Retraction

Retracted: Athlete's Physical Fitness Prediction Model Algorithm and Index Optimization Analysis under the Environment of AI

Mathematical Problems in Engineering

This article has been retracted by Hindawi following an investigation undertaken by the publisher [1].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.

References

[1] L. Zhao, Y. Zhao, and X. Wang, "Athlete's Physical Fitness Prediction Model Algorithm and Index Optimization Analysis under the Environment of AI," *Mathematical Problems in Engineering*, vol. 2021, Article ID 6680629, 10 pages, 2021.

Research Article

Athlete's Physical Fitness Prediction Model Algorithm and Index Optimization Analysis under the Environment of AI

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With the rapid progress of network technology and computers, the Internet of Things has slowly entered people's lives and work. The Internet of Things can bring a lot of convenience to people's lives and work. People have been living in a networked era, and communications, computers, and network technologies are changing the entire human race and society. The extensive application of databases and computer networks, coupled with the use of advanced automatic data collection tools, has dramatically increased the amount of data that people have. There are many important information hidden behind the surge of data, and people hope to conduct higher-level analysis on it in order to make better use of these data. This article mainly introduces the prediction model algorithm and index optimization analysis of athletes' physical fitness under the Internet of things environment. This paper proposes an algorithm and index optimization method for the athletes' physical fitness prediction model in the Internet of Things environment, which is used to conduct athletes' fitness prediction model algorithm and index optimization experiments in the Internet of Things environment, and designs steps for athletes' physical fitness prediction in the Internet of Things environment to lay a solid foundation for related applications of athlete index optimization. The experimental results in this article show that the prediction accuracy rate of the professional group with the athlete's physical fitness prediction model and index optimization under the Internet of Things environment is higher than that of the control group, with a difference $p < 0.001$.

1. Introduction

The Internet of Things is an emerging global Internet-based information service architecture. It is a communication protocol based on international standards. It is the development trend of modern networks and the integration of future networks. It is a global dynamic network facility with self-configuration capabilities. People use terminals to seamlessly access the human-computer interaction interface of the Internet of Things, thereby achieving the goal of resource sharing.

As early as 2010, it was proposed that the Internet of Things is based on the sensor network as the underlying infrastructure. According to the Internet of Things protocol family specified by the International Organization for Standardization, each item in the access network is connected to the network for information communication and resource sharing. Realize a highly intelligent network system, and the Internet of Things is an extension and expansion of the existing Internet. The Internet of Things generally uses wireless networks to achieve communication. According to the survey, there are thousands of Internet of Things devices around each person. The Internet of Things may contain five to one trillion items. The Internet of Things uses electronic tags under radio frequency identification technology to number real objects one by one. From a book to a car, as long as they are connected to the Internet, their specific location and related information can be found on the Internet of Things.

Gerpott's research attempted to provide a basis for evaluating the effectiveness of IoT-enhanced forecasting in the context of existing forecasting models. Currently, many

experts consider merging IoT components to achieve forecasting advantages, thereby revising or expanding its scope and algorithm portfolio. However, unsystematic automatic connection of sensors and actuators in existing models does not necessarily lead to predictive success. Gerpott's approach is to determine the different roles that IoT components can play in predictive models. It can be achieved by combining models and algorithms with IoT components to clarify the development goals of IoT predictive models and report case examples. These examples help to highlight how to achieve the development goals of predictive models through IoT components fulfilling specific roles. Gerpott believes that when IoT components are integrated into predictive models, there may be three different functions. The functional distinction is essential to understand how IoT corrections can help relevant personnel to achieve predictive model development goals. The starting point and foothold of this research are good and sufficient, but it lacks examples to support [1]. Burg believed that wireless sensors and actuators connected through the Internet of Things are crucial to the design of athletes' fitness prediction models. In this complex heterogeneous system, the transmission link must meet stringent requirements for data throughput, delay, and range, while also complying with strict energy budgets and providing a high level of security. Burg first summarized the principle of wireless communication from the perspective of the Internet of Things and the predicted connection needs of athletes. Based on these principles, the most relevant wireless communication standards will be reviewed before focusing on the key security issues and functions of such systems. In particular, Burg pointed out the gap between the security functions in the communication standards used in the Internet of Things and athlete fitness prediction models and their actual vulnerabilities through examples and emphasized the need for more in-depth research on security issues at all protocol layers, including logical layer security and physical layer security. Although this method provides examples for proof, the examples are not typical enough [2]. Yang introduced some audit programs through investigation and research to ensure the completeness and validity of athletes' physical fitness prediction data and analyzed the program and found some safety flaws. First of all, individual models cannot retain the privacy of shared data in cloud storage; in addition, analysis shows that the data in the predictive model are vulnerable to integrity forgery attacks, and malicious cloud servers can perform the forgery attacks, even if there is no correct data storage. A malicious cloud server can forge seemingly valid prediction data for any prediction instruction. Then, Yang determined that the main reason for insecurity was that the linear combination of randomly sampled data was not properly shielded; finally, Yang proposed an improvement to the audit program while retaining data privacy and perfect index optimization, while bringing the best prediction results and calculation overhead. This research data support is relatively sufficient, but the use cost is high, which is not conducive to popularization [3].

The innovations of this article are as follows: (1) research methods for the athletes' physical fitness prediction model in the Internet of Things environment, including literature retrieval, expert survey, logical analysis, and mathematical statistics, are proposed (2) clustering algorithms for the athletes' fitness prediction model are proposed; and (3) fuzzy support vector regression is proposed.

2. Athlete's Physical Fitness Prediction Model Algorithm and Index Optimization Method in the Internet of Things Environment

2.1. Method of Athlete's Physical Fitness Prediction Model in Internet of Things

2.1.1. Document Retrieval Method. A large number of documents are searched and sorted through related academic websites such as CNKI, master and doctoral dissertation database, Baidu Academic, and Springer. The keywords are Internet of Things, athletes, physical fitness, specific physical fitness, index optimization, prediction models, and so on, and focus on collecting information relevant literature data on physical fitness prediction models provides forward-looking primary material for related research in this article [4].

2.1.2. Expert Investigation Method. On the basis of consulting the relevant literature and summarizing it, using the expert survey method, by issuing questionnaires to relevant experts, the framework of the athlete's specific physical fitness test model is initially constructed [5]. The final result of this article is to collect data from three rounds of expert questionnaires and combine expert opinions to scientifically and reasonably construct an athlete prediction model under the Internet of Things environment [1]. The main selected experts are national coaches and national referees who have been engaged in sports training and practice for a long time and professors who have been doing research in the field of competitive sports [6]. After the questionnaire is distributed to the expert group, the first round of collected questionnaires is counted and analyzed, and then the second round of questionnaires is formulated for distribution, and then the third round of questionnaires is distributed. Finally, the three rounds of questionnaires are sorted and analyzed. Our experience screens out reasonable prediction model algorithms and determines the type of physical fitness test required for fitness prediction [7].

2.1.3. Logic Analysis Method. Through the analysis of sports items, refer to the existing literature and related materials, carry out creative thinking, formulate indicators that meet the specific physical fitness of competitive athletes, and use logical analysis methods such as summary, induction, and synthesis to provide feedback from experts to construct athletes, and analyze, organize, and draw relevant conclusions and suggestions based on the physical fitness prediction model [8].

2.1.4. Mathematical Statistics. Mathematical statistics is divided into factor analysis and structural equation model analysis. Factor analysis is to use a certain amount of partial

factors to reflect most of the information content of the raw materials in order to achieve the basic structure of the factor and simplify the data [9]. Through factor analysis, common factors can be extracted from highly correlated observed variables, and the number of common factors also represents the basic structure of scale [10]. In order to verify the structure of various indicators of the expert survey method, this paper uses the principal component analysis method to make up for the subjective deficiencies of the expert survey method [11]. In scientific research, variables that do not have direct measurement operability are called latent variables. However, latent variables can be reflected indirectly by finding some objective variables [12]. Traditional statistical analysis and statistical results will always be interfered by the measurement errors of independent variables. Although traditional statistical methods can also handle measurement errors, they cannot accurately explain the relationship between variables [13]. Structural equation models can deal with errors and structural relationships between latent variables. This paper uses SPSS22.0 software to perform relevant statistical analysis on different items in the test and the collected data [14].

2.2. Athlete's Physical Fitness Prediction Model Clustering Algorithm.

Predicting physical fitness of athletes is also a kind of data collection and mining. The clustering algorithm divides objects in the database into multiple classes or clusters and finds useful information from them [15]. Data clustering makes the data objects in the same cluster as similar as possible, and the data objects in different clusters are as different as possible. Data clustering has very important applications in many fields, such as pattern recognition, information retrieval, e-commerce, marketing, and document classification [16]. In many applications, the data objects in a cluster can be treated as a whole [17]. Through clustering, it is possible to identify dense and sparse regions, thus discovering global distribution patterns and interesting correlations between data attributes [18]. In the field of data mining, research work has focused on finding appropriate methods for effective and practical cluster analysis of large databases, and the research topic has focused on the scalability of clustering methods [19]. The effectiveness of the method for clustering complex shapes and types of data, high-dimensional clustering analysis techniques, and clustering methods for mixed numerical and categorical data in large databases is focused [20]. The general method of clustering is to first define the distance between objects and then use an appropriate algorithm to cluster according to the calculated distance between objects. It can be roughly divided into division method, hierarchical method, density-based method, and grid-based method. It can be roughly divided into division method, hierarchical method, density-based method, grid-based method, and model-based methods [21, 22]. The most commonly used distance measurement methods include Euclidean distance, Manchester distance, and Mincos distance. The formulas are expressed as follows:

$$d(i,j) = \sqrt{\left|x_{i_1} - x_{j_1}\right|^2 + \left|x_{i_2} - x_{j_2}\right|^2 + \Lambda + \left|x_{i_p} - x_{j_p}\right|^2},$$

$$d(i,j) = \sqrt{\left|x_{i_1} - x_{j_1}\right| + \left|x_{i_2} - x_{j_2}\right| + \Lambda + \left|x_{i_p} - x_{j_p}\right|},$$

$$d(i,j) = \sqrt{\left|x_{i_1} - x_{j_1}\right|^q + \left|x_{i_2} - x_{j_2}\right|^q + \Lambda + \left|x_{i_p} - x_{j_p}\right|^{1/q}}.$$

(1)

If each variable is assigned a weight ω_i according to its importance, then the weighted distance has the following calculation relationship:

$$d(i,j) = \sqrt{\omega_1\left|x_{i_1} - x_{j_1}\right|^2 + \omega_2\left|x_{i_2} - x_{j_2}\right|^2 + \Lambda + \omega_p\left|x_{i_p} - x_{j_p}\right|^2}.$$

(2)

2.3. Fuzzy Support Vector Regression.

Given a training sample $A = \{(x_1, y_1), (x_2, y_2), \ldots, (x_m, y_m)\}, y_i \in \{-1, 1\}$, where x_i is the feature vector of the i-th sample and y_i is the sample label. In the sample space, the classification hyperplane can be expressed by the following formula:

$$W^T x + b = 0.$$

(3)

In this formula, W is the normal vector that determines the direction of the hyperplane and b is the displacement term that determines the distance between the hyperplane and the origin. To determine a classified hyperplane is to determine W and b [23]. In order to correctly classify all samples and have the classification interval, the following relationship needs to be satisfied:

$$y_i \lfloor W^T x_i + b \rfloor \geq 1, \quad i = 1, 2, \ldots, m.$$

(4)

The optimal classification hyperplane is to maximize the sum of this distance, so the problem of finding the optimal hyperplane is transformed into the following:

$$\min_w \frac{1}{2}\|W\|^2,$$

$$\text{s.t. } y_i\left[W^T x_i + b\right] \geq 1, \quad i = 1, 2, \ldots, m.$$

(5)

In order to avoid the influence of abnormal points on the classification hyperplane and also to avoid over-fitting of the model, with the help of the idea of soft interval, slack variables are introduced to complete, and the range of errors is controlled by the regularization constant C [24, 25]. Then, $\min_w (1/2)\|W\|^2$ has the following relationship:

$$\min_w \frac{1}{2}\|W\|^2 + C \sum_{i=1}^{m} \xi_i, \xi > 0.$$

(6)

In the traditional support vector machine, because each sample point has the same impact on the classification hyperplane, the accuracy of the model is greatly reduced when facing noise points [26]. Fuzzy support vector machine combines the idea of membership in fuzzy set with support

vector regression and gives each sample point a membership S_i through the membership function [27]. Due to the different degree of membership, each sample point has a different slack variable, so the problem of noise point interference is solved to a certain extent, and the predictive ability of the model is improved. Lagrange coefficient is introduced. At this time, the following relationship exists:

$$f(x) = \sum_{i=1}^{m} (\alpha_i^*) k(x, x_i) + b. \tag{7}$$

The degree of membership can be expressed as a function of time:

$$S_i = f(t_i). \tag{8}$$

In the research process of this paper, it is hoped that the data closer to the prediction point will play a more important role in the regression prediction process. The membership function can be expressed in the form of a quadratic function. The formula is as follows:

$$S_i = (1 - \phi)\left(\frac{t_i - t_1}{t_1 - t_2}\right) + \phi. \tag{9}$$

For the evaluation of prediction results, two main conditions should be considered: one is that the observation value should fall into the prediction interval as much as possible; the other is that the range of the prediction interval should be as small as possible [28, 29]. According to these two conditions, two evaluation indicators can be defined: coverage (Coverage) and interval width (width). The relationship is expressed as follows:

$$\text{Coverage} = \frac{1}{n} \sum_{i=1}^{n} \text{count}_i,$$

$$\text{count}_i = \begin{cases} 1, & \widehat{x}_i^{\text{low}} < x_i < \widehat{x}_i^{\text{up}} \\ 0, & \widehat{x}_i^{\text{low}} > x_i \text{ or } \widehat{x}_i^{\text{up}} < x_i \end{cases}, \tag{10}$$

$$\text{width} = \frac{1}{n} \sum_{i=1}^{n} \sqrt{\left(\widehat{x}_i^{\text{low}} - x_i\right)^2 + \left(\widehat{x}_i^{\text{up}} - x_i\right)^2}.$$

For the method part of this article, the above methods are used to study the algorithm and index optimization of the athlete's physical fitness prediction model under the Internet of Things environment. The research is carried out according to the Internet of Things, physical fitness prediction, prediction model, index optimization, and so on. The technical process is shown in Figure 1.

3. Athlete's Physical Fitness Prediction Model Algorithm and Index Optimization Experiment in the Internet of Things Environment

3.1. Design the Steps of Athlete's Physical Fitness Prediction in the Internet of Things Environment

3.1.1. Selection of Physical Fitness Evaluation Indicators. The design of the index system must have the function of reflecting the evaluation goal. In a scientific attitude, we

must follow the basic design principles, directional principles, objectivity, feasibility, independence, and comprehensiveness principles in the indicator design process, and the principle of consistency. And, the design of the evaluation index system is carried out in accordance with the following procedures: clarify the evaluation object; determine the evaluation target; propose preliminary indicators; screen the preliminary indicators; assign index weights; prepare evaluation standards; constitute an indicator system; conduct trial evaluations; and modify and improve the system.

3.1.2. Classification of Physical Fitness Test. According to the expert survey method in the previous method, the specific physical fitness test categories for athletes determined after interviews with experts include BMI, fitness percentage, Quetelet index, weight, forearm tight circumference, forearm relaxed circumference, waist circumference, chest circumference, height, hand length, foot length, leg length, arm span, heart rate, vital capacity, maximum oxygen uptake, 30 squats in 30 seconds, step test, 50-meter run, select reaction time, rapid tapping with both hands, rapid footing in sitting posture, grip strength, 1 min sit-ups, standing long jump, vertical jump, push-ups, pull-ups, flexion arm hang, parallel bars flexion and extension, 2000-meter run, 15-second standing ups, cross quadrant jump, cross change running, repeated side steps, and round trip running 20 meters × 4, sitting forward bending, standing forward bending, front and rear splitting, left and right splitting, shoulder turning, standing experiment, horizontal stepping on wood, stepping with closed eyes, and dynamic balance (walking in a straight line) and are organized into tables according to related categories, as shown in Table 1.

3.1.3. Screening of Physical Fitness Evaluation Indicators. The number of evaluation indicators initially proposed is generally large. Because of the fear of missing important factors, the indicators are confusing and cannot reflect the essential characteristics of the evaluation object. Indicators that contain contradictions and causality should be combined and classified, and they should be selected, to retain those indicators that meet the design principles and reflect the essential characteristics of the evaluation. The expert survey method is used to screen indicators. According to the principle of indicator screening, experts can select, delete, and supplement the primary indicators based on reasonable operations. A large number of indicators will also complicate testing and calculations, which is not conducive to programmatic operations. In order to select physical index characteristics that are as independent, feasible, and consistent as athletes and can accurately represent the specific physical signs of athletes, 30 sports experts were surveyed this time. They are engaged in the research of athletes' physical function and training experts, experts in the field of physical fitness and many college physical education teachers and coaches. The feedback results of various experts to sort out the indicators to ensure the rationality of indicator selection are combined. The Likert scoring method is
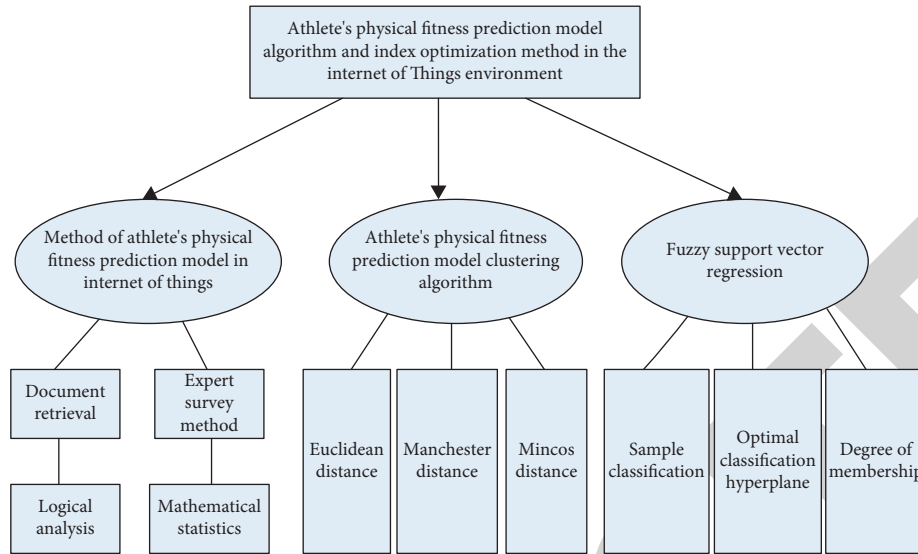
Figure 1: Part of the technical flow chart of this method.

Table 1: Classification of the physical fitness test.

Body shape	Body function	Athleticism
		50 m run
		Select reaction time
		Tap quickly with both hands
		Sitting fast
		Power grip
		1 min sit-ups
BMI		Standing long jump
Physique percentage		Vertical jump push-ups
Quetelet index		Pull-ups
Body weight		Arm hang
Forearm tension		Parallel bar arm extension
Forearm relaxation	Heart rate	2000 m run
Waist circumference	Vital capacity	15 s standing up cross quadrant jump
Bust	Maximal oxygen uptake	Cross run
Height	30 s 30 squats	Repeated side steps
Hand length		Round trip 20 meters × 4
Foot length		Sitting forward bending
Leg length		Standing forward bending
Arm span		Cheating
		Split left and right
		Turn shoulders
		Outstanding experiment
		Horizontal wood
		Keep your eyes closed
		Dynamic balance (walking in a straight line)

used to allow experts to evaluate the importance of indicators.

3.2. Carry Out Related Applications of Athlete Index Optimization under the Internet of Things Environment

3.2.1. System Development Environment. The system development environment is divided into hardware environment and software environment. The hardware environment includes Intranet network environment, Sq1Server2000

database server, Windows NT server; software environment includes Windows 2000, Advanced Server, Delphi 6.0, Sqlserver2000.

3.2.2. Implementation of Index Optimization Algorithm. First, the transaction database is converted into a relational data table, which has three columns of attributes: transaction identifier, item identifier, and cumulative count. The cumulative count is used in the construction of the schema base table later. For any given indicator, there are multiple rows in the

relationship table representing multiple items in the transaction. In addition, a relational table must be designed to store optimized data. It can be seen from the construction process of the second relational table that for any frequent item, all possible frequent patterns included can be obtained along its node chain. In addition, in the physical fitness test phase, for any frequent item, its conditional pattern base is composed of the prefix path set that appears simultaneously with it. Therefore, a list of attributes is required to reflect the set of prefix paths that appear at the same time. Since mining the relevant indicators in the second relational table is a recursive process and the table needs to be reused, it is also necessary to design a list of attributes to distinguish between different recursive processes and use this column to record the pattern before growth. The first stage of the construction of the relational table is completed, and then the frequent pattern growth method is used to mine frequent patterns from the table. For each frequent item, construct its condition pattern base table and condition pattern tree table. Then, the function can generate the conditional pattern tree. When the generated conditional pattern tree contains only a single path, the frequent pattern is generated by combining the index data and each node in the path; otherwise, it is recursively mined; when the table contains the nodes that do not repeat each other and the values in the fields are not equal, the conditional pattern tree at this time contains only a single path, and frequent patterns can be generated; if the nodes in the table are repeated or the values in the fields are equal, recursion is performed of mining.

3.2.3. Preprocessing of Physical Fitness Prediction Data.
The collected analysis data are aimed at the athlete's physical fitness index record. Physical fitness indicators are all numerical, and data association rules mine Boolean data. Therefore, we must preprocess the numerical data and convert it into Boolean data before mining. The central problem of numerical association rule mining technology is the discretization of continuous attributes. After the discretization of continuous attributes is completed, the numerical association rule mining problem can be mapped to the Boolean association rule mining problem. The mapping of numeric attributes and category attributes to Boolean attributes can be completed by the following two methods: one is to map each attribute value to a Boolean attribute for category attributes or numerical attributes with fewer values; for numeric attributes, first divide its attribute value into multiple subintervals and then map each subinterval to a Boolean attribute.

4. Athlete's Physical Fitness Prediction Model Algorithm and Index Optimization Analysis under the Environment of Internet of Things

4.1. Experimental Data Sources.
(1) Basic Situation of the Expert Group

This article conducts interviews and surveys with 30 experts in the sports industry in order to get more professional and accurate opinions and suggestions. The basic situation of the expert group is shown in Table 2 and Figure 2.

It can be seen from the chart that the 30 experts selected in the survey are all engaged in sports coaching. Among them, the number of basketball coaches is the largest, with 8 people, and the number of sprint coaches is the least, with 3 people; and the expert group has basically a long experience with the most years of experience. The longest PE teaching experience is 15 years, and the least is 7 years. Experts are professional and experienced enough, and their relevant opinions are more persuasive, which is conducive to the conduct of research.

(2) The experiment selected 30 sports athletes as the professional group and 30 ordinary college students with no professional sports experience as the control group. Among them, athletes were recruited from sports colleges, with the level of national second-level athletes and above, and often participated in sports events above the city level having four years or more of professional sports experience; the students selected in the control group have not undergone professional training in ball games, track, and field, except for general physical education, and have watched related sports games frequently or occasionally. The specific situation is shown in Table 3. All athletes and students selected in the experiment are in good health, have no mental illness, and have normal vision or corrected vision. They are all right-handed. A certain amount of remuneration will be given after the experiment.

The training years and training frequency of the professional group into graphs for more intuitive analysis are drawn, as shown in Figure 3.

It can be seen from the figure that the training years, weekly training frequency, and daily training frequency of the selected athletes in the professional group are relatively average. In this case, the physical fitness test is relatively representative.

4.2. Analysis of Athlete's Body Circumference Index.
According to the physical fitness test items set in the experimental part, the athlete's body circumference index is collected and sorted out and drawn into a chart, as shown in Table 4 and Figure 4.

The hip/waist circumference reflects the central obesity of the athlete's body. In sports training, the hip/waist index is appropriate, and the small hip circumference indicates that the athlete's hip muscles are lifted and tightened. This is conducive to the athletes in the exercise of jumping and other difficult movements. On the one hand, the appropriate hip-to-waist ratio index is derived from genetics. On the other hand, sports training also plays an important role in improving this index. Athletes have a good level on this index, indicating that athletes' physical condition adapts to sports in training. The bust/waist circumference reflects the upper body shape of the athlete. From the data, it can be seen that the shape of the male and female athletes indicates that the upper body of the athlete is relatively well-proportioned and has better chest muscles. The athlete needs to complete the relevant actions. Athletes have better strength to ensure

TABLE 2: Basic situation of the expert group.

Profession	Working time (unit: year)	Number of people
Long-distance running coach	8.5	4
Sprint coach	12	3
Swimming coach	9	6
Skating coach	7	5
Basketball coach	11	8
Table tennis coach	15	4

FIGURE 2: Basic situation of the expert group.
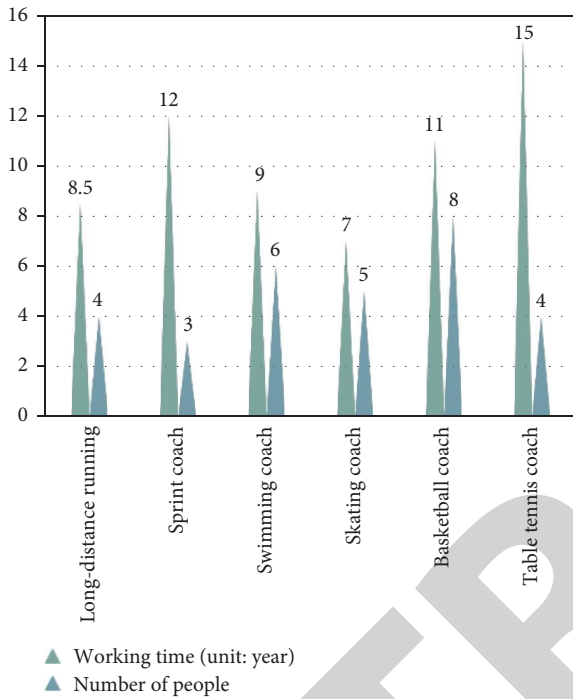
FIGURE 3: Training situation of the professional group.

TABLE 3: Basic situation of subjects.

	Professional group	Control group
Number of people	30	30
Sex	15 men, 15 women	15 men, 15 women
Age	20 ± 3	20 ± 3
Training years	8.12 ± 2.25	—
Training frequency (hours/day)	5.15 ± 2.36	—
Training frequency (day/week)	5 ± 1	—

the completion of the action and can maintain a better body shape when completing the action. The width of the medulla/shoulder width is an index of the ratio of the athlete's torso. In terms of lower limb circumference, male athletes have slightly more indicators of thigh circumference and calf circumference than female athletes, but the test value of male athletes is slightly higher. Male athletes have good performance in lower limb muscle strength, but they still need to strengthen lower limb strength training.
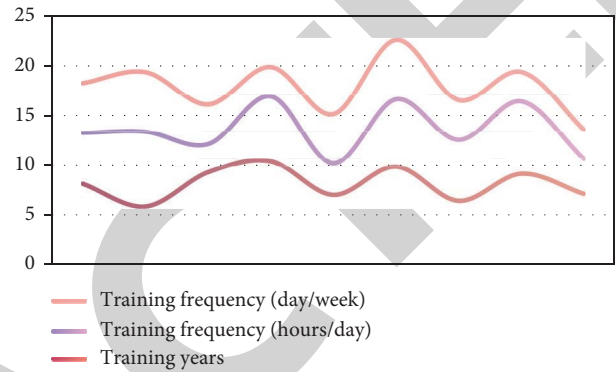
4.3. Experimental Manipulation Effect Analysis. Before the formal analysis, we must first determine whether there is a speed-accuracy trade-off between the subjects before and after the test and compare whether there is a significant difference between the subjects' response before and after the test, and it turns out that there is no significant change in the subjects' response time before and after the test. In addition, it is necessary to confirm the validity of the choice of the expert group and the control group. The independent sample *t*-test was used to compare the difference in the correctness of the action prediction between the two groups in the pretest. It was found that the correct rate of the professional group was significantly higher than that of the control. Group $p < 0.001$, which is consistent with previous studies. This result proves the professional advantages of athletes in predicting specific actions in physical fitness, which means that the grouping of subjects in this experiment is effective. Finally, in order to confirm the randomness of the intervention grouping and whether there are differences in the action responses of different groups of subjects, this article, respectively, carried out an analysis of variance on the correct rates of the pretested responses of the professional group and the control group. The results meet the requirements of the experimental design. The main effect of the intervention conditions and the interaction between the two are not significant (professional group: main effect $p_s \geq 0.270$, interaction $p = 0.857$; control group: $p_s \geq 0.563$, interaction $p = 0.728$), as shown in Table 5 and Figure 5. The above results ensure the validity of analysis and experimental design.

With correctness as the dependent variable, repeated measures analysis of variance was performed on the professional group and the control group. The results showed that the main effects of test time, intervention and test bias,

TABLE 4: Athletes' body circumference index.

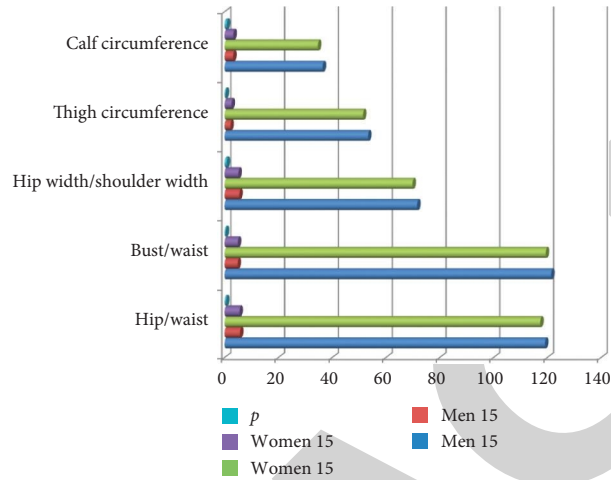|		Hip/waist	Bust/waist	Hip width/shoulder width	Thigh circumference	Calf circumference
Men	15	119.12 ± 5.71	121.42 ± 4.83	71.58 ± 5.46	53.31 ± 2.17	36.45 ± 3.17
Women	15	117.35 ± 5.52	119.42 ± 4.91	69.87 ± 5.13	51.46 ± 2.56	34.67 ± 3.24
p		0.537	0.413	0.765	0.379	0.798

FIGURE 4: Athlete's body circumference index situation.

TABLE 5: Descriptive statistical results of the correct rate of the two groups of subjects.

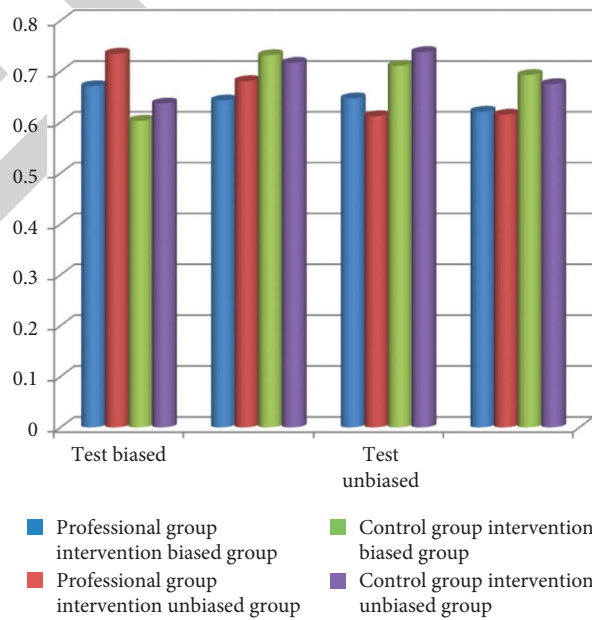|		Test biased		Test unbiased	
Professional group	Intervention biased group	0.671	0.643	0.647	0.621
	Intervention unbiased group	0.735	0.681	0.612	0.615
Control group	Intervention biased group	0.603	0.732	0.711	0.693
	Intervention unbiased group	0.637	0.717	0.738	0.675

FIGURE 5: Descriptive statistics of the correct rate of the two groups of subjects.

TABLE 6: Descriptive statistical results of response time of the two groups of subjects.

		Test biased		Test unbiased	
Professional group	Intervention biased group	436.352	415.873	398.325	371.652
	Intervention unbiased group	441.173	420.365	413.268	379.254
Control group	Intervention biased group	447.254	426.358	442.731	455.214
	Intervention unbiased group	393.651	435.367	452.161	435.287

- Professional group intervention biased group
- Professional group intervention unbiased group
- Control group intervention biased group
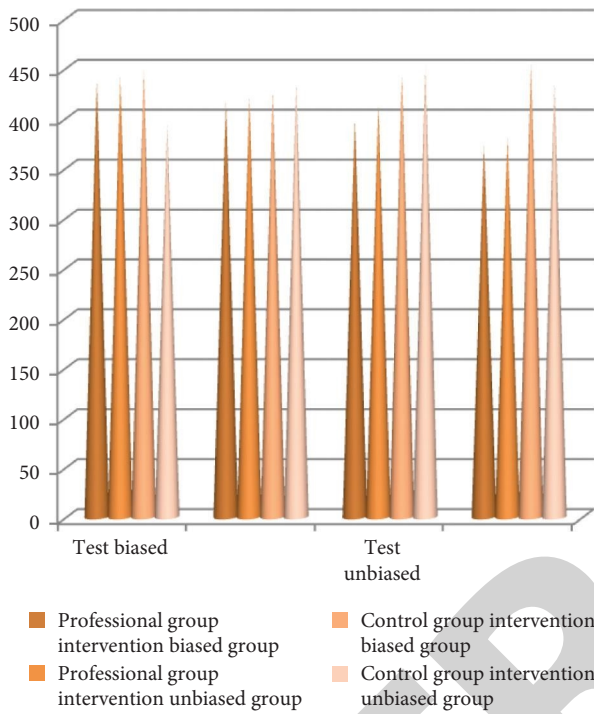- Control group intervention unbiased group

FIGURE 6: Descriptive statistics of the response time of the two groups of subjects.

and interaction effects were not significant in the professional group (main effects: $p_s \geq 0.083$; interaction effects: $p_s \geq 0.180$). However, the control group found that the main effect of test bias was significant, the interaction of intervention × test bias was significant, the interaction of test time × intervention was significant, and the edge of the third-order interaction of test time × intervention × test bias was significant. The simple effect analysis results of the third-order interaction found that whether the intervention conditions and test biases affect the prediction level of the control group participants. When the intervention is biased/ test unbiased, compared with the pretest, the control group is tested after the scores of students dropped significantly ($p = 0.001$), and the scores did not change significantly under other conditions ($p_s \geq 0.513$), as shown in Table 6, Figure 6.

Combining the above statistical results, it can be inferred that the professional group is more inclined to use a reasonable and professional method for physical fitness prediction, while the control group lacks relevant professional experience and relies more on personal judgment for physical fitness prediction, which leads to conflicts between professional training methods and innate self-mobilization time, and the forecast performance dropped significantly.

5. Conclusions

After index optimization, the use of neural network technology to evaluate and predict athletes' physical functions will be more targeted, which will greatly help to improve the accuracy of neural network evaluation and prediction of athletes' physical functions in the future. After index optimization, each training site can only provide optimized index detection records, thereby improving data integrity. For an indicator of individual missing data, use the level of the indicator value that is correlated with the indicator to predict it and fill in the missing data value with the predicted value.

In the early stage of the research, this paper summarized the research methods of the athletes' physical fitness prediction model in the Internet of Things environment, including literature retrieval, expert survey, logical analysis, and mathematical statistics. It also proposed the application of the clustering algorithm to the athlete's fitness prediction model, including European Giridian distance, Manhatan distance, Mincos distance, and other formulas and proposed the fuzzy support vector regression algorithm, including classification samples, membership function, coverage, interval width. Subsequent experiments on the algorithm and index optimization of athletes' fitness prediction models in the Internet of Things environment were carried out, and the steps for athletes' fitness prediction in the Internet of Things environment were designed, such as the selection of physical fitness evaluation indicators, the classification of physical fitness tests, and the selection of fitness evaluation indicators; the Internet of Things realizes the preprocessing of physical health prediction data, the main way is through related programs optimized by athletes and index optimization algorithms.

This article combines the athlete's form, function characteristics, and competitive sports characteristics in the selection of physical training methods to strengthen the pertinence of physical training. On the basis of regular training, special physical training is strengthened, and combined training methods and functions are used in complete training. Targeted training methods such as reserve improve the athletes' completion of the complete set of competition training. The combined training method, functional reserve, and other targeted training methods are used, and the method of predicting the athlete's physical fitness improves the accuracy of the athlete's completion of the game.

Data Availability

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

Conflicts of Interest

The authors declare that they have no conflicts of interest.

References

[1] T. J. Gerpott and S. May, "Integration of Internet of Things components into a firm's offering portfolio-a business development framework," *Info*, vol. 18, no. 2, pp. 53–63, 2016.

[2] A. Burg, A. Chattopadhyay, and K. Y. Lam, "Wireless communication and security issues for cyber–physical systems and the internet-of-things," *Proceedings of the IEEE*, vol. 106, no. 1, pp. 38–60, 2017.

[3] T. Yang, B. Yu, H. Wang, J. Li, and Z. Lv, "Cryptanalysis and improvement of Panda-public auditing for shared data in cloud and Internet of Things," *Multimedia Tools and Applications*, vol. 76, no. 19, pp. 19411–19428, 2017.

[4] S. Mayer, J. Hodges, D. Yu, M. Kritzler, and F. Michahelles, "An open semantic framework for the industrial Internet of Things," *IEEE Intelligent Systems*, vol. 32, no. 1, pp. 96–101, 2017.

[5] T. Andreas, "The Internet of Things," *International Paper Board Industry*, vol. 60, no. 2, pp. 40–42, 2017.

[6] T. Xu and I. Darwazeh, "Non-orthogonal narrowband Internet of Things: a design for saving bandwidth and doubling the number of connected devices," *IEEE Internet of Things Journal*, vol. 5, no. 3, pp. 2120–2129, 2018.

[7] L. Du, Y. Du, Y. Li et al., "A reconfigurable streaming deep convolutional neural network accelerator for Internet of Things," *IEEE Transactions on Circuits and Systems I: Regular Papers*, vol. 65, no. 1, pp. 198–208, 2018.

[8] X. Liu, S. Zhao, A. Liu et al., "Knowledge-aware proactive nodes selection approach for energy management in Internet of Things," *Future Generation Computer Systems*, vol. 92, pp. 1142–1156, 2017.

[9] F. H. Bijarbooneh, W. Du, C. H. Ngai et al., "Cloud-assisted data fusion and sensor selection for internet-of-things," *IEEE Internet of Things Journal*, vol. 3, no. 3, pp. 257–268, 2017.

[10] I. Joe and M. Shin, "Energy management algorithm for solar-powered energy harvesting wireless sensor node for Internet of Things," *Iet Communications*, vol. 10, no. 12, pp. 1508–1521, 2016.

[11] Z. Liu, K.-K. R. Choo, and J. Grossschadl, "Securing edge devices in the post-quantum Internet of Things using lattice-based cryptography," *IEEE Communications Magazine*, vol. 56, no. 2, pp. 158–162, 2018.

[12] M. Xia, T. Li, Y. Zhang, and C. W. de Silva, "Closed-loop design evolution of engineering system using condition monitoring through Internet of Things and cloud computing," *Computer Networks*, vol. 101, pp. 5–18, 2016.

[13] M. Voegler, J. M. Schleicher, C. Inzinger et al., "Ahab: a cloud-based distributed big data analytics framework for the Internet of Things," *Software: Practice and Experience*, vol. 47, no. 3, pp. 443–454, 2017.

[14] M. Ge, J. B. Hong, W. Guttmann, and D. S. Kim, "A framework for automating security analysis of the Internet of Things," *Journal of Network and Computer Applications*, vol. 83, pp. 12–27, 2017.

[15] S. A. Aljawarneh, R. Vangipuram, V. K. Puligadda, and J. Vinjamuri, "G-SPAMINE: an approach to discover temporal association patterns and trends in Internet of Things," *Future Generation Computer Systems*, vol. 74, pp. 430–443, 2017.

[16] R. Malhotra and M. Khanna, "Dynamic selection of fitness function for software change prediction using particle swarm optimization," *Information and Software Technology*, vol. 112, pp. 51–67, 2019.

[17] R. Arena, C. Ozemek, D. Laddu-Patel, and J. Myers, "Refining the risk prediction of cardiorespiratory fitness with network analysis," *Circulation Research*, vol. 122, no. 6, pp. 804–806, 2018.

[18] A. B. M. Fuermaier, D. Piersma, D. D. Waard et al., "Assessing fitness to drive—a validation study on patients with mild cognitive impairment," *Traffic Injury Prevention*, vol. 18, no. 2, pp. 145–149, 2016.

[19] Y. Ma, S. Wang, P. C. K. Hung et al., "A highly accurate prediction algorithm for unknown web service QoS values," *IEEE Transactions on Services Computing*, vol. 9, no. 4, pp. 511–523, 2017.

[20] B. D. Dancila, R. Botez, and D. Labour, "Fuel burn prediction algorithm for cruise, constant speed and level flight segments," *The Aeronautical Journal*, vol. 117, no. 1191, pp. 491–504, 2016.

[21] H. Nazaktabar, K. Badie, and M. N. Ahmadabadi, "RLSP: a signal prediction algorithm for energy conservation in wireless sensor networks," *Wireless Networks*, vol. 23, no. 3, pp. 919–933, 2017.

[22] W. Yi and M.-J. Liao, "Efficient inter-prediction depth coding algorithm based on depth map segmentation for 3D-HEVC," *Multimedia Tools and Applications*, vol. 78, no. 8, pp. 10181–10205, 2019.

[23] J. D. J. Rubio, I. Elias, D. R. Cruz, J. Pacheco, G. J. Gutierrez, and A. Zacarias, "A fuzzy algorithm for the prediction of future data," *IEEE Latin America Transactions*, vol. 15, no. 8, pp. 1361–1367, 2017.

[24] S. C. Hsia, W. K. Wong, and Y. H. Shih, "Fast-efficient algorithm of high-profile intra prediction for H.264 encoding system," *Iet Image Processing*, vol. 12, no. 3, pp. 329–336, 2018.

[25] A. Martchenko and G. Deng, "Fast algorithm for least-squares based image prediction," *Iet Image Processing*, vol. 10, no. 8, pp. 582–589, 2016.

[26] M. Zhu, H. Qu, and J. Zhao, "Instance expansion algorithm for micro-service with prediction," *Electronics Letters*, vol. 54, no. 6, pp. 356-357, 2018.

[27] H. konno and H. Watanabe, "Bond portfolio optimization problems and their applications to index tracking: a partial optimization approach," *Journal of the Operations Research Society of Japan*, vol. 39, no. 3, pp. 295–306, 2017.

[28] X. Zhu, W. Hong, H. Xu, L. Yu, and Y. Zhao, "Spatial quality index based rate perceptual-distortion optimization for video coding," *Journal of Visual Communication and Image Representation*, vol. 38, pp. 423–432, 2016.

[29] H. M. Dubey, M. Pandit, and B. K. Panigrahi, "Hydro-thermal-wind scheduling employing novel ant lion optimization technique with composite ranking index," *Renewable Energy*, vol. 99, pp. 18–34, 2016.