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Analysis Method of Special Physical Training Mode of Basketball Teams in Colleges Based on WeChat Applet and FTTA Optimised LSTM

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Abstract

OBJECTIVE: this paper proposes a basketball special physical training mode analysis method based on WeChat applet and optimization algorithm to improve the deep learning network.
METHODS: Using the applet data set and the coaches' record data as model input data, the proposed method is used to analyse and thus improve the performance of the basketball team's special physical training pattern.
RESULTS: Comparing the analysis effect between FTTA-Attention-LSTM analysis model and LSTM, FTTA-LSTM, FTTA-GRU, FTTA-BiLSTM models, the WeChat mini-program oriented basketball team's special physical fitness training mode analysis index system contains 14 factors affecting the analysis model; in analysing the relationship between the size of FTTA population and Attention-LSTM network hidden layer node number experiments, it was found that the selection of the population size of 80, the number of hidden layer nodes for 90; by analysing the FTTA-Attention-LSTM analysis model and other comparative models, it was found that the analysis accuracy of the FTTA-Attention-LSTM analysis model is the smallest, and the analysis time meets the real-time requirements, controlled within 0.001s.
CONCLUSION: In the future, principal component analysis technology can be introduced for feature selection to further achieve intelligence and improve the analysis efficiency of the model.

Keywords: basketball team specialised physical training model analysis, wechat applet, football team training algorithm, attentional mechanism, bidirectional long and short-term memory network

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1. Introduction

In the context of the strategy of sports power, the enthusiasm and enthusiasm of the general high efficiency of basketball is constantly rising, and colleges and universities have established basketball teams [1]. With the increase of college basketball team participation, college basketball sports team training faces many challenges, college basketball team is mainly composed of students, training and curriculum often conflict; no special training, basketball team members special physical characteristics and training basis of the existence of large differences; basketball team coach is part-time by the college teachers, its energy and the reality of the conditions of the limitations [2]. The traditional training mode has been unable to meet the specific training needs of college basketball team members, thus affecting the performance of the game [3]. Basketball as a skill-driven class of same-court competitive sports, not only to focus on technical and tactical improvement, but also to pay attention to the role of physical fitness[4].

Specialised physical fitness as an important role in college basketball games, not only to enhance the physical strength of athletes, but also to ensure that the technical and tactical better play[5]. At present, with the rapid development of Internet technology and computer technology, the study of special training mode based on intelligent algorithms and network platforms has become the development trend of basketball physical training specialisation, intelligence and scientification [6]. Basketball special physical training mode analysis refers to the analysis of college basketball competition related to physical ability, under the guidance of certain physical training theory and concept, a form of training standards organised by coaches or athletes on their own initiative, so as to use certain analytical means to analyse and evaluate the training standards [7]. Currently based on the Internet and computer technology, basketball special physical training mode analysis research includes special physical training evaluation index research [8], special physical training practice research [9], network platform intervention sports training research [10] and other aspects. Literature [11] studied the evaluation of the physical fitness level of basketball players, which includes function class indicators, sports quality class indicators, skill physical fitness class indicators and psychological class indicators, and constructed the evaluation index system; Literature [12] constructed the physical fitness test indicators of youth according to the characteristics of youth basketball players, and after word frequency analysis and expert evaluation, screened out the first-level indicators of the special physical fitness and second-level indicators, and used factor analysis to The evaluation indexes are further classified as speed quality factor, strength quality factor and other quality factors; Literature [13] designs the physical fitness evaluation index system of national male basketball players, in which the first-level indexes include four aspects of body morphology class, body function, sports quality and psychological quality; Literature [14] puts forward that not through the position of the basketball should have the corresponding evaluation standard, by analysing the targeted evaluation indicators, and construct the evaluation index system. With the development of network technology and computer technology, the use of network platforms to study sports training mode is widely used in the field of physical education [15]. Literature [16] designed and developed a university sports teaching platform based on WeChat applet, which mainly includes three functional modules such as course management, exercise management and user management; literature [17] introduces and analyses the individual intervention mode of students' physical fitness through the use of applets and finds that the sports training mode based on applets has a promotional effect on students' physical fitness and health. From the existing basketball special physical training literature and the previous research results on its point of view, although the basketball special physical training has been a long time, a large number of yana on, but the lack of special physical training and network technology, artificial intelligence technology integration, which leads to the basketball sports special training practice is not accurate, objective, scientific [18].

Aiming at the problems existing in the current basketball special physical training analysis method [19], this paper proposes a basketball special physical training mode analysis method based on WeChat applet and optimization algorithm to improve the deep learning network. This paper analyzes the implementation process of the college basketball team's special training mode based on WeChat applet, extracts the special training mode analysis indexes, improves the recurrent neural network by combining the human behaviour heuristic optimization algorithm, and constructs the college basketball team's special training mode analysis model based on the intelligent optimization algorithm and the attention mechanism to improve the long and short-term memory network for WeChat applet. The effectiveness and feasibility of the method proposed in this paper are verified through the WeChat app training behaviour data and compared with the algorithms of other references.

2. Analysis of the special physical training mode of basketball team in colleges based on WeChat applet Description of the problem

2.1. The implementation process of the special physical training model for basketball teams in colleges based on WeChat applet

This paper takes the special physical training mode of general college basketball team as the object of analysis, and analyses and describes the implementation process of the special physical training mode of general college basketball team in WeChat applet.

According to the principles of implementation of basketball team special training mode such as technology-assisted training, training according to materials, precise training and more training according to time [20], the implementation process of general college basketball team special physical training mode based on WeChat applet refers to the organised, planned and measured implementation of the specific requirements of this mode and the specific practices at different stages within the scope of the training mode from the beginning to the end. College basketball team special physical fitness specific implementation process should include planning, preparation, implementation, inspection, summary, evaluation and other six steps, respectively, for the training programme communication, special physical fitness level test, athlete training implementation, coaches monitoring feedback, training session communication summary and evaluation of athletes, coaches, specific implementation process flowchart shown in **Figure 1**.

Figure 1 Implementation process of the physical fitness special training model for college basketball teams

2.2. Extraction of indicators for analysing the specialised physical training model of the basketball team

In order to construct the basketball team special physical training mode analysis index system for WeChat applet, according to the implementation process of college basketball team physical fitness special training mode, the basketball team special physical training mode analysis indexes are extracted from the six aspects of communication of training plan, special physical fitness level test, athlete training implementation, coaches' monitoring and feedback, communication summary of the training meeting, and evaluation of athletes and coaches [21], and so on, and the specific extracted indicators are shown in **Figure 2**.

Var	Training plan communication
G1	Communication method
G2	Communication content
Var	Special fitness level test
T1	Physical fitness test
Var	Athlete training implementation
S1	Training results entry
S2	Training results analysis
S3	Personal characteristic exercise prescription

Var	Coach monitoring feedback
F1	Training plan adjustment strategy
F2	Training targeted strategy
F3	Training real-time feedback strategy
Var	Training meeting communication summary
Z1	Problem discovery
Z2	Problem cause analysis
Z3	Problem solution
Var	Athlete and coach evaluation
P1	Athletes' self-evaluation
P2	Coaches' evaluation

Figure 2. Extraction of indicators for analysing the special physical training model of the basketball team

(1) Communication aspects of the training programme

After the development of training objectives and the general search for your plan, coaches need to establish communication with athletes, communication methods include the establishment of training WeChat group and pre-training mobilisation meeting [22]. This paper mainly focuses on the premise of WeChat small programme, mainly on the establishment of WeChat way to discuss. The main content of the training programme communication includes training time and venue, and whether there are special training requirements, and the extracted training mode analysis indexes are the establishment of pre-training communication mode G1 and communication content G2.

(2) Specialised physical fitness level tests

After the communication of the training programme, coaches need to arrange suitable time for the accurate mastery of the level of athlete-specific physical fitness within the athlete. Precision test is mainly reflected through the initial physical fitness, the extracted training mode analysis index is pre-training physical fitness test T1.

(3) Athlete Training Implementation

After the end of training specialised physical fitness and the coach logged the result verification summary into the applet, each athlete logged into the applet by themselves to check the individual characteristic sports prescription and used the applet to complete the training in the training session. The training pattern analysis indicators extracted in this phase include training result entry S1, training result analysis S2, and personal characteristic sports prescription provision S3.

(4) Coach monitoring and feedback aspects

In the process of coaches supervising athletes' training, it is important to provide real-time monitoring and feedback on the quality of athletes' current training movements and training effects [23]. The training model analysis indexes extracted in this stage include training plan adjustment strategy F1, training targeting strategy F2, and training real-time feedback strategy F3.

(5) Communication summary of training sessions

According to the athlete's training situation, after the end of each training cycle, the coaches organise the athletes and hold a training session to communicate the summary meeting. The training pattern analysis indicators extracted at this stage include problem discovery Z1, problem cause analysis Z2, and problem solution Z3.

(6) Evaluation of athletes and coaches

At the end of a training cycle or training phase, athletes and coaches should carry out evaluations in a

timely manner. Athlete evaluation mainly refers to the athlete's self-reflection on his/her own personal understanding and difficulties encountered in training during this phase of training. Coaches' evaluation refers to the coaches' summary and analysis of the training situation in this phase on the basis of the comprehensive background athletes' sports prescription playing time, playing times and playing dates, real-time monitoring of the athletes' training completion, and praising or rewarding the athletes who have completed the training with better quality [24]. The training mode analysis indexes extracted in this stage include athlete self-evaluation P1 and coach evaluation P2.

2.3. Construction of the index system for analysing the special physical training mode of the basketball team

Basketball team special physical fitness training mode analysis index system to training plan communication, special physical fitness level test, athlete training implementation, coaches monitoring feedback, training meeting communication summary and athlete, coach evaluation and other key implementation process steps for the first level indicators, to pre-training communication mode establishment G1, communication content G2, pre-training physical fitness test T1, training results entry S1, training results analysis S2, S3, training plan adjustment strategy F1, training targeted strategy F2, training real-time feedback strategy F3, problem discovery Z1, problem cause analysis Z2, problem solution Z3, athlete self-evaluation P1, coach evaluation P2, and other 14 analytical elements for the second level indicators, fully embodies the whole process of the basketball team's special physical training, constructed a scientific, objective, Comprehensive basketball team special physical training mode analysis index system, the specific schematic diagram is shown in **Figure 3**.

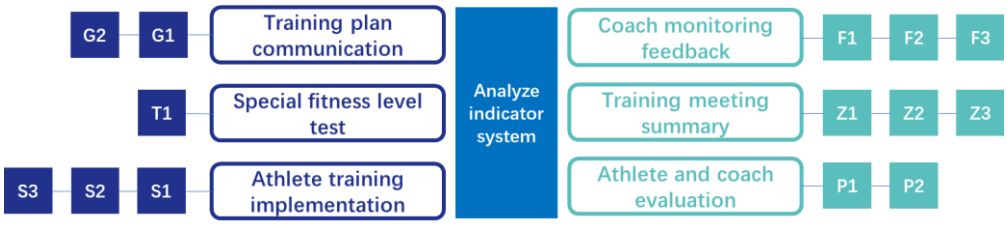


Figure 3. Indicator system for analysing the mode of specialised physical training of the basketball team

3. Related Technologies

3.1. FTTA algorithm

Football team training algorithm (FTTA) [25] is a novel meta-heuristic algorithm (intelligent optimisation algorithm) inspired by the behaviours of players in high level football training sessions. The Football Team Training Algorithm (FTTA) is implemented by simulating the behaviour of players in high level football training sessions. Usually, a football training session is divided into three parts: collective training, group training and individual extra training.

(1) Group training phase

At the start of the training, the players will work collectively under the guidance of the coach, who will first give the players an idea of their level through a series of tests (physical functioning). The players will then develop their own group training programme based on their level. We categorise players into four different types: followers, discoverers, thinkers and fluctuators. In each iteration, players randomly change their type.

1) Followers

A follower is an avid follower of the current best player, who works towards the best player in each dimension in the hope of reaching the current best player level, but due to power limitations often can only move randomly to the best player in each dimension. The specific model is as follows:

$$F_{i,j}^{k}new = F_{i,j}^{k}old + rand \times \left(F_{Best,j}^{k} - F_{i,j}^{k}old \right) \quad (1)$$

Where, $F_{Best,j}^{k}$ denotes the current best player's value in dimension j, k denotes the number of iterations, $F_{i,j}^{k}$ denotes the current player's value in dimension j, and $F_{i,j}^{k}new$ denotes the player's position information in dimension j after training.

2) Discoverer

Discoverers are more rational than followers. They see not only the best players, but also the worst players, so they not only work towards the best players, but do their best to avoid being the worst. The specific model is as follows:

$$F_{i,j}^{k}new = F_{i,j}^{k}old + rand \times \left(F_{Best,j}^{k} - F_{i,j}^{k}old\right) - rand \times \left(F_{Worst,j}^{k} - F_{i,j}^{k}old\right) \quad (2)$$

where $F_{Worst,j}^{k}$ denotes the current value of the best player in dimension j, and $F_{i,j}^{k}new$ denotes the position information of the player in dimension j after training.

3) Thinkers

Thinkers are more alert than those in front of them, they see the gap between the best players and the worst players straight away and work to reach each dimension.

$$F_{i,j}^{k}new = F_{i,j}^{k}old + rand \times \left(F_{Best,j}^{k} - F_{Worst,j}^{k}\right) \quad (3)$$

where $F_{Best,j}^{k} - F_{Worst,j}^{k}$ denotes the current difference vector between the best player and the worst player.

4) Fluctuators

Fluctuators refuse to learn from anyone, they train on their own, so the state will fluctuate somewhat. Of course, as the number of trainings increases (number of iterations), the fluctuation of the player's state will become smaller and smaller. The specific model is as follows:

$$F_{i,j}^{k}new = F_{i,j}^{k}old \times \left(1 + t\left(k\right)\right) \quad (4)$$

where $t\left(k\right)$ is a random number with a t-distribution and its degree of freedom is the current number of iterations. As the degree of freedom increases, the probability that the t distribution is close to the middle value is higher and higher, and the distribution at the two ends gradually decreases, and will be closer and closer to the normal distribution. Therefore, as the number of iterations increases, the degree of fluctuation will become smaller and smaller and gradually change from a global search to a local search.

The principle of the collective training phase is shown in **Figure 4**.

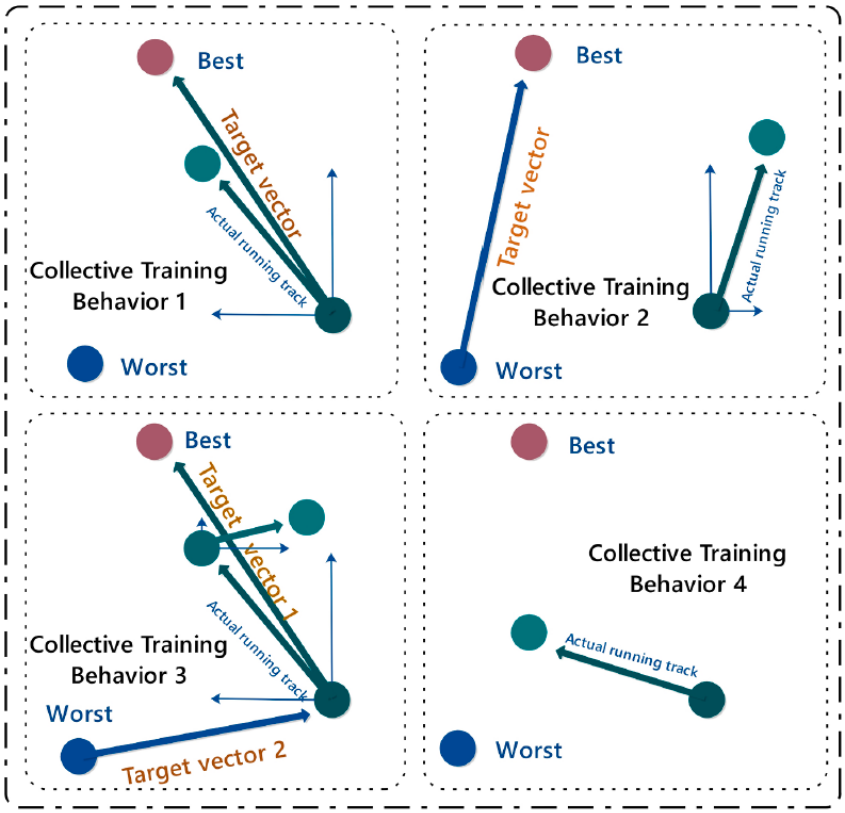


Figure 4. Group training

(2) Group training phase

After the collective training, the football training process has entered the group training phase, where the coach divides the players into four categories (each dimension is an eigenvalue) based on their characteristics: strikers, midfielders, defenders and goalkeepers. In group training, the FTTA algorithm uses the MGEM adaptive clustering method (MixGaussEM), which simulates the behaviour of the coaches through the clustering method and divides the population into four categories according to their own characteristics. The specific classification strategy is as follows:

$$\begin{aligned} &All \quad Players \xrightarrow{MGEM} [Team1, Team2, Team3, Team4] \\ &if \quad Anyteam \le Team \quad number \\ &All \quad Players \xrightarrow{Randomuniformgrouping} [Team1, Team2, Team3, Team4] \end{aligned} \tag{5}$$

The FTTA algorithm sets a threshold value: teamnumber⩾2, which is the minimum number of people in each group. If the number of groups is less than this value, group training cannot be implemented. Once this occurred, the coaches would perform a second grouping, using a uniform random grouping strategy that randomly and evenly divided the players into four groups.

After the coach completes the grouping, players will learn or communicate with other players in the group. We define group training as three states: optimal learning, random learning, and random communication. We define the learning probability as p_{study} and the communication probability as p_{comm} , and players will randomly choose the state in each iteration.

1) Optimal Learning

In each dimension, the player has a certain probability of directly learning the ability value of the best player in the group.

$$F_{i,j}^{k,team_l} new = \begin{cases} F_{Best,j}^{k,team_l} & rand \le p_{study} \\ F_{i,j}^{k,team_l} old & rand > p_{study} \end{cases} \tag{6}$$

where $F_{Best,j}^{k,team_l}$ denotes the jth dimension value of the best player in group l, and $F_{i,j}^{k,team_l} new$ denotes the player's state in the jth dimension after optimal learning.

2) Randomised Learning

In each dimension, the player has a certain probability of directly learning the ability values of any random player in the group.

$$F_{i,j}^{k,team_l} new = \begin{cases} F_{Random,j}^{k,team_l} & rand \le p_{study} \\ F_{i,j}^{k,team_l} old & rand > p_{study} \end{cases} \tag{7}$$

where $F_{Random,j}^{k,team_l}$ denotes the jth dimension value of a random player in group l.

3) Random exchanges

Learning is only part of the equation in training, and communication between two players is even more important for ability. In each dimension, the player has a certain probability to communicate with any player in the group. When $rand \le p_{comm}$ is used, the positional update formula is as follows:

$$\begin{aligned} F_{i,j}^{k,team_l} new &= F_{Random,j}^{k,team_l} old \cdot (1 + randn) \\ F_{Random,j}^{k,team_l} new &= F_{i,j}^{k,team_l} old \cdot (1 + randn) \end{aligned} \tag{8}$$

where $randn$ denotes a normally distributed random number.

When $rand > p_{comm}$ is used, the position update formula is as follows:

$$\begin{aligned} F_{i,j}^{k,team_l} new &= F_{Random,j}^{k,team_l} old \\ F_{Random,j}^{k,team_l} new &= F_{i,j}^{k,team_l} old \end{aligned} \tag{9}$$

4) Random errors

During group training, there is a certain probability that mistakes will occur, i.e., they accidentally learn other dimensions from others. The probability of this occurring is low, but it is real and objective. Therefore, p_{error} is defined as the probability of error and the specific model is updated as follows:

$$\begin{cases} F_{i,j}^{k,team_l} new = F_{Random1,Random2}^{k,team_l} old & rand \le p_{error} \\ F_{i,j}^{k,team_l} new = F_{i,j}^{k,team_l} old & rand > p_{error} \end{cases} \tag{10}$$

The principle of the group training phase is shown in **Figure 5**.

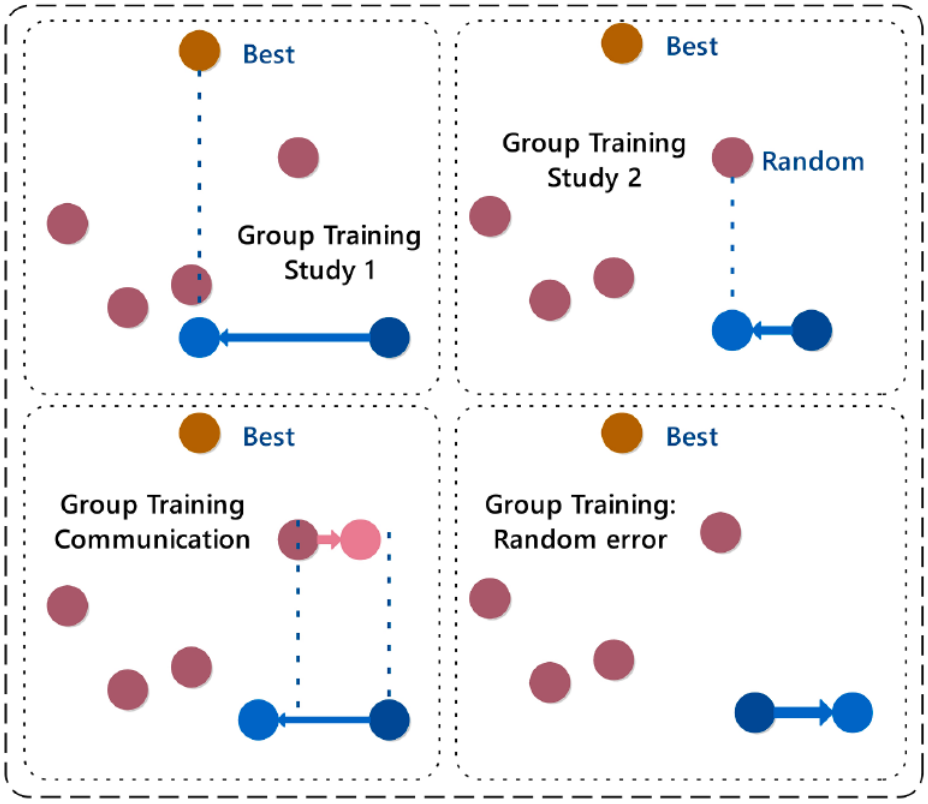


Figure 4. Diagram of group training

(3) Additional personal training phase

After the group training, it is necessary to recalculate the new fitness values and update the player's status by replacing the worse fitness values with better ones. After updating, the coach will choose the best player and let him practice to get better so that he can better drive the training status of others with the following training formula:

$$F_{Best}^{k}new = F_{Best}^{k}old \times \left(1+\left(1-1/k\right)\times Gauss+1/k\times Cauchy\right) \quad (11)$$

where the joint Cauchy and Gaussian variances are used to describe the additional training of individuals and k is the number of iterations. The reason for choosing the Gaussian Cauchy distribution is that in the early stages of training, everyone's level is usually low, so the best players have a greater probability of getting a bigger boost, and at this time, the Cauchy distribution function occupies a large proportion, which can effectively provide a large range of boosts for the players, which facilitates the global search. As the number of iterations increases, it becomes more and more difficult to improve the player's ability, at this time the Gaussian distribution occupies a relatively large proportion, and the promotion range of the player gradually decreases, which is more conducive to local search.

(4) Algorithm flowchart

According to the optimisation strategy of FTTA algorithm, the flowchart of FTTA algorithm is shown in **Figure 5**. During each iteration, an initial solution is randomly generated, and the final optimal solution is continuously obtained by evaluation with greedy selection strategy.

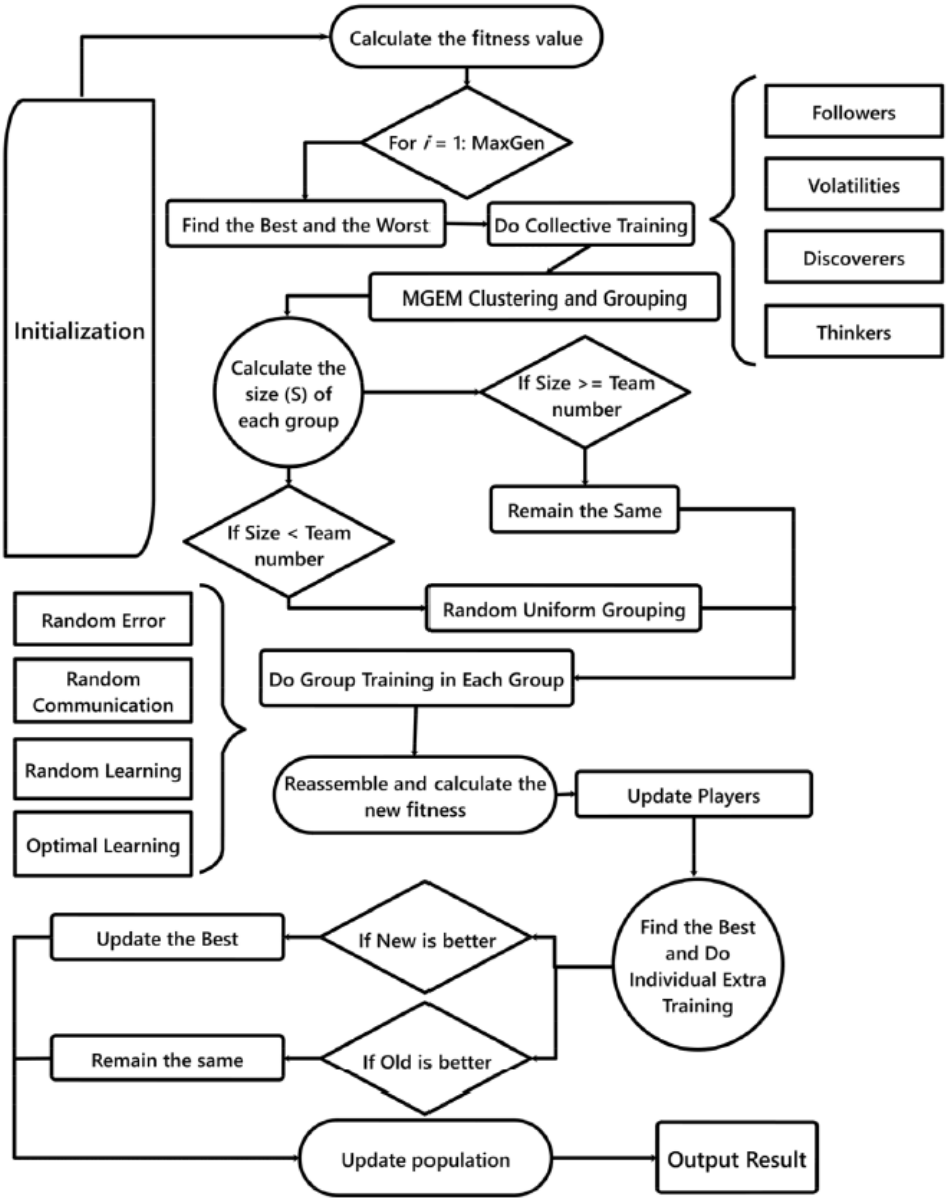


Figure 5. FTTA algorithm

3.2. Attention-LSTM network

In order to increase the performance of the physical fitness special training pattern analysis method for the basketball team of WeChat applet, this paper adopts Attention-LSTM (Attention-LSTM), which is an improved long and short-term memory network for the attention mechanism, as a physical fitness special training pattern analysis model for the Chi basketball team, and solves the problems of gradient explosion and gradient disappearance of the recursive neural network [26].

(1) Long and short time domain memory networks

As an improved version of RNN, LSTM networks are based on the idea of gating and new memory modules are designed to replace the original hidden units in RNN. Long time dependencies are modelled by maintaining the gradient paradigm during backpropagation. Figure 6 illustrates its basic network internal structure. In LSTM, a memory cell and three different types of gates (input gate, output gate, forgetting gate) are encapsulated within each memory module. The input gate determines the amount of input information to be stored in the hidden state. The output gate focuses on what hidden state information should be included in the current time step output. The forgetting gate directly determines the hidden state information that should not be further memorised.The LSTM updates the storage cells and outputs the hidden state according to the following calculations, which are performed at each time step. The following equations describe the complete mechanism of this process:

$$i_t = \sigma\left(W_{xi}X_t + W_{hi}h_{t-1} + W_{ci}c_{t-1} + b_i\right) \quad (12)$$

$$f_t = \sigma\left(W_{xf}X_t + W_{hf}h_{t-1} + W_{cf}c_{t-1} + b_f\right) \quad (13)$$

$$c_t = f_t c_{t-1} + i_t \tanh\left(W_{xc} X_t + W_{hc} h_{t-1} + b_c\right) \quad (14)$$

$$o_t = \sigma\left(W_{xo} X_t + W_{ho} h_{t-1} + W_{co} c_t + b_o\right) \quad (15)$$

$$h_t = o_t \tanh\left(c_t\right) \quad (16)$$

$$y_t = \sigma\left(W_{yh} h_t\right) \quad (17)$$

where i_t , f_t , o_t , and c_t are the vectors of input gates, forget gates, output gates, and memory cells, respectively ; b_i , b_f , b_o , and b_c are their corresponding bias vectors; and W denotes the weight matrix of the connection between the two components. W_{x} W_{h} , W_{c} and W_{y} are the connection weights of the input vector, hidden vector, memory cell and output vector to the other components, h_t is the hidden state vector and y_t is the final output vector.

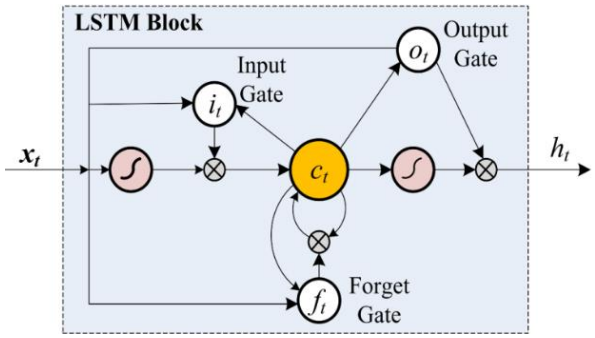


Figure 6. Internal structure of LSTM

(2) Attention mechanism

Attention mechanism (Attention) [27] optimises the input influencing factors by assigning different weights according to the degree of importance of the input influencing factors.The specific computational principle of the Attention mechanism is shown in **Figure 6** and the detailed steps are as follows **Figure 7**:

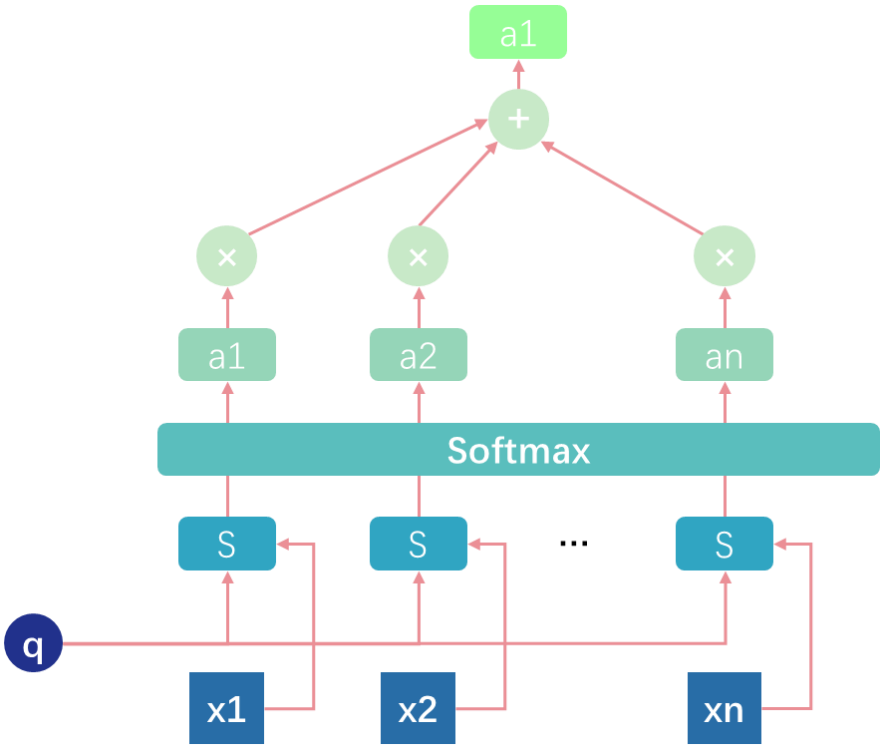


Figure 7. Diagram of the attention mechanism

Step 1: Calculation of Attention Distribution α_n . Calculate the attention distribution on the input influence factor information to get the weight coefficients.

$$\alpha_n = p\left(z = n \mid X, q\right) = soft\max\left(s\left(x_n, q\right)\right) = \frac{\exp\left(s\left(x_n, q\right)\right)}{\sum_{j=1}^{N} \exp\left(s\left(x_j, q\right)\right)} \quad (18)$$

Where, X denotes the input vector, q denotes the query vector related to the task, α_n denotes the degree of interest of the n th input vector, z denotes the index position, and $oft\max\left(\cdot\right)$ denotes that it is a real-valued transformed bit probability value function.

Step 2: Calculation of the attention scoring function $s(x,q)$. The tanh function is used to calculate the similarity score between the input and output values as follows:

$$s(x,q)=v^T \tanh(Wx+Uq) \tag{19}$$

Where W denotes the weights of the input vector X , U denotes the weights of the query vector q , and v denotes the weight vector of the score calculation.

Step 3: Weighted average. Calculate the weighted average of the input information based on the attention distribution.

$$att(X,q)=\sum_{n=1}^{N}\alpha_n x_n \tag{20}$$

Where α_n denotes the degree of interest of the n th input vector and x_n denotes the n th input vector.

(2) Attention-based long and short time domain memory networks

In this paper, Attention mechanism and LSTM network structure are introduced into the LSTM implicit layer, and the fused Attention-LSTM neural network structure is shown in **Figure. 8**.

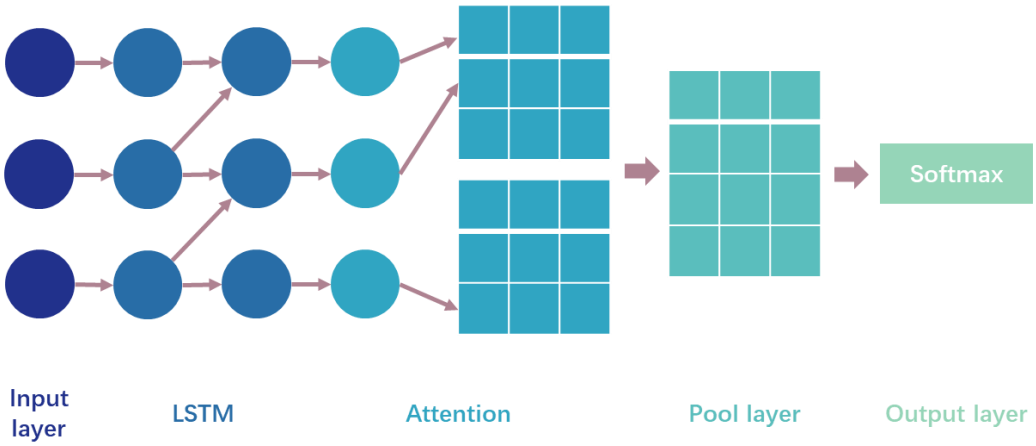


Figure 8. Attention-LSTM structure

4. Improvement of Attention-BiLSTM network based on FTTA algorithm for intelligent sports app using logical reasoning analysis methodology

(1) Design of coding method

In order to improve the analysis accuracy of Attention-BiLSTM, the FTTA algorithm is used to optimise the Attention-BiLSTM parameters, i.e., the network parameter matrix θ , which consists of $[W_{yh},W_{xi},W_{hi},b_i,W_{xf},W_{hf},b_f,W_{xc},W_{hc},b_c,W_{xo},W_{ho},b_o]$, and $W_{yh}\in\mathbb{R}^{m\times q}$, $W_{xi}\in\mathbb{R}^{m\times p}$, $W_{hi}\in\mathbb{R}^{m\times m}$, $b_i\in\mathbb{R}^{m\times 1}$, $W_{xf}\in\mathbb{R}^{m\times p}$, $W_{hf}\in\mathbb{R}^{m\times m}$, $b_f\in\mathbb{R}^{m\times 1}$, $W_{xc}\in\mathbb{R}^{m\times p}$, $W_{hc}\in\mathbb{R}^{m\times m}$, $b_c\in\mathbb{R}^{m\times 1}$, $W_{xo}\in\mathbb{R}^{m\times p}$, $W_{ho}\in\mathbb{R}^{m\times m}$, $b_o\in\mathbb{R}^{m\times 1}$. m denotes the number of hidden neurons. p That is $timestep$,which is set to 1 in this paper. q denotes the analysis step size, which is set to 1.

(2) Adaptation function design

In order to improve the Attention-BiLSTM training accuracy, the root-mean-square error function is used as the objective function of the FTTA-Attention-BiLSTM algorithm, which is calculated as follows:

$$\min RMSE=\sqrt{\left(\sum_{i=1}^{M}(\hat{y}_i-y_i)^2\right)/M} \tag{21}$$

(3) Steps and Processes

Based on the FTTA algorithm optimisation Attention-BiLSTM network for WeChat applet basketball team physical fitness special training pattern analysis method is mainly to take the training pattern indicators as input and the pattern analysis value as output, to construct the mapping relationship between the training pattern indicators and the pattern analysis value. The flowchart of the physical fitness-specific training pattern analysis method for WeChat applet basketball team based on the FTTA-Attention-BiLSTM algorithm is shown in **Figure 9**. The specific steps are as follows:

Step 1: Construct the index system for analysing the physical fitness special training mode of the basketball team for WeChat applet; divide the data set into training set, validation set and test set;

Step 2: The Attention-BiLSTM network parameters are encoded using the FTTA algorithm, and the algorithm parameters such as the population parameters and the number of iterations are initialised at the same time; the population is initialised and the objective function value is calculated;

Step 3: Acquire the de-optimal players and the worst players to execute the collective training phase according to the four types of followers, discoverers, thinkers and fluctuators;

Step 4: Divide the populations, execute the group training phase, calculate the objective function values and update the optimal players;

Step 5: Perform an individual additional training phase in conjunction with the joint Corsi and Gaussian variation strategy;

Step 6: Calculate the fitness value and update the optimal solution;

Step 7: Determine whether the termination condition is satisfied, if so, exit the iteration, output the Attention-BiLSTM network parameters, and perform step 3, otherwise continue to perform step 8;

Step 8: Decode the optimised Attention-BiLSTM network parameters based on the FTTA algorithm, obtain the optimal Attention-BiLSTM network parameters, and construct a physical fitness special training pattern analysis model for WeChat small program basketball team based on the FTTA-Attention-BiLSTM algorithm;

Step 8: Test and analyse the current test set using the trained WeChat applet oriented basketball team physical fitness special training pattern analysis model and output the corresponding test results.

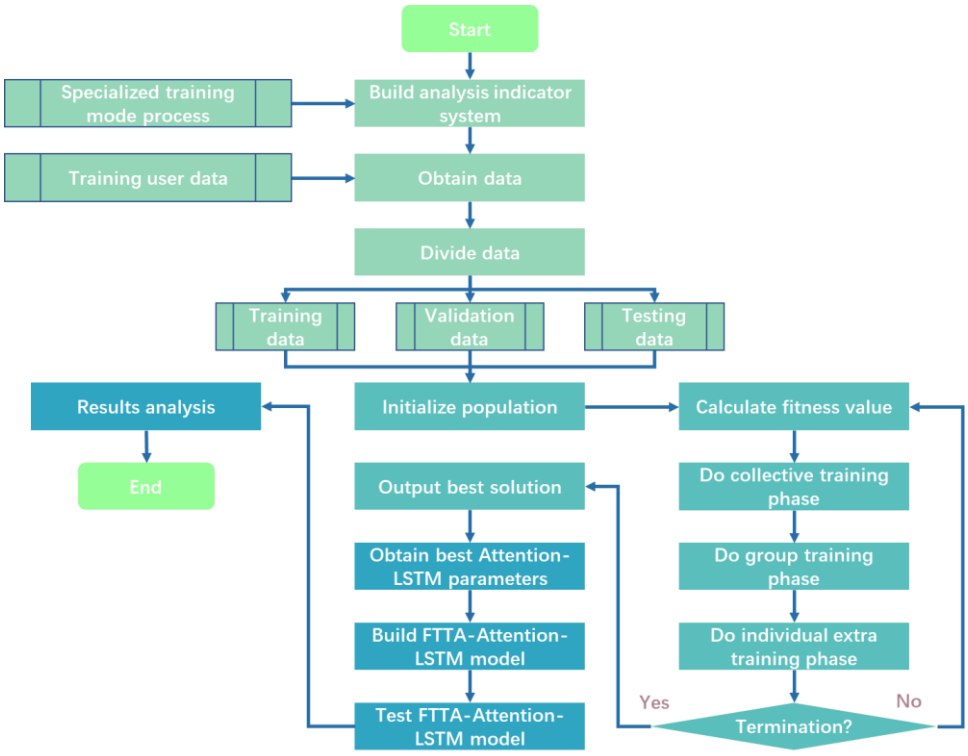


Figure 9. FTTA-Attention-BiLSTM-based method for analysing the physical fitness special training patterns of basketball teams

5. Experiments and analysis of results

In order to verify the advantages and disadvantages of the analysis method of the physical fitness special training mode of the basketball team proposed in this paper, four analysis methods were selected for comparison, and the specific parameters of each algorithm were set as in **Table 1.**The experimental simulation environment was Windows 10, CPU 2.80GHz, 8GB memory, and programming language Matlab2022a.

Table 1 Parameter settings for the method of analysing fitness-specific training patterns for basketball teams

arithmetic	parameterisation

arithmetic	parameterisation
LSTM	The number of nodes in the hidden layer of the LSTM network is given by 5.2, using Adam's technique
FTTA-LSTM	The number of nodes in the hidden layer of the LSTM network and the population size of the FTTA algorithm is given by 5.2
FTTA-GRU	The number of nodes in the hidden layer of the GRU network and the population size of the FTTA algorithm are given by 5.2
FTTA-BiLSTM	The number of nodes in the hidden layer of the BiLSTM network and the population size of the FTTA algorithm are given by 5.2
FTTA-Attention-LSTM	The number of nodes in the hidden layer of the Attention-LSTM network and the population size of the FTTA algorithm are given by 5.2

5.1. Experimental approach

The experimental subjects are 600 members of men's basketball sports team in colleges, and the experimental subjects have no history of major injuries and illnesses, their physical condition is at a good level, and their body morphology and technical level are in line with the requirements of this experiment. The body shape index and basic physical quality of the experimental subjects were investigated. The experimental subjects were trained in a targeted training mode, using sports prescriptions and other supporting training methods within the applet. The data set of the applet and the coaches' record data were collected to construct the experimental data set [28].

5.2. Experimental performance analysis

(1) Parameter impact analysis

In order to analyse the impact of the population size of the FTTA algorithm and the number of LSTM hidden layer nodes on the analysis method of the basketball team's physical fitness training pattern, this paper compares and analyses the performance of the analysis method of the basketball team's physical fitness training pattern under the conditions of different population sizes and different hidden layer nodes. **Figure 10** and **Figure 11** give the results of the impact of different population sizes and different hidden layer nodes on the accuracy and time of the analysis method of the basketball team's physical fitness training mode, respectively.

From **Figure 10**, it can be seen that as the number of FTTA algorithm populations increases, the analysis accuracy of the basketball team's physical fitness special training mode gradually increases; as the number of LSTM hidden layer nodes increases, the analysis accuracy gradually increases. As can be seen from **Figure 11**, with the increase in the number of FTTA algorithm populations, the analysis time gradually increases; with the increase in the number of LSTM hidden layer nodes, the analysis time also gradually increases. In summary, the population size of FTTA algorithm selected in this paper is 80, and the number of hidden layer nodes is 90.

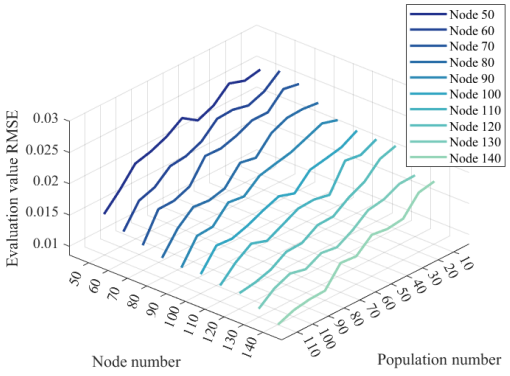


Figure 10. Different population sizes and different hidden layer node conditions on the accuracy of analysing the physical fitness-specific training patterns of basketball teams

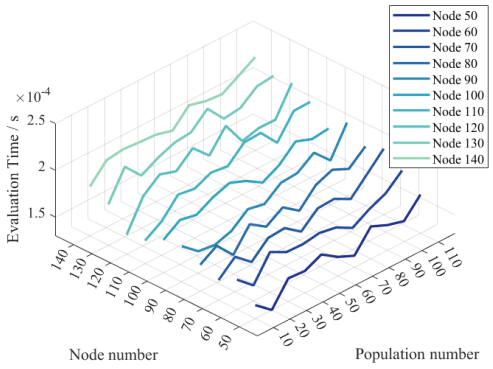


Figure 11. Analysing the time of the basketball team's physical fitness-specific training model under different population sizes and different cryptic node conditions

(2) Comparative analysis of algorithms

In order to verify the effectiveness and superiority of the basketball team physical fitness special training pattern analysis method based on FTTA-Attention-LSTM algorithm, the basketball team physical fitness special training pattern analysis method based on FTTA-Attention-LSTM algorithm is compared with LSTM, FTTA-LSTM,

FTTA-GRU, and FTTA-BiLSTM. comparison, and the performance results of each model are shown in **Figures 12, 13 and 14.**

As can be seen from **Figure 12** and **Figure 13**, the analysed value of the basketball team's physical fitness special training pattern based on the FTTA-Attention-LSTM algorithm is the closest to the true value; the relative error between the analysed value and the true value of the basketball team's physical fitness special training pattern based on the FTTA-Attention-LSTM algorithm is the smallest and it is controlled in the range of 0.02, and the remaining algorithms ranked in error FTTA-BiLSTM, FTTA-GRU, FTTA-LSTM, LSTM in that order, and the error ranges are controlled within 0.06, 0.065, 0.075 and 1.17 respectively.

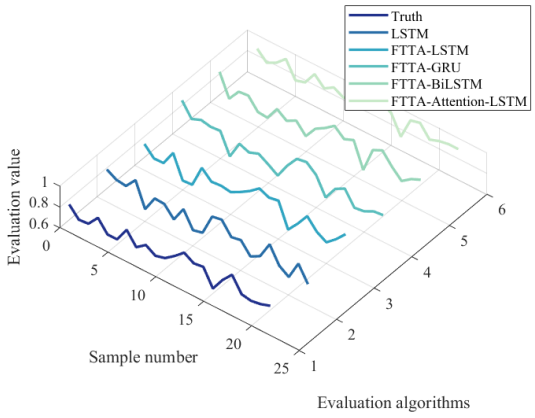


Figure 12. Analysing the physical fitness-specific training patterns of basketball teams based on each algorithm

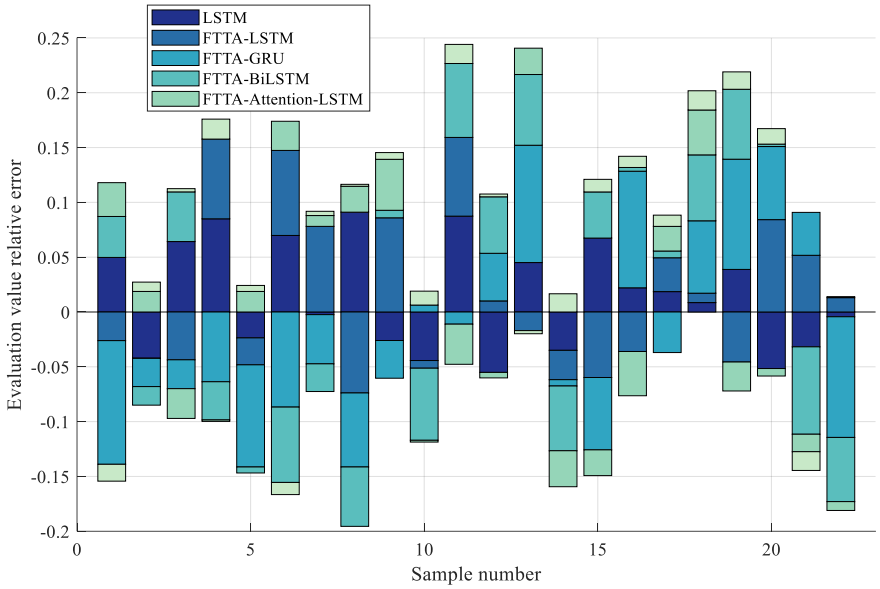
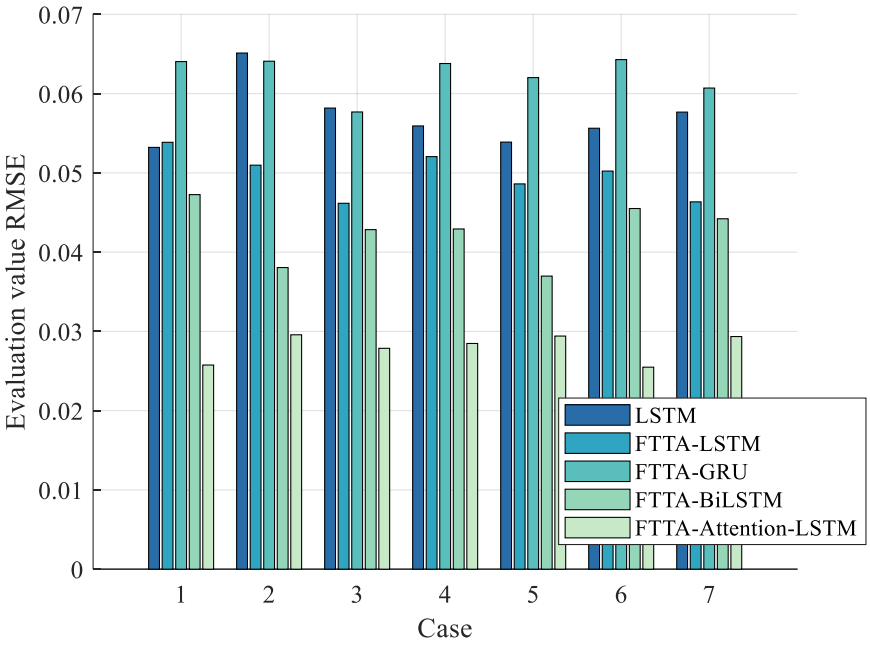
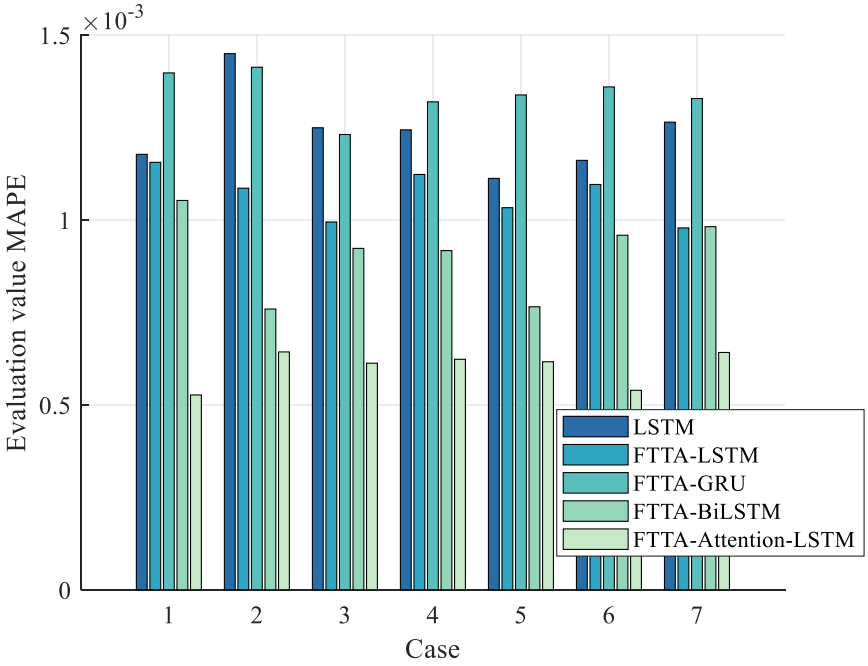


Figure 13. Relative error between the analysed value and the true value of the physical fitness-specific training model of the basketball team based on each algorithm

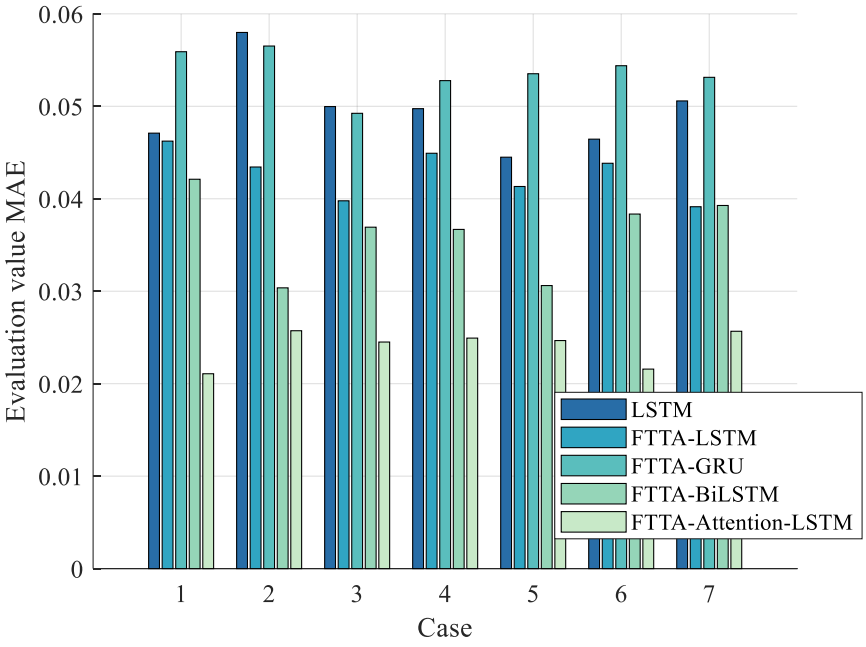
As can be seen from Figure. 14, the rankings of the mean values of RMSE analytically predicted by each algorithm under different working conditions are, in order, FTTA-Attention-LSTM, FTTA-BiLSTM, FTTA-LSTM, FTTA-GRU, and LSTM; the rankings of the mean values of MAPE analytically predicted by each algorithm under different working conditions are, in order, FTTA-Attention-LSTM FTTA-Attention-LSTM, FTTA-BiLSTM, FTTA-LSTM, LSTM, FTTA-GRU; the mean values of MAE predicted by each algorithm under different working conditions are FTTA-Attention-LSTM, FTTA-BiLSTM, FTTA-LSTM, LSTM, FTTA-GRU; the mean values of R2 predicted by each algorithm under different working conditions are FTTA-LSTM, FTTA-BiLSTM, FTTA-LSTM, LSTM and LSTM. mean rankings are FTTA-Attention-LSTM, FTTA-BiLSTM, FTTA-LSTM, LSTM, FTTA-GRU; and the analytical prediction time mean rankings of the algorithms are, in order, FTTA-Attention-LSTM, FTTA-BiLSTM, FTTA-GRU, FTTA-LSTM, LSTM.This shows that the accuracy of the analysis and prediction method of the physical fitness special training pattern of the basketball team based on the FTTA-Attention-LSTM algorithm is better than other algorithms, and the real-time performance is better than other algorithms.


0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
Evaluation value RMSE
1
2
3
4
5
6
7
Case
LSTM
FTTA-LSTM
FTTA-GRU
FTTA-BiLSTM
FTTA-Attention-LSTM

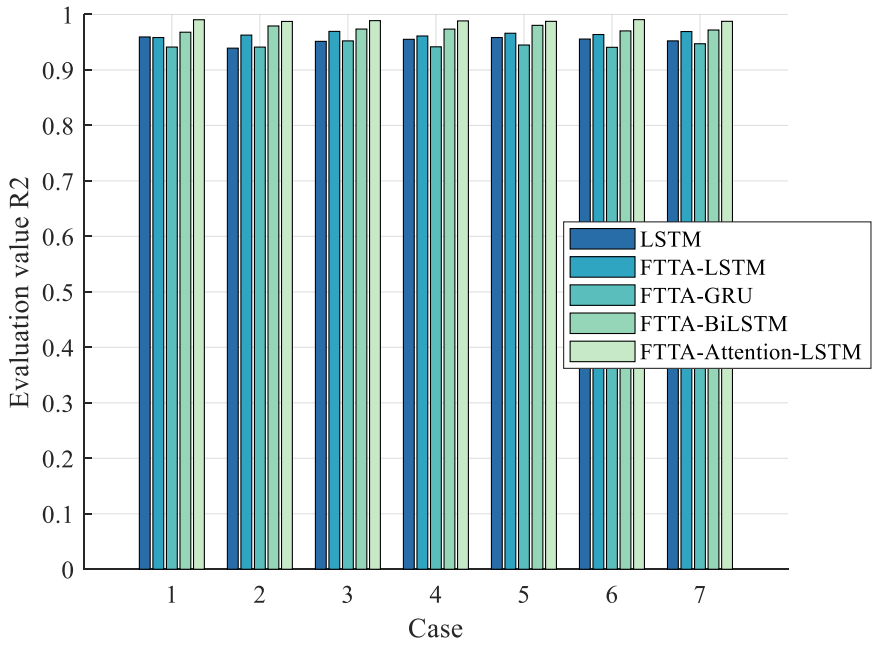
(a) RMSE


×10-3
1.5
1
0.5
0
Evaluation value MAPE
1
2
3
4
5
6
7
Case
LSTM
FTTA-LSTM
FTTA-GRU
FTTA-BiLSTM
FTTA-Attention-LSTM

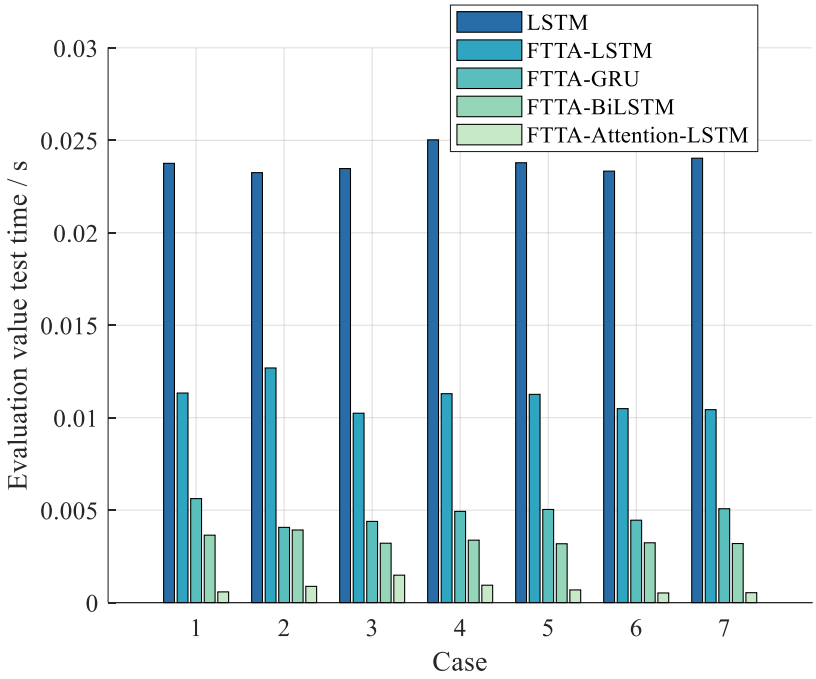
(b) MAPE


0.06
0.05
0.04
0.03
0.02
0.01
0
Evaluation value MAE
1
2
3
4
5
6
7
Case
LSTM
FTTA-LSTM
FTTA-GRU
FTTA-BiLSTM
FTTA-Attention-LSTM

(c) MAE


1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
Evaluation value R2
1
2
3
4
5
6
7
Case
LSTM
FTTA-LSTM
FTTA-GRU
FTTA-BiLSTM
FTTA-Attention-LSTM

(d) R2



(e) Time consuming

Figure 14. Comparison of the performance of analysing the physical fitness-specific training patterns of basketball teams based on each algorithm

6. Conclusion

Aiming at the current basketball special training practice is not precise, objective and scientific enough, this paper combines the football heuristic optimisation algorithm with the LSTM network neural network based on the attention mechanism, constructs the FTTA-Attention-LSTM pattern analysis model, and carries out the analysis and assessment of the basketball team's physical fitness special training pattern with the mini-programme dataset and the coaches' record data. Comparing the analysis effect between FTTA-Attention-LSTM analysis model and LSTM, FTTA-LSTM, FTTA-GRU, FTTA-BiLSTM models, the WeChat mini-program oriented basketball team's special physical fitness training mode analysis index system contains 14 factors affecting the analysis model; in analysing the relationship between the size of FTTA population and Attention-LSTM network hidden layer node number experiments, it was found that the selection of the population size of 80, the number of hidden layer nodes for 90; by analysing the FTTA-Attention-LSTM analysis model and other comparative models, it was found that the analysis accuracy of the FTTA-Attention-LSTM analysis model is the smallest, and the analysis time meets the real-time requirements, controlled within 0.001s. In this paper, the selection of influencing factors in the model is not pre-processed and analysed, which consumes too much time and energy. In the future, principal component analysis technology can be introduced for feature selection to further achieve intelligence and improve the analysis efficiency of the model.

Acknowledgements.
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