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Retraction

Retracted: Efficiency Analysis and Utilization of College Sports Equipment Based on Intelligent Computing

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets 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 own 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.

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[1] C. Li, J. Wang, and Q. Yu, "Efficiency Analysis and Utilization of College Sports Equipment Based on Intelligent Computing," *Journal of Sensors*, vol. 2022, Article ID 7497555, 10 pages, 2022.

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Research Article

Efficiency Analysis and Utilization of College Sports Equipment Based on Intelligent Computing

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Under the background of the new curriculum standard, promote the all-round development of moral education, intellectual education, physical education, aesthetic education, and labor education. Children's health exercise also makes physical education one of the subjects that schools and parents attach importance to. Different from the teaching methods of other disciplines, physical education is carried out outdoors and has high requirements for equipment and facilities, which is not only related to the effective implementation of physical education but also related to students' enthusiasm for outdoor physical exercise. It is actually a powerful theoretical support for physical education. With the frequent loss, damage, and lack of sports equipment in colleges and universities, people do not think: how can we manage the equipment efficiently and orderly and keep its integrity? It can be seen that the effective use of school sports equipment and facilities in the new period should grasp the research core, clarify the research direction and goal, and provide strong support for the continuous innovation of school sports education. The management of sports equipment is an important part of the daily work of schools. All schools have formulated management systems and use norms, but from the long-term practice, it is obvious that the implementation of the system and use norms is not ideal, and various management systems and norms become a mere formality. Even physical education teachers do not strictly follow this requirement, resulting in the management process of sports equipment and facilities in trouble. It can be seen that the management of sports equipment is not strictly controlled, and it is difficult to implement it, which limits the application value and effectiveness of sports equipment, and students are prone to safety problems in class. Therefore, the school should employ full-time personnel to manage sports equipment, which also improves the attention of the personnel to equipment management. For equipment damage, many students use equipment wrongly and damage equipment, so reasonable use of equipment and facilities can prolong the service life of equipment and facilities. However, physical education teachers usually do not demonstrate the use of equipment scientifically in the teaching process and lack guidance to students, which leads to many students not paying enough attention to the use of equipment, such as kicking basketball, sitting on a stool with basketball, and inflating football; these are the reasons that lead to the damage of equipment. We can through the intelligent optimization of the management mode of sports equipment for a qualified management delay the service life of equipment.

1. Introduction

With the continuous development and progress of society, people's value of sports has become increasingly prominent, and more and more people realize the importance of strengthening their bodies and ensuring their health. Therefore, many people will choose to participate in various sports activities to enhance their physical fitness, and many schools also buy many sports equipment that make students full of interest. However, it is against this background that various sports equipment in schools frequently have problems. Literature [1] reveals the management status of sports equipment room in colleges and universities, and literature [2] puts forward the application of intelligent management of sports equipment. Literature [3] and literature [4] talk about the design and implementation of sports equipment sharing management and the exploration of management system. Literature [5] discusses why sports equipment frequently

appears to have problems in recent years; reference [6] analyzes the countermeasures of classified management of sports equipment in colleges and universities and analyzes the tentative plan of diverted management of equipment in literature [7]. Literature [8] optimizes the purchase and management of sports equipment and concretely carries out the reform of "six-oriented" sports equipment management in [9]. Reference [10] talks about fiber-reinforced composites that can increase the performance of equipment, and reference [11] optimizes the material to prolong the service life of equipment. Analysis and research of new materials are discussed [12] in the manufacturing process of sports equipment. Reference [13] expounds the application of computer technology in gymnasium equipment management [14], intelligent optimization algorithm [15], and intelligent optimization algorithm of road strength planning. Literature [16] discusses the design and implementation of college sports equipment sharing management system; literature [17] uses the five-routine method to thoroughly study the management of school sports equipment. Reference [18] presents the preparation of waterborne polyurethane and its application in sports equipment. This material [19] is optimized to prolong the service life of equipment. Literature [20] talks about the interest of primary school sports equipment to stimulate children, literature [21] talks about the application value of high-performance composite materials to sports competition, and literature [22] teaches them how to scientifically manage equipment and facilities. Literature [23] talks about the influence of the choice of sports equipment on physical education. The influence of intelligent optimization method on various applications is adopted in references [24, 25].

2. The Management Status and Solutions of Sports Equipment

2.1. Current Situation of School Sports Equipment Management

2.1.1. Wear Degree of Sports Equipment. At present, there is no strict implementation plan for the management of school sports equipment in China. According to the requirements of physical education teachers, after the study of physical education class content, the remaining time will be spent by the class sports committee members entering the sports equipment room to borrow the sports equipment needed by physical education class, and the management personnel responsible for managing the equipment only require students to fill in simple borrowing information, such as class and name, that is, to distribute sports equipment to them. When the equipment is returned after the physical education class, the administrator only counts the number and category of sports equipment and puts it into the sports storage room, but ignores the wear and tear of sports equipment. After a long time, students will not care for sports equipment.

2.1.2. Sports Equipment Management Is Not Strict. Although there is a corresponding management system for the management of sports equipment, the managers do not strictly and seriously manage the equipment. If almost all sports equipment in the management system "requires the consent of the school administration to be outsourced and must be registered, such as the necessity of claiming compensation for damage or loss," although many schools only provide an arbitrary number of equipment in terms of quantity, type, etc., which is not clearly listed when actually outsourcing. If damage or loss occurs, it is often due to the situation, so it cannot solve the problem.

2.1.3. Lack of Funds for Sports Equipment Procurement. Due to the limited funds of schools, reasonable equipment procurement is also an important link in the management of sports equipment. When purchasing, the lack of equipment is mainly purchased by managers, without checking whether the equipment is qualified in performance and whether the price is reasonable. Under the influence of various factors, management loopholes often appear, especially the accounting of procurement funds. If there is a mistake in purchasing funds, it will greatly consume manpower and material resources and seriously affect the effective utilization rate of sports equipment. This kind of management flaws proves that the previous management methods have great defects, and there is a lack of strong communication between various departments.

2.1.4. Improper Use in Teaching. The correct use of sports equipment can prolong the service life of the equipment, while some physical education teachers allow students to use the equipment in class without considering its correct use, which may cause serious damage. For example, some students sit on basketball as a stool, scrape badminton rackets on the ground, and damage bows and arrows with improper techniques. These improper use methods undoubtedly greatly shorten the life of sports equipment. The survey found that more than 30% of sports equipment in many schools were damaged due to improper use.

2.2. Solutions. In order to improve the management efficiency of school sports equipment, we must build an intelligent sports equipment management system, which is mainly divided into two aspects: on the one hand, it is a student management system, which is mainly aimed at students; on the other hand, it is an equipment administrator system, which is mainly aimed at the staff of sports equipment management. Students can clearly see the real-time information of sports equipment by creating personal accounts and inputting basic information such as name, class, and student number in the system, determine the return period of sports equipment, and avoid the adverse effects of delayed return on the work of staff. Staff can register the actual use of sports equipment by using the intelligent management system, such as the borrowing and returning information of equipment and wear and tear. By exchanging information between the intelligent management system and the internal management system of the school, the school administrators can know the damage degree of the equipment with the help of the system, so as to make the corresponding procurement plan in time. Data sharing provides a new way of thinking for the management of sports equipment in colleges and universities. Through the sharing of sports equipment, the role of sports equipment can be brought into

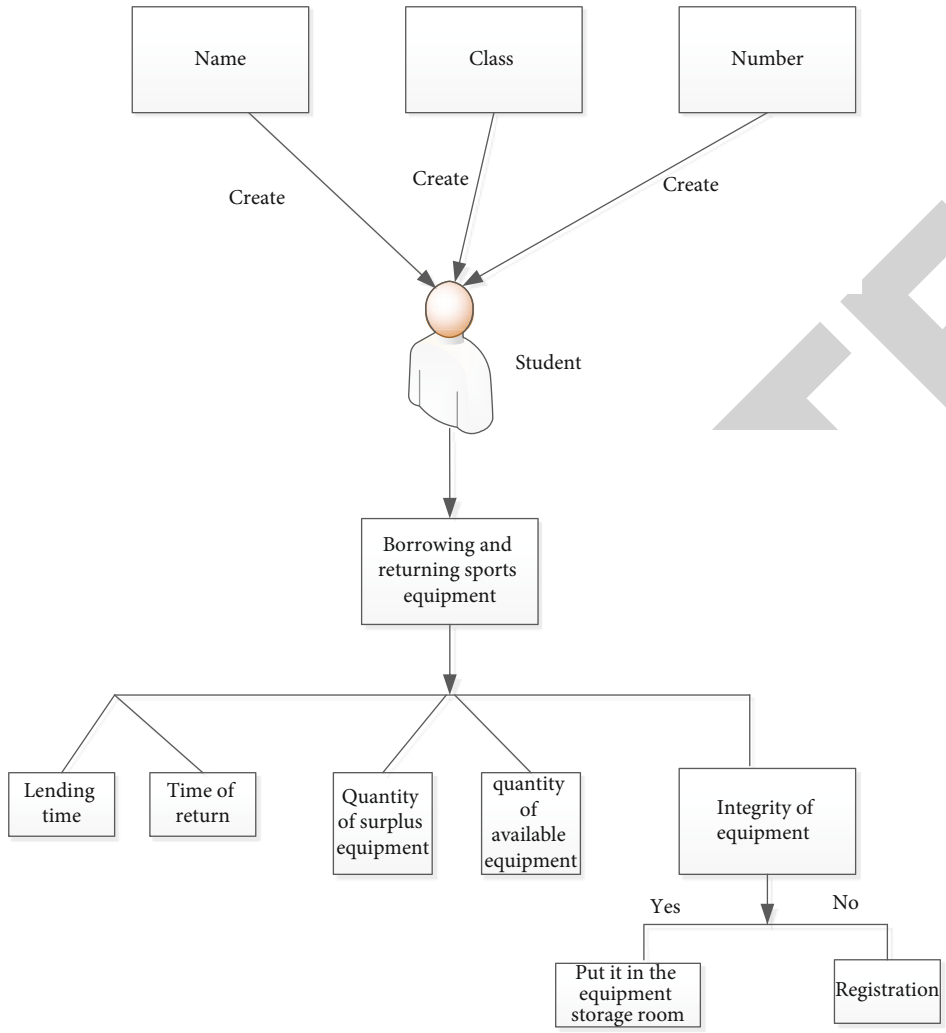

Figure 1: Student management system.

full play. The student management system is shown in Figure 1, and the sports equipment sharing system is shown in Figure 2.

3. Optimize Management Efficiency

3.1. Material Planning Management Optimization Measures. From the process of ordering sports equipment, the main factors that can improve the equipment cost are economic order quantity, purchase quantity, first order quantity, supplementary order point, and safety inventory. Therefore, this paper will consider the above factors to optimize the planning management of sports equipment.

$$TC = \frac{CD}{Q} + PH\frac{Q}{2}, \tag{1}$$

where D is the planned annual demand, Q is the order quantity, C is the cost, and P is the order unit price.

Take the partial derivative equal to 0:

$$\frac{\partial TC}{\partial Q} = \frac{-DC}{Q^2} + \frac{PH}{2} = 0. \tag{2}$$

Seek economic order quantity:

$$Q^* = \sqrt{\frac{2D\,C}{PH}}. \tag{3}$$

Because students will use the same equipment at the same time in class, it brings the problem of equipment inventory demand. According to the square root rule, the comprehensive standard deviation of total equipment demand is equal to the square root of the sum of variances of subsets of demand in each class:

$$\partial = \sqrt{\left(\partial_1^2 + \partial_2^2 + \partial_3^2 + \cdots + \partial_n^2\right)}. \tag{4}$$

Standard deviation of average equipment ordering cycle:

$$\partial = \sqrt{\mathrm{LT}}. \tag{5}$$

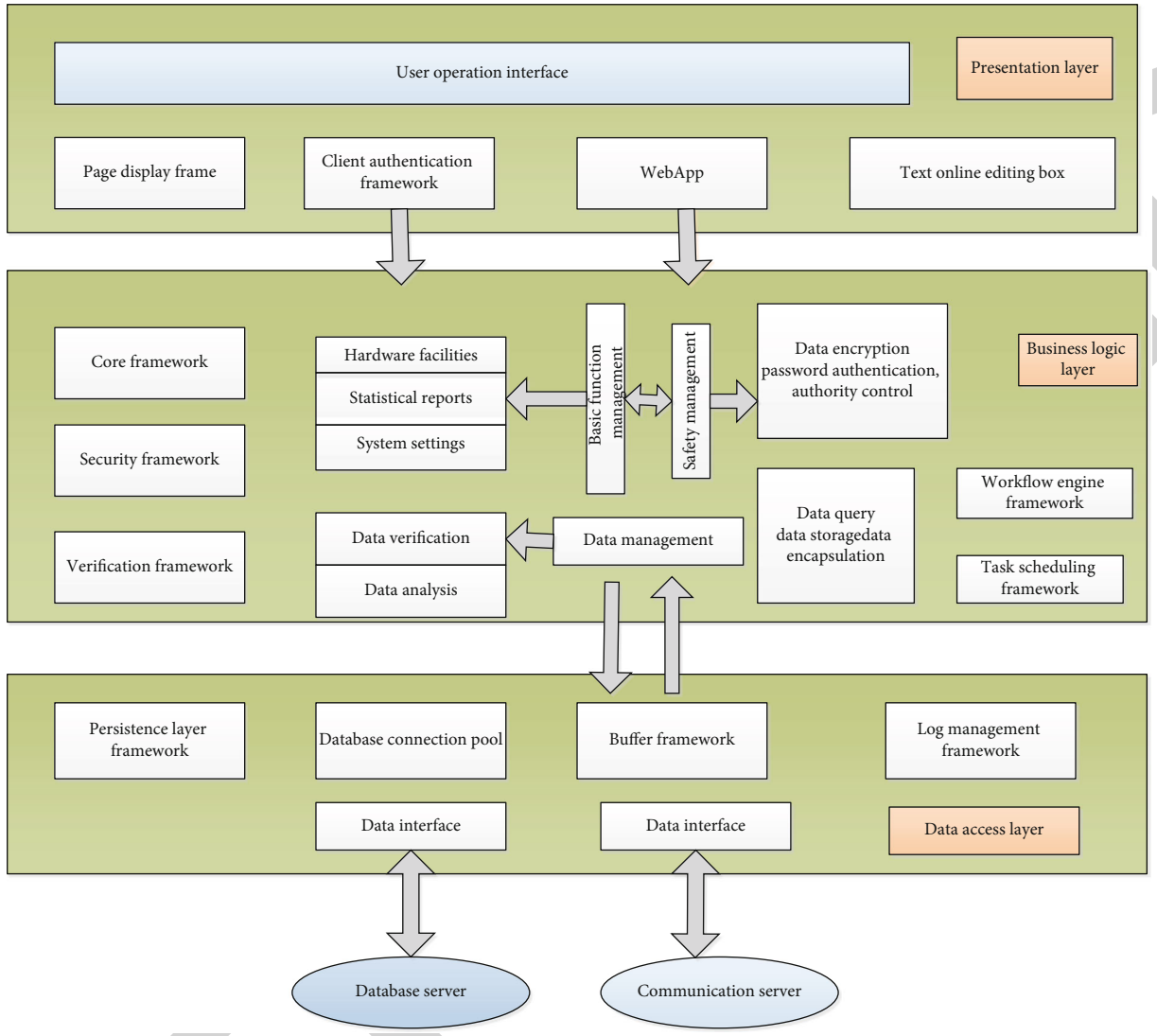

Figure 2: Data sharing system diagram of sports equipment data.

Table 1: Data sheet of sports equipment supply.

Category	Ball games	Shooting	Running	Running
Quotation	1200	23000	1000	1100
Freight	50	80	20	20
Warranty period	1 year	1 year	1 year	1 year
Qualified rate	98.6%	98.9%	99.2%	99.3%
Enterprise credit	Excellent	Excellent	Excellent	Excellent

Table 2: Table of retained individual volume and iteration times.

Parent	20%	20%	30%	30%	40%
Child	12%	15%	12%	10%	12%
Optimal iteration times	45	65	30	86	45

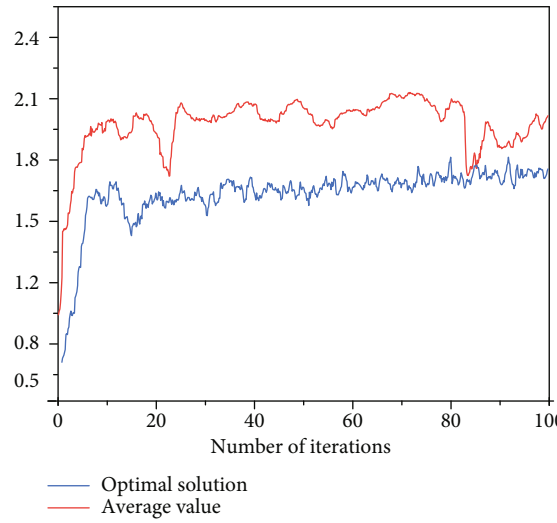

Figure 3: Simulation result diagram.

Table 3: Classification and comparison table.

Method factors	Importance classification	ABC classification		
	Importance to the normal use of equipment	Price and quantity of equipment		
Grades	Important factors of equipment	Category	Quantity	Price
	General: small inventory	A	10%	70%
	More important: proper inventory	B	20%	20%
	Very important: large inventory	C	70%	10%
Advantages	Equipment is supportable	Simple distinction, heavy management and small workload		
Disadvantages	The workload of statistical analysis is heavy	Great limitation		

Table 4: Elements of optimized classification model.

Thoughts	Multiple classification control methods are optimized			
Objects	Use material support		Price cost	
	Normal	Equipment quality	Equipment price	Equipment wear degree
Problems to be solved	The classification workload is heavy and the equipment is not guaranteed			
Expected goals	Whether the equipment is used normally and whether the inventory of equipment is safe			
Implementation methods	Importance classification combined with ABC classification			
Theoretical support	Relationship between price cost and material support rate			

Average fixed equipment cycle after correction:

$$\mathrm{LT} = \mathrm{LT} + \sqrt{\mathrm{LT}}. \tag{6}$$

Supplementary order demand:

$$\lambda = \mathrm{FS} \times \mathrm{FH} \times QA \times \mathrm{LT} \times \frac{\mathrm{UUR}}{100}. \tag{7}$$

FS is the quantity of equipment, FH is the average daily utilization rate, LT is the average order cycle, and URR is the failure replacement rate.

Standard deviation of prefetch equipment support ratio to average draft 1.65:

$$\text{Then the safety stock} = 1.65 \times \sqrt{\lambda}. \tag{8}$$

Safety stock model:

$$S = p\sqrt{\sigma_q^2(1) + \sigma_1^2(q)}. \tag{9}$$

Safety inventory directly affects the guarantee rate and availability rate of sports equipment. The safety inventory model is established by analyzing the inventory data, ordering cycle, demand, and guarantee rate of equipment.

3.2. Basic Algorithms

3.2.1. Particle Swarm Optimization Algorithm for Sports Equipment. Suppose n particles are initialized and each particle contains k scatter points, then for the i-th particle of generation t, formula (10) denotes its position vector p_i^t, and formula (11) denotes its velocity vector v_i^t.

$$p_i^t = \left[(p(1,x), p(1,y), p(1,z)), \cdots, (p(k,x), p(k,y), p(k,z))\right]_{(t,i)}^T, \tag{10}$$

$$v_i^t = \left[(v(1,x), v(1,y), v(1,z)), \cdots, (v(k,x), v(k,y), v(k,z))\right]_{(t,i)}^T. \tag{11}$$

Particles will generate memories, and then, choose the best position in the process of each iteration I and share the best position.

The particle position after the next iteration is determined according to the velocity update formula shown in formula (12) and the position update formula shown in formula (13).

$$v_i^{t+1} = \omega V_i^t + c_1 r_1 \left(p_i^{\text{best}} - p_i^t\right) + c_2 r_2 \left(g_i^{\text{best}} - p_i^t\right), \tag{12}$$

$$p_i^{t+1} = p_i^t + v_i^{t+1}. \tag{13}$$

After each iteration, the individual optimal position and the global optimal position are updated, and the updating rules are

$$p_{t+1}^{\text{best}} = \begin{cases} p_t^{\text{best}}; f\left(p_{t+1}^{\text{best}} \geq f\left(p_t^{\text{best}}\right)\right), \\ p_{t+1}^{\text{best}}; f\left(p_{t+1}^{\text{best}}\right) < f\left(p_t^{\text{best}}\right), \end{cases} \tag{14}$$

$$g_{t+1}^{\text{best}} = \begin{cases} g_t^{\text{best}}; f\left(g_{t+1}^{\text{best}} \geq f\left(g_t^{\text{best}}\right)\right), \\ g_{t+1}^{\text{best}}; f\left(g_{t+1}^{\text{best}}\right) < f\left(g_t^{\text{best}}\right). \end{cases} \tag{15}$$

3.2.2. Genetic Optimization Algorithm for Sports Equipment. For the t-th iteration, if the genome of the i-th individual contains k genotypes, its coding method is as shown in

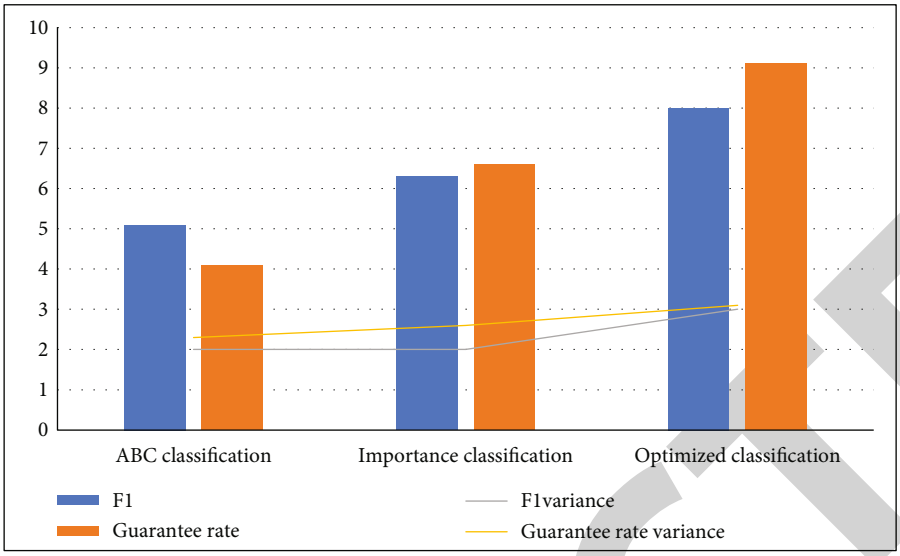

Figure 4: Comparison diagram of classification.

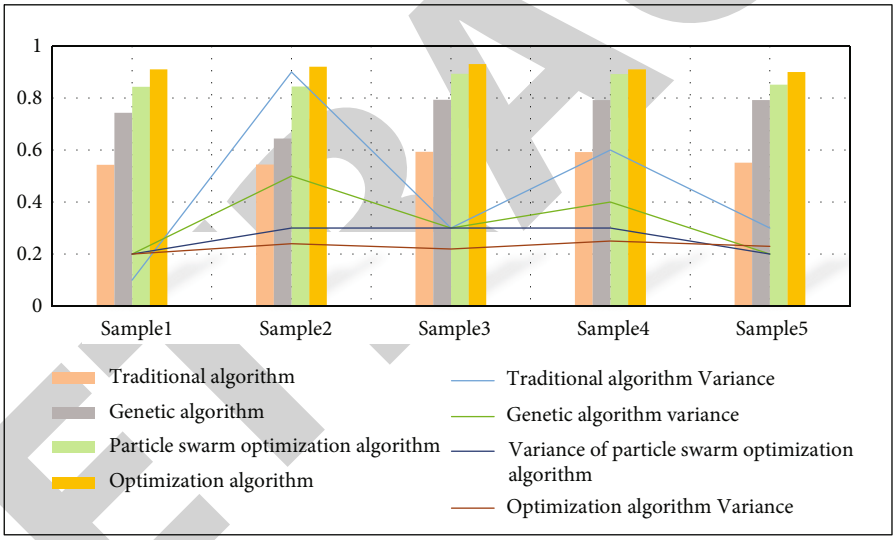

Figure 5: Accuracy comparison chart.

$$S_i^t = \left\{ [(p(1,x), p(1,y), p(1,z)), \cdots, (p(k,x), p(k,y), p(k,z))]_{(t,i)}^T \right\}_{(t,i)}. \tag{16}$$

In this paper, the roulette algorithm is used to select equipment individuals, and the survival probability T_i of the i-th individual in this round of survival competition is shown in formula (16).

3.2.3. Improved Particle Algorithm Combined with Genetic Algorithm. The particles whose fitness reaches the optimal value blend with each other and accelerate the local convergence speed; mutate the particles with poor fitness and improve the global search ability, such as

$$P_c = \frac{f_{\max} - f_i}{f_{\max} - f_{\min}}, \tag{17}$$

$$P_m = \frac{f_i - f_{\min}}{f_{\max} - f_{\min\, i}}. \tag{18}$$

Mutation operation:

$$P_m = k_p \times P_m. \tag{19}$$

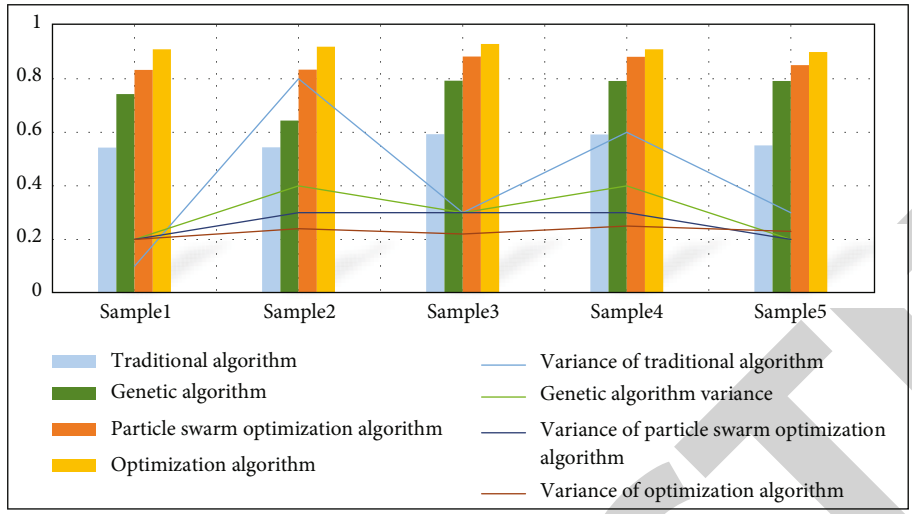

Figure 6: Comparison chart of recall rate.

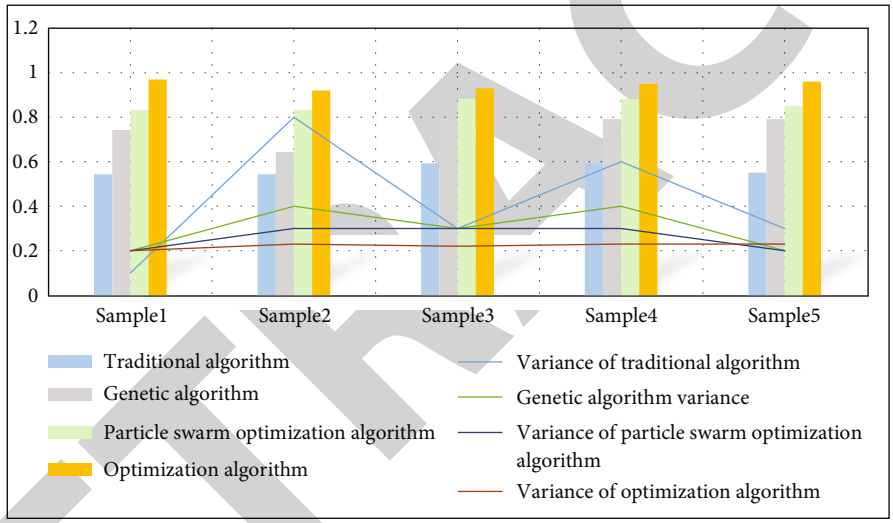

Figure 7: Comparison of $F1$ values.

k_p is a random parameter in the range of $(0, 1)$, which is used to improve the uncertainty of mutation.

Set dynamic inertia weights:

$$\omega_f = \omega_s\left(\frac{f_i - \bar{f}}{f_{\max} - f_{\min}} + 1\right),$$
$$\omega = \begin{cases} \omega_{\max}, & \\ \omega_f, & \omega_{\max} \geq \begin{cases} \omega_f > \omega_{\max}, \\ \omega_f \geq \omega_{\min}, \\ \omega_f < \omega_{\min}, \end{cases} \\ \omega_{\min}, & \end{cases} \tag{20}$$

where $\bar{f}$ the average fitness is the value of particles and ω_s is the standard inertia weight value.

The expression of step factor r relative to fitness value obtained by undetermined coefficient method is shown in the formula:

$$r = \frac{f_i - \bar{f}}{f_{\max} - \bar{f}} + 1\left(f_i > \bar{f}\right),$$
$$r = \frac{f_i - f_{\min}}{2\left(\bar{f} - f_{\min}\right)} + \frac{1}{2}\left(f_i < \bar{f}\right). \tag{21}$$

The improved particle velocity update formula v_i^{t+1} is shown in formula (22), and the position update formula is shown in formula (23):

$$v_i^{t+1} = r \bullet v_i^{t+1}, \tag{22}$$

$$p_i^{t+1} = p_i^t + v_i^{t+1}. \tag{23}$$

4. Experiments and Results

4.1. Experimental Testing

4.1.1. Contents of the Experiment. After processing the original data of the school in this experiment, there are five

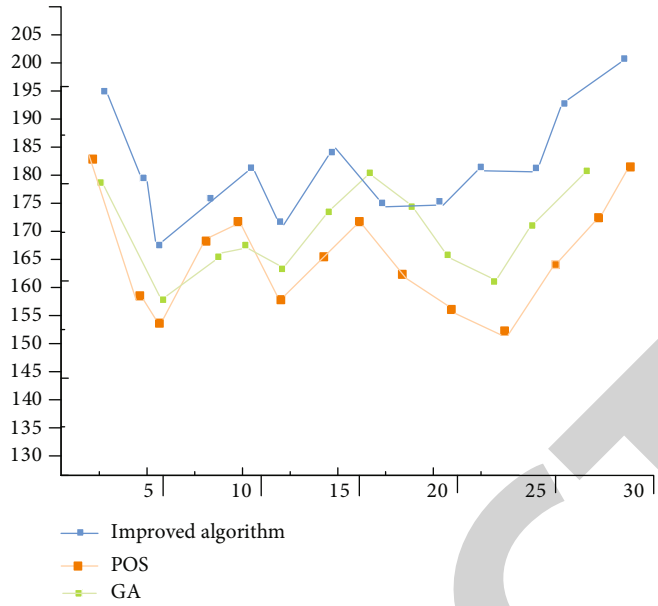

Figure 8: Algorithm comparison experiment.

indexes of purchased sports equipment, which are quotation, freight, warranty period, qualified rate, and enterprise credit supply data of sports equipment, as shown in Table 1.

4.1.2. Data Cleaning. Before calculation, there may be missing values and wrong data in the data. If the data is directly analyzed in this way, it will cause errors in the operation results. Therefore, before operation, it is necessary to clean the data set to improve the analysis quality of operation.

(1) Error data processing: this kind of error occurs because the business in the system is not perfect, and it is directly written into the background database without judgment after receiving the input, such as inputting numerical data into full-angle digital characters. This kind of data can be found and modified by writing SQL statements

(2) Missing value processing: some of the data values of enterprises are 0. In view of this situation, interpolating the missing values with the most possible values will cause less information loss than deleting all incomplete samples. Therefore, we must first find the missing value and fill it with the average value of this kind of data

4.2. Simulation Experiment. In this experiment, the population size is 1000, the maximum genetic algebra is 100 generations, and the variation probability is 0.01.

(1) Blending experiment: parent-child fusion needs to select the appropriate number of parent-child excellent individuals and child-child excellent individuals. From the experimental results in Table 2, it can be seen that when 30% of the optimal parent-child individuals and 12% of the optimal child-child individuals are preserved, the faster the genetic algorithm can get the optimal solution

(2) Example simulation, as shown in Figure 3

4.3. Comparison of Taxonomy

4.3.1. Traditional Taxonomy. To optimize the inventory control of sports equipment, the administrator classifies and optimizes the equipment with importance classification and ABC classification. First, the valuables of equipment are regarded as the main classification criteria, then classified according to price, and finally classified according to wear degree.

Comparative analysis of importance classification and ABC classification is shown in Table 3.

From Table 3, we know that the two classifications have their own advantages and disadvantages. If they are comprehensively improved, they will achieve efficient guiding significance in the management of sports equipment.

4.3.2. Improved Taxonomy. Combining the two classifications in Table 4 will produce a more optimized classification model, as shown in Table 4.

Comparative analysis of the $F1$ value and guarantee rate of improved classification, importance classification, and ABC classification is shown in Figure 4.

4.4. Model Comparison. The traditional management mode, genetic algorithm, particle swarm optimization algorithm, and the combination of the two optimization algorithm models are compared in accuracy, recall, and $F1$ equivalence, as shown in Figures 5–7.

Compare the accuracy of five batches of sports equipment according to genetic algorithm model, particle swarm

optimization algorithm, optimization algorithm, and traditional management model, as shown in Figure 5.

Compare the recall rates of five batches of sports equipment according to genetic algorithm model, particle swarm optimization algorithm, optimization algorithm, and traditional management model, as shown in Figure 6.

Five batches of sports equipment are compared in $F1$ according to genetic algorithm model, particle swarm optimization algorithm, optimization algorithm, and traditional management model, as shown in Figure 7.

4.5. Comparative Experiment of Optimization Algorithm. The genetic algorithm and particle algorithm are improved to achieve the optimal fitness, as shown in Figure 8.

By contrast experiments, the improved algorithm can achieve the best fitness with the least number of iterations and consumes the least time.

To sum up, from the experiment and experimental results, we can see that the improved genetic algorithm proposed in this paper can choose a better sports equipment supplier for schools to a certain extent, so as to purchase better equipment, greatly increase the service life of equipment, and then help schools save costs.

5. Conclusion

Under the background of the new era, physical education is no longer an unimportant subject before, but the focus of parents on whether their children take healthy exercise in school. In the physical education classroom, the management of sports equipment is particularly important. This paper mainly studies and analyzes whether the equipment is used normally, whether the equipment is safe, whether the inventory of the school equipment room is safe, and how to purchase the equipment reasonably:

(1) According to the current situation of sports equipment, put forward solutions, and use intelligent system to register and share data on the borrowing and returning of sports equipment

(2) Combining particle swarm optimization and genetic algorithm to calculate the guarantee rate of equipment and get the optimal algorithm to ensure the normal and safe use of equipment and whether there is a safe inventory for students to use

(3) According to the simulation experiment, it is known that the optimal fitness gets the least iteration times, which helps schools to purchase sports equipment with better quality and higher cost performance to a certain extent

(4) Optimize the classification algorithm model, synthesize the traditional classification model, and classify and store the equipment, which can greatly increase the service time of the equipment to a certain extent

(5) By comparing genetic algorithm, particle swarm optimization algorithm, optimization algorithm, and traditional algorithm model, it is obvious that the indexes of optimization algorithm are superior to the other three 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 declared that they have no conflicts of interest regarding this work.

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