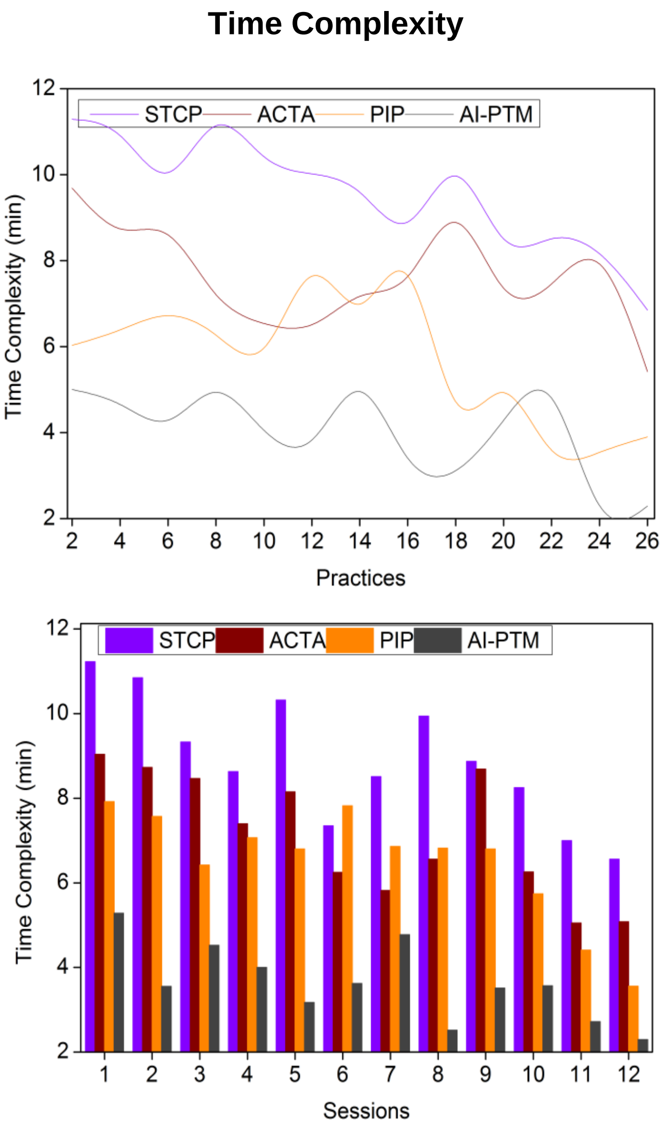

Figure 10 Time Complexity Analyses

This proposed method achieves less time complexity compared to the other factors as represented in Figure 10. The training accuracy and precision handling required at different stages of clinical practices are less for the proposed work. This is precise for analyzing error detection and training qualifications for different clinical practices. The training time and error detection factor are computed, which determines the time complexity under consecutive processes. The different training sessions of fitness nursing students are represented using error attributes validation as in equation (6). In this condition, if the maximum clinical practice is required, then the training sessions are also increased for further training instances. This error-causing feature requires high computation time for classifying the training and therefore the session qualifications are performed. Hence, the error detection and training quality under different time interval is analyzed for $\left[t - \frac{T_i^q}{T_j^q}, q\right]$. Therefore, the training session for which the above-mentioned condition does not train alone reduces error. Thus the total error detection and training session-based time complexity of the proposed method lack of concentration is less. The inference for the above comparison is presented with the final values in the following tables.

Table 2 Comparison Inference for Practices

Metrics	STCP	ACTA	PIP	AI-PTM
Training Accuracy	0.501	0.668	0.855	0.955
Precision	0.574	0.677	0.847	0.972
Error %	32.74	21.84	15.09	3.978
Time Complexity (min)	6.85	5.42	3.9	2.291

Inference: The proposed method improves training accuracy and precision by 14.02% and 13.63% respectively whereas it reduces the error and time complexity by 9.62% and 9.58%.

Table 3 Comparison Inference for Sessions

Metrics	STCP	ACTA	PIP	AI-PTM
Training Accuracy	0.513	0.67	0.828	0.955
Precision	0.551	0.665	0.815	0.964
Error %	33.86	20.91	15.12	4.014
Time Complexity (min)	6.56	5.08	3.56	2.295

Inference: The proposed method improves training accuracy and precision by 14.23% and 14.35% respectively whereas it reduces the error and time complexity by 9.64% and 9.11%

CONCLUSION

This article introduced a novel proposal for validating the performances of fitness nursing students using the artificial intelligence paradigm. The proposed method relies on training and practice sessions and its outcome for identifying the performance. In particular, the needle injury kind of errors in fitness nursing practice is identified and addressed using this proposed method. The error detection and qualification processes are distinguished using conventional classification learning. Errors from the different session allocation and practice instigation sequences are identified using recurrent classification. Based on the stored error-causing features, recurrent training is instigated for improving the precision handling. The current and previous assessment features are jointly used for improving the training accuracy. In this process, different precision handling factors such as needle injury prevention, equipment handling, patient response, etc. are satisfied with less complexity over different training sessions and clinical practices. The proposed method improves training accuracy and precision by 14.02% and 13.63% respectively whereas it reduces the error and time complexity by 9.62% and 9.58%. This is observed in coherence with the varying clinical practices. In the future, rule-based clinical practices for performance assessment and reducing session re-allocations are planned to be incorporated. This would improve the training consistency with standardization. Besides, the globally adapted clinical procedures can be fit in a congruent manner for fitness nursing students.

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