

Retraction

Retracted: Quality Evaluation and Informatization Analysis of Physical Education Teaching Reform Based on Artificial Intelligence

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This article has been retracted by Hindawi, as publisher, following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of systematic manipulation of the publication and peer-review process. We cannot, therefore, vouch for the reliability or integrity of this article.

Please note that this notice is intended solely to alert readers that the peer-review process of this article has been compromised.

Wiley and Hindawi regret that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

- [1] Y. Xu, S. Huang, and L. Li, “Quality Evaluation and Informatization Analysis of Physical Education Teaching Reform Based on Artificial Intelligence,” *Security and Communication Networks*, vol. 2022, Article ID 5473153, 13 pages, 2022.

Research Article

Quality Evaluation and Informatization Analysis of Physical Education Teaching Reform Based on Artificial Intelligence

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With the continuous reform of China's education and the development of the educational environment, English will no longer be the third subject for Chinese students and physical education will replace it as the third subject. The teaching mode has also gradually changed from the traditional artificial mode to the current smart education. In the context of artificial intelligence, physical education can also apply this technology to daily teaching. After physical education becomes the third subject, it is necessary to reform the existing teaching mode and conduct quality evaluation and informatization analysis. In order to achieve this effect, we use artificial intelligence action scenes to detect students' detailed actions and identify key actions and then use computer vision system to create regression models and Bayesian formulas to give the criteria for judging the subsequent training points of the computer. Then, according to the training data of each student in the training process, the quality analysis and informatization evaluation of the teaching reform of physical education are carried out. Using the action bank algorithm as the basic algorithm of feature extraction, a template research method based on multispectral clustering is proposed to facilitate its dissemination in the computer background database. Then, through experiments to compare the before and after optimization of the algorithm, the data analysis of the resolution, time consumption, and detection error of the action bank model were carried out, and it was found that the performance was improved. Then, by means of mean shift detection method and spatiotemporal action detection method, the resolution, time consumption, and detection error of the action bank model are optimized to achieve the quality evaluation and informatization analysis of physical education teaching reform.

1. Introduction

The logistic regression model algorithm based on artificial technology [1–4] determines the quantitative relationship between two or more variables that depend on each other, to find out the data with a strong correlation with the evaluation index. The preliminary classification of the data is completed, and then, the data mining technology is used [5–8]. By comparing the feature information of the data, the data with the same or strong correlation with the feature information of the data are mined in the same database, to achieve the preliminary mining and classification of the data, so as to facilitate the subsequent data cleaning and data mining. Changes and data purification: taking the above as the core idea, a physical education teaching reform quality

evaluation and information analysis system are established, to a certain extent, the interference of human subjective consciousness is put aside, data and evaluation indicators are used to establish a more objective evaluation behavior, based on such prerequisites, and we need to regard the algorithm model and evaluation system we have established as a system with two correlations. Using the method of data mining classification, the data related to the indicators affecting the evaluation are classified into the background database [7, 9–12], and then, to a certain extent, it is regarded as transforming into a geometric mathematical model with high flexibility [13, 14] to deal with the rigid conditions of lack of transformation ability, standing in the mathematical discussion form unnatural conditions are combined with mathematical models, and finally through the combination

of classical numbers and shapes. In this way, the indicators with strong correlation that affect the evaluation results in the evaluation system are more intuitively represented in the way of images. The evaluation system is standardized, and it is made fair. Numbers are the most concise and powerful language of reality, and the mathematical expression of everything is true, valid, and concise enough, provided the result is correct. The algorithm optimization and more scientific improvement under artificial intelligence technology are also worth looking forward to and paying attention to in the future.

2. Evaluation and Analysis of College English Education Informatization Degree under Big Data Technology

In this study, the quality evaluation and informatization analysis of physical education teaching reform are mainly based on artificial intelligence technology, while the data mining technology of background database based on artificial intelligence technology mainly collects and integrates various and complicated data information, to obtain more accurate and effective data. The representative data information allows us to evaluate and analyze the quality of physical education teaching reform [15–18] more objectively. Firstly, we analyze the ideas according to the data mining technology and construct the idea map. We construct the five stages in the data mining process. Based on the data mining technology of the background database under the artificial intelligence technology, the model and its algorithm are constructed, and then, the quality of physical education teaching reform is carried out.

First of all, considering the technical difficulty, most data mining tools are user-friendly, easy to understand, and easy to use, which greatly reduces the difficulty for analysts or industry evaluators to mine value from massive data. Secondly, data mining technology is the product of countless experiments and is widely recognized and accepted by everyone. It can clean, calculate, and visualize data through various built-in programs and realize automatic management and control of multitasking, which can significantly reduce the user's time and cost and reduce the workload and provide substantial help for analysts and evaluators.

Evaluation and analysis are shown in Figure 1.

At this stage, data mining is performed through artificial intelligence technology to complete the data mining work, and the generated model can be used in the follow-up to solve more complex problems.

2.1. Artificial Intelligence Technology Mining Learning Model and Its Algorithm

2.1.1. Logistic Regression Model. By introducing the logistic regression model algorithm, the correlation strength of the data collected in the students' class is calculated, and the classification function is used to classify it. After fitting the classified data, the logistic regression function is used to

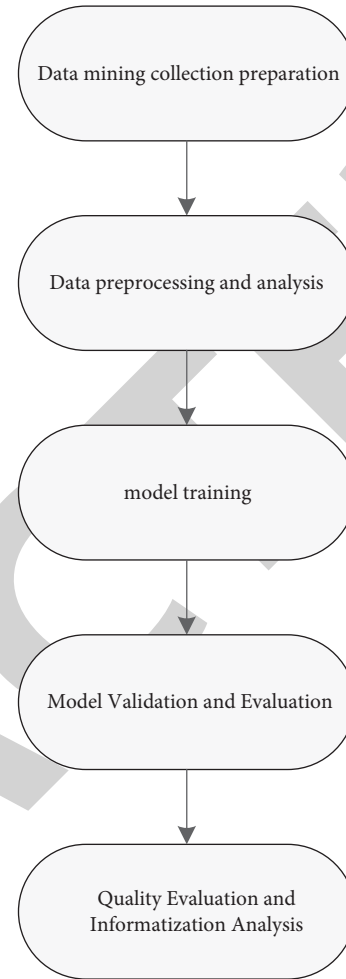


FIGURE 1: Analysis of the informatization of physical education teaching reform under artificial intelligence technology.

perform linear regression [19–21] on the basis of normalization, so that the difference between the data value and the true value obtained by the model and function becomes smaller.

The computational model experiment in the article is a special computational experiment, and its computation is nothing more than two results, either success or failure, and each experimental sample exists independently and is not disturbed, and each experiment has a fixed value. The probability of success p and then the probability of occurrence of the experimental calculation sample are assumed to conform to the Bernoulli distribution, which not only simulates the real situation of the model calculation to a great extent but also facilitates the calculation of the mathematical expectation and variance of the distribution due to the simple distribution of the results so that we can derive the log-likelihood function and find the maximum-likelihood estimate from it.

- (1) The logistic regression model algorithm mainly multiplies each attribute of the data sample participating in the experiment by the corresponding parameter value and accumulates the results we get. The formula of its model is as follows:

$$h(x) = w_0x_0 + w_1x_1 + w_2x_2 + \dots + w_mx_m. \quad (1)$$

The vectorized formula is expressed as follows:

$$h(x) = w^t x. \quad (2)$$

(2) The value of the sigmoid function is calculated.

The calculated result of the above formula into the sigmoid function is substituted. The calculated result obtained by the function calculation will be between (0, 1). The calculated value is compared with the set threshold value, which is greater than the threshold value, that is, positive class; otherwise, it is negative class, and its calculation formula is as follows:

$$g(z) = \frac{1}{1 + e^{-wx}}. \quad (3)$$

2.1.2. Model Calculation. Here, we assume that n samples are used for calculation training. It is known that the probability of occurrence of each assumed sample conforms to the Bernoulli distribution, and the probability of occurrence is calculated experimentally for each sample.

(1) The probability of occurrence of positive and negative classes is calculated.

$$\begin{aligned} p(y_i = 1|x_i), \\ 1 - p(y_i = 1|x_i). \end{aligned} \quad (4)$$

(2) The posterior probability of each sample is calculated.

$$p(y|x, w) = p(y_i = 1|x_i)^{y_i} (1 - p(y_i = 1|x_i))^{1-y_i}. \quad (5)$$

2.1.3. Log-Likelihood Function. Due to the extremely large amount of data, in our calculation process, the model and data overfitting state will inevitably occur. To avoid this problem, here we introduce the loss function $l(w)$, by adding the loss function $l(w)$ plus a penalty term for w , making the penalty a regularizer. Its calculation formula is as follows.

The impact of data purity on the results is undoubtedly the most direct. It is undeniable that such a problem does exist in this article. However, based on the diversity and quantity of data types, it is difficult to formulate a unified, specific, and standardized measurement system for the measurement of the purity of multiple types of data. Therefore, in this article, by purifying the data multiple times, the information entropy value is reduced as much as possible, and the impact of data purity on the results is minimized.

$$l(w) = \prod_{i=1}^m p(y_i = 1|x_i)^{y_i} (1 - p(y_i = 1|x_i))^{1-y_i}. \quad (6)$$

It is expanded and solved, and the derivative of w is taken:

$$\frac{\partial l(w)}{\partial w} = \sum_{i=1}^m (y_i - g(z))x_i. \quad (7)$$

2.1.4. Naive Bayes Algorithm

(1) naive Bayesian model originated from classical mathematical theory. Its stable classification efficiency and simultaneous multitask processing, especially when the amount of data information is huge, greatly improve the efficiency of classification and sorting of our data mining information. The function model is as follows:

$$C_x = \arg \max_{k \in \{1, 2, \dots, k\}} \left(P(C_k) \prod_{j=1}^n p(x_j|C_k) \right). \quad (8)$$

(2) The above formula is calculated, and the frequency is used to estimate the probability. The calculation formula is as follows:

$$p(C_k) = \frac{m_k}{m}. \quad (9)$$

(3) Here, we make reasonable assumptions about the distribution of data characteristics of the samples and calculate separately.

The naive Bayes that conforms to the multinomial distribution is calculated as follows:

$$p(x_{js}|C_k) = \frac{m_{kjs}}{m_k}. \quad (10)$$

Sometimes if the value of a feature in the sample is 0, it will seriously affect the probability distribution of the feature, so we use the Laplace smoothing to avoid this situation, namely,

$$p(x_{js}|C_k) = \frac{(m_{kjs} + \lambda)}{(m_k + \lambda)}. \quad (11)$$

The naive Bayes conforming to the Bernoulli distribution is calculated as follows:

$$p(x_{js}|C_k) = \begin{cases} p(x_{js} = 0|C_k) = 1 - p(x_{js} = 1|C_k) \\ p(x_{js} = 1|C_k) \end{cases} \quad (12)$$

The naive Bayes that conforms to the Gaussian distribution is calculated as follows:

$$f(x, \mu, \sigma) = \frac{1}{\sigma\sqrt{2\pi}} \exp\left(-\frac{(x - \mu)^2}{2\sigma^2}\right). \quad (13)$$

2.2. Decision Tree Model and Its Data Purification. After the data mining is collected, the data will be sorted and summarized to get a database with a huge amount of information. In our database, the invalid information we have collected is often retained. At this time, the introduction of

the decision tree model can effectively solve the data. Purity issues: decision tree model is mainly a nonparametric classifier that is simple to use and less difficult to operate. Here, we refer to the ID3 algorithm, as well as the C4.5 algorithm.

In the article, only some indicators that affect the degree of informatization in college English education are tested and the evaluation standards are formulated, but in fact, there are many factors that affect the degree of informatization in college English education. There are many indicators for reference. In this article, we only select a few of the more important reference indicators for testing, but that does not mean we are turning a deaf ear to other influencing factors. The final evaluation and analysis results must be discussed under the influence of various factors. Due to the similarity of the calculation methods, they are not tested and displayed in this study.

The commonly used algorithms in the decision tree model [22] mainly include the ID3 algorithm and the C4.5 algorithm. These two algorithms can be used to divide the data set, and the ultimate goal of the decision tree node splitting is to make the nodes that fall on each branch node. The samples are in the same category to the greatest extent possible, which means that the node purity is higher.

2.2.1. ID3 Algorithm. Aiming at the problem of data purity after data mining classification, we introduce the concept of information entropy [23] to measure the data purity after classification. Its calculation formula is as follows:

$$H = - \sum_{k=1}^{|y|} p_k \log_2 p_k. \quad (14)$$

H represents the information entropy D , and the smaller the calculated H value, the higher the purity of the information entropy.

In this article, we only quoted a part of the cart algorithm, and we used the Gini index algorithm to improve the other part. Compared with the original algorithm, the Gini index algorithm is simpler and faster. The original algorithm is added as follows:

$$\begin{aligned} R_1(j, s) &= \{x | x^j \leq s\}, \\ R_2(j, s) &= \{x | x^j > s\}, \end{aligned} \quad (15)$$

$$c_m = \frac{1}{N_m} \sum_{x_i \in R_m(j,s)} y^i, x \in R_m, m = \{1, 2\}.$$

It can be clearly seen that our use of the Gini index algorithm is indeed more concise.

The ID3 algorithm quoted here conforms to the data gain criterion. The so-called data gain is the positive change in the original data and the classified data after the data are classified, and the gain of an indicator after the data classification is the data set. Under this condition, D represents the difference between the information entropy and the empirical conditional entropy:

$$H(D, a) = H - \sum_{v=1}^v \frac{|D^v|}{|D|} H(D^v). \quad (16)$$

3. Algorithm Improvement

In summary, we have made a preliminary framework for the big data technology algorithm, but there may still be deficiencies or loopholes. Next, we will optimize and improve our artificial intelligence counting algorithm to improve the computing power and accuracy of the algorithm.

3.1. Logistic Regression Model Algorithm Optimization. In the logistic regression algorithm, it is not excluded that the last derivative is 0. In this case, we cannot solve w , and we need to use the gradient iterative optimization algorithm to optimize the algorithm. The combination of stochastic gradient descent and batch gradient descent can help us solve the above problems by taking the derivation of the objective function.

Here, we use the batch gradient descent method to find the partial derivative of w and obtain the gradient corresponding to each w . The calculation formula is as follows:

$$\frac{\partial l(w)}{\partial w_j} = -\frac{1}{m} (y^i - h_w(x^i)) x_j^i. \quad (17)$$

Since we need to minimize the risk function, we need to update w in the negative direction of w . The calculation formula is as follows:

$$w_j^* = w_j + \frac{1}{m} (y^i - h_w(x^i)) x_j^i. \quad (18)$$

By calculating the formula, we will finally get a comprehensive optimal solution, but every change in w requires all the training data. If the data are too large, it will greatly affect the speed of w change, so we use random combined with the gradient descent method, and the calculation formula is as follows:

$$\begin{aligned} l(w) &= \frac{1}{2m} \sum_{i=1}^m (y^i - h_w(x^i))^2 \\ &= \frac{1}{m} \sum_{i=0}^m \cos t(w, (x^i, y^i)), \end{aligned} \quad (19)$$

$$\cos t(w, (x^i, y^i)) = \frac{1}{2} (y^i - h_w(x^i))^2.$$

Through the loss function of each sample, the partial derivative of w is obtained to obtain the corresponding gradient, and then, w is updated.

$$w_j^* = w_j + (y^i - h_w(x^i)) x_j^i. \quad (20)$$

3.2. Improvement of Naive Bayes Algorithm. Among the three classification algorithms based on the naive Bayes algorithm, the best classification effect is the multinomial

naive Bayes algorithm classification model, but the disadvantage is that the algorithm automatically defaults to the same weight of all features and ignores the features of each data. To a certain extent, it will reduce the accuracy of our data classification. Therefore, we need to combine other algorithms for related optimization. Here, we introduce the TD-IDF algorithm and improve and optimize the original algorithm before applying it to the data processing module.

The improved TDF-IDF-LD is combined into a multinomial naive Bayesian algorithm to obtain the final formula.

$$C_x = \arg \max_{k \in \{1,2,\dots,k\}} \left(\frac{m_k}{m} \prod_{j=1}^n \frac{m_{kjs} + \lambda}{m_k + s_j \lambda} \right) \quad (21)$$

* TF * IDF * LF * DTF.

3.3. Improvement of Decision Tree Model Algorithm. The main idea of the ID3 algorithm is a top-down greedy strategy from the root node to the leaf node. First, the information gain of each feature is calculated according to the above formula, and finally, the feature with the largest information gain is selected as the node of the decision tree. Splitting further improves the purity of the child nodes of the decision tree, and the ability to divide samples into corresponding categories is stronger, and the representativeness of such features is stronger. However, the shortcomings of ID3 are also obvious. The algorithm has a preference for attributes with a large number of values. The decision tree created only by the ID3 algorithm obviously cannot achieve the expected effect for unknown data. At this time, we use the C4.5 algorithm for collaborative calculation, so that the decision tree we create is sufficiently convincing [24].

3.3.1. C4.5 Algorithms. In view of the limitations of the ID3 algorithm, to minimize the adverse effects of the ID3 algorithm, we use the C4.5 algorithm for collaborative calculation. The calculation formula is as follows:

$$H(D, a)_{\text{ratio}} = \frac{H(D, a)}{H(D)}. \quad (22)$$

3.3.2. Classification and Regression Tree Algorithm. Classification and regression trees are a type of decision tree and are very important. It can realize the generation of classification tree and regression tree at the same time. The CART algorithm we introduce here is a binary recursive segmentation technique. The internal node of the generated decision tree has only two branches and only two categories of yes or no. Even if a feature or attribute has multiple values, it is divided into two parts.

Create a Classification Tree. In the recursive process of creating the split tree, the CART algorithm selects the feature with the smallest Gini index in the current data set as the node to divide the decision tree. The Gini index is similar to

the information entropy and is usually used to measure the purity of the data set D. The calculation formula is as follows:

$$Gin(D) = 1 - \sum_{k=1}^{|y|} p_k^2. \quad (23)$$

The Gini index is obtained by calculation, and the purity is estimated by observing the value of the final calculation result of the index. The smaller the value, the higher the purity.

In the process of classifying data, the Gini index is calculated for the indicator a, and the formula is as follows:

$$Gini_{\text{index}(D,a)} = \sum_{v=1}^v \frac{|D^v|}{D} Gini(D^v). \quad (24)$$

Create a Regression Tree

The regression tree created by CART uses the principle of least mean square variance to determine the optimal division of the regression tree, so that our final data result prediction is closest to the true value. To avoid security vulnerabilities as much as possible, first of all, we need to understand which security vulnerabilities are most likely to cause security threats to the database. The first and most direct one is that the username and password in the database are too simple, which leads to some malicious hackers. It is easy to steal user information from our database, leading to security breaches, followed by unpatched databases, insufficient authentication, and other related issues. In response to these problems, we have targeted management personnel awareness, systems, and technical means and follow the basic threat prevention guidelines, but if only from a technical perspective, we will consider the use of monitoring (DMI) system, that is, so-called database auditing systems to circumvent security breaches. Assuming that the mean squared error is calculated for a feature, and the feature with the smallest error is found, it is theoretically the optimal splitting point. The squared error formula is as follows:

$$\sum_{x_i \in R_m} (y_i - f(x_i))^2. \quad (25)$$

4. Based on Artificial Intelligence Technology Algorithm Evaluation Experimental Test

Traditional physical education can no longer be satisfied. In the current educational environment, based on the technology of action bank, a multidimensional analysis of physical education is carried out. Traditional sports can only provide simple action guidance for human actions under the intuitive vision of the human body. However, in the artificial intelligence motion scene, it can store the data of the human body dynamic action accurately to the frame, score, and correct the accuracy of the dynamic action and can also match the corresponding data based on the stored dynamic action data. Sports carry out intuitive information analysis and make quality evaluation. A decision tree is a tree structure consisting of nodes and directed edges. Its essence is a set of causal rules. The decision tree model we introduced

in this article is a simple and easy-to-use nonparametric classifier that does not require any assumptions on the data. Now, with the technology of action bank, the experimental simulation of the existing sports actions is carried out to compare the improvement of the action bank model compared with the traditional physical education. Now, model experiments are conducted based on a certain action data, as shown in Table 1.

The above is a demonstration of the experimental data after the model simulation experiment. It can be seen that the error correction rate of the experimental dynamic data is still maintained at more than half. Now, the same example is artificially tested, and then, the obtained data are compared, as shown in Table 2 and Figure 2.

As shown in the table, it can be intuitively found that the traditional physical education is manual inspection, so the error detection, error correction, and effective error correction are all the same, but the effective error detection of the model is more than the manual error detection by 2. From this, it can be seen that manual error detection will still be more or less affected by factors such as environment, man-made, and force majeure, while the model will not be affected by so many factors, unless there is an error in the algorithm itself, the shortcomings of the model are reflected in the correction. The error rate may be due to the lack of control data. In the future experiments, the basic behavior will be stored and the database will be improved to achieve the optimal operation of the model. Downtime is a deadlock situation that is very likely to occur in computer computing, and the possibility of server database deadlock is not ruled out. For this, we have considered setting up a framework that includes alerts and monitoring. In the event of downtime, our alert monitoring framework can detect and diagnose problems in a timely manner, reducing the possibility of data loss.

4.1. Performance Comparison before and after Model Optimization. Now, an example action in an artificial intelligence action scene is collected. By comparing the resolution of the experiment, the consumption of recognition time, and the number of recognition errors, it can be concluded whether the optimization of the model has a substantial effect on the model.

4.1.1. Identification Resolution Comparison. Comparison of unit detection volume and resolution is shown in Table 3 and Figure 3.

It can be seen from the figure that the blue one is the primary model, and the orange one is the optimized model. It can be seen intuitively that the optimized model has a significantly improved resolution than the primary model. According to the table, it can be seen that in the resolution data there is also a significant improvement in accuracy.

4.1.2. C4.5 Algorithm and ID3 Algorithm Test. In the previous article, based on the ID3 algorithm introduced by data processing and purification, we further optimized it and

introduced the C4.5 algorithm. We compared the advantages brought by the improvement of this algorithm through a more direct experimental test. Taking a university as an example, we use two algorithms to calculate the university's investment in physical education and compare it with the actual situation and then compare the advantages and disadvantages of the two algorithms. The calculation results are shown in Table 4, and the visualization is shown in Figure 4.

According to the visualization in Figure 4, the data results obtained by our optimized C4.5 algorithm compared with the ID3 algorithm to purify the data are compared with the actual investment of the school. The optimized C4.5 algorithm is closer to the real situation of the experiment. The existing artificial technology has a relatively complete system, and combined with the experimental tests made in this article, the artificial intelligence algorithm has been able to process data more flexibly and build a more perfect evaluation system accordingly. Then, in the future development of artificial intelligence technology, the accuracy of data and the improvement of data processing speed are worthy of attention. It will bring more convenient and substantial help to the education industry.

4.1.3. Time Consumption Comparison of Unit Detection Amount. In the action scene of artificial intelligence, the time requirements for detection are relatively strict, and the general detection must ensure timeliness, so that the data obtained from the detection can be effectively used.

Comparison of time consumption per unit detection amount is shown in Table 5 and Figure 5.

The figure shows that the blue one is the primary model, and the orange one is the optimized model. It can be seen intuitively that the time consumption of the optimized model is shorter, and it can better meet the requirements of the experiment for timeliness.

4.1.4. Comparison of the Number of Recognition Errors per Unit Detection Amount. The detection of model performance can be intuitively analyzed by the number of errors in the number of experiments. By comparing the number of errors before and after the optimization of the experimental model, the performance of the model before and after optimization can be compared, as shown in Table 6 and Figure 6.

In the figure, the blue one is the primary model, and the orange one is the optimized model. It can be seen intuitively that after the model is optimized, the number of detection errors has dropped significantly, meeting the performance requirements of the experimental model.

To sum up, the performance of the optimized model is more in line with the inspection requirements, the resolution of the experiment is optimized, and the motion data obtained by the inspection can be stored more accurately. The reduction in the number of recognition errors is an essential improvement in the performance of the model.

TABLE 1: Experimental simulation data table.

Example	Action data storage (s)	Action error detection times	Action correction times	Error correction rate (%)	Satisfaction (%)
Run	162	36	23	63.8	80.6
Shoot	195	45	30	66.7	85.3
Ping pong swing	145	33	21	63.6	96.3
Badminton swing	207	56	31	55.3	84.2
Archery	105	22	15	56.9	89.5
Shoot the ball	150	51	25	54.7	93.6
Smash	167	24	35	48.6	85.2
Swing the sword	231	61	26	68.4	86.2
Dance	164	14	19	63.6	87.7
Softball swing	176	56	26	57.4	89.3

TABLE 2: Experimental data comparison table.

	Error detection times	Error correction times	Effective error correction	Error correction rate (%)
Traditional physical education	18	9	9	100
Action bank model	16	10	7	70

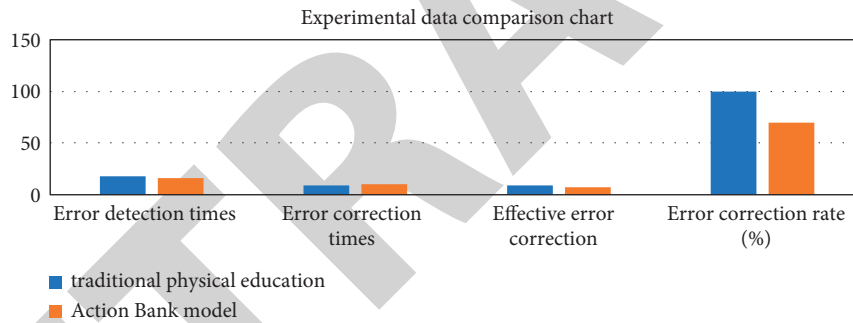


FIGURE 2: Experimental comparison diagram.

TABLE 3: Comparison of unit detection amount and resolution (%).

Teaching action	Primary model	Optimization model
Running action	69.2	70.56
Shooting action	79.3	82.01
Table tennis swing	85.2	87.21
Badminton swing	85.6	86.24
Archery	79.3	74.92
Shoot the ball	84.3	78.43
Smash	75.6	84.52
Swing the sword	73.9	89.32
Dance	87.5	79.15
Softball swing	89.6	76.34

4.2. *Performance Comparison before and after Model Optimization.* By introducing the mean shift detection method and the spatiotemporal action detection method, the action scenes of several cases are detected and analyzed, and the experimental models or algorithms are compared by comparing the resolution, time consumption, and number

of experimental errors of the experiments. Finally, it is concluded whether the performance of the action library model meets the detection requirements.

Now for the detection of the experimental resolution, based on the data collected and sorted out, the results are shown in Table 7 and Figure 7.

In the figure, the blue is the action bank model, the orange is the mean shift detection method, and the gray is the spatiotemporal action detection method. It can be seen intuitively from the figure that the blue line in the figure is the resolution data of the action bank model. Both are at the top of the datasheet, and it follows that the action bank model is superior to the other two models in terms of resolution.

The time consumption of the referenced model or algorithm is now tested to determine whether the timeliness of the model or algorithm meets the testing requirements. The testing data are shown in Table 8 and Figure 8.

In the figure, the blue one is the action bank model, the orange one is the mean shift detection method, and the gray one is the spatiotemporal action detection method. You can

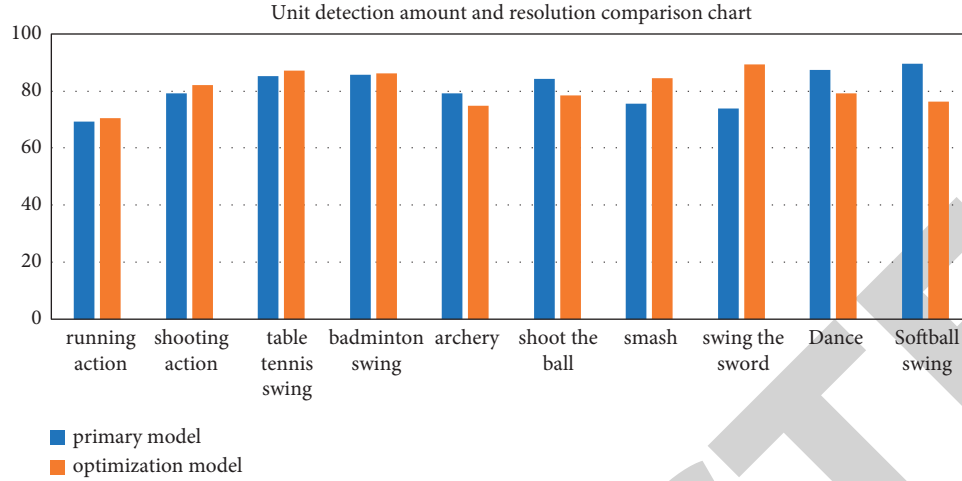


FIGURE 3: Comparison of bit detection amount and resolution.

TABLE 4: Comparison of the results of ID3 algorithm and C4.5 calculation of investment capital (unit: ten thousand yuan).

Algorithmic input	Hire a physical education teacher	Physical education equipment	Sports professional equipment	Sports e-books	Other
ID3 algorithm calculation input	22.3	72.2	88.7	11.4	7.8
C4.5 algorithmic computing input	21.9	74.8	90.6	10.1	7.5
Actual input	21.5	74.3	90.2	10.5	7.2

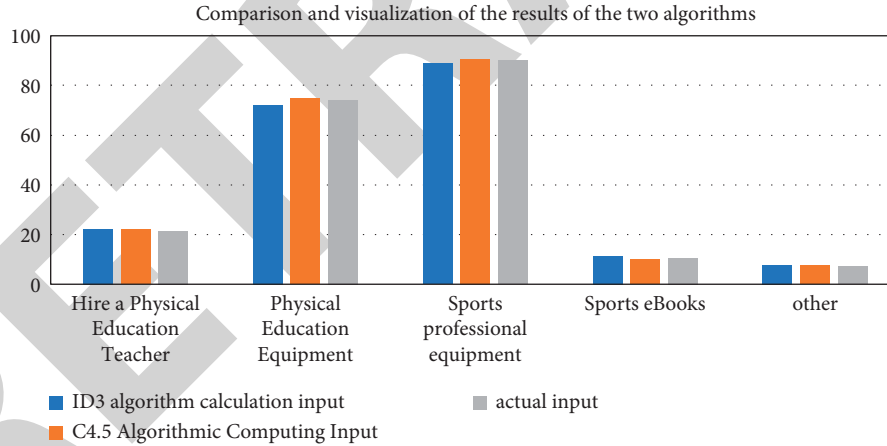


FIGURE 4: Comparison and visualization of the results of the two algorithms.

TABLE 5: Time consumption comparison of detection amount (unit: second).

Teaching action	Primary model	Optimization model
Running action	1.1	0.8
Shooting action	1.3	0.9
Table tennis swing	1.4	1
Badminton swing	1.3	0.8
Archery	1.5	0.7
Shoot the ball	1.2	0.6
Smash	1.7	1.3
Swing the sword	1.8	1.2
Dance	1.6	0.8
Softball swing	1.4	0.6

intuitively see the blue line; that is, the action bank model time consumption data is at the lowest end of the table. It can be concluded that the model is better than other models in terms of time consumption, but based on the consideration of timeliness, the time consumption of all models meets the requirements for timeliness.

To verify the accuracy of the experiment, we compare the performance, recall rate, accuracy rate, and F1 of the following three algorithms to reflect the matching degree of the three methods, as shown in Table 9 and Figure 9.

According to the data table and the comparison chart, the action bank model is better than the mean shift detection method and the spatiotemporal action detection method in

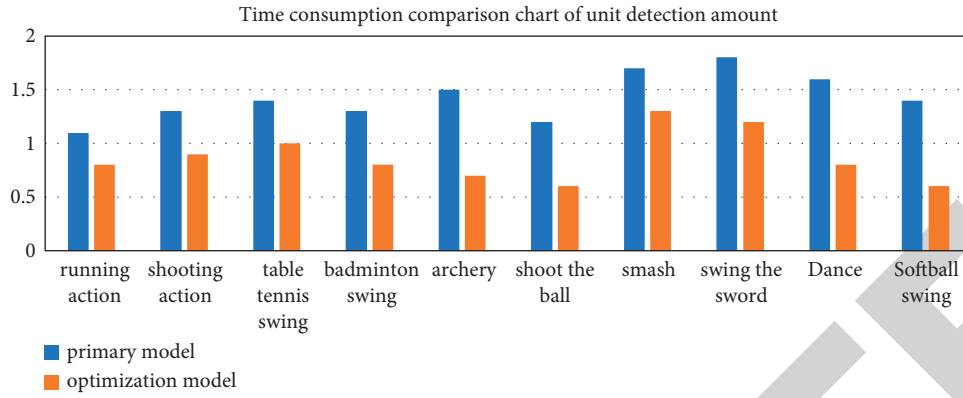


FIGURE 5: Time consumption comparison chart of detection amount.

TABLE 6: Comparison of the number of recognition errors per unit of detection.

Teaching action	Primary model	Optimization model
Running action	8	2
Shooting action	5	1
Table tennis swing	6	2
Badminton swing	12	5
Archery	7	4
Shoot the ball	11	6
Smash	9	2
Swing the sword	7	3
Dance	8	1
Softball swing	10	4

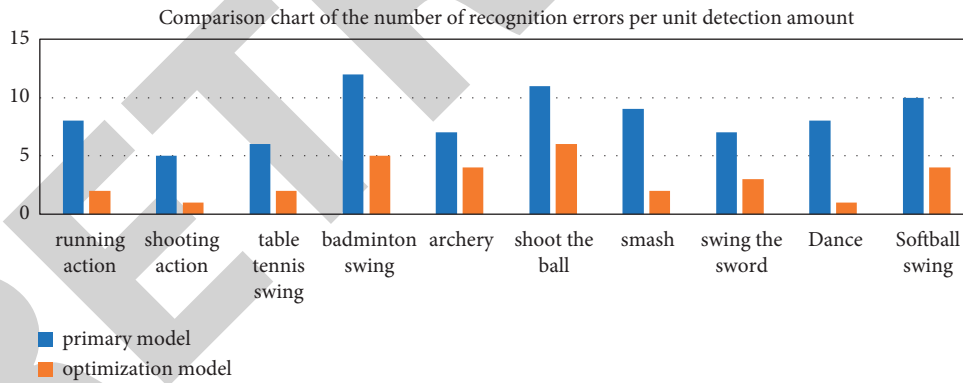


FIGURE 6: Comparison of the number of recognition errors per unit detection amount.

TABLE 7: Comparison table of resolution (%).

Teaching action	Action bank model	Mean shift detection method	Spatiotemporal motion detection
Running action	70.56	65.2	67.3
Shooting action	82.01	79.3	81.2
Table tennis swing	87.21	85.3	86.6
Badminton swing	86.24	83.3	84.3
Archery	86.43	75.6	79.4
Shoot the ball	85.43	84.2	78.6
Smash	89.46	76.3	85.2
Swing the sword	86.43	79.5	85.7
Dance	78.53	86.7	78.6
Softball swing	79.43	89.6	79.5

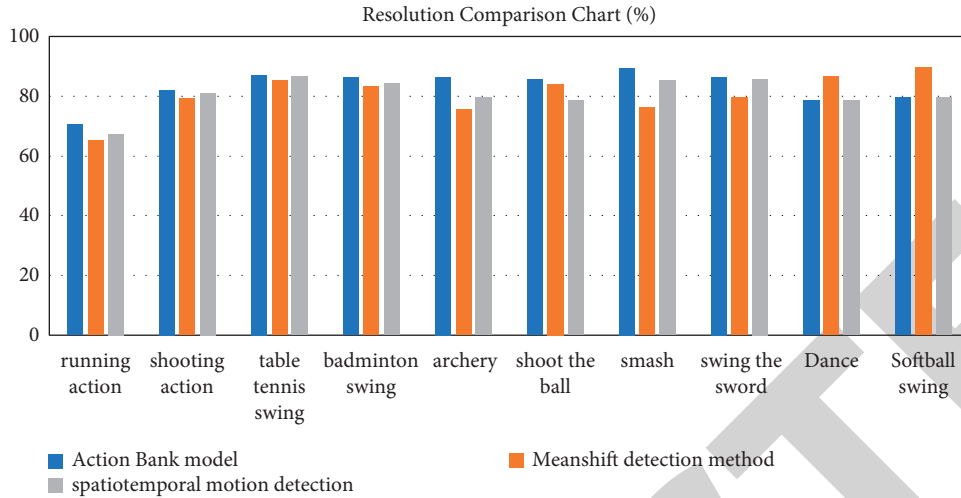


FIGURE 7: Comparison of resolutions.

TABLE 8: Comparison of test duration and consumption (unit: seconds).

Teaching action	Action bank model	Mean shift detection method	Spatiotemporal motion detection
Running action	0.8	1.1	1
Shooting action	0.9	1.3	1.1
Table tennis swing	1	1.5	1.3
Badminton swing	0.8	1.3	1.2
Archery	0.7	1.2	1.4
Shoot the ball	0.8	1.4	1.3
Smash	1.1	1.7	1.1
Swing the sword	1.4	1.3	1.5
Dance	0.9	1.1	1.4
Softball swing	0.7	1.4	1.2

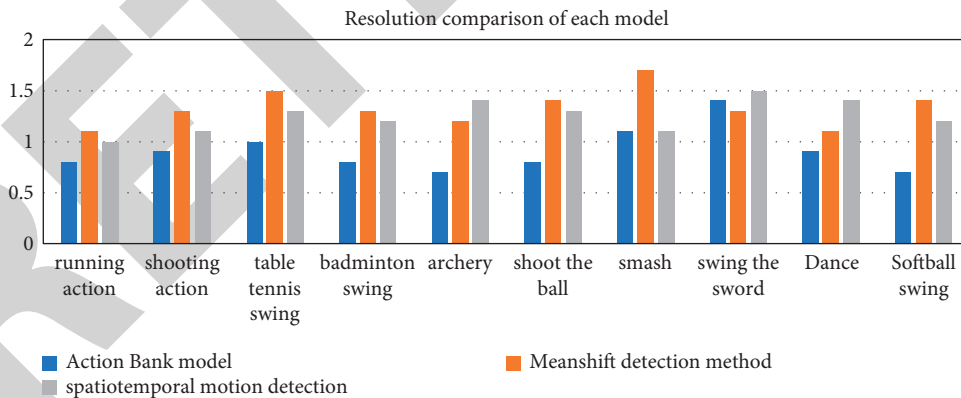


FIGURE 8: Comparison of time consumption for each model test.

all indicators. Therefore, it is trustworthy to use the action bank model as the detection algorithm.

4.3. *Quality Evaluation and Informatization Analysis.* Through the above data of error correction rate, number of errors, effective error correction, satisfaction, and other data, we can draw the following data as shown in Table 10 and Figure 10.

According to the above data, it can be seen that the satisfaction of various sports activities before the education reform is not as good as the satisfaction of various sports activities after the education reform. Based on this, we can draw the quality evaluation of physical education after the reform. According to the difference in satisfaction before and after the reform, we can draw the quality comparison before and after the reform. From the above data, it can be seen that the quality after the

TABLE 9: Data table of three methods on various indicators.

Performance	Action bank model	Mean shift detection method	Spatiotemporal motion detection
Recall	0.867	0.853	0.872
Accuracy	0.894	0.792	0.736
F1	0.874	0.857	0.785

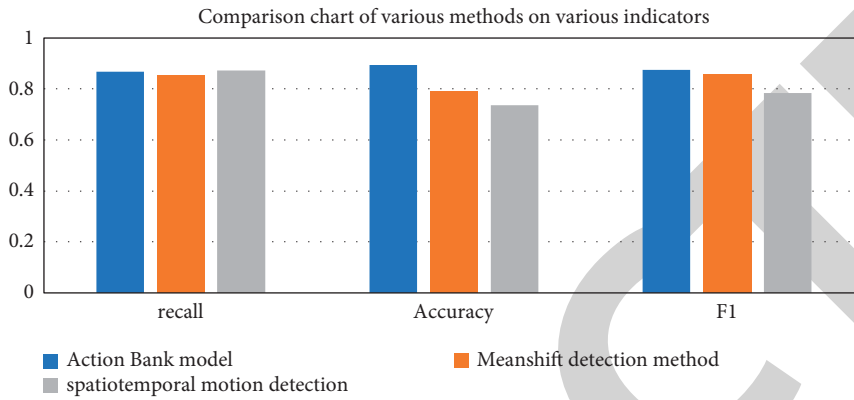


FIGURE 9: Comparison of various methods on various indicators.

TABLE 10: Satisfaction data table before and after physical education reform.

Teaching action	Satisfaction before education reform (%)	Satisfaction after education reform (%)
Running action	69.2	70.56
Shooting action	79.3	82.01
Table tennis swing	85.2	87.21
Badminton swing	85.6	86.24
Archery	79.3	74.92
Shoot the ball	84.3	78.43
Smash	75.6	84.52
Swing the sword	73.9	89.32
Dance	87.5	79.15
Softball swing	89.6	76.34

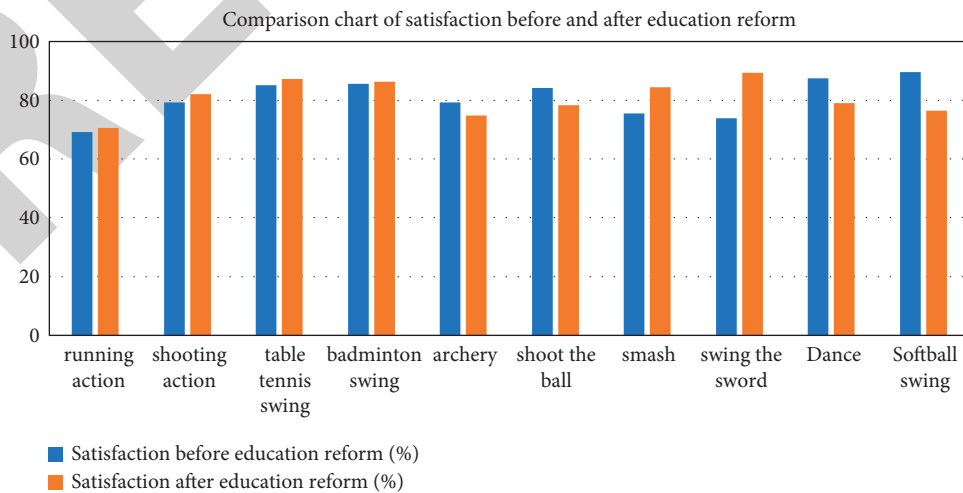


FIGURE 10: Comparison of satisfaction before and after the teaching reform.

education reform is generally higher than that before the education reform.

Information analysis can use the above action bank model, mean shift detection method, and spatiotemporal action detection method to perform information analysis on the data such as the resolution and detection duration of the pictures taken in physical education, which can ensure that the data we get are based on the correctness. The data and thus the resulting quality assessment can be convincing.

5. Conclusion

With the rapid development of artificial intelligence technology, there are many examples of artificial intelligence technology being applied to the education industry. It has gradually evolved into a major trend. After years of technical improvement and optimization, a large number of valuable teaching data in the artificial intelligence technology database have provided the theoretical basis and practical cases for data mining technology. The algorithm deduced based on artificial intelligence technology is introduced into the quality evaluation and informatization analysis of physical education teaching reform in this study. Compared with the traditional subjective assessment analysis and small sample sampling survey evaluation, its main advantage is reflected in data mining. Technical algorithms combine qualitative subjective events into the scope of mathematics to carry out rigorous quantitative analysis. In our simulation experiments, we mainly study the reasonable application of artificial intelligence technology algorithms to physical education teaching reform quality evaluation and information analysis test performance. If and only when we transform qualitative problems into quantitative problems under artificial intelligence technology, when there is a quantification of useless parameters for evaluation, we cleverly use the C4.5 algorithm to eliminate the useless parameters and ensure the parameters involved in evaluation and analysis. All of them have a strong correlation with the quality of physical education teaching reform, so that the evaluation results are more scientific and rigorous, close to the real situation. Then, through experimental simulation, the resolution, detection time consumption, and number of detection errors before and after the optimization of the model are compared experimentally, and experimental data are obtained, and it is concluded that the performance of the optimized model is significantly improved than that of the primary model. Meanshift detection method and spatiotemporal action detection method are compared in terms of resolution, detection time consumption, and detection error times of action library model; it is found that action bank model is superior in resolution and detection time consumption. Compared with the other two algorithms, it is weaker than the spatiotemporal detection method in terms of detecting errors. Based on the research on experimental data, this algorithm still meets the requirements of the detection performance for the experiment and also meets the requirements of the current environment. Trend development: to sum up, artificial intelligence technology is enough to provide substantial help to the evaluation and analysis

personnel in the quality evaluation of physical education teaching reform, and it also meets the requirements of the evaluation system for quantitative algorithms.

Data Availability

The experimental data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding this work.

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