Journal of Computers Vol. 31 No. 3, 2020, pp. 226-241
doi:10.3966/199115992020063103018

# College Online Psychological Consultation Platform Based on Deep Learning

Xuejun Zhang*

School of Mechanical and Electrical Engineering, Rizhao Polytechnic, Rizhao, China
173042796@qq.com

Received 2 June 2019; Revised 10 August 2019; Accepted 6 January 2020

Abstract. In order to solve the psychological problems of college students more effectively, in this study, deep learning is applied to psychological counseling in colleges and universities. By designing an online psychological counseling platform, students' psychological counseling needs can be met without infringing on their privacy, thus solving psychological problems. All kinds of people living in modern society are facing heavy pressure and burden, which can easily lead to abnormal psychological and physical manifestations. When these abnormal manifestations reach a certain level, they will cause various diseases. For college students, as a special group, their body and psychology are still in the stage of development. Problems in life, study, social intercourse, love, employment and so on make many college students feel uncomfortable. Serious problems will also lead to psychological barriers and mental illness. Especially in recent years, there are more and more college dropouts, suicides and other incidents, and the number of students with psychological disorders is also increasing year by year. Domestic colleges and universities are fully aware of this, so relevant mental health classes are actively carried out and psychological counseling rooms are set up, hoping to help them. However, in fact, most students are reluctant to consult even if they have psychological problems, since they believe that they will reveal their privacy. At present, the existing online psychological consultation platform can only provide some simple solutions, and cannot give specific opinions. Deep learning in other areas of application, can help the platform to obtain more data and information, but there is not too much application in psychological consultation. Therefore, through the recognition of user's discourse description, the corresponding Restricted Boltzmann Machine (RBM) model is constructed in this study and deep learning is applied to the design of online psychological consultation platform in universities. The results show that the accuracy and privacy of the information obtained by the platform system can be guaranteed, and through the case data in the platform database, students' questions can be answered pertinently, which can effectively solve the psychological problems of college students. It is of great significance to promote the mental health of college students, and provides some ideas for colleges and universities to further improve the online psychological consultation platform.

Keywords: college students, deep belief networks, deep learning, online psychological counseling, RBM

## 1 Introduction

With the continuous development of society, people need to face more and more things, which invisibly causes varying degrees of pressure to people, resulting in a lot of psychological problems. As for the special group of college students, their body and psychology are still in the stage of development, and they cannot adjust themselves well. In addition, many problems, such as the inadaptability to enter universities at the beginning, the complication of interpersonal relationships, and the competitive pressure of graduation and employment, have troubled many college students, and some sensitive students will have many psychological problems, even psychological disorders and mental illness. This

* Corresponding Author

may affect students' school life, and even make them have uncooperative and isolated psychology, which will seriously affect and hinder their future development of life [1]. Even so, they either complain to their friends around them or endure it silently, thinking that there would be no problem, but this is not the case.

Many colleges and universities are also aware of this point. They have set up psychological counselling rooms and mental health courses in colleges and universities, expecting to give college students some psychological guidance and correct understanding of psychological problems so as to achieve self-regulation. But this measure does not seem to play its due role, just hope to do some simple psychological tests, find the crowd with more serious problems, and then make targeted education. Many of the psychological problems of college students are just lack of self-confidence, interpersonal communication and environmental adaptability and they need more reasonable suggestions. Students with more serious problems may be more reluctant to communicate with others about their psychological problems. They are afraid to be regarded as "problematic students" by others. They are afraid to reveal their privacy when they seek help from psychological counselling teachers, and they cannot find effective solutions. Therefore, the design of online psychological consultation platform has become a new measure of mental health education in colleges and universities.

With the continuous development of computer technology, machine learning has become an important tool in many fields, and deep learning technology has also been widely concerned by researchers, especially in computer vision, speech recognition, and natural language processing, and has been praised by many enterprises. However, deep learning technology has rarely been applied to the field of education, especially in the field of psychological counseling in Colleges and universities [2].

The emergence of online psychological counselling platform also provides new channels for many students to talk and solve problems. How to make full use of online psychological counselling platform and how to solve the problems in counselling and treatment scientifically and effectively have become the focus of discussion and research in universities and academia. Moreover, the application of deep learning technology in psychological counseling is less, and it is hoped that the advantages of deep learning can be utilized to provide help for more college students. Therefore, deep learning is applied to the design of online psychological counselling platform in colleges and universities, and corresponding models are built through the recognition of user discourse description. Intelligent assistant diagnosis system is also used for diagnosis and analysis, and final opinions are given according to data and data in the database, so that it can effectively help students solve psychological problems and maintain them on the basis of protecting users' privacy and main the healthy development of psychology.

## 2 Literature Review

### 2.1 A Summary of Students' Mental Health

Students' physical and mental development has always been the focus of attention of society and schools, so how to effectively solve students' mental health problems has become the focus of many scholars. E.G. Williamson first proposed the term consultation in the 1930s. By the end of the 19th century, psychology became an independent discipline, which laid a theoretical foundation for the emergence of psychological consultation. Bruffaerts, Mortier, and Kiekens (2017) studied the relationship between college students' mental health problems and their academic achievements to understand the extent of college students' mental health problems [3]. Cheng (2017) gave corresponding suggestions from three aspects: society, students and universities, hoping to help college students solve their corresponding psychological problems [4]. Tang and Mao (2017) strengthened the responsibilities of college counselors by making rational use of existing ethical norms, and finally optimized online psychological counseling [5]. Zhang and Xu (2017) studied the problems of students at the university stage, and put forward the strategies to construct the defense system of students' mental health problems, so as to ensure the development of students' physical and mental health [6].

### 2.2 A Summary of the Application of Deep Learning

With the deepening of the study of artificial neural networks, deep learning has gradually become the focus of scholars' research, and has also been applied in many fields. Luo et al. (2017) proposed a short-term traffic flow forecasting method based on deep learning, aiming at the situation that the existing

forecasting methods cannot completely predict traffic flow. Through the actual data test, it is proved that the forecasting model based on deep learning has higher forecasting accuracy than the traditional forecasting magic core, and the accuracy is improved by 18.01%, which is an effective forecasting method [7]. Wang et al. (2018) applied deep learning to image processing in the field of unmanned driving. The results show that there is a breakthrough in the research of image processing, and it has a good application in the field of unmanned driving vehicles [8]. Zhang et al. (2018) pointed out the importance of deep learning technology by understanding the latest research progress of deep learning technology, and prospected its future research direction [9].

In the 1940s, the idea of "voiceprint" promoted the development of automatic speaker recognition, which gradually became the focus of scholars' research [10]. Liu and Li (2018) summarized the influence of artificial intelligence technology based on deep learning on education through comparative analysis of different models of deep learning, and pointed out that online teaching and other technologies will become the future direction of development [11]. Duan (2017) applied the face recognition technology of deep learning in the field of security. The results show that the recognition accuracy, contrast accuracy and recognition speed have made breakthroughs, and can be transformed into a variety of products and systems to meet customer needs [12].

Deng et al. (2018) pointed out that chat robots have received widespread attention in academia and industry, and chat robots are becoming more and more intelligent, especially in the application of campus psychological counseling scenarios, can achieve better matching effect [13]. Based on the information intelligent service of the smart campus, Liu (2018) used the data with category labels to conduct supervised learning, and established a deep learning model, so as to realize the information intelligent recommendation and service for specific users [14].

In summary, deep learning technology is widely used in the field of technology, but less in the field of education, especially in the field of psychological counseling. Therefore, deep learning is applied to the research of online psychological counseling platform in colleges and universities, aiming to help college students solve mental health problems more pertinently, so as to make them have more time and energy to do other things.

## 3 Research Methodology

### 3.1 College Students' Psychological Problems and Counselling

Psychological problem refers to a series of problems caused by the central nervous system of the human brain, which indirectly changes people's personality, world outlook and emotions. This is also known as "psychological imbalance", such as depression, bad mood, anxiety, fear, personality disorders, abnormal psychology and other negative and bad psychology. With the continuous development of society, social problems are increasing day by day, which also brings great pressure to people's life and work. According to an online survey data, nearly two-thirds of 1 million employees feel great pressure, focusing on police, volunteers, senior managers and other groups, among whom insomnia, memory loss, anxiety and depression are symptoms due to high stress. Many people find it difficult to adjust their thoughts and behaviors and have fewer chances to vent [15]. Moreover, due to the imperfection of various systems and mechanisms and the unfairness of many social resources, some people are prone to psychological imbalance in comparison. In addition, with the development of modern network technology, a large number of unfair information spreads rapidly. Over time, people accept more and more negative moral emotions, which is prone to psychological problems and social contradictions, and even endanger social order and security.

Especially for the special group of college students, when they first enter the university, the adaptation to new life and new environment easily makes them have a certain psychological burden; and when they are sophomores and juniors, the pressure of study and interpersonal relationship is particularly prominent; by the senior stage, the competition of graduate employment has become the mainstream. Psychological problems caused by these pressures are very common. Some data show that the number of professional counselling teachers in Chinese universities is only a single digit, and the ratio of them to students is 1:10000, while the number of counselling teachers and students in foreign universities is about 1:400. It can be seen that there are some deficiencies in the proportion of counselling teachers in Chinese universities, which also affects the further development of psychological health education in universities

[16]. Secondly, personal privacy will be involved in the process of psychological counselling, which makes many people unwilling to go to the doctor for fear of being recognized as people having problems. Therefore, some people will choose to complain with their friends or get some information silently through the network, books and so on, which is not conducive to the solution of the problem.

The first reason is that colleges and universities pay less attention to students' psychological problems, invest less in this part of the funds, and lack professional psychological counselling teachers. Secondly, in the process of psychological counselling, students' personal privacy cannot be well protected. Considering that besides their own psychological problems, they may also suffer from the different eyes of others around them. They prefer to bear the serious consequences of psychological problems rather than face them, and they are reluctant to ask for help from teachers. Some introverted students are unwilling to easily tell others about their difficulties, so they are unwilling to do one-to-one or face-to-face psychological counselling. With the increasing prominence of college students' psychological problems, it has a negative impact on families, schools and society. Therefore, in the following period of time, the Ministry of Education and major universities have increased the education of students' mental health. On the one hand, extensively carry out public welfare lectures on mental health and related courses, such as "Love Psychology" courses. On the other hand, vigorously develop and establish psychological counselling website. However, due to the inadequate consultation system of the website, the relevant cases and knowledge system cannot be updated in time, so that students think that this online psychological consultation platform is like their own Baidu or access to relevant books. Therefore, many simple online psychological consultation websites have become furnishings [17-18].

Based on this situation, many scholars have made further research on online psychological counselling platform, such as the use of intelligent university network psychological counselling interactive system for research and the use of data ideas to improve the system, but due to the short exploration time, there are still some shortcomings.

During the study of psychological counselling, it is found that people's psychological state can be divided into two categories, normal and abnormal, as shown in Fig. 1 [19-21]. Normal mental state can also be divided into healthy and unhealthy. For unhealthy normal mental state, it can be divided into general psychological problems, serious psychological problems and neurosis. Among them, general and serious psychological problems belong to the category of psychological counselling. But in people's view, if a person receives psychological treatment actively or passively, he will be recognized having some mental problems. Patients may not choose to go to the doctor in this case. However, some patients with psycho-neurological or psychiatric disorders cannot achieve the desired results only through psychological counselling, and must be assisted by drugs and professional psychotherapy in order to achieve a certain effect. Therefore, those who need psychological counselling are normal people, just because of personal ideals and practical problems in daily life, their own personality and social problems, or serious depression or anxiety.

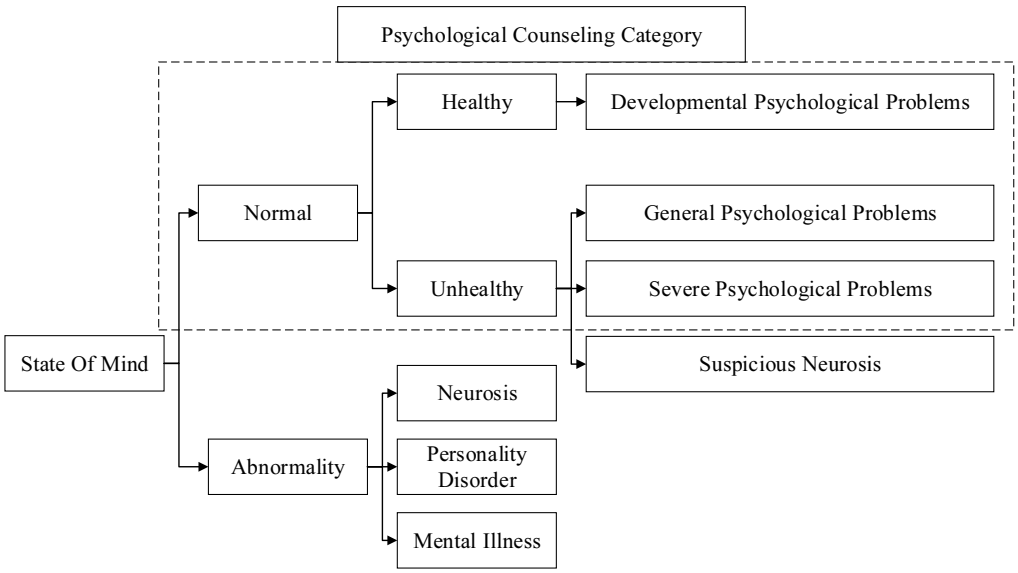


**Fig. 1.** Classification of mental state and category of psychological counselling

Mental health problems are closely related to their own health and social development. As shown in Fig. 2, especially for college students who are still in the period of physical and mental development, mental health is very important.

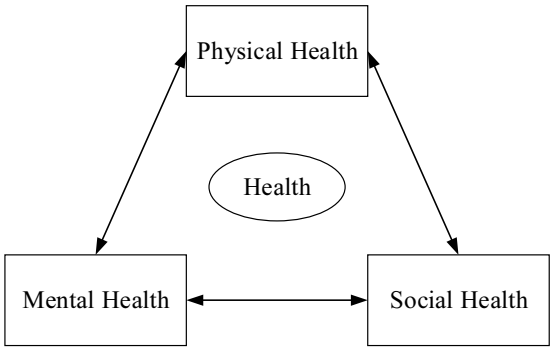


**Fig. 2.** Healthy three-dimensional structure

### 3.2 Deep Learning

Deep learning is developed from traditional artificial neural networks, and has a wide range of applications and development prospects. Among them, multi-layer perceptron with multi-hidden layer is a kind of deep learning, which combines the underlying features to form more abstract high-level attribute categories or features to discover the distributed feature representation of data. Deep learning is a new field in machine learning. It is to build and simulate the neural network of human brain for analysis and learning, and to imitate the operation mechanism of human brain to further interpret data, such as voice, image and text. It is precisely because of the high recognition and better interpretation of visual speech by deep learning that it has become a popular tool in many fields [22-24].

There are many types of deep learning, and different structure of network training methods are also different, but its basic node and basic composition is the same. Deep learning network is a complex multi-layer network structure. Restricted Boltzmann Machine (RBM) is chosen to construct it. It is composed of hidden layer and visual layer. There is no connection between hidden layers and between visual layers. There is a certain relationship between visible layer and hidden layer [25-27], and its model is shown in Fig. 3.

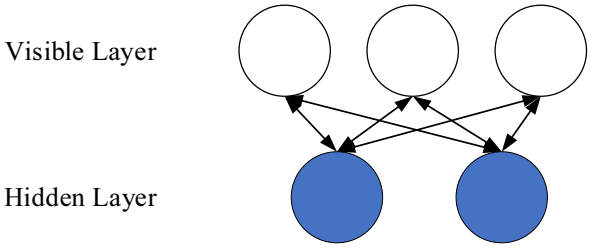


**Fig. 3.** RBM model

$$E(v,h) = -v^T Wh - a^T v - b^T h = -\sum_{i=1}^{V}\sum_{j=1}^{H} W_{ij} v_i h_j - \sum_{i=1}^{V} a_i v_i - \sum_{j=1}^{H} b_j h_j \quad \textbf{(1)}$$

In Formula (1), $v_i$ and $h_j$ represent the ith node state of the visible layer and the jth node state of the hidden layer, respectively. $W_{ij}$ represents the link weight of the ith node of the visible layer and the jth node of the hidden layer. $a_i$ and $b_j$ are the offset of the nodes of the visible layer and the hidden layer, respectively. The joint probability distribution of visible layer v and hidden layer h is as follows:

$$p(v,h) = \frac{1}{z}\exp\left(-E(v,h)\right) \quad \textbf{(2)}$$

Z is an allocation function, which can be calculated by allocating energy to all hidden layer elements and visible layer elements.

$$Z = \sum_{v}\sum_{h}\exp\left(-E\left(v,h\right)\right) \tag{3}$$

Therefore, the conditional probability and the marginal probability distribution function can be obtained from joint distribution.

$$p\left(v\right) = \frac{\sum_{h} e^{-E(v,h)}}{\sum_{v,h} e^{-E(v,h)}} \tag{4}$$

$$p\left(h\right) = \frac{\sum_{v} e^{-E(v,h)}}{\sum_{v,h} e^{-E(v,h)}} \tag{5}$$

$$p\left(v/h\right) = \frac{e^{-E(v,h)}}{\sum_{v} e^{-E(v,h)}} \tag{6}$$

$$p\left(h/v\right) = \frac{e^{-E(v,h)}}{\sum_{h} e^{-E(v,h)}} \tag{7}$$

Updating formulas of weight parameters between hidden layer and visible layer can be obtained from the above formulas.

$$\Delta w_{ij} = \varepsilon\left(\left\langle v_i\, h_j\right\rangle_{data} - \left\langle v_i\, h_j\right\rangle_{model}\right) \tag{8}$$

$\varepsilon$ is the updating learning rate of the model and it is generally valued 0.0002, $\left\langle v_i\, h_j\right\rangle_{data}$ is the average statistics of the distribution of the input data, and $\left\langle v_i\, h_j\right\rangle_{model}$ represents the actual situation of the model.

In practical application, there are many continuous signal inputs, such as image data, voice features and so on, which need to be improved on the basis of the basic RBM. As a result, the Gauss-Gauss RBM model is used, that is to say, both the state of the visual layer node and the state of the hidden layer node need the Gauss distribution, whose energy function is expressed as:

$$E\left(v,h\right) = \sum_{j\in vis}\frac{\left(v_i - a_i\right)}{2\sigma_i^2} - \sum_{j\in hid} b_j h_j - \sum_{i,j}\frac{v_i}{\sigma} h_j w_{ij} \tag{9}$$

$$E\left(v,h\right) = \sum_{i\in vis}\frac{\left(v_i - a_i\right)}{2\sigma_i^2} - \sum_{j\in hid}\frac{\left(h_j - b_j\right)^2}{2\sigma_i^2} - \sum_{i,j}\frac{v_i}{\sigma_i}\frac{h_j}{\sigma_j} h_j w_{ij} \tag{10}$$

Deep Belief Networks (DBN) is a model with multiple hidden layers. In the structure, the output of each layer will become the input of the upper layer, and the upper layer will further capture its characteristics. It is the superposition of several restricted Boltzmann machines. In other words, the structure contains one visual layer and multiple hidden layers, and the layers have connection relations, but there is no association between different elements, as shown in Fig. 4:

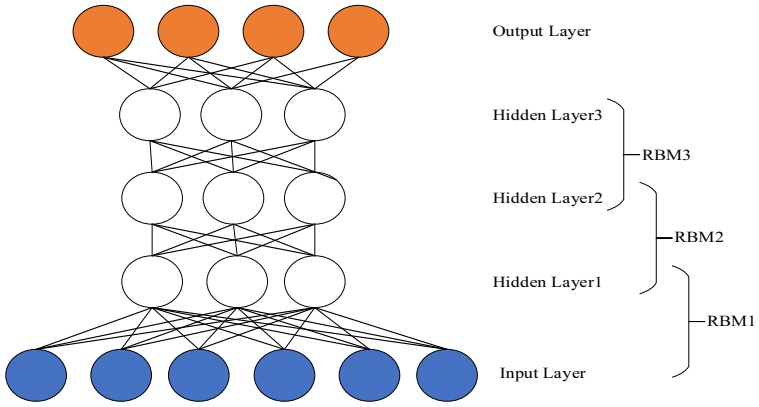


**Fig. 4.** Structural model diagram of DBN

By combining supervised learning with unsupervised learning, DBN can accurately acquire learning data, avoid falling into local optimum, and obtain high quality non-linear representation. User's voice contains a variety of complex signals, and DBN can be used to achieve multiple iterations. Mel Frequency Cepstrum Coefficient (MFCC) [28] is used to obtain effective feature information from voice data. MFCC is a kind of coefficient which is simulated according to the non-linear characteristics of human auditory system. It can reflect human auditory system well and has stronger recognition ability. Moreover, because MFCC has good anti-noise ability, it can extract potential information in speech more conveniently. The process of extracting information is shown in Fig. 5.

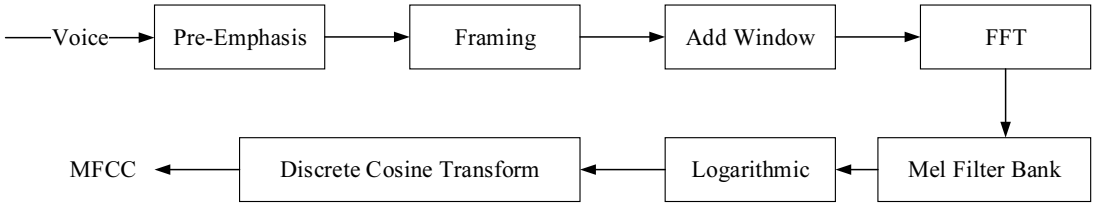


**Fig. 5.** MFCC extraction process

The MFCC coefficients can be transformed into complete data after cosine transformation. The formulas are as follows:

$$MFCC_i = \sqrt{\left(\frac{2}{N}\right)\sum_{i=1}^{L}\left\{\log\left[m(l)\right]\cos\left[\left(l-\frac{1}{2}\right)\frac{i\pi}{L}\right]\right\}} \tag{11}$$

### 3.3 Online Psychological Consultation Platform in Colleges and Universities

In many colleges and universities, in order to better serve students and enable students to face up to their mental health problems, so as to ensure the normal and orderly work of the school, many colleges and universities have developed and designed online psychological counseling platform. College students use the Internet more widely on campus. It is a way for them to acquire the knowledge they need from the internet. Especially for the more private things, they are more willing to solve through the internet. Therefore, when they have mental health problems, they also have a strong sense of trust in the Internet psychological counseling, which helps them to open their hearts and talk about their problems. And there are many professional psychological counseling teachers in the online psychological counseling platform of colleges and universities to help students solve the corresponding problems [29-30]. However, China's mental health education has not received enough attention from universities, making the online psychological consultation platform in the relevant knowledge system imperfect and fewer professional psychological consultation teachers. As a result, online psychological consultation platform has become a decoration to a certain extent [31-32].

In this context, the number of college students with mental health problems is increasing, crime, suicide and other phenomena emerge in an endless stream, which shows that the level of mental health of college students is declining. Even though some students are aware of their mental health problems, they refuse to communicate with professional mental health teachers because of respect obstacles. Similar cases have not been found in the online psychological consultation platform of colleges and universities, and the problems cannot be solved, which makes the psychological problems more and more serious. Therefore, in this situation, the improvement of online psychological counseling in colleges and universities has become an important work for colleges and universities to continue to carry out mental health education. The research framework of this study is shown in Fig. 6.

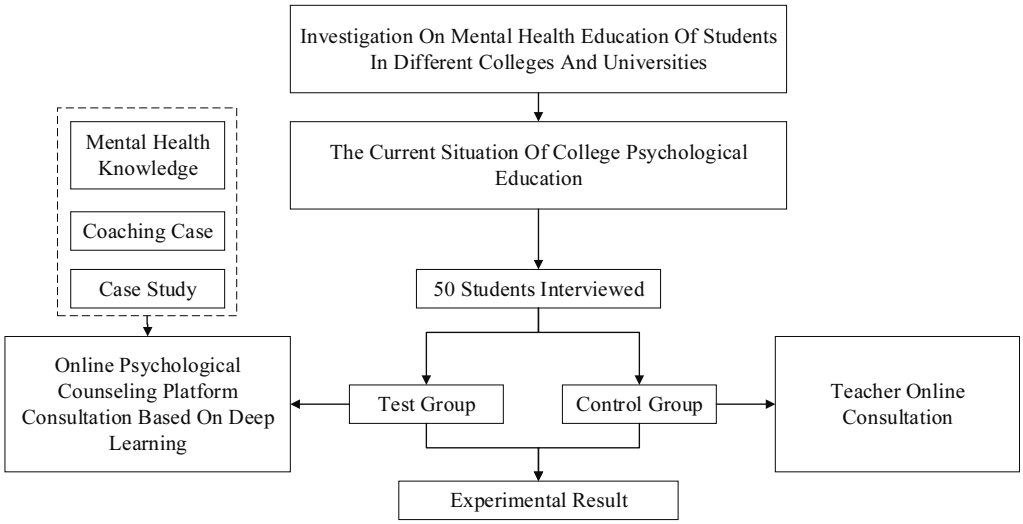


**Fig. 6.** Research framework

## 4 Results and Discussion

### 4.1 Experimental Design and Environment

The introduction of deep learning into online psychological consultation platform in colleges and universities is to improve the use of consultation platform, hoping to really help college students solve psychological problems. In order to achieve global optimization, it is supposed to use greedy algorithm to optimize the whole network layer by layer.

Firstly, the RBM of each layer is trained to get the initial parameters of the network, and then the network parameters are fine-tuned in accordance with relevant information. At this time, the RBM of each layer has multiple nodes, which means that the parameters of the model are trained by the results of unsupervised learning. The training process is shown in Fig. 7.

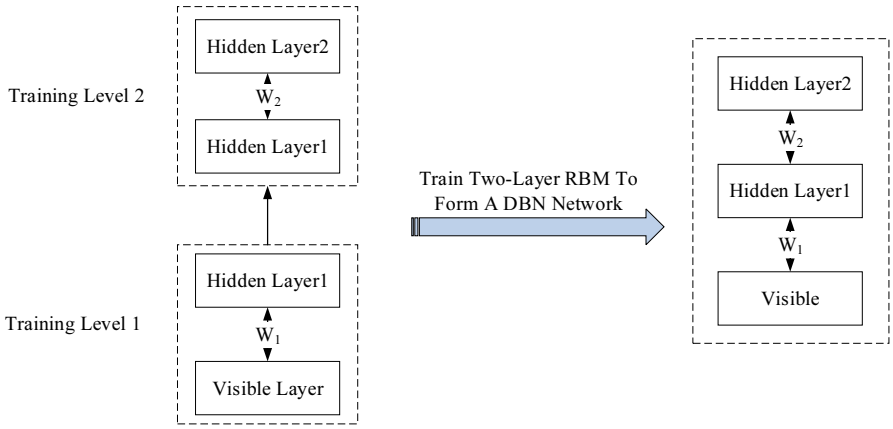


**Fig. 7.** DBN network training chart

Secondly, the voice used for consulting students is pre-processed, and then the feature parameters of the voice are obtained. Then, the vector quantization (VQ) model is used to train and recognize, and the feature map of MFCC is obtained. The user's voice is unstable, and it is vulnerable to many factors. The parameters of MFCC also contain a lot of information of the user. By improving the performance of the system, high-quality information features are extracted to improve the recognition rate of the system.

Finally, the identified data are applied to the online psychological counseling platform of colleges and universities. When users use the online counseling platform, they can get relevant information from their discourse, and give suggestions through the cases and related knowledge in the background database. They can also connect to professional counselors in related problem areas to help them solve problems.

Moreover, it is pointed out in many literatures that deep learning technology has good performance in speech feature extraction. Because speech signal has short-term stationary property, its acoustic characteristics remain relatively stable in a short time (10-30ms), so most speech recognition systems now use short-term spectrum features as acoustic characteristics. MFCC is also used for recognition. However, due to the phenomenon of "co-pronunciation" in the process of speech formation, that is, the current speech will be affected by the adjacent sound, and there will be abundant connotation information in the speech, it is necessary to combine the adjacent short-term features of successive frames to obtain long-term features, so as to get the original input of the network.

After recognition, the correct rate of words and sentences is over 87% and 60%, and the correct rate of the MFCC feature extraction based on deep learning is 4.54% higher than that of the traditional MFCC feature extraction. Thus, deep learning technology has good performance in acoustic characteristics and speech information extraction.

### 4.2 Dataset Collections and Data Pre-processing

The results of an anonymous questionnaire survey of 10400 college students are analyzed, and Fig. 8 and Fig. 9 are obtained.

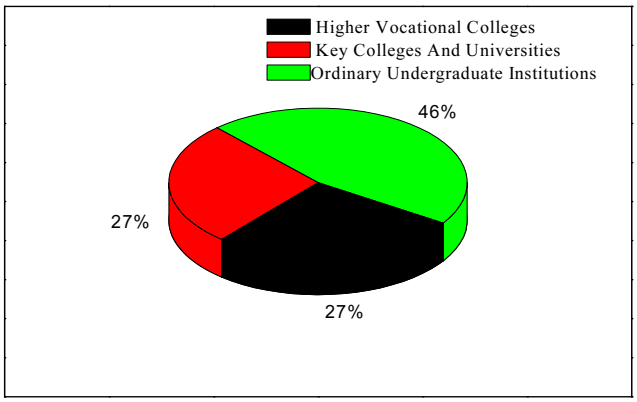


**Fig. 8.** Types of colleges and universities surveyed

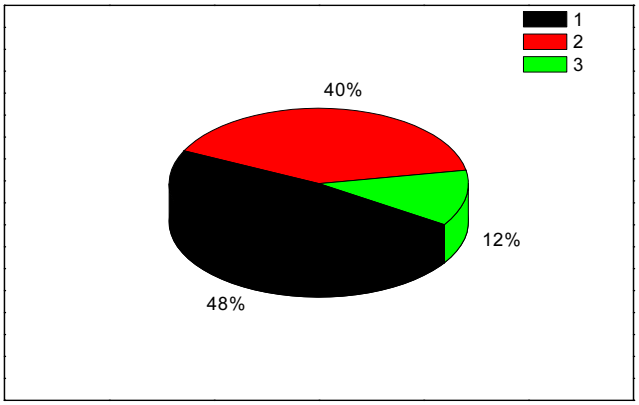


**Fig. 9.** Data on students' views on mental health

1 said that the proportion of people who think "people's psychological problems are serious in the society now"; 2 indicated that the proportion of people who think "it is unclear"; 3 suggested that the proportion of people who think "it is not serious". Of these students, 74% said it was not convenient to get psychological counselling services. The contents of mental health education that college students care about are understood (Fig. 10).

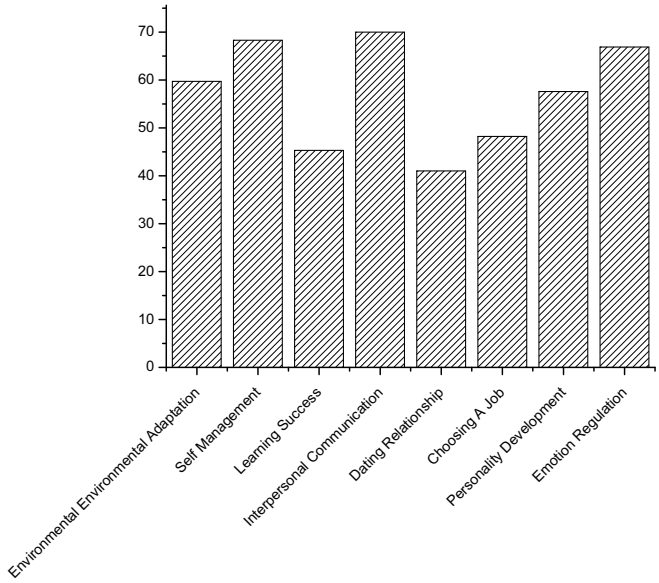


**Fig. 10.** Students' interest in different contents of mental health education (%)

The above data show that some college students have a vague understanding of mental health problems, and many students who know the mental health status clearly need a variety of mental health education content, but the satisfaction angle is low. Only 35.6% of the students are satisfied, 57.6% of the students are generally satisfied, and 6.8% of the students are unsatisfied. Secondly, the recognition of the professional ability of mental health teachers' memory counsellors is low; thirdly, in the process of experiential psychological counselling, their experience is poor; fourthly, many lectures, courses or extracurricular activities on mental health carried out by schools are full of gimmicks, but in the actual implementation process, they have not given enough attention, and teachers, counsellor, or head teacher are not enough. Counsellors or head teachers do not know enough about these courses or activities.

However, on the whole, college students are very approving of mental health education. Nearly 84.0% of the students think it is necessary to receive mental health education. About 70% of college students hope to improve interpersonal communication, self-management and emotional regulation. More than half of them hope to get help in environmental adaptation and personality development. More than 40% of students hope to get guidance in job hunting, learning and dating. It can be seen that mental health education plays an important role in college students' daily life and growth process. Therefore, it is necessary to improve the online psychological consultation platform to improve the satisfaction of college students with information health education, and to solve college students' mental health problems in a timely and effective manner, so as to ensure the healthy and normal operation of college things.

50 students are found through questionnaires for research. After questioning, they are given psychological tests, and the data in Table 1 are obtained.

**Table 1.** Assessment of the students interviewed

| No. | Situation | Score | No. | Situation | Score |
|---|---|---|---|---|---|
| 1 | Physical factors | 8 | 7 | Impulsion | 11 |
| 2 | Anxiety | 10 | 8 | Social withdrawal | 18 |
| 3 | Inferiority | 17 | 9 | Sex psychology | 12 |
| 4 | Depression | 10 | 10 | Social attack | 10 |
| 5 | Paranoia | 11 | 11 | Dependence | 9 |
| 6 | Social withdrawal | 17 | 12 | Psychiatric tendency | 9 |

The 50 students' age and grade distribution are fairly uniform, of which 15 do on-line help-seeking by teachers and 35 do the psychological platform of deep learning. Through comparative analysis, the research is carried out.

### 4.3 Performance Evaluation and Discussion

Through the study on the effect of psychological counselling of two groups of students, the following results are obtained, as shown in Table 2.

**Table 2.** Statistical table of psychological counselling effectiveness

| Content of investigation | Teachers' online consultation | Online psychological consultation platform for deep learning |
|---|---|---|
| Is psychological counseling helpful to your psychological problems? | Very agree (20); agree (11); general (5); disagreement (0) | Very agree (40); agree (9); general (1); disagreement (0) |
| Does this psychological counseling effectively reduce psychological symptoms? | Very agree (37); agree (10); general (1); disagree (0) | Very agree (44); agree (5); general (1); disagreement (0) |
| Have you improved your outlook on life after receiving this kind of counseling? | Very agree (39); agree (5); general (4); disagree (0) | Very agree (46); agree (3); general (1); disagreement (0) |

Table 2 shows that the overall effect of online counseling by teachers is lower than that of online psychological counseling platform of students who use deep learning, and the satisfaction of students who use online psychological counseling platform of deep learning is higher. It can be seen that this way of psychological counseling can more effectively solve students' mental health problems.

And through interviewing 35 students who use the online psychological counseling platform of deep learning, we get their satisfaction data of this kind of counseling method as shown in Fig. 11.

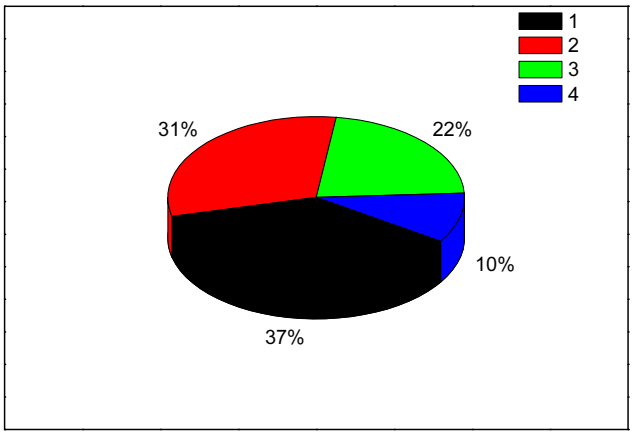


**Fig. 11.** Satisfaction data of college online psychological consultation platform based on deep learning

1 means that the privacy of users is well protected, 2 means that they can find problems and solutions similar to their own problems, 3 means that the content can be updated in time, 4 means that they will continue to use the platform and recommend it to friends.

The 35 students also indicated that they could get more accurate analysis and corresponding results by voice explaining their own problems, and the reaction speed was faster. Therefore, they are more satisfied with this consulting platform for deep learning, and hope to continue to promote it.

In summary, the online psychological counselling platform can effectively help students to analyze the problems they encounter, provide similar solutions, and effectively alleviate the psychological problems of students. The speech recognition analysis function can help them to further understand their problems, and has a higher accuracy, and improve the use satisfaction.

## 5 Conclusion

Through the investigation of traditional psychological consulting rooms and teachers' online consulting methods, it is found that most students cannot recognize these forms because they cannot guarantee students' privacy, are afraid of face-to-face communication, and cannot get the solutions they want, which also makes students' mental health problems more serious to a certain extent. As a result, the deep learning technology is used to improve the online psychological counseling platform, and 50 students are divided into two groups. One group uses online counseling by teachers, and the other group uses online psychological counseling platform of deep learning technology for counseling. Finally, through the follow-up visits, students' satisfaction with psychological health counselling is obtained, thus judging the reliability and accuracy of online psychological counseling platform based on deep learning. However, there are fewer samples in the research process, which will affect the accuracy to a certain extent. Therefore, in the future work, the sample size will be expanded to improve the reliability and accuracy of the new consultation method. Deep learning technology is applied to improve the online psychological counseling platform in Colleges and universities, so that the problems faced by students can be profoundly analysed. In a word, it is expected that the research provides better tools for psychological health education in Colleges and universities, and provide some ideas for the establishment of other online counseling platform.

## References

[1] J. Gartner, D.B. Larson, G.D. Allen, Religious commitment and mental health: a review of the empirical literature, Journal of Psychology & Theology 19(1)(2018) 6-25.

[2] Y. Chen, Z. Lin, X. Zhao, G. Wang, Y. Gu, Deep learning-based classification of hyperspectral data, IEEE Journal of Selected Topics in Applied Earth Observations & Remote Sensing 7(6)(2017) 2094-2107.

[3] R. Bruffaerts, P. Mortier, G. Kiekens, Mental health problems in college freshmen: prevalence and academic functioning. Journal of Affective Disorders 225(2017) 97.

[4] J.P. Cheng, Psychological health problems and countermeasures of contemporary college students, Journal of Changsha Aeronautical Vocational And Technical College 17(1)(2017) 1-3.

[5] B. Zhang, X.H. Xu, An analysis of the strategies for the overall construction of the prevention system of mental health problems among college students, China External Education 21(2017) 5-5.

[6] X.L. Luo, Q.Q. Jiao, L.Y. Niu, Short-term traffic flow prediction based on deep learning, Computer Application Research 34(1)(2017) 91-93.

[7] K.J. Wang, Y.D. Zhao, X.L. Xing, Research progress of the application of deep learning in the field of driverless cars, Journal of Intelligent Systems 13(01)(2018) 55-69.

[8] J.Y. Zhang, H.L. Wang, Y. Guo, Research review on deep learning, Computer Application Research 321(7)(2018) 7-14+22.

[9] Anonymous, Research on the application of deep learning technology in the construction of smart campus, Micro Computer Application 34(12)(2018) 134-136+146.

[10] Y. Liu, Q. Li, C.B. Yu, Application of deep learning technology in education: current situation and prospects, Open Education Research 23(5)(2017) 113-120.

[11] Y.K. Duan, Application of face recognition technology based on deep learning in security field, China Security 11(2017) 72-74.

[12] S. Deng, L. Huang, G. Xu, On deep learning for trust-aware recommendations in social networks, IEEE transactions on neural networks and learning systems 28(5)(2018) 1164-1177.

[13] R.A. Okumu, M. Muiva, M. Wagoro, Association between Socioeconomic and psychological experiences of parents with children on leukemia treatment in Kenyatta National Hospital, Kenya, Asia Pac J Oncol Nurs 4(1)(2017) 38-44.

[14] J. Liu, A. Shahroudy, D. Xu, Skeleton-based action recognition using spatio-temporal LSTM network with trust gates, IEEE Transactions on Pattern Analysis and Machine Intelligence 40(12)(2018) 3007-3021.

[15] L. Zhang, T. Luo, F. Zhang, A recommendation model based on deep neural network, IEEE Access 6(2018) 9454-9463.

[16] N. Shone, T.N. Ngoc, V.D. Phai, A deep learning approach to network intrusion detection, IEEE Transactions on Emerging Topics in Computational Intelligence 2(1)(2018) 41-50.

[17] M. Kahng, P.Y. Andrews, A. Kalro, Activis: Visual exploration of industry-scale deep neural network models, IEEE Transactions on Visualization and Computer Graphics 24(1)(2019) 88-97.

[18] Y. Shen, N.C. Harris, S. Skirlo, Deep learning with coherent nanophotonic circuits, Nature Photonics 11(7)(2017) 441.

[19] J.B. Heaton, N.G. Polson, J.H. Witte, Deep learning for finance: deep portfolios, Applied Stochastic Models in Business and Industry 33(1)(2017) 3-12.

[20] B. Shickel, P.J. Tighe, A. Bihorac, Deep EHR: a survey of recent advances in deep learning techniques for electronic health record (EHR) analysis, IEEE Journal of Biomedical and Health Informatics 22(5)(2018) 1589-1604.

[21] T. O'Shea, J. Hoydis, An introduction to deep learning for the physical layer, IEEE Transactions on Cognitive Communications and Networking 3(4)(2017) 563-575.

[22] L. He, K. Ota, M. Dong, Learning IoT in edge: deep learning for the Internet of things with edge computing. IEEE Network 32(1)(2018) 96-101.

[23] T.Y. Wong, N.M. Bressler, Artificial intelligence with deep learning technology looks into diabetic retinopathy screening, The Journal of the American Medical Association 316(22)(2016) 2366-2367.

[24] Greenspan, Hayit, B. Van Ginneken, R.M. Summers, Guest editorial deep learning in medical imaging: overview and future promise of an exciting new technique, IEEE Transactions on Medical Imaging 35(5)(2016) 1153-1159.

[25] Wen, K. Chao, S. Wan-Ting, J. Shi, Deep learning for massive MIMO CSI feedback, IEEE Wireless Communications Letters 7(5)(2018) 748-751.

[26] Z.X. Li, Efficacy of a deep learning system for detecting glaucomatous optic neuropathy based on color fundus photographs, Ophthalmology 125(8)(2018) 1199-1206.

[27] L.H. Ngo, Using a deep learning network to diagnose congestive heart failure, Radiology 290(2)(2019) 523-524. DOI: 10.1148/radiol.2018182341.

[28] H.T. He, Deep learning-based channel estimation for beamspace mmWave massive MIMO systems, IEEE Wireless Communications Letters 7(5)(2018) 852-855.

[29] P. Xia, J. Hu, Y. Peng, EMG-based estimation of limb movement using deep learning with recurrent convolutional neural networks, Artificial organs 42(5)(2018) E67-E77.

[30] L.L. Qin, N.W. Yu, D.H. Zhao, Applying the convolutional neural network deep learning technology to behavioural recognition in intelligent video, Tehnicki Vjesnik 25(2)(2018) 528-535. DOI:10.17559/TV-20171229024444.

[31] F.M. Deng, Compressive strength prediction of recycled concrete based on deep learning, Construction and Building Materials 175(2018) 562-569.

[32] R.C. Mayo, J. Leung, Artificial intelligence and deep learning–Radiology's next frontier? Clinical Imaging 49(2018) 87-88.

## Appendix: Questionnaire on Psychological Counseling Ways and Effectiveness

Hello! We are conducting a survey on the ways and effects of psychological counseling to find out how you can solve some mental health problems. We will keep all the information you provide confidential. Our questions are not difficult to answer, and no right or wrong answers, as long as you answer following your own real ideas and the real situation. Thank you for your cooperation!

1. What is your gender?
   □ male
   □ female

2. What is your academic grade?
   ○ Freshman
   ○ Sophomore
   ○ Junior
   ○ Senior

3. How often do you read books and newspapers about psychology?
   ○ At least 2-3 times a month
   ○ Once a month
   ○ Once every two to three months
   ○ 1-3 times a year
   ○ Very seldom

4. What do you think of the mental health level of the students?
   ○ Healthy
   ○ Sub-healthy
   ○ Low

5. How much attention do you pay to your psychological quality?
   ○ Have great concern
   ○ Relatively concern
   ○ Do not concern

6. Have you ever done psychological counseling?
   ○ Often
   ○ Occasionally
   ○ No

7. How can you solve your psychological confusion?
   ○ Psychological counseling
   ○ Talk to friends
   ○ Self-regulation
   ○ Other ways

8. Do you know where the counseling room is in your school?
   ○ Yes, I know.
   ○ Unclear.
   ○ I wonder if there is any.

9. What aspects do you want to know more about mental health?
   ○ Pressure and decompression
   ○ Self-awareness and self-acceptance
   ○ Self-experience and self-growth
   ○ Interpersonal communication
   ○ Transposition thinking and empathy
   ○ Emotion exchange management and EQ management

10. Do you have a clear idea of mental health?
    ○ Perfectly clear
    ○ A little understanding
    ○ Know a little
    ○ It's not clear.

11. Do you think you have any obstacles in communicating with others?
    ○ There are big obstacles.
    ○ Sometimes there are obstacles.
    ○ Relatively few
    ○ No

12. Do you think you need the help of a professional counselor?
    ○ It doesn't matter.
    ○ A little
    ○ I need it urgently.
    ○ I'm in good health. I don't need it.

13. What do you think is the most typical characteristic of a person with mental health?
    ○ Be optimistic, enthusiastic and sincere
    ○ Peace of mind, no struggle with the world, willing to help others
    ○ Have good interpersonal relationships
    ○ Have good sleep

14. Which is the most important factor in determining mental health?
    ○ Congenital psychological quality
    ○ The impact of acquired family education
    ○ The impact of daily learning and living environment
    ○ Others

15. What would you do if there were friends around you who had mental health problems?
    ○ Enlighten him (her)
    ○ It's none of my business.
    ○ Publicize that he or she has mental health problems
    ○ Stay away from him (her) for own safety
    ○ Accompany him (her) to find professionals
    ○ Others _____

16. Do you think students should pay attention to mental health problems?
    ○ Take it seriously
    ○ It doesn't matter
    ○ Never mind

17. What kind of mental health education do you like? (Up to 4 options)
    ○ Teaching method
    ○ Case analysis and discussion
    ○ Simulated scenario method
    ○ Group activity
    ○ Others _____

18. If there is a professional teacher's guidance, what is the reason why you will not go to consult? (Up to 4 options)
    ○ Privacy concerns
    ○ Afraid of being known and laughed at by classmates
    ○ Counseling can't solve the problem.
    ○ Nothing to consult.
    ○ Others _____

19. How long do you spend online every day? (Up to 4 options)
    ○ Within 2 hours
    ○ 2-4 hours
    ○ More than 4 hours
    ○ Uncertain

20. What are your hobbies?
    - ○ Read a Book
    - ○ Take exercises
    - ○ Surf the Internet
    - ○ Talk to Friends
    - ○ Others _____

21. How do you usually decompress it?
    - ○ Listen to the music
    - ○ Find a place to vent
    - ○ Do sports
    - ○ Cry
    - ○ Others _____

22. If you have any comments or suggestions on this questionnaire, please fill in the following input box.
    _____