DEEP LEARNING FOR ANALYSIS OF CHANGES IN VITAL CAPACITY AND BLOOD MARKERS AFTER SWIMMING MATCHES BASED ON BLENDED LEARNING

ORIGINAL ARTICLE
ARTIGO ORIGINAL
ARTÍCULO ORIGINAL

APRENDIZADO PROFUNDO PARA ANÁLISE DAS ALTERAÇÕES DA CAPACIDADE VITAL E MARCADORES SANGUÍNEOS APÓS JOGOS DE NATAÇÃO BASEADOS NO APRENDIZADO COMBINADO

APRENDIZAJE PROFUNDO PARA EL ANÁLISIS DE LOS CAMBIOS EN LA CAPACIDAD VITAL Y LOS MARCADORES SANGUÍNEOS DESPUÉS DE LOS PARTIDOS DE NATACIÓN BASADOS EN EL APRENDIZAJE COMBINADO

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ABSTRACT

Introduction: Nowadays, more people are concerned with physical exercise and swimming competitions, as a major sporting event, have become a focus of attention. Such competitions require special attention to their athletes and the use of computational algorithms assists in this task. Objective: To design and validate an algorithm to evaluate changes in vital capacity and blood markers of athletes after swimming matches based on combined learning. Methods: The data integration algorithm was used to analyze changes in vital capacity and blood acid after combined learning swimming competition, followed by the construction of an information system model to calculate and process this algorithm. Results: Comparative experiments show that the neural network algorithm can reduce the calculation time from the original initial time. In the latest tests carried out in about 10 seconds, this has greatly reduced the total calculation time. Conclusion: According to the model requirements of the designed algorithm, practical help has been demonstrated by building a computational model. The algorithm can be optimized and selected according to the calculation model according to the reality of the application. ***Level of evidence II; Therapeutic studies - investigation of treatment outcomes.***

Keywords: Deep Learning; Vital Capacity; Blood Chemical Analysis; Athletes.

RESUMO

Introdução: Atualmente, mais pessoas preocupam-se com o exercício físico e as competições de natação, como evento esportivo de destaque, tornou-se foco de atenção. Tais competições exigem atenção especial aos seus atletas e o uso de algoritmos computacionais auxiliam nessa tarefa. Objetivo: Projetar e validar um algoritmo para avaliação das alterações da capacidade vital e marcadores sanguíneos dos atletas após os jogos de natação baseados no aprendizado combinado. Métodos: O algoritmo de integração de dados foi usado para analisar as mudanças de capacidade vital e ácido sanguíneo após competição de natação de aprendizado combinado, seguido à construção de um modelo de sistema de informação para calcular e processar esse algoritmo. Resultados: Experiências comparativas mostram que o algoritmo de rede neural pode reduzir o tempo de cálculo a partir do tempo inicial original. Nos últimos testes levados à cabo em cerca de 10 segundos, isto reduziu muito o tempo total de cálculo. Conclusão: De acordo com os requisitos do modelo do algoritmo projetado, foi demonstrada a ajuda prática pela construção de um modelo computacional. O algoritmo pode ser otimizado e selecionado de acordo com o modelo de cálculo, segundo a realidade da aplicação. ***Nível de evidência II; Estudos terapêuticos - investigação dos resultados do tratamento.***

Descritores: *Aprendizado Profundo; Capacidade Vital; Análise Química do Sangue; Atletas.*

RESUMEN

Introducción: Hoy en día, cada vez más personas se preocupan por el ejercicio físico y las competiciones de natación, como evento deportivo destacado, se han convertido en un foco de atención. Estas competiciones requieren una atención especial para sus atletas y el uso de algoritmos computacionales ayuda en esta tarea. Objetivo: Diseñar y validar un algoritmo para evaluar los cambios en la capacidad vital y los marcadores sanguíneos de los atletas después de los partidos de natación basado en el aprendizaje combinado. Métodos: Se utilizó el algoritmo de integración de datos para analizar los cambios de la capacidad vital y la acidez de la sangre tras la competición de natación de aprendizaje combinado, seguido de la construcción de un modelo de sistema de información para calcular y procesar este algoritmo. Resultados: Los experimentos comparativos muestran que el algoritmo de la red neuronal puede reducir el tiempo de cálculo con respecto al tiempo inicial. En las últimas pruebas realizadas en unos 10 segundos, esto redujo en gran medida el tiempo total de cálculo. Conclusión: De acuerdo con los requisitos del modelo del algoritmo diseñado, se ha demostrado la ayuda práctica mediante la construcción de un modelo computacional. El algoritmo puede optimizarse y seleccionarse según el modelo de cálculo en función de la realidad de la aplicación. ***Nivel de evidencia II; Estudios terapéuticos - investigación de los resultados del tratamiento.***

Descriptores: *Aprendizaje Profundo; Capacidad Vital; Análisis Químico de la Sangre; Atletas.*

DOI: http://dx.doi.org/10.1590/1517-8692202329012022_0199 Article received on 04/04/2022 accepted on 04/28/2022

INTRODUCTION

With the development of the times, people have begun to pay more and more attention to physical exercise. Sports events have also become the focus of attention. Swimming competitions in sports competitions have also become an important type of concern for people.[1] For example, changes in vital capacity and blood acid levels require people to use computers to help us solve these problems.[2] The use of computer algorithms has always been a hot topic in the era.[3] This article explores the changes in body height of our body based on the neural network algorithm's change of vital capacity and blood acidity index after a mixed learning swimming competition.[4] Find out the shortcomings and defects in the neural network algorithm, and then further make up for the shortcomings and defects to prove the superior performance of our choice of neural network algorithm to show the accuracy of the neural network algorithm.[5] It can also broaden the depth and breadth of our country's algorithm research model, and strive to improve international recognition and participation.

State of the art

the study of neural network algorithms in the international community has actually started very early. The main research of neural network algorithms started in developed countries in Europe.[6] The United States was also one of the earlier countries that used neural network algorithms. As early as the 1970s, the United States had already begun to use neural network algorithms and used them. Since the research and achievements of neural network algorithms in recent years have become higher and higher, we began to gradually use the positive neural network algorithm and the gradual acceptance of the neural network algorithm's help to our daily life, the neural network algorithm has been more and more convenient to use after many years of perfection and development. The gradual study of the neural network algorithm has begun to be used in various fields of the industry.[7] It plays an important role in predicting the player's bodily functions. The convenience of detecting changes in body functions after the player's movement can help us to better save us the time we designed.[8] After in-depth research by our scholars, the basic theory of neural network algorithms has been digested and absorbed by us. The basic model of the important neural network algorithm has been introduced into China by European developed countries.[9] Our research in this area lags far behind with some European countries. After the calls and demands of the majority of scholars, our efforts in learning neural network algorithms have increased. Great progress through systematic study and research has been made. This paper mainly focuses on the basic knowledge of neural network algorithm.[10]

Methodology

introduction to the basic information of neural network algorithms

The composition of the neural network algorithms we studied is generally modeled on artificial intelligence. In order to ensure the accuracy of the neural network algorithm, we need to do a comprehensive analysis and comparison of the basic information of the neural network algorithm according to the neural network algorithm. The information transfer process to construct the system model of body index changes we need, according to the system model continuous tests and calculations can be carried out, integrated the above-mentioned neural network algorithm introduction process we can get is the initial idea of neural network algorithm is the brain function of simulated organisms can independently perform computational and retrieval requirements, but in the actual design process, it is far from being able to meet the requirements of thinking, because the independence and complexity of the human brain far exceeds the prediction of scientists. We can only make continuous use and simplification of the functions of the human brain and obtain the neural network algorithm model we have designed. The transfer model and network system of the information system of our designed neural network algorithm are shown in the following Figure 1.

The neural network algorithm is actually an algorithm model that changes the impact rate, not only can change analysis according to the operating space of the system, but also can expand the computing function of the host. Based on the operation and analysis, multiple data models can also be used by us. To analyze the algorithm model formula we have designed, according to the change of the calculation method and the flexibility of processing, we can use neural network algorithm to analyze and solve various problems comprehensively. This method can also greatly reduce our work burden, and provide accurate and unambiguous calculation results for our lives. However, in the research theory of neural network algorithms, it is needed to continuously extract and improve the analysis structure of neural network algorithms. In the division structure of neural network algorithms, we need to consider the different frequencies for the operation, in order to change our calculations. As a result, the computer to perform precise analysis and calculations can be used, finding the individual computational aspects of our design based on the results of our precision analysis operations. However, considering that the computational methods we have found are not unique, we can perform computations in various ways. The choice and extraction of the method, this kind of flexible arithmetic analysis structure brings us great convenience for the calculation of our neural network algorithm, in order to continuously improve and analyze the calculation model of the neural network algorithm. The different influencing factors need to be eliminated in the neural network algorithm. Based on the results eliminated, the structural diagram of the neural network algorithm is shown. The legend of three-layer wavelet packet decomposition tree is shown in Figure 2

For the calculation of the change in vital capacity and blood acidity index after a mixed-learning swimming competition, we are determined by certain calculation rules. The first thing we must control is the sample training number of the data calculation node. The number of

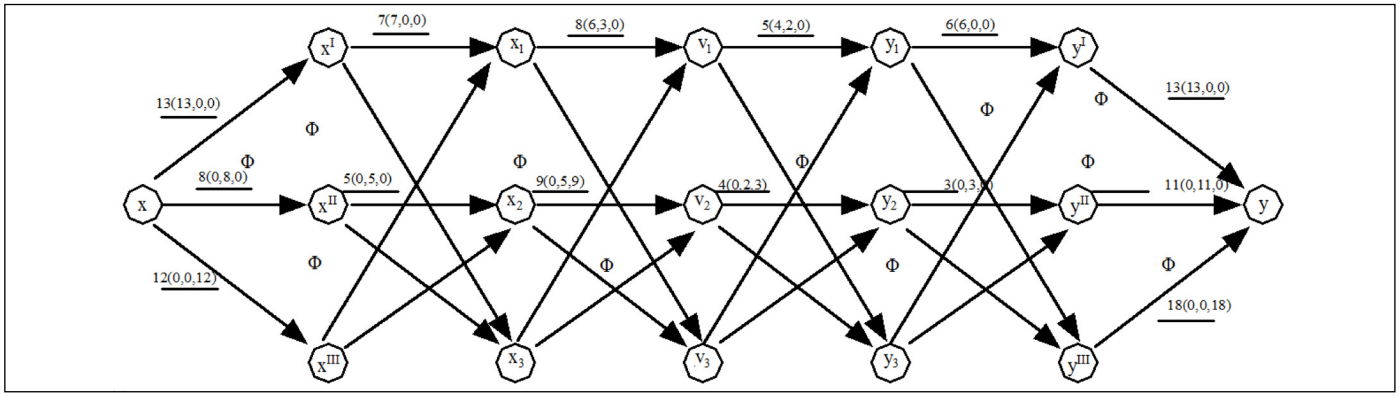

Figure 1. The information transfer path of the algorithm model and the network structure are as follows.

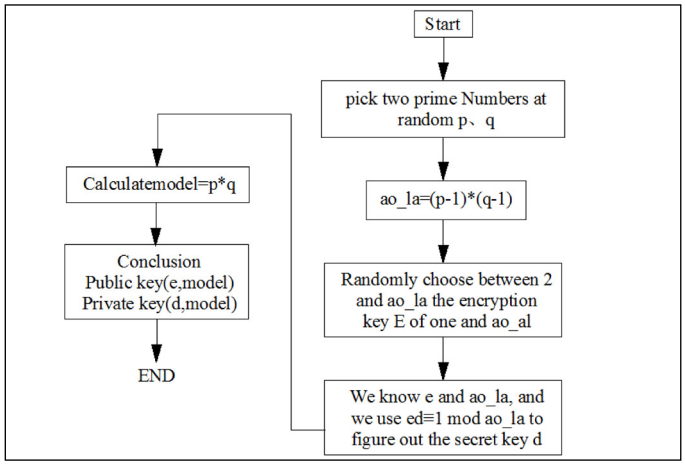

Figure 2. Three-layer wavelet packet decomposition tree legend.

training samples in the training node is controlled within a reasonable range and then the screening process of the transformation values is performed reasonably according to the selectivity function so as to ensure the overall accuracy of our calculation results. In order to ensure the number of hidden data nodes, we cannot do this. The data nodes set up account for a very small part, and the calculation results of most of the data nodes are very reliable. Operations can be easily performed for selecting hidden nodes of such data. In general, they cannot be set too much. Many data hiding nodes, because of this we will lead to errors in the calculation results, will lead to inaccurate calculations in the actual, in the case of a lack of data functions, such operations will affect our overall calculation law which will lead to the lack of reference data, and the occurrence of uncontrollable changes in data parameters, reasonable solutions to the situation need to be proposed. First of all, a large number of comparative experiments to find the best entry point for our data functions should be designed based on the results of comparative experiments. Based on the consideration of the nodes of our data implied function, the key to finding these problems is to read through the data which can be found. According to the documentation of the data description, find the number of nodes that are most suitable for the data function we choose.

Neural Network Calculation Steps and Process Analysis

After introducing the neural network function step by step, the common points of the neural network function can be found and the meaning of the data that can be referenced. According to the combination of numbers and letters, the combination of letters and numbers in the neural network function can be found, and then use the hierarchical and hierarchical selection of network algorithms. Numbers and letters of data functions are needed, and the effect of hierarchical data functions in neural network algorithms is a proportional relationship, not just a relation of reduced numbers, but also a function according to size. The functional relationship for hierarchical training is considered based on this different relationship. The actual data we need through the arithmetic analysis can be found. We don't have errors in front of the actual data. This will help us improve the overall accuracy. Below a reasonable analysis and calculation of the formula of the neural network algorithm is made.

The translation and expansion and contraction $\psi_{\alpha,\tau}(t)$ using the fast-decreasing oscillation function $\psi(t)$ is used instead of the window function to perform calculations, where α, τ are the stretching and translation functions, respectively. The calculation expression is as follows:

$$WT(\alpha,\tau)\leq\psi_{\alpha,\tau}(t)\geq\frac{1}{\sqrt{\alpha}}\int_R f(t)\overline{\psi\left(\frac{t-\tau}{\alpha}\right)}dt \quad (1)$$

The formula for the filtered impulse response function is as follows:

$$\psi_{\alpha,\ \tau}=\frac{1}{\sqrt{\alpha}}\psi\left(\frac{t-\tau}{\alpha}\right)=g(t-\tau)e^{-j\omega t} \quad (2)$$

In addition, we set $\alpha=\alpha^m_0$, $\tau=n\tau_0\alpha^m_0$, the above formula can be interpreted as the following form:

$$\psi_{m,n}(t)=\alpha_0^{-m/2}\psi\left(\frac{t-n\tau_0\alpha_0^m}{\alpha_0^m}\right) \quad (3)$$

A kind of wavelet is called as a dyadic wavelet, which is usually taken as $\alpha_0=2$, $\tau_0=1$ in practical application. It is equivalent to only making binary discretization on the scale of a continuous wavelet, but its displacement is also continuous change. The wavelet is as follows:

$$\psi_{m,n}(t)=2^{-m/2}\psi\left(2^{-m}t-n\right) \quad (4)$$

In addition, the calculation of information decomposition is also needed. When calculating, the calculation information of the incoming algorithm will be decomposed into high frequency and low frequency calculation forms. The decomposition formula is as follows:

$$f(t)=f^s(t)+f^d(t) \quad (5)$$

Among them, $f^s(t)$ represents the low frequency and $f^d(t)$ represents the high frequency.

Through the above introduction, we understand that there is a good practical operation space in the data analysis function, designing the actual troubleshooting model and the calculation and analysis of the troubleshooting model function according to the data participation function. The different data functions to carry out the results we find in the field can be established when the result of the calculation analysis is not selected explicitly. The test is based on the test results and makes a reasonable analysis. The results of the analysis will show that the actual model of our data participation function will have a great impact on our input and output data. In order to eliminate these effects, the analysis of the data function can be awaited. The result is an increase in the overall accuracy of the neural network algorithm. In order to ensure the overall operability of our experimental data, the following graphical representation of the information transfer is designed. The computer calculation model of information transmission network is shown in Figure 3.

RESULT ANALYSIS AND DISCUSSION

The test environment of the network algorithm, according to the test environment of the neural network algorithm we designed, we find some types of fault participation, and troubleshooting functions, and then perform the conversion of the expected value according to the actual values in our troubleshooting function. The conversion of the desired value we have designed is shown in the figure below. The expected values of test results are shown in Table 1

To manipulate the result values of our data model functions, the failure analysis rate in the data participation function can be found. We

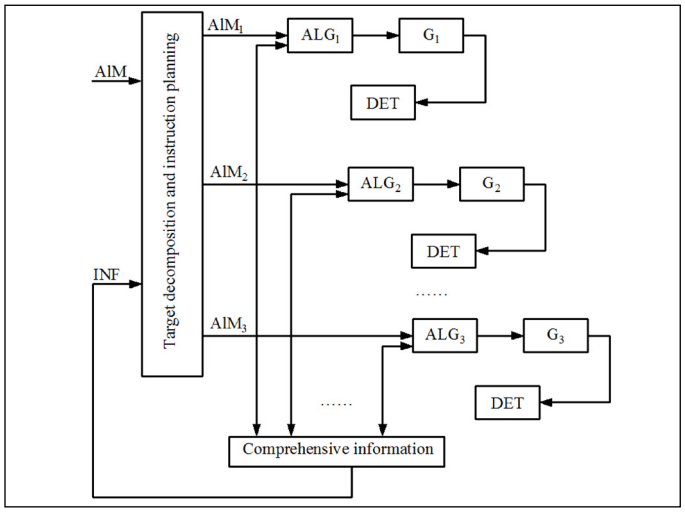

Figure 3. Computer computing model of information delivery network.

Table1. Test results expected value table.

Status number	Expected output					
	Y0	Y1	Y2	Y3	Y4	Y5
1	0	0	0	0	0	0
2	1	0	0	0	1	1
3	1	0	1	0	0	0
4	1	1	0	0	0	0
5	1	0	0	0	1	1

have certain rules for determining the number of hidden layer nodes. This factor should allow us to take into account that, at the same time when the data function is expressed, we should note the overall accuracy of the data participation function and find the actual model goals of our algorithm analysis based on the overall accuracy. The data participation functions we found are shown in the following table. The test results of optimization algorithm are shown in Table 2.

By comparing the data in Table 2 and Table 3 above, it can be seen that the improved wavelet packet analysis and neural network algorithm used in this paper greatly shortens the number of iterations we compute. Solved the most common local minimum problem in the neural network algorithm, the number of iterations of the calculation was reduced to less than 5 times, on the other hand, the number of iterations of the traditional algorithm was more than 30 times, which greatly reduced the difficulty of our calculation and reduced the calculation pressure. The test results of traditional algorithms are shown in Table 3

The calculation accuracy is very high. Even the calculation accuracy of the third group reached the expected value of 100%. However, the calculation accuracy of the traditional algorithm has been hovering around 65%. It is an algorithm with low calculation accuracy and cannot be used for direct calculation. The comprehensive test of test content change index is shown in Figure 4.

In order to more clearly show the comparability of the calculation time of our optimized algorithm, we have established the following Figure 4 for comparison. By contrasting the following figure, the huge advantage of computing time can be seen clearly, reducing the original calculation time by as much as two-thirds. The calculation of time comparison diagram is shown in Figure 5.

CONCLUSION

After constructing the model of vital capacity and blood acidity index after swimming competition based on hybrid learning, the model can be continuously optimized by using the computational advantages of neural network algorithm. This is the neural network algorithm we

Table 2. Optimization algorithm test results.

Status number	The number of iterations	calculating time	Accuracy
1	3	12	91%
2	4	15	92%
3	3	16	100%
4	5	14	94%
5	4	15	97%

Table 3. Test results of traditional algorithms.

Status number	The number of iterations	calculating time	Accuracy
1	35	42	61%
2	44	42	63%
3	31	41	58%
4	52	42	61%
5	35	31	65%

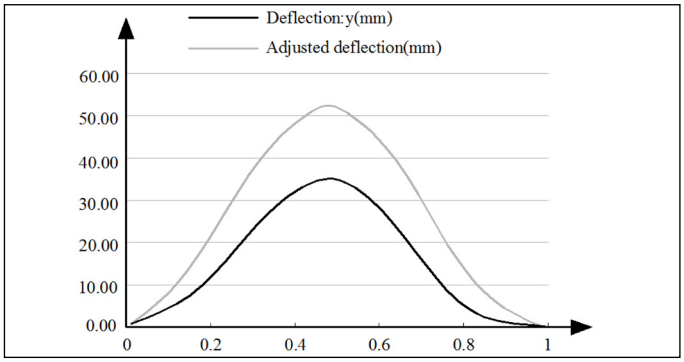

Figure 4. Comprehensive test of change index of test content.

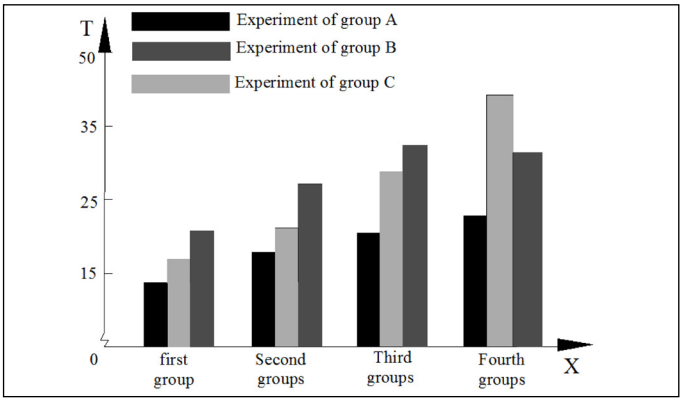

Figure 5. Computation of time comparison chart.

strongly recommend. Its intrinsic significance lies in that it can not only help us greatly reduce the calculation time, but also improve the actual efficiency of all our calculations. Comparative experiments show that the neural network algorithm can reduce the calculation time from the original initial time. In the past 10 seconds or so, this has greatly reduced the overall computing time. Although there may still be some problems in the algorithm model, we believe that through our continuous efforts, these problems can be solved and the performance of the algorithm can be continuously improved.

ACKNOWLEDGEMENTS

The study was supported by the Humanities and Social Sciences of Ministry of Education Planning Fund: Research on the development dynamic mechanism of sports small and micro enterprises under the self-organization theory (Project No.: 19YJC890039).

All authors declare no potential conflict of interest related to this article

AUTHORS' CONTRIBUTIONS: The author has completed the writing of the article or the critical review of its knowledge content. This paper can be used as the final draft of the manuscript. Every author has made an important contribution to this manuscript. Each author has made important personal contributions to this manuscript. HL Meng: writing and execution.

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