



## Assessment Algorithm based on Deep Learning for Psychological Capital and Job Performance of Kindergarten Teachers

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**Abstract.** For a long time, the research perspective of human psychology has focused on the discussion of negative psychology such as job burnout and work stress, lacking the attention and development of good psychological qualities such as personal optimism and health. As the pressure of social competition intensifies, it is more necessary for individuals to have positive psychological quality and internal adjustment ability. This article presents a psychological assessment algorithm for kindergarten teachers based on deep learning (DL) and computer-aided design, so it is feasible to analyze the performance with this algorithm. After many iterations, the error of this method is 32.64% lower than that of SVM algorithm, and the recall rate is over 95%. Therefore, it is feasible to use this model to analyze the ability to resist stress. The study of good psychological capital can help kindergarten teachers to adjust their working conditions with a positive attitude, face the hardships and disappointments with tenacity, thus improving their work performance and putting their infinite passion into the great preschool education work.

**Keywords:** Kindergarten Teacher; Psychological Capital; Deep Learning; Computer Aided Design.

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### 1 INTRODUCTION

Teachers are engineers of human souls, shouldering the great responsibility of cultivating future talents of the motherland. Teachers' psychological state directly affects students' groups, and has an important impact on students' psychology and study, that is, directly affects the future development of the country [1]. For a long time, the research perspective of human psychology has focused on the discussion of negative psychology such as job burnout and work stress, lacking

the attention and development of good psychological qualities such as personal optimism and health. As the pressure of social competition intensifies, it is more necessary for individuals to have positive psychological quality and internal adjustment ability [2]. In the contemporary society with rapid economic and social growth, the country needs a large number of talents to promote the economic development, and it is particularly important for teachers to train talents. Previous empirical research and analysis show that teachers' self-assessment lacks self-confidence, and teachers' ideas and attitudes have a more significant impact on job satisfaction [3]. The performance of preschool teachers is of great significance to preschool teachers themselves, preschool children and preschool education. In the stage of preschool teachers' own growth and development, high-level job performance is the requirement of fulfilling job responsibilities and achieving professional development [4]. As an important reflection and assessment index of teachers' psychological quality, good psychological resilience can not only promote the individual's adaptability, but also further explore its internal growth motivation, which has a direct or indirect impact on preschool teachers themselves and children's psychological development [5]. Children's mental resilience will not only affect their own mental state, but also directly or indirectly affect children's mental development. Therefore, it is of great significance to sort out the influencing factors of preschool teachers' psychological resilience and explore how to improve their psychological resilience. This article puts forward a model of kindergarten teachers' psychological assessment based on DL and computer aided design. Its main innovations include:

(1) This paper analyzes teachers' mental health through information entropy attribute weighting. The attribute structure affected by clustering results is found.

(2) The constructed model predicts the test data set with DNN, and analyzes some internal relationship between mental health problems and attributes.

The first section is the introduction, which introduces the background and significance of kindergarten teachers' psychological assessment, and puts forward that DL and computer-aided design technology should be applied to the construction of psychological assessment model. The second section is related work, which analyzes the research related to psychological assessment and puts forward the research methods of this article. The third section is the theory and model part, which introduces the feasibility of identifying kindergarten teachers' mental health problems driven by big data, and constructs a psychological assessment model for kindergarten teachers. In the fourth section, the validity of the proposed psychological assessment model is verified by comparative experiments. The fifth section summarizes the contribution of this article to kindergarten teachers' mental health education, and points out the limitations of this algorithm and the ideas for future improvement.

## 2 RELATED WORK

Villar [6] enable students to interact with the course of computer programming and give it to the experimental group. Computer aided modular teaching and traditional teaching methods have brought the same level of achievement to students, but there are slight challenges in teaching facilities for students and teachers. Yasmin et al. [7] from the perspective of college students' insufficient communication ability, discussed the challenges faced by computer assisted language teaching in private universities in teaching English as a communicative language. This research aims to cultivate college students. This research fills the gap in English teaching research and integrates. Yilmaz et al. [8] believes that at present, many educators still use old ideas to treat education problems. They adopted an attitude of resistance and resistance, and still blindly inherited backward teaching ideas. The use of outdated teaching methods has hindered the overall reform process of teaching. Although teachers have rich traditional teaching experience, they can still meet the teaching requirements. However, they do not understand the specific content of the concept of educational technology under the information technology environment. I don't know how to use information technology to promote the overall reform of education. I don't know how to give full play to the advantages of information to carry out efficient teaching, and I don't know

how to use computer assisted teaching methods. Zaranis and Synodi [9] believes that CAI, as a new teaching method, will cause teachers to lack motivation and confidence in learning, resulting in resistance. Faced with the new teaching methods, they have been lacking of passion for learning, and learning new teaching methods also seems powerless, so they resist the new teaching methods. Zhou et al. [10] believes that most teachers neglect the creation of interactive teaching environment and the overall effect is poor. Language and emotional communication, such as body behavior, emotional expression, on-site blackboard writing design, can hardly be used to reduce the teaching effect. As we all know, in order to achieve the best effect of light shadow harmony in multimedia courseware, it is necessary to create a certain dark and soft environment. It is often necessary to pull dark curtain cloth at the light passage, which is very depressing for a while. As soon as the courseware was released, the teacher had to be busy clicking the mouse and searching carefully, totally selfless. As a result, teaching does not reflect the advantages of multimedia teaching, and it is even difficult to teach by words and deeds like traditional teaching methods.

At present, the research on psychological capital and job involvement mainly involves their connotation, structure division, influencing factors, action mechanism and the relationship with other variables, but little research is done from the perspective of preschool teachers. Based on this, this article takes kindergarten teachers as an example, constructs a psychological assessment model based on DL and computer aided design, realizes the intelligent assessment of kindergarten teachers' psychological barriers, and then analyzes the relationship between kindergarten teachers' psychological capital and job performance based on this model.

### **3 METHODOLOGY**

#### **3.1 The Application of Data Mining (Dm) in the Analysis of Teachers' Psychological Capital**

Kindergarten level is closely related to teachers' mental resilience. The lower the kindergarten level, the higher the level of teachers' mental resilience. The possible reason is that there are relatively few students in ordinary kindergartens, and the social attention and parents' expectations are relatively low, so teachers' psychological pressure is relatively low. Teachers' perceived interpersonal trust in school, school working conditions and teachers' psychological resilience are all significantly related, that is, the higher the trust of teachers to school colleagues, school leaders, parents and students, the higher the support of school leaders to teachers, and the more sufficient resources for education and teaching.

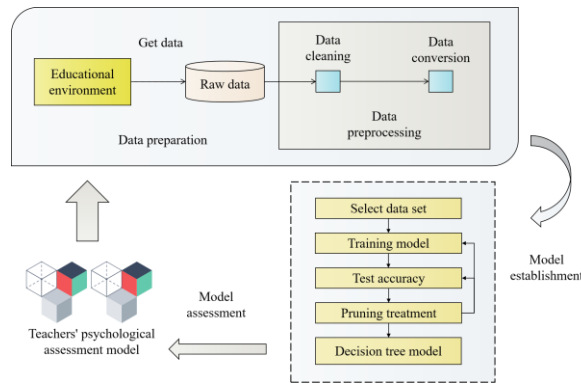
As one grows older, one's ability to cope with external pressure, adversity and difficulties gradually increases. However, the shorter the teachers' teaching experience, the lower the level of psychological resilience, and the weak psychological endurance of novice teachers, which needs to grow up gradually in work practice. And get the analysis results intuitively and quickly. It can not only save the marginal cost of work, but also set up the screening model of teachers' abnormal mental state more quickly, which is beneficial to master the overall mental state of teachers as well as individual mental state. The psychological DM decision model based on DL is shown in Figure 1.

Driven by big data, teachers' mental health problems can be found in time and effectively, and positive and effective countermeasures can be formulated to promote kindergarten teachers' mental health development.

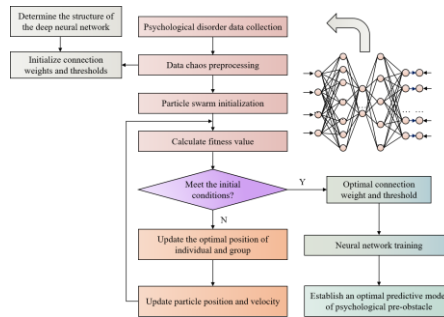
#### **3.2 Psychological Assessment Model Based on DI and Computer-Aided Design**

The analysis of kindergarten teachers' mental health data, first of all, collects the data of kindergarten teachers' mental health, selects and cleans up the data attributes, integrates effective data to establish a comprehensive psychological test database, and uses DNN algorithm

weighted by information entropy attributes to cluster and analyze the data. The working principle of DNN-based teacher psychological assessment model is shown in Figure 2.



**Figure 1:** Decision model of psychological DM based on DL.



**Figure 2:** Based on the working principle of DNN teacher psychological assessment model.

Reasonable data collection can provide reliable sources for DM, and only enough data sets can enhance the reliability and persuasiveness of DM. The information entropy is introduced into the objective function, so that the membership function of the sample points presents Gaussian distribution, which avoids the influence of noise data on initialization. Let the factor set  $U$  and the judgment level set  $V$  of the object of psychological analysis:

$$U = \{u_1, u_2, \dots, u_m\} \tag{1}$$

$$V = \{v_1, v_2, \dots, v_m\} \tag{2}$$

Fuzzy judgment is performed on each factor in  $U$  according to the grade index in the judgment set, and the judgment matrix is obtained:

$$R = (r_{ij})_{n \times m} \tag{3}$$

Among them,  $r_{ij}$  represents the affiliation degree of  $u_i$  with respect to  $v_j$ . After determining the importance index of each factor, record it as:

$$A = \{a_1, a_2, \dots, a_m\}, \quad \sum_{i=1}^n a_i = 1 \quad (4)$$

Synthesized to:

$$\bar{B} = AR = (\bar{b}_1, \bar{b}_2, \dots, \bar{b}_m) \quad (5)$$

After normalization, the following results are obtained:

$$B = \{b_1, b_2, \dots, b_m\} \quad (6)$$

$$P_r(C = c_i | A_1 = a_1 \wedge \dots \wedge A_k = a_k) = \frac{P_r(A_1 = a_1 \wedge \dots \wedge A_k = a_k | C = c_i)}{P_r(A_1 = a_1 \wedge \dots \wedge A_k = a_k)} P_r(C = c_i) \quad (7)$$

$P_r(C = c_i)$  is the prior probability of each class,  $P_r(A_1 = a_1 \wedge \dots \wedge A_k = a_k)$  is independent of any  $c_i$ , and  $P_r(A_1 = a_1 \wedge \dots \wedge A_k = a_k | C = c_i)$  is the conditional probability.

$$gain = \inf o(T) - \sum_{i=1}^s \frac{|T_i|}{T} \times \inf o(T_i) \quad (8)$$

$$\inf o(T) = - \sum_{j=1}^{N_{class}} \frac{freq(C_j, T)}{|T|} \times \log_2 \left( \frac{freq(C_j, T)}{|T|} \right) \quad (9)$$

In the actual training process, the learning speed often chooses an adjustable parameter that will change with the training. The stage of gradient descent is expressed as:

$$x+ = \eta \frac{dy}{dx} \quad (10)$$

According to the interception principle of the optimal path, it only needs to calculate:

$$U(S) = R(X) + \gamma \sum_{S'} P(S \rightarrow S') U(S') \quad (11)$$

$$U(S_0) = E \left[ \sum_{t=0}^{\infty} \gamma^t R(S_t) \right] \quad (12)$$

The split information is used in the above formula to normalize the information gain. The split information is similar to  $Info(D)$  and is defined as:

$$SplitInfo_A(D) = - \sum_{j=1}^v \frac{|D_j|}{|D|} \times \log_2 \left( \frac{|D_j|}{|D|} \right) \quad (13)$$

$SplitInfo_A(D)$  represents the information produced by dividing the training sample set  $D$  into  $v$  plans corresponding to the  $v$  outputs of the attribute  $A$  test.

$$U(S_0) = E \left[ \sum_{t=0}^{\infty} \gamma^t R(S_t) \right] \quad (14)$$

$$U^*(S) \max_a \{R(a) + U^*(S')\} \quad (15)$$

$$x+ = \eta \frac{dy}{dx} \quad (16)$$

The agent can only learn sequentially all possible actions on a certain path. According to the interception principle of the optimal path, it is only necessary to calculate:

$$U(S) = R(X) + \gamma \sum_{S'} P(S \rightarrow S') U(S') \quad (17)$$

In the formula,  $R$  is the reward value of the state  $S$  itself, plus the  $U$  value of all possible states, multiplied by the average of the probability, and then multiplied by the discount factor. Use this formula to find the  $U$  value of the state  $S$ , and get the relationship with the subsequent state.

## 4 RESULT ANALYSIS AND DISCUSSION

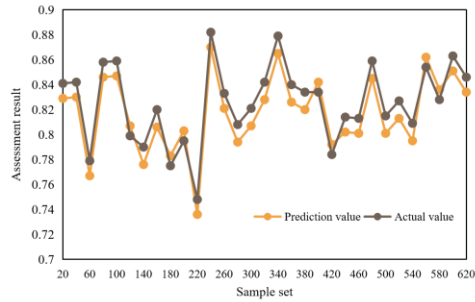
### 4.1 Psychological Model Test

Positive psychological resilience refers to the idiosyncratic factors within an individual that can help to cope with frustration and stress situations, and ensure that the individual can adapt well and develop actively. Select appropriate neural network parameters and establish appropriate neural network model. Then use the sample set to train the network, train the weights of the network, and test the network performance to determine whether the trained neural network meets the requirements. Finally, find the sample data for processing, verify whether the expected goal can be achieved, and intervene and deal with teachers with mental health problems later. Compare the output data of the constructed psychological assessment model with the real teachers' psychology, as shown in Table 1 and Figure 3.

The predicted data output by the constructed model is in good agreement with the real data. The value of data can optimize resource allocation, improve decision-making level and work efficiency, and promote work innovation in kindergarten teachers' psychological counseling. To make full use of big data technology, we must establish and improve the corresponding safeguard mechanism, so as to meet the challenges driven by big data. Under the information education mode driven by big data, the precision of different psychological assessment algorithms in kindergarten teachers' psychological assessment is shown in Figure 4.

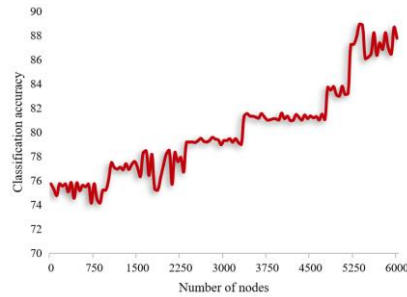
<i>Sample set</i>	<i>Prediction value</i>	<i>Actual value</i>
60	0.767	0.779
120	0.807	0.799
180	0.783	0.775
240	0.87	0.882
300	0.807	0.821
360	0.826	0.84
420	0.792	0.784
480	0.845	0.859
540	0.795	0.809
600	0.851	0.863

**Table 1:** DNN learning results.

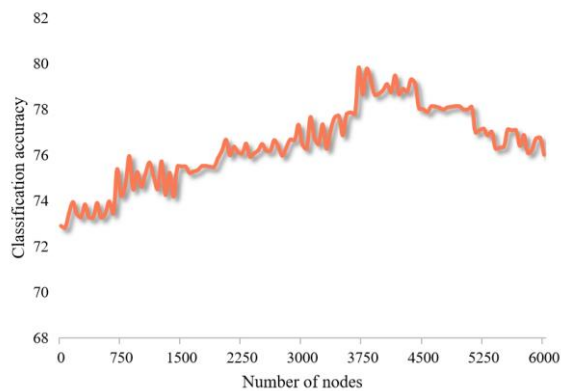


**Figure 3:** DNN learning results.

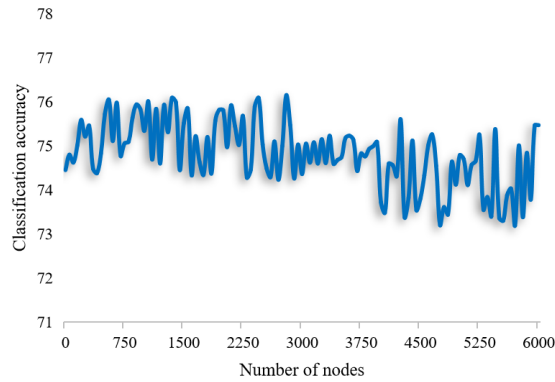
It is not difficult to find that when the number of samples reaches a certain level, the accuracy of this psychological assessment model will be improved. Compared with the traditional psychological assessment algorithm, the accuracy of this algorithm has obvious advantages, reaching more than 90% after training.



(a) The psychological assessment model of this article.



(b) SVM.



(c) FCA.

**Figure 4:** Prediction accuracy of different algorithms in kindergarten teachers' psychological assessment.

Driven by big data, data is constantly expanding, so it is very important to manage and screen information. Data should be analyzed and corrected in time. False information, outdated information and unsubstantiated information existing on the network should be deleted in time, and real and reliable data information should be kept. Taking the accuracy rate of teachers' psychological assessment as the test index, traditional SVM and FCA are selected as the contrast objects. The experimental results are shown in Table 2, Table 3 and Table 4.

<i>Sample size</i>	<i>Accuracy of psychological assessment (%)</i>
15	97.64
30	95.55
45	94.68
60	93.73
75	91.85
90	90.95
105	90.27

**Table 2:** Accuracy rate of teachers' psychological assessment by this method.

<i>Sample size</i>	<i>Accuracy of psychological assessment (%)</i>
15	91.08
30	86.45
45	82.18
60	76.23
75	71.55



90	69.85
105	66.84

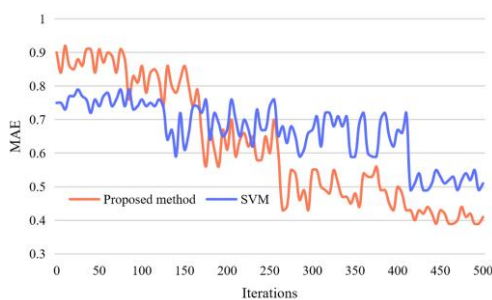
**Table 3:** Accuracy rate of SVM teachers' psychological assessment.

Sample size	Accuracy of psychological assessment (%)
15	88.82
30	86.11
45	82.75
60	76.83
75	74.07
90	70.15
105	66.86

**Table 4:** Accuracy of teachers' psychological assessment of FCA.

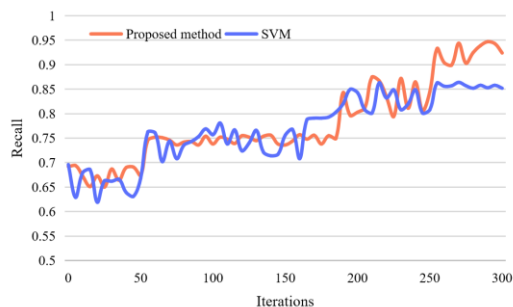
From the experimental data, it can be seen that when the number of test samples starts to increase, the accuracy of psychological assessment of different recommendation methods shows a downward trend. However, compared with traditional SVM and FCA, the accuracy of psychological assessment of this method is obviously higher.

In the assessment data of kindergarten teachers' mental health. Pretreatment of unsatisfactory data sources can greatly improve the execution efficiency and knowledge discovery stage of DNN. Comparing the average absolute error and recall rate of the psychological assessment model in this article with the model in SVM, the results are shown in Figure 5 and Figure 6.



**Figure 5:** MAE comparison.

It can be seen from Figure 5 and Figure 6 that after many iterations, the error of this method is 32.64% lower than that of SVM algorithm, and the recall rate is over 95%. Therefore, the psychological assessment model based on DL and computer-aided design is a reasonable and feasible assessment model, which is of great significance for the innovation of kindergarten teachers' mental health and performance management.

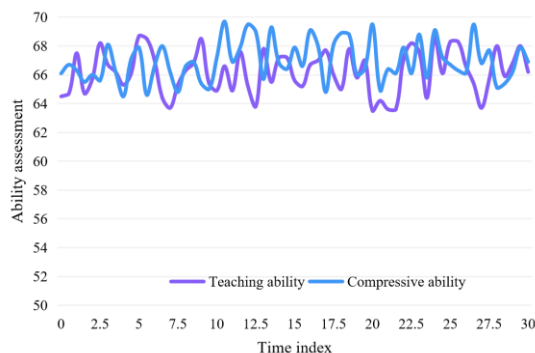


**Figure 6:** Comparison of recall rate.

#### 4.2 Influence of Psychological Counseling on College Students' Learning Ability and Anti Pressure Ability

This article adopts DL algorithm to grade kindergarten teachers' teaching ability and anti-stress ability. Figure 7 shows the scores of teachers' teaching ability and stress resistance under the conventional education mode. Figure 8 shows the scores of teaching ability and stress resistance after effective psychological counseling for teachers.

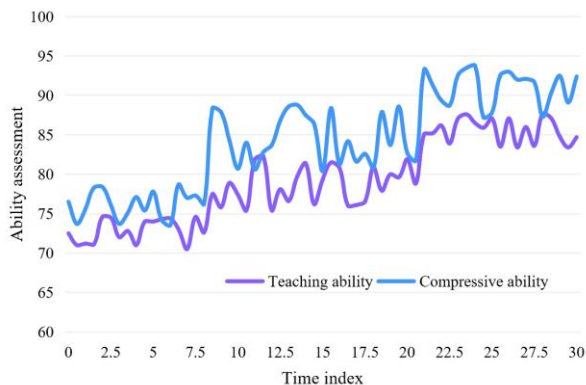
With high attention and high expectations, there are not only development opportunities, but also challenges to preschool teachers. Therefore, preschool teachers must pay attention to their own professional development, which is not only an inevitable requirement to cope with opportunities and challenges, but also a necessary condition for professional development. Only by studying the most advanced educational concepts, constantly improving their educational, teaching and management abilities, and continuously conducting professional reflection and self-analysis can children actively respond to various professional challenges and pressures.



**Figure 7:** Teachers' teaching ability and stress resistance score under traditional mental health education.

## 5 CONCLUSIONS

This article constructs a psychological assessment model based on DL and CAD. The model has the ability of autonomous learning, which can realize the intelligent assessment barriers and provide theoretical and technical support for analyzing the relationship between kindergarten performance.



**Figure 8:** Score of teachers' teaching ability and stress resistance under the deep integration of music education.

After many iterations, the error of this method is 32.64% lower than that of SVM algorithm, and the recall rate is over 95%. From the analysis of the relationship between kindergarten teachers' psychological capital and job performance, it can be seen that teachers' psychological counseling can promote the cultivation of teachers' teaching ability and ability to resist stress. Personal mental ability to work hard is psychological capital, and personal active working state is job involvement. There may be a certain connection between them. Children's mental resilience will not only affect their own mental state, but also directly or indirectly affect children's mental development. Education departments and kindergartens should provide positive support environment for teachers at different professional development stages, improve teachers' psychological resilience, and maintain the vitality and effectiveness of preschool teachers' continuous professional development.

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