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Exploration on Psychological Well-being Education of College Athletes

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Abstract
The mental health education of college athletes is an important work, because the mental health status of athletes has a crucial impact on their performance and results. The physical and mental health of athletes is the basis of whether they can achieve excellent results continuously and stably. Mental health education can help athletes better manage their emotions, pressure and psychological state, and ensure their physical and mental health. In this article, the optimized deep learning (DL) algorithm is selected to build an athlete's psychological well-being assessment model based on DL, and the network is trained according to the topological structure of the network and the setting of its parameters, and its system structure and function are designed in detail to provide an efficient solution for university students to carry out intelligent pre-alarm. The simulation results show that the time-consuming of the psychological characteristics identification method in this article is significantly lower than that of the traditional method, and it can effectively extract the psychological characteristics of university athletes, shorten the identification time and have high operating efficiency. The recognition accuracy is improved by about 10% after using the Dropout method. Applying this method to psychological well-being assessment can provide theoretical and technical support for psychological well-being education, thus assisting teachers to carry out more targeted psychological well-being education in combination with the results of psychological well-being assessment of university students.
Keywords: University students; Athletes; Psychological well-being; Assessment.

1. Introduction

Today, with the growth of society in the new era, national education has new requirements and regulations for the psychological health growth of university students (Ahmed et al., 2022). However, in some university campuses, university psychological well-being courses have not yet adapted to the needs of educational development, and there are some serious problems in university psychological well-being courses. College athletes need to understand the impact of mental health on their performance and outcomes. They can raise their mental health awareness through publicity, lectures, training, etc., so that they realize that mental health is equally important. Students who lack good psychological quality, anti-pressure ability and stress channels can't face and solve psychological problems well, resulting in frequent problems on campus now (Brownlie et al., 2014). Whether university students are mentally healthy or not is an important prerequisite and strength guarantee for university students to move towards society. In the management of students, universities should give priority to the psychological state of university students and give priority to their psychological well-being (Riekie et al., 2017). Excessive physical stress not only seriously affects sports performance, but also directly affects the physical and psychological well-being of university athletes (Espy-Wilson, 2021). It has become an urgent problem to analyze the psychological well-being status and causes of university athletes and intervene and assist them in time and effectively (Modabber et al., 2019). Strengthening the psychological well-being education, maintaining and improving students' psychological well-being level will lay a good foundation for preventing and reducing the occurrence of university students' mental diseases and improving the efficiency of university athletes' sports training (Gouttebarge et al., 2021).

Among all the negative events caused by psychological problems, the major psychological crisis is the most harmful. Constructing a scientific and reasonable psychological crisis pre-alarm and intervention system in universities is the key to the sustainable growth of psychological well-being education in universities and the maintenance of a harmonious and warm campus environment in universities (Lehmann et al., 2017). This requires schools to conduct psychological tests on university students, analyze and study their psychological conditions, and carry out psychological counseling activities (Hardy et al., 2016). How to use modern information technology to develop a psychological assessment system for university students, which integrates psychology, behavior and computer technology, in order to improve the overall psychological quality of university students, has become an urgent requirement for doing a good job in psychological well-being education for university students under the new situation (Lim & Chen, 2021). In practical application, DL algorithm solves many problems with complicated causality (Hart et al., 2012). In this article, an athlete's psychological well-being assessment model based on DL is constructed, and its

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system structure and function are designed in detail to provide an efficient solution for university students to carry out intelligent pre-alarm.

Improving the psychological quality of university students in an all-round way is not only the need of social development, but also one of the requirements of the future society for the quality of talents (Chadwick & Porter, 2014). A person's healthy psychology is the basis and guarantee for exerting professional knowledge or potential, which requires schools to correct the status of psychological well-being education in overall education, and must strengthen and improve psychological well-being education, so that students can study well and live well at school, and at the same time make full use of and cultivate their physical and psychological well-being and other specialties (Andersen et al., 2021). Traditional psychological prediction methods can only describe and quantify some aspects of psychological activities, but most of these descriptions and expressions are based on verbal reactions or individual external behaviors, which leads to one-sided inferences or conclusions (Hoover & Bostic, 2021). In order to find the psychological problems of athletes and university students in time and provide psychological help, this article studies the psychological state assessment method and makes the following innovations:

① The structure of convolutional neural network (CNN) is determined according to the actual influencing factors and conditions, and the network is trained by combining the topological structure of the network and the setting of its parameters, and the predicted value is obtained.

② In data processing, behavioral characteristics, attribute characteristics, content characteristics and social relations characteristics are extracted from psychological state information as the input of CNN.

2. Related Work

Psychological health education is an urgent need of social progress and the growth of the times, an urgent requirement of cultivating high-quality talents in universities, a need of promoting harmonious families and an inevitable requirement of healthy physical and mental development. Heilbrun and others (Heilbrun et al., 2016) pointed out that strengthening the research and study of university students' psychological assessment will lay a good foundation for comprehensively improving their psychological well-being level, adapting to the characteristics and laws of higher education in the new period, and maintaining and improving their psychological well-being level. Davis and others (Davis, 2018) believe that the psychological well-being education of university students is an important part of students' daily education and management, and it is also the unshirkable responsibility of all faculty members, especially teachers. Harwood et al. elaborated the relationship between psychological well-being education and moral education system, put forward a series of methods to develop psychological well-being education, and provided some feasible suggestions for theoretical workers and practitioners engaged in psychological well-being (Harwood et al., 2017). Lehr et al. based on the investigation and analysis of the psychological well-being status of university athletes, discussed the influence of physical exercise on the promotion of' psychological well-being, in order to provide a basis for promoting the coordinated growth of university students' body and mind (Lehr & Kaplan, 2013). Suldo et al. optimized the modeling and simulation of psychological well-being quality (Suldo et al., 2016). Barrett et al. designed and implemented the psychological well-being tracking system for university students (Barrett & Jackson, 2013). Lee et al. based on the structural equation model to analyze the factors affecting the psychological well-being of urban floating population (Lee et al., 2022). Moynihan et al. established a prediction system of psychological well-being based on multiple factors, and combined with university students' own situation, simulated the model system, which proved that the model had certain advantages (Moynihan et al., 2018).

Although some universities have improved the psychological test methods, the data processing stage of the test results is often long, and the information feedback of the testees is not timely and targeted, which is not suitable for university students in a specific environment. In this study, the main factors affecting psychological well-being are analyzed, and the basic principle and algorithm of DL are introduced. According to the actual influencing factors and conditions, the parameters of the model are determined to determine the CNN structure, and the network is trained and the predicted value is obtained by combining the topological structure of the network and the setting of its parameters. Finally, the validity of the model in the assessment of athletes' psychological well-being is tested.

3. Construction of a DL based psychological well-being assessment model

3.1 Significance of intelligent algorithm in students' psychological evaluation

If the course of psychological well-being quality can be effectively carried out in the university campus, it will help to improve the growth of students' comprehensive quality and ability to some extent, so that students can improve their psychological well-being literacy through effective psychological well-being courses. When different individuals face the same objective dilemma, some can finally solve the problem smoothly through their own efforts and adjustments, without causing psychological problems for

themselves. Teachers' effective psychological well-being education and teaching activities for students in college can promote students' comprehensive quality to a certain extent. In the process of activities, it is conducive to the formation of stable personality of university students, which also has a positive impact and promotion on the future outlook on life. In the teaching process, we should always reflect the students' dominant position and fully mobilize their enthusiasm and initiative in the learning process. Reasonably arrange the training, study and rest time of university athletes, prolong the sports life of athletes, prevent and reduce the occurrence of injuries, and enable them to participate in training and competitions in a state of physical and mental pleasure.

In the management of students, college teachers should establish students' self-confidence and self-esteem in various ways, educate students to learn how to manage their personal emotions and give them a reasonable vent, and improve their ability to resist setbacks. In the process of university students' mental and behavioral maturity, pressure and frustration are inevitable, but because of their immaturity and lack of experience, they are easily trapped in the emotions caused by these setbacks, which leads to psychological problems (Gerolamo, 2016). Constructing a complete and scientific pre-alarm and intervention mechanism for university students' psychological crisis is the need of institutionalizing and standardizing university students' psychological crisis intervention, so as to solve university students' psychological health problems in time and as soon as possible, avoid the deterioration of university students' psychological problems and prevent serious consequences. Universities need to give priority to the education of students' psychological well-being, find students' psychological problems in time and take appropriate measures to solve these problems, help students form a correct view of the world and individuals, enhance their ability to resist setbacks, let students express their psychological pressure and promote their better development. Through the guidance and education of teachers, students can control their emotions well. Students can avoid indulging and deal with it correctly through rational analysis when facing the temptation on the Internet and in life.

Different students will have different reactions to the same pressure because of their different anti-pressure abilities (Faustin et al., 2022). Therefore, it is needed to help students train their anti-pressure ability so that they can cope with the pressure brought by stressors in order to face up to and solve the psychological crisis. Teachers can increase the forms of psychological well-being education, enhance students' interest in relevant knowledge, make students know more about their own psychological situation, and help themselves in time when students have psychological problems. Psychological assessment of students is an important part of university students' education management, and it is a very detailed and complicated work. For a long time, psychological tests have been conducted by hand. Because of the complicated data, high labor intensity, low work efficiency, it is easy to make mistakes, and it is not convenient to query, classify, summarize and analyze data information scientifically. The application of computer technology in the growth of psychological measurement information system is the process of making the psychological test process perfect, regular and modern by using management science and technical science. Psychological assessment is an important tool for educational assessment. According to the growth of university students' intelligence, morality and personality, we can provide them with targeted quality education, which can provide reference for early detection, timely intervention and follow-up service of university students' psychological problems.

3.2 DL model construction

How to use modern information technology to develop a psychological evaluation system for college students, which integrates psychology, behavior and computer technology, in order to improve the overall psychological quality of college students has become an urgent requirement for doing a good job in psychological health education for college students under the new situation. In essence, CNN belongs to a multi-layer perceptron. It has the advantages of unique local connection mode and shared weights, which not only greatly reduces the model parameters to make the network more convenient to optimize, but also effectively prevents the network data from being over-fitted. In CNN model, attention mechanism has its unique importance, and most models will apply its attention mechanism characteristics to improve the performance of their own models. Attention mechanism can make feature maps of different levels use their different semantic values to generate saliency maps, but most existing methods integrate multi-scale features indiscriminately, which leads to information redundancy.

Developing a psychological evaluation system for college students that integrates psychology, behavior, and computer technology can indeed be beneficial for improving the overall psychological quality of college students. Utilizing modern information technology, such as the Convolutional Neural Network (CNN) and attention mechanisms, can enhance the system's effectiveness. Below are the steps to build such a system:

1. Data Collection: Gather a diverse dataset of college students' psychological and behavioral information. This data can include self-reported surveys, psychological assessments, academic performance, extracurricular activities, social interactions, and other relevant factors.
2. Data Preprocessing: Clean and preprocess the collected data to ensure consistency and accuracy.

This step may involve data cleaning, feature engineering, and data normalization.

3. Feature Extraction: Extract relevant features from the preprocessed data. These features should represent psychological traits, behaviors, and other aspects that can be used for analysis.
4. CNN Model Construction: Design and implement a CNN model that takes the extracted features as input. The CNN architecture should be optimized for processing sequential data and capturing spatial relationships within the data.
5. Attention Mechanism Integration: Incorporate attention mechanisms into the CNN model. Attention mechanisms allow the model to focus on relevant information and ignore irrelevant or redundant data, improving the model's performance and efficiency.
6. Model Training: Divide the dataset into training and validation sets. Train the CNN model with the attention mechanism using the training data, and fine-tune the model to prevent overfitting.
7. Psychological Evaluation: Implement the trained model to evaluate the psychological status of college students. The system should be able to analyze input data and provide insights into students' psychological well-being and potential areas of concern.
8. User Interface: Develop a user-friendly interface for the system, enabling college students and relevant professionals (e.g., counselors, educators) to interact with the system easily. The interface should allow input of relevant data and display the evaluation results clearly.
9. Continuous Improvement: Regularly update and improve the system based on user feedback and new research findings. Continuous improvement is crucial to ensure the system remains accurate and relevant over time.
10. Ethical Considerations: Address ethical concerns related to data privacy, consent, and potential biases in the system. Protecting the privacy and well-being of college students should be a top priority throughout the system's development and implementation.

The CNN model constructed in this article is shown in the Figure 1.

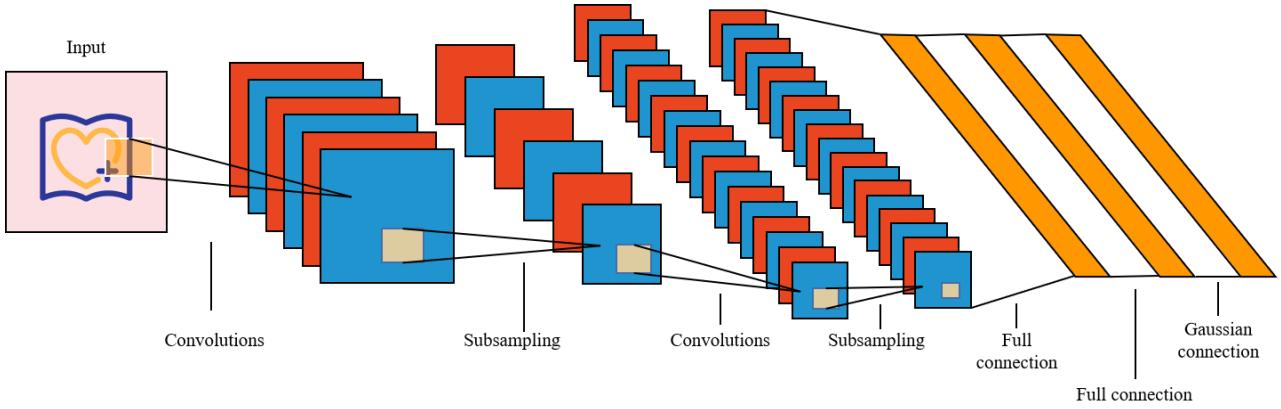

Figure 1 CNN model structure

In general practical work training, it is rare to start training directly from the first layer, but by training the model in advance on a large data set, and then fixing the parameters of the layer in front of the model. Then when dealing with the current problem, only the last few layers are modified and fine-tuned with the data of the current problem. If the method of defining difficult samples is adopted, it is needed to add an artificially set superparameter. These methods revolve around which samples are most suitable for training and learning. In the metric space, the network is actually concerned about whether the result list calculated according to the features extracted from the query samples is correct.

Convolution is the most important part of CNN, which is used to extract feature information from data. The discrete convolution process is as follows:

$$H(x,y)=A\otimes k(x,y)=\sum_{M,N}A(m,n)k(x-m,y-n) \quad (1)$$

Assuming that the l-th layer is a fully connected layer, the weight matrix is W^l and the bias is b^l. The calculation process of the fully connected layer is:

$$Z_j^l=f\left(W^l X^{l-1}+b^l\right) \quad (2)$$

Use ReLU as activation function:

$$f(x)=\max(0,x) \quad (3)$$

ReLU is a linear function, so its calculation speed is faster, which will make the network training speed faster.

When the model has been trained for the previous task, the parameters are updated through our own data set. When the data volume is small, only the last layer parameters of the network can be updated. When the data volume is medium, the parameters of the later layers can be retrained. When the data volume is large, the training needs to be restarted.

3.3 Application of DL model in psychological well-being assessment

Psychological test is a special measurement and a systematic procedure to measure a behavior sample. By measuring people's behavior, the test infers the characteristics and level of the individual's intelligence, personality and attitude. In order to establish a test with construct validity, we must first derive the basic assumptions related to this theoretical conception from a certain theory, and then design and compile the test accordingly, and then examine whether the test results conform to the theoretical opinions of psychology by retrospective analysis.

People's thinking activities often require the certainty and accuracy of concepts. law of excluded middle, who adopts formal logic, is neither true nor false, and then makes judgments and inferences and draws conclusions. In order to make the computer simulate the characteristics of advanced intelligence of human brain, it is needed to transfer the computer to multi-valued logic and study fuzzy logic. Combining psychological assessment with computer can cost less, shorten the assessment time and enhance the possibility and universality of psychological assessment.

The psychological assessment system developed for university students should help our teachers to complete all kinds of information processing in the process of psychological testing by modern means, and give corresponding measures according to the test results to improve work efficiency and management level, so as to realize the informationization and modernization of psychological health education and psychological file management in our school. The CNN operation flow of psychological well-being assessment is shown in Figure 2.

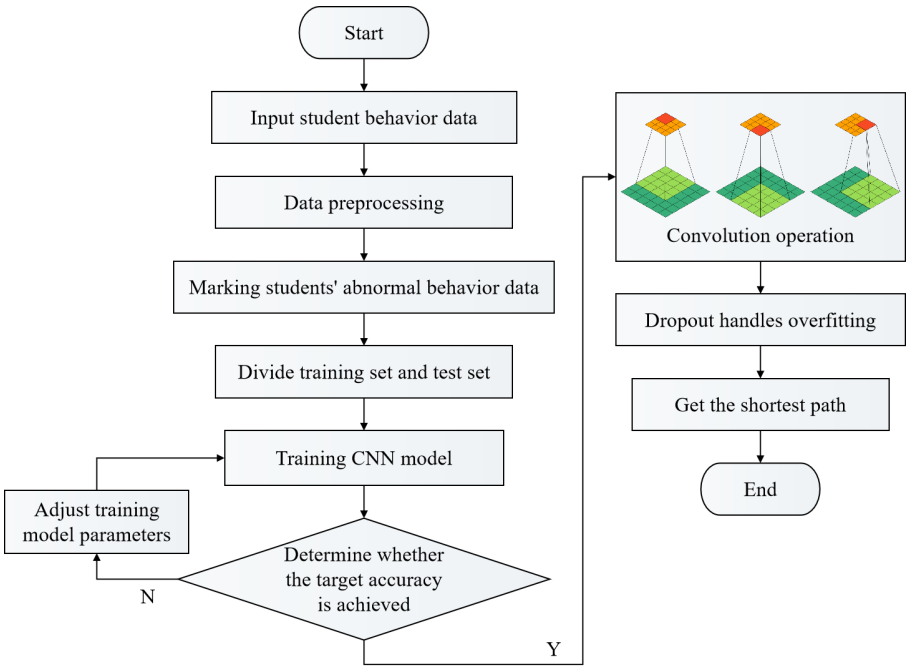

Figure 2 Operation process of CNN

Psychological test is a common tool to collect quantitative data for psychological assessment. Different from ordinary object measurement, the results of psychological measurement need to be explained to get exact meaning. In essence, the process of explanation is not only the causal explanation of the relationship between the characteristics of the measured objects, but also the comparison.

The selection range of learning rate is generally between 0.01 and 0.8. Set the factor set U and the assessment grade set V of the analysis object of psychological and emotional fluctuation:

$$U = \{u_1, u_2, \ldots, u_m\} \quad (4)$$

$$V = \{v_1, v_2, \ldots, v_m\} \quad (5)$$

Fuzzy assessment is carried out on each factor in U according to the grade index in the assessment set, and the assessment matrix is obtained:

$$R = (r_{ij})_{n\times m} \quad (6)$$

In which r_{ij} indicates the degree of u_i 's membership in v_i. After determining the importance index of each factor, record it as:

$$A = \{a_1, a_2, \ldots, a_m\}, \quad \sum_{i=1}^{n} a_i = 1 \quad (7)$$

Synthetic:

$$\overline{B} = AR = \left(\overline{b}_1, \overline{b}_2, \ldots, \overline{b}_m\right) \tag{8}$$

In this way, students' psychological status can be evaluated.

In this method, the accuracy of the candidate list calculated by the features returned by the current training network is used to evaluate the metric space, and the failed samples are given different degrees of punishment according to the order of the samples in the candidate list. So as to ensure that the correct samples can be ranked as far as possible in the results when the metric space can not be optimized to best distinguish different types of samples.

In the calculation process, if the input signal is $x \in R^{n \times m}$, the size of the convolution kernel is $w \in R^{s \times k}$. The resulting output signal:

$$y = x * w \in R^{u \times v} \tag{9}$$

The size of the extracted features:

$$u = \left[\frac{n - s + 2 \cdot Zeropadding}{Stride}\right] + 1 \tag{10}$$

$$v = \left[\frac{m - k + 2 \cdot Zeropadding}{Stride}\right] + 1 \tag{11}$$

The most important way of psychological well-being education and psychological quality training should be classroom teaching. Course teaching can guarantee to meet the needs of all university students for psychological well-being education knowledge, and truly realize universal education for university students. Psychological teaching can be carried out according to the psychological problems faced by different students in different grades.

4. Simulation and result analysis

Psychological assessment of students is an important part of university students' education management, and it is a very detailed and complicated work. The application of computer technology in the growth of psychological measurement information system is the process of making the psychological test process perfect, regular and modern by using management science and technical science.

In this article, according to the actual influencing factors and conditions, the parameters of the model are determined to determine the CNN structure, and the network is trained and the predicted value is obtained by combining the topological structure of the network and the setting of its parameters. In this section, the application of this model in the psychological well-being assessment of university athletes is simulated and tested. The simulation operating system is Windows 11, the processor is Core i7 13700k, the graphics card is RTX 3070, the memory is 16GB, and the hard disk capacity is 1TB. The data used in the simulation is the sample data provided by the research project of risk identification and comprehensive judgment technology of university students' suicide behavior. 100 groups of data are taken as training samples and the other 50 groups of data are taken as prediction samples, and the provided samples are trained and predicted. A comparative experiment is set up between the psychological well-being assessment model based on CNN and the traditional method, and the data of students' behavior with different regional distributions are discretized in intervals, as shown in Figure 3.

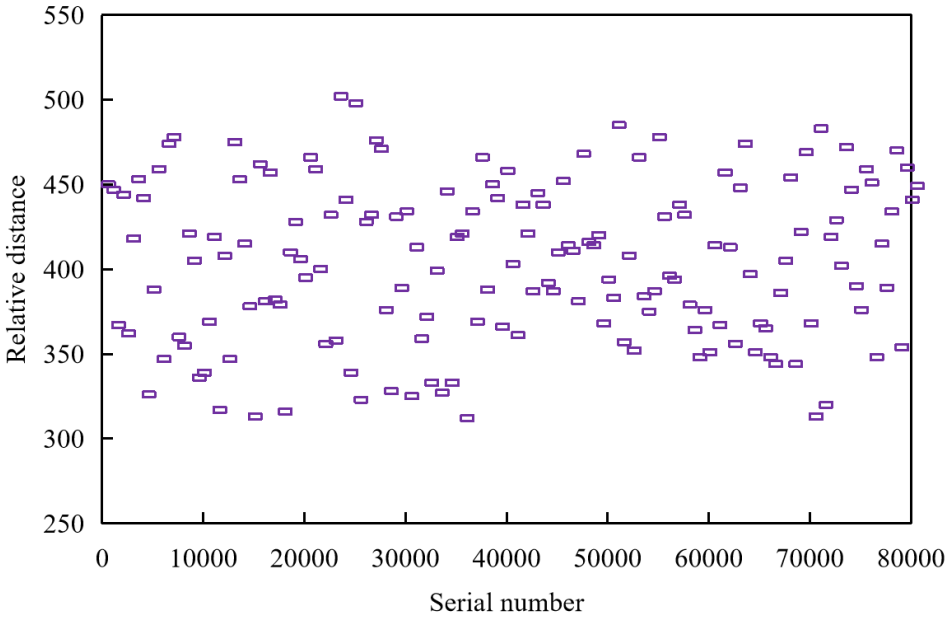

Figure 3 Interval discretization processing

The process of obtaining the information of students' attributes in the behavior data to be processed is called feature extraction. Feature selection is an important data analysis process and an important step to realize students' psychological identification. The test result of the algorithm's psychological feature recognition error is shown in Figure 4.

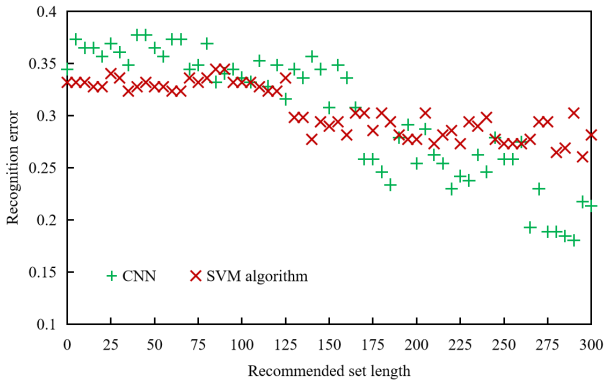

Figure 4 Recognition error of psychological characteristics

Compared with the traditional SVM algorithm, this algorithm has significant advantages in the later stage, and the error rate has decreased by 30.66%. In the structure of CNN, the memory weight of each pixel is obtained by convolution operation, the memory of each characteristic pixel is realized by Hadamard product, and then the loop function is used for reverse transmission. In the training of CNN, a difficult problem is how to choose an appropriate weight to assign the network for initialization training. If the initialization weight is not ideal, it will usually lead to the slow convergence of the whole network. Compare the convergence performance of the traditional SVM method with the DL method proposed in this article in the maximum cluster structure (see Figure 5).

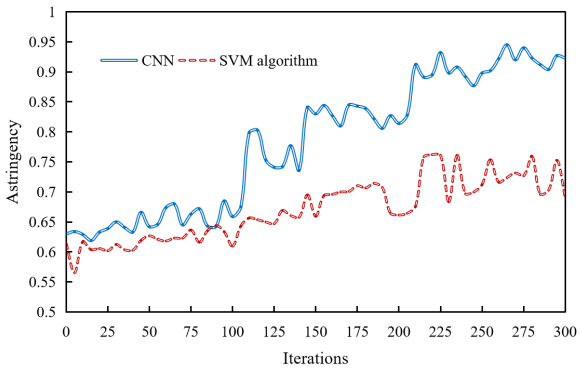

Figure 5 Convergence test results

Experiments show that compared with the conventional SVM algorithm, this algorithm can get more reasonable and practical analysis results of students' psychological characteristics. If the training set is large, you can increase the value of the class. The determination of the quantity of neurons in the output layer depends on how to determine the standard output. The output nodes represent the functional goals to be achieved by the system, that is, the performance index of the system, the category attribution of the classification problem, and the function value of the nonlinear function. Dropout method is adopted to prevent over-fitting. Before adding fitting measures, the recognition accuracy test is shown in Figure 6.

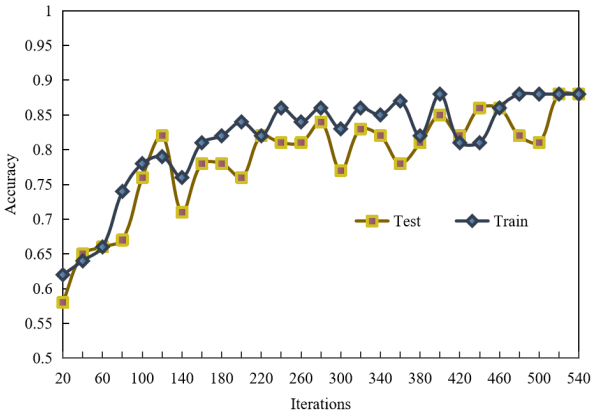

Figure 6 Accuracy before adding overfitting measures

Sample-by-sample mean subtraction is mainly used in those stable data sets, that is, the statistical properties of those data are the same among each dimension. Because of the nonlinear characteristics of the system, the initialization of network weights determines where the training of the network starts from the error surface, so the initialization method is very important for whether it can converge and the length of training the network. DL-based psychological well-being service system takes students' psychological data as the research object, and makes analysis, prediction and crisis warning of university students' psychological problems by means of deep and intelligent data mining methods, so as to provide assistance for psychological counseling teachers in university psychological well-being centers. The accuracy test after using the Dropout method is shown in Figure 7.

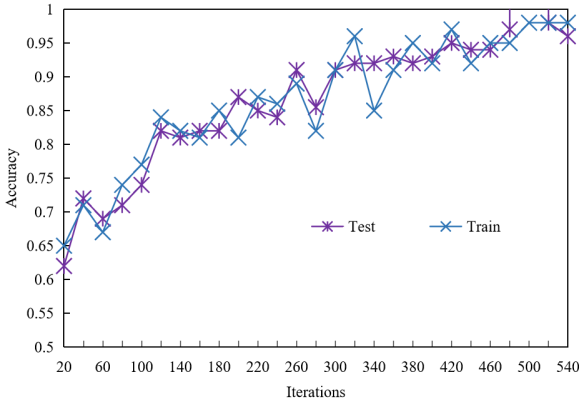

Figure 7 Accuracy after adding overfitting measures

Combined with the results of Figure 6 and Figure 7, it

can be seen that through repeated iterative training, the Dropout method added in this article can effectively prevent over-fitting, strengthen the generalization ability of the network, improve the recognition accuracy by about 10% as a whole, and effectively complete the task of psychological feature recognition. For the psychological assessment model, the more characteristic parameters, the more detailed the description of the target psychological characteristics. In this large quantity of features, there must be some features that have little or even negative effects on the assessment results of the model, and too many feature parameters will increase the calculation time of the system and reduce the operation efficiency of the system. The experimental results of different algorithms for identifying time are shown in Figure 8.

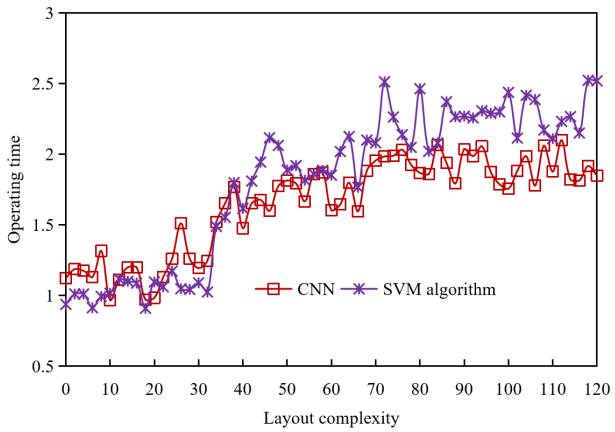

Figure 8 Recognition time test results

The time-consuming of the psychological characteristics identification method in this article is significantly lower than the traditional method, which effectively extracts the psychological characteristics of university athletes, shortens the identification time and has high operating efficiency. University students' psychological well-being education should always focus on prevention, and improve their anti-frustration ability, psychological adjustment ability and problem-solving ability through various channels, improve their comprehensive psychological quality, enable students to master their psychological ability to solve big problems and eliminate small problems, and prevent crisis events.Computer technology provides many advantages for psychological assessment, such as improving the efficiency of implementing, scoring and explaining psychological tests, saving time and reducing the error of manual scoring. Users can answer questions directly on the computer, which simplifies the daily work of functional departments. Through special channels, the psychological health problems of university athletes are specially guided and corrected, and students with serious psychological well-being problems are focused on and guided to help university athletes eliminate factors that are not conducive to psychological well-being, reduce psychological pressure and maintain psychological balance.

5. Conclusions

Psychological factors have an important impact on the athletic level of athletes. Through mental health education, athletes can better grasp their emotions, adjust the state, improve concentration and self-confidence, so as to improve the competitive level. Mental health education is not only aimed at the performance of athletes in the competition, but also involves the improvement of the overall quality of athletes. By cultivating athletes' mental health literacy and skills, they can improve their comprehensive quality, including teamwork, leadership and innovation ability. In this article, an athlete's psychological well-being assessment model based on DL is constructed, and its system structure and function are designed. Combined with the topological structure of the network and the setting of its parameters, the network is trained and the predicted value is obtained. Finally, the validity of the model in the assessment of athletes' psychological well-being is tested. The results show that the time-consuming of the psychological feature identification method in this article is significantly lower than that of the traditional method, which can effectively extract the psychological features of university athletes and shorten the identification time, and has high operating efficiency. Through repeated iterative training, the Dropout method added in this article can effectively prevent over-fitting, strengthen the network generalization ability, and improve the overall recognition accuracy by about 10%, which can effectively complete the task of psychological feature recognition and provide theoretical and technical support for the psychological well-being education. For the assessment results, only simple scales and simple graphs can be used now, which requires diversified excavation of the display forms of statistical results in future research, so that school leaders and ideological and political counselors can see the help students need more intuitively.

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