

Research Article

Research on Emotion Recognition and Mental State Prediction of College Students Based on Deep Neural Network

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Since entering the new century, people's living standards have steadily improved, and their living conditions have also continuously improved. The improvement in living standards has brought greater pressure to people. The recognition of emotion and psychological state has become one of the research hotspots. Because of excessive work pressure, many students now suffer from depression. In this paper, we use a large number of research data and comparative charts to facilitate the analysis of the collected data. At the same time, we use LDA topic classification and NLDA neural network algorithm for refining and concise data processing. The research shows that students' psychological state will affect their academic achievements. Students should try their best to manage their mental state, learn to know their emotional state, and ensure a good mental state. Emotional leadership is very important for students' physical and mental health. Emotional leadership is a very important task for students and schools. Schools and students should actively cooperate to improve 'students' ability to manage emotions, especially their ability to self-regulate emotions, and to jointly help build a harmonious campus. Because of the contradiction between the complexity of interpersonal relationship and society and the simplicity of students, students are often frustrated in interpersonal communication. The biggest reason for students' psychological state is that they have no courage to express themselves in public, cannot communicate with others, and are interested in and concerned about the failure of various activities.

1. Introduction

From a technical point of view, this study represents the most comprehensive treatment of neural networks. It is comprehensive, well organized, and completely up-to-date, exploring VLSI implementations including learning processes, back propagation learning, basic radial networks, and neural networks [1]. In this paper, a recognition system based on neural networks is proposed and connected to a small window of the retina to determine whether each window contains a face. The system is carried out among multiple networks to improve the performance of a single network. We propose a simple program to match positive samples before training. In order to collect negative samples, we use the trigger algorithm to add error observations to the training set during training [2]. The way to improve the performance of any machine learning algorithm is to train

several different models with the same data. The results have shown that the information about the whole can be compressed into a model that is easier to implement. We have further developed this method using different packaging techniques [3]. In this paper, a neural network model for ruin prediction is proposed, and a more traditional ruin prediction method—multivariate discriminant analysis—is used to test the financial data of different companies in the same dataset. The prediction ability and discrimination methods of neural networks are compared [4]. This paper introduces a general neural network model for fuzzy logic control and decision system. The model in the form of a multilayer input network combines the idea of a fuzzy logic controller with the structure and learning ability of a neural network and forms a fuzzy logic control decision system based on a neural network. Learning from practical examples will automatically form a decision network for fuzzy

logic control [5]. For a long time, people have different views on the influence of facial information and contextual information on how to deal with and judge facial emotional expression. However, the evolution of how individuals use this information remains largely unexplored, which may help in trying to reconcile these opposing views. The current research tests age-related differences, that is, how individuals give priority to watching emotional faces and context when making emotional judgments [6]. In order to solve the hidden depression tendency recognition problem in microblog texts, a depression tendency recognition model based on emotion attenuation factor is proposed. This model makes self-rating depression scale, collects students' microblog texts, and asks psychologists to comment on microblogs manually [7]. This study examines whether cultural matching between subjects (cultural dominance model) contributes to empathy accuracy and physiological connection in emotion recognition, or whether unaffected (cultural equivalence model) contributes to empathy accuracy and physiological connection in emotion recognition. The subjects were 161 African-American, Chinese-American, European-American, or Mexican-American college students. To assess the accuracy of empathy—knowing how another person feels—participants (raters) use scoring dials [8]. Feature selection in an emotion recognition system is a NP-hard problem. The goal of establishing a good two-class emotion recognition system is to find a subset of initial features, which can minimize the loss rate and error rate of the system [9]. In the era of We Media, the new characteristics of social thoughts, the characteristics of college students themselves, the negative influence of society, and the poor effect of ideological and political education have impacted the socialist core values and affected the rational cognition, emotional identity, and practice of college students [10]. Mental state is a function of brain activity; with the development of brain-computer interface (BCI) tools, they can effectively predict. Generally, the research of brain-computer interfaces is complex, requires multi-channel electrodes, and is often carried out in a controlled laboratory environment [11]. In recent years, people pay more and more attention to the research of human-computer interaction technology. In this paper, the results of our low-level gesture detection module are given. This module can be used as a building block of real-time gesture recognition and psychological state prediction system. The system includes four processing modules: skin spot detection module, skin spot tracking module, gesture recognition module, and psychological state prediction module [12]. The invention relates to a remote emergency psychiatric medicine system and a method based on an emergency psychiatric state prediction model. The system can include an acquisition unit used for collecting real-time mental health symptoms of patients and medical history and family history data of patients; a prediction unit for predicting the psychiatric state of the patient based on the collected real-time mental health symptoms and medical and family history data of the patient; and a transmission unit for providing a predicted psychotic mental state [13]. The focus of this study is to identify the true psychology of individuals, that is, the

constructive psychology and the expressive psychology. Therefore, geometric space technology is adopted, focusing on eyes, and measurement is carried out from three aspects: characteristics, structure, and color [14]. In this paper, we try to use cognitive emotion to predict an emotion. We investigate what events affect future emotions. Emotional prediction can help young people grasp their depression in the future. We combine biological information, weather information, and cognitive emotion to construct an emotion prediction model. The average prediction accuracy is 1.2% higher than that without prediction. We found that leisure and other emotions affect the accuracy of prediction [15].

2. Emotion Recognition of College Students

2.1. How College Students Maintain Healthy Emotions. Positive emotions must have the following important points: (1) having reasonable life value and direction, knowing what you can do, and having a good pursuit and a good belief. We should improve the quality of others and make contributions to the society. This should be the “value of life, not asking for contribution” in study and life, study and work. Only by establishing a positive attitude towards life can we meet our inner needs and make our own strength to this society. (2) Chest width: keeping your chest is the most important condition for forming a good state of mind. In this world, we live with our classmates. We must give up some feelings, embrace others with great pressure, and sincerely move others through a “selfish” small circle. (3) Find joy and kiss pleasure. Being optimistic and cheerful is an important sign of health. Two psychologists believe that “not laughing” is a way to measure a person's adaptability to the environment. Smiling is not only a good mood but also an important physiological function. It can make people laugh. Take some deep breaths naturally, so as to relax people's emotions tense, make people's emotions clearer, improve people's emotions, make people's feelings more active, and spiritual activities more active, which leads to spiritual expansion.

2.2. Methods of Emotion Recognition. Different emotion recognition methods correspond to different emotion recognition methods. Traditional emotion recognition methods can be divided into two types. Emotion recognition methods based on character signals mainly include face feature recognition and voice recognition. The method of facial expression recognition is to recognize different emotions according to the relationship between expressions and emotions. In a certain emotional state, people will have certain facial muscle movements and expressions. For example, when the corners of their mouth rise and they are in a good mood, their eyes will appear in circles. When angry, he will frown, open his eyes, and so on. At present, face feature recognition is mainly performed through image recognition. The speaker recognition method is based on different language expressions of people in the same emotional state. For example, when emotional, the voice of speech may be more interesting and emotional is more annoying. The advantage of the noncharacter signal recognition method is that it is

simple and does not need special equipment. The disadvantage is that there is no guarantee of the speaker's credibility because people can change their facial expressions and sounds to hide their true feelings, and this behavior is difficult to recognize. Secondly, for some disabled people with special diseases, their physical reasons will make it difficult for them to achieve these functions.

2.3. Improve the Ability of Emotion Recognition. Emotional ability is called emotional intelligence by others. It is the ability to express your feelings by knowing how you and others react. The first step is to feel yourself. Self-emotion recognition is the basis of controlling emotions. You can express your feelings well and correctly, and express and use your feelings correctly. Therefore, in the face of a bad attitude, students should calmly accept and seriously understand. The first step is to summarize your emotions, review and summarize your past behaviors, and further understand your unique internal reaction patterns and the reasons for emotional reactions. At the same time, through repeated adjustments, it lets you know that you have made progress. The second step is to record and control daily emotions. Another way to understand emotions is through a diary, which can be used to record your daily activities. While daily records can easily find our emotions, this method can let college students know how they feel at that time. It can not only deepen college students' understanding of emotional factors, that is, emotional factors at that moment but also deal with the relationship between emotions and events. The third step is to understand the feelings of others.

2.4. An Analysis of the Causes of College Students' Emotional Distress. Genetic factors have a great influence on emotion, which is mainly reflected in the types of human nerve cells. Human neuronal types are inherited, and the environment and education will greatly influence them. All in all, there are obvious differences in emotional experience among different types of neuropathy patients. Cognitive reasons are the same attitude and different attitudes of different people who have different neurons, so their emotional experiences are different. Students face the changes in the learning environment, the adjustment of learning tasks, the conflicts and contradictions between ideals and reality, and the prejudice of knowledge, which often lead to countless psychological conflicts and negative emotions. One-way cognition is the root cause of negative emotions such as personal anxiety, depression, self-sadness, and fear.

3. Neural Network Algorithm

3.1. God Will Classify Texts Based on LDA Topics in the Network. The Nears network is widely used in various fields. For example, the BP neural network is a multilayer neural network, and its main component is the neural unit. A neural network consists of an input layer, a hidden layer, and an output layer. The measurement of input neural data is the same as the input data, and the data of output neural elements should be the same as the measurement method,

hiding the size and position of neural data and changing the links of data. In the network nerve and the input x_1, x_2, \dots, x_n , the connection data between the network layers is W_i , and through the propagation of the neural network, its output can be expressed as formula (1):

$$y = f\left(\sum_{i=1}^m w_i \times x_i\right). \quad (1)$$

The fifth word in the dictionary is represented by a V-dimensional vector w , where for each $u \neq v$, $w_v = 1$ and $w_u = 0$. An article is a series of N words, denoted by $d = \{w_1, w_2, \dots, w_n\}$, and w_n is the nth word series. All M objects form a collection $D = \{d_1, d_2, \dots, d_n\}$. Assuming there are T elements, the probability of the word I in the set d can be expressed by formula (2):

$$p(w_i) = \sum_{j=1}^T P(w_i|z_i = j)P(z_i = j). \quad (2)$$

The probability of the word w appearing in article d can be expressed as formula (3):

$$P(w|d) = \sum_{i=1}^M \phi_w^j \times \theta_j^d. \quad (3)$$

The LDA topic model can be expressed as formula (4):

$$P(w|d) = P(w|T)P(T|d). \quad (4)$$

A super parameter β is introduced to the word topic probability distribution, and the parameter

θ, ϕ is estimated by Gibbs sampling with variable Z. LDA model is used to model corpus, and Gibbs sampling is used to iterate parameter reasoning. The Gibbs sampling estimation is the Gibbs sampling algorithm, which uses conditional probability to generate samples that fit the distribution and is used to estimate the expectation of the distribution and the marginal distribution. It is a method of computer simulation when accurate calculation is not possible. At the same time, record the value of z_i , and calculate the parameter θ, ϕ as shown in formulas (5) and (6):

$$\phi^{(w)} = \frac{n_j^{(w)} + \beta}{n_*^{(d)} + v\beta}, \quad (5)$$

$$\theta^{(w)} = \frac{n_j^{(w)} + \beta}{n_*^{(d)} + v\beta}, \quad (6)$$

where n_{dj} is the number of words of topic J in article d, $n(d)^*$ is the number of words of all topics in article d, $n(j_w)$ is the number of times that word W appears under topic J, and (j^*) is the total number of words of topic J in article d.

3.2. Implementation of NLDA Neural Network Algorithm. In training, first extract d_1 and let $d_1 \in t_i$, and in matrix $w.T_{nj}(o)$, if $w_n \in d_1$, the word frequency of the word E under this topic will increase by 1, that is, formula (7):

$$(w_n, t_{i+1}) = (w_n, t_i) + 1. \quad (7)$$

Otherwise, initialize the frequency of the word w_n under this topic to 0, which is formula (8):

$$(w_n, t_i) = 0. \quad (8)$$

Run forward algorithm to calculate the result of article d_1 in neural network, that is, the probability of each topic p_j (1) transforming articles. Then, the error is obtained by comparing it with the target probability p_j of the transfer floor. A back propagation algorithm is run to alternately propagate the obtained errors back to correct and update the (1) matrix, the V_t (1) matrix, and the learning factor.

Normalized weights. The weight is multiplied by a uniform adjustment factor E and then divided by the total number of words under the topic. The calculation formula is formula (9):

$$W_{-T_{nj}}(p) = \frac{V_{wt}(p)\delta}{k}, \quad (9)$$

where $V_{wt}(p)$ is the weight before normalization, δ is the adjustment factor, and K is the number of all words under the object.

3.3. God Will Update the Network Model Parameters. Assuming that the result of the neural network is T_1, T_2, \dots, T_p , where P represents the number of rounds trained by the neural network, there is a certain error between the current output of the neural network and the ideal output, and the current error of the teaching process is shown in the following equation:

$$E_p = \frac{1}{2}(T_s - T_p)^2. \quad (10)$$

During the current error period, the neural network enters the inverse correction update state, updates the matrix and the matrix learning factor, and the neural network adopts the gradient descent strategy, and the gradient direction learned by V_{tp} is formula (11):

$$\frac{\partial E_p}{\partial V_t(p)} = \frac{\partial E_p}{\partial T_{out}(p)} \frac{\partial T_{out}(p)}{\partial T_{in}(p)} \frac{\partial T_{in}(p)}{\partial V_t(p)}. \quad (11)$$

The activation function $f(x) = (1/1 + e^{-x})$ has properties as shown in formulas (12)–(14):

$$\frac{\partial f(x)}{\partial x} = f(x)(1 - f(x)), \quad (12)$$

$$\frac{\partial E_p}{\partial T_{out}(p)} = -(T_s - T_{out}(p)), \quad (13)$$

$$\frac{\partial T_{in}(p)}{\partial V_t(p)} = Mout_j(p). \quad (14)$$

According to the properties of the activation function, formula (15) can be obtained:

$$\frac{\partial E_p}{\partial V_t(p)} = Mout_j(p)T_s \times T_{out}(1 - p)^2. \quad (15)$$

The notation is introduced to obtain formula (16):

$$\lambda_{T(p)} = (T_s - T_{out}(p))T_{out}(p)(1 - T_{out}(p)). \quad (16)$$

Finally, formula (17) is obtained:

$$\frac{\partial E_p}{\partial V_t(p)} = -\lambda_{T(p)}Mout_j(p). \quad (17)$$

By updating the learning factor from the above formula, the correction relationship can be obtained with formula (18):

$$\eta_{2j}(p) = \eta_{2j}(p-1)(1 - \lambda_{T(p)}). \quad (18)$$

The weight ΔV_{tp} between the hidden layer and the output layer can be obtained by formula (19):

$$\Delta V_t(p) = \eta_{2j}\gamma_j\lambda_{T(p)}Mout_j(p). \quad (19)$$

Then, the revised and updated weight value is formula (20):

$$V_t(p) = V_t(p-1) + \Delta V_t(p). \quad (20)$$

In the same way, we can continue to update in reverse with similar calculation method and get C and D , with formulas (21) and (22):

$$\eta_{1j}(p) = \eta_{1j}(p-1)(1 - \lambda_{T(p)}), \quad (21)$$

$$W_{-T_{nj}}(p) = W_{-T_{nj}}(p-1) + \Delta W_{-T_{nj}}(p). \quad (22)$$

The last one is WT_{nj} probability distribution, so neural network is used to replace Gibbs to complete the parameter fitting process, and the LDA topic model is used to classify texts.

3.4. BP Neural Network. Because the stimulus function is intended to be used in the nonlinear data conversion of the BP neural network, the selection of the stimulus function directly affects the learning ability of the BP neural network. The commonly used excitation function is the sigmoid function. Because the expression is fixed, so are the grid position, slope, and image area. In order to improve the edge recognition effect of the BP neural network on the basis of traditional sigmoid function, this paper proposes a method of constructing completely consistent sigmoid function as the adjustment function of the BP neural network to the edge. The sigmoid function is also known as the logistic function. It is used for the output of hidden layer neurons. The value range is 0.1. It works better when the feature differences are more complex, or the differences are not particularly large. The advantage of sigmoid as an activation function is that it is smooth and easily distracting.

4. Research on College Students' Psychological State

4.1. Research on the General Situation of College Students' Emotion Recognition. With the development of society and the acceleration of the pace of life, the employment situation of students is becoming more and more severe; at the same time, the requirements of the information society for the quality of talents are gradually improving, and healthy psychology is an important prerequisite for cultivating talents in today's society. As an important human resource in the future society, students have healthy body and mind, healthy personality, and harmonious development, which is not only the need to successfully complete university studies but also the need to grow into qualified ability and participate in the future social construction. The following figure shows the general situation of recognizing students' emotions.

Figure 1 shows the overall score distribution of college students' emotion recognition ability. It can be seen from Figure 2 that the accuracy of college students' emotion recognition is normally distributed, and the accuracy is 64.407 compared to 19.405.27% of the subjects with the highest total score of emotion recognition are classified as high group of emotion recognition, and 27% of the subjects with the lowest total score are classified as low group of emotion recognition. The data of high and low groups are compared. The results are shown in Table 1. From Table 2, it can be seen that there are significant differences between the high and low groups of emotion recognition.

T-test uses the *T*-distribution theory to derive the probability of difference to compare whether the difference between two mean values is significant. It is second only to *t* test and chi-square test. *P* value is the probability of obtaining sample observation or more extreme results when the original hypothesis is true. If *P* value is small, the probability of the original hypothesis is very small.

The abscissa of Figure 2 indicates that the emotion recognition of college students is divided into high and low groups, and the differences between the two groups of data are compared, and then the weight content is calculated. The survey results show that 43.4% of the surveyed students are very interested in learning, 15.8% and 27.6% are very interested, 10.3% are not interested, 49.8% trust their work, and 18.9% distrust it. 1/3 of students often exchange learning experiences, and 8.8% of students never communicate with their classmates. 12.2% of the students had nursing experience due to mental health problems; 81.3% of the students want school psychological training courses.

4.2. Research on Emotion Prediction of College Students. Forty-five students were randomly selected from the whole school to recall happy experiences, and the other 40 students recalled sad experiences to arouse students' happiness and sadness. After a questionnaire survey, the subjects were asked to evaluate the probability that these 20 events would happen in the next six months (1 unlikely, 2 likely).

The results showed that M Happy Group = 17.78, SD = 2.56, and M Sad Group = 16.31, SD = 2.40, and the

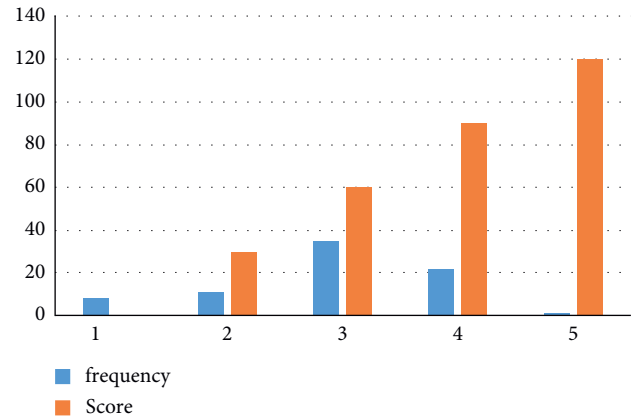


FIGURE 1: Overall score of college students' emotion recognition ability.

probability of negative events in M Happy Group = 12.98, SD = 2.61, and M Sad Group = 15.74, SD = 2.02. The interaction between emotional state and event type was significant (Figure 3): $F(1, 81) = 26.22, P < 0.001, \eta^2 = 0.25$. Correlation analysis showed that emotions (from very unhappy to very happy) were positively correlated with the probability of positive events ($r = 0.33, P < 0.01$) and negatively correlated with the probability of negative events ($r = -0.50, P < 0.001$). All these confirmed the influence of consistency in evaluating the possibility of future events among senior high school students. Therefore, this cognitive task can be used to support the authenticity of students' emotional experience reports.

4.3. Psychological State of Students of Different Grades. The survey results ($P < 0.05-0.001$; see Figure 4 for details) show that with the increase of school time, students' psychological state has undergone obvious changes. With the improvement of scores, the demand for psychology courses gradually decreased to the lowest level in junior year but rebounded to the highest level in senior year, forming a U-shaped curve, showing a significant positive correlation. The relationship between learning interest and self-confidence ($R = 0.97, P < 0$); Students' learning communication is the lowest in the second grade and then gradually increases. On the contrary, friendship showed an inverted U-shaped curve and was negatively correlated with learning interest and self-confidence ($R = -0.93 \sim 0.94, P < 0.001$).

The survey results in Figure 5 show that students majoring in soil and water conservation are more concerned about their psychological status, and they are willing to spend time communicating, taking psychological classes, or seeing psychologists, and the students in management have confidence in their psychological state. It is found that the students of agricultural college are obviously superior to those of agricultural college and economic college in humanities exchange, learning interest, and learning exchange. Agricultural college students not only have the lowest self-confidence but also have the highest proportion of

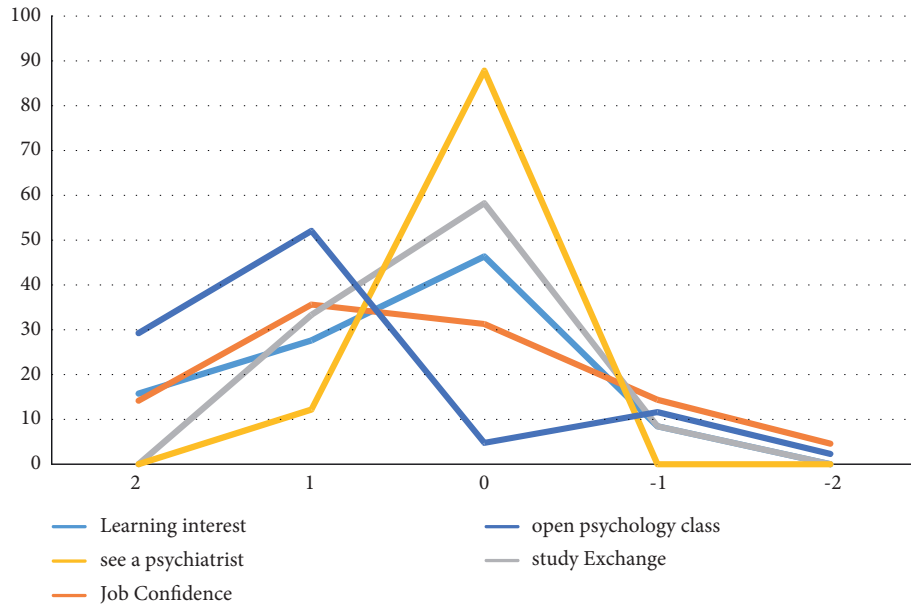


FIGURE 2: psychological state analysis chart.

TABLE 1: Grouping differences between high and low total scores of microexpression recognition of college students.

Quantity	Average	Standard deviation	Quantity	Average	Standard deviation	t
95	39.4	14.3	85	7.6	21	0

TABLE 2: Psychological state analysis table.

Stat. weight	2	1	0	-1	-2
Learn interest	15.75	27.63	46.35	8.45	1.83
Job confidence	14.16	35.62	31.28	14.38	4.57
Study exchange	0	33.33	58.22	8.45	0
See psychiatrist	0	12.21	87.79	0	0
Psychology	29.22	52.05	4.79	11.64	2.28

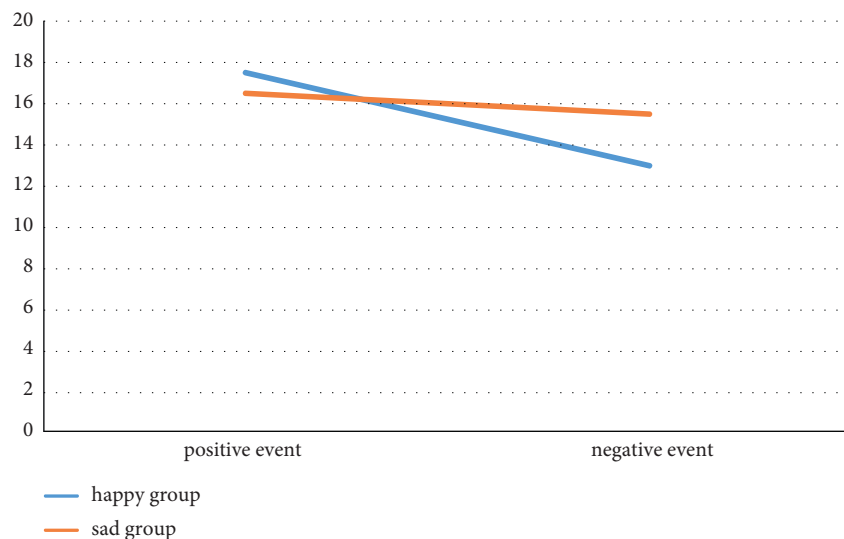


FIGURE 3: Emotion prediction of college students.

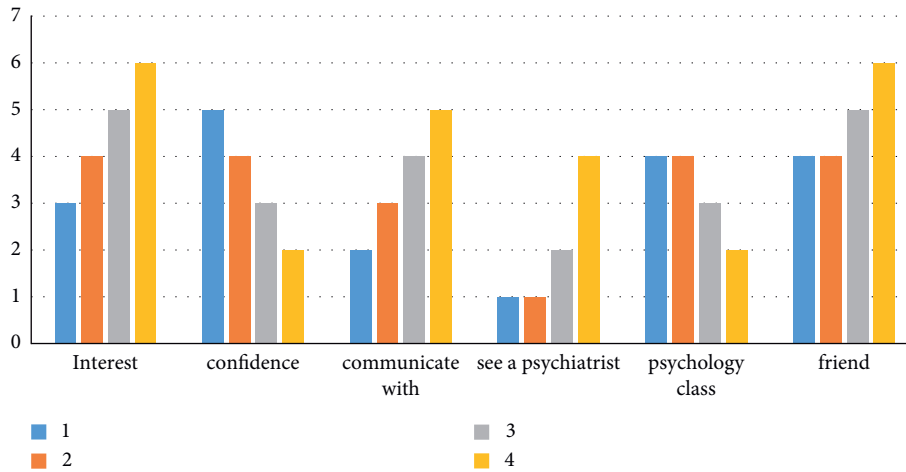


FIGURE 4: Psychological state of different grades.

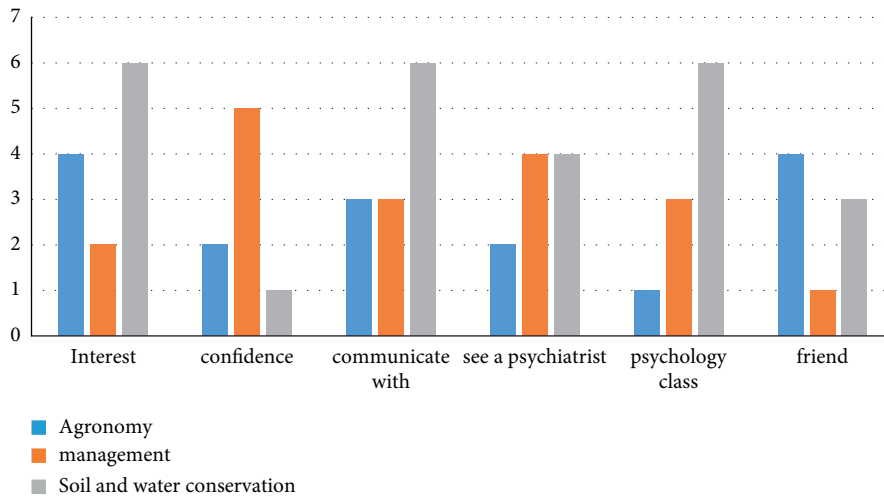


FIGURE 5: Psychological state of students of different majors.

psychologists, but they are more interested in psychology courses and have little demand.

4.4. Analysis of the Causes of Psychological Stress. The survey results (see Table 3 for details) show that 12.6% of students have unclear learning and life goals, 27.2% students have work pressure, 21.5% students have high learning pressure, 17.1% students have poor interpersonal relationship, 8.7% students are dissatisfied with teachers and schools (including their majors), 3.4% students have their own diseases, 1.8% students have emotional fluctuations, and only 2.7% students have no significant difference in the psychological state of carefree interpersonal relationship. In recent years, many researchers have used various methods to study students' mental health. The results show that the mental health status of Chinese students is not optimistic. Our results also show that there are some side effects and obstacles in students' psychological adaptation. Because middle school education focuses on college entrance examination, some students (especially girls) cannot find their life goals when they enter colleges and

TABLE 3: Factor stress of psychological stress of students of different genders.

Content	Men	Women	Total
Family poverty	10.2	1.53	5.02
Target unknown	9.09	14.89	12.56
Employment pressure	14.7	35.5	27.17
Interpersonal relationship	17.6	16.79	17.13
School responsibility	14.2	4.96	8.67
Other	4.55	5.73	5.25

universities, and they are confused and sad under the pressure of work. Especially for girls, discrimination is reflected not only in working life but also in the setting of life goals and the development of social responsibilities. Therefore, due to the lack of students with higher ideals, the number of boys who are confused after entering university has increased by 1.4 times. This is an important issue in university education. Therefore, college education should offer psychological training courses related to life according to students' real needs to meet students' psychological needs.

Some colleges and universities offer more courses for freshmen to curb the behavior of fresh graduates and increase the psychological burden of students' study. Although the original intention of this practice is good, it may not be scientific and wise, which needs careful consideration. There is a positive correlation between learning interest and self-confidence, and improving students' learning interest is an important direction of psychological education in universities. The research results of some researchers show that with the improvement of grades, students' fatigue and self-confidence also show a sharp declining trend, but universities themselves have adaptability.

5. Concluding Remarks

Through the comparison of algorithms and experiments, it can be concluded that students' psychological state will affect their academic achievements, and students should try their best to manage their psychological state, learn to know their emotional state, and ensure a good psychological state. Emotional management is very important for students because physical and mental health is very important. Students' academic performance is the most direct embodiment of its value, and emotional instability will naturally affect students' learning behavior and then affect their academic performance. Therefore, improving students' emotional leadership ability is helpful to maintain students' stable mental health. Students are not mature enough, and their emotions have a great influence on them. When students are in a positive emotional state, everything in their eyes is beautiful, and even leaders they usually do not want to obey become acceptable. Running a school is of no use to them when negative emotions arise because they are just immersed in their emotional experience at present. Therefore, helping students control their emotions and teaching them to express their feelings rationally is another important task for university teachers today. Emotional management is very important for students themselves and for universities. Schools and students should actively cooperate to improve students' ability to deal with emotions, especially their ability to regulate their emotions. Only in this way can we really help students develop themselves in many ways. At the same time, it helps to build a harmonious campus.

Due to the limited number of research samples, there are still many shortcomings in this paper. In future research, we will continue to keep the academic belief of striving for perfection and never ending and advance towards exploring the connotation of college students' emotional recognition and psychological state.

Data Availability

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

Conflicts of Interest

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

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