Retraction

Retracted: Prediction of Employment Index for College Students by Deep Neural Network

Mathematical Problems in Engineering

This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope
(2) Discrepancies in the description of the research reported
(3) Discrepancies between the availability of data and the research described
(4) Inappropriate citations
(5) Incoherent, meaningless and/or irrelevant content included in the article
(6) Peer-review manipulation

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

References

[1] D. Wu, "Prediction of Employment Index for College Students by Deep Neural Network," *Mathematical Problems in Engineering*, vol. 2022, Article ID 3170454, 8 pages, 2022.

Research Article

Prediction of Employment Index for College Students by Deep Neural Network

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With the acceleration of popularization of higher education in China and the intensification of employment difficulties for college graduates, the employment field has gradually widened, the number of entrepreneurs has gradually increased, and the regional differences are obvious. The employment difficulty of college graduates has aroused wide-spread concern in the society. Therefore, the convolution neural network (CNN) is used to establish a prediction and evaluation model for the employment development trend of college graduates in this paper. The feasibility and practicability are proved by a case, which is of great significance for the government and colleges to provide decision-making support and suggestions to solve the problem of difficult employment.

1. Introduction

College students are special groups in the social network, with high starting point, high quality, high expectations, and other characteristics [1]. College students have a higher level of knowledge and ideological consciousness after higher education, and they will actively seek to adapt to their own quality of work after entering the society, but there is also a lack of social experience in this group. This paper studies the employment of college students from a narrow sense, only to investigate the employment of college graduates, mainly the occupation choice and implementation of this group after the end of their studies in a certain period [2].

National colleges and universities input a certain number of college graduates into the society every year. If the full employment of college students is not realized, it will not only cause the waste of talents but also may cause various social problems. Therefore, the employment of college students is different from ordinary employment, which is a complex and difficult task [3]. The graduation time of Chinese college students is generally concentrated in June and July each year, and the time for graduates to find a job is tight and the task is heavy. They generally actively look for their ideal jobs in the months before graduation. Therefore, the employment of college students has certain timeliness. Especially in recent years, the relevant government departments have a fixed time limit when they count the employment rate of colleges and universities.

Along with China college students' employment system reform, especially the two-way choice, gradually establish and perfect the employment mechanism, the limitation period of university students' employment has changed. The employment period is two years commonly, and there are good opportunities for university students' employment and find the right job within the time available, and compared with other employment groups, college students' employment timeliness is relatively strong [4], which is longer responsible for the assignment of college students in the process of employment. It is responsible for helping and guiding them to plan their career, cultivate their employability, and improve their employability competitiveness. Therefore, college students and other employment groups are impossible to receive such high-level systematic education and guidance. In addition, due to the advantages of the platform and network of colleges, students have more channels for employment than other groups and can obtain more employment information. College students can widely use campus recruitment, network recruitment, school and

teacher recommendation, alumni relationships, and other channels to find satisfactory jobs [5].

In the present stage, a person is considered employed if he meets the three basic requirements above. The above conditions distinguish employment from compulsory labor and general household labor and limit the scope of employment [6]. From a broad perspective, the employment situation of college students includes four aspects: employment subject, the employment object, the employment environment, and the employment result. Employment subject status includes college graduates' employment concept, employment psychology, and comprehensive quality. The employment environment includes employment laws and regulations, employment policies, market supply and demand, employment market construction, employment services, and guidance. Employment results refer to the graduates of the postimplementation of the situation, the narrow sense from a narrow point of view [7].

This study classifies and compares the original employment dispatch data of college graduates in recent years in China, describes the employment situation of college graduates in a macro way, and summarizes the trend of college graduates' employment. The results of this study have important roles. One is to provide decision-making reference for government departments to promote employment. In this paper, the employment system change and foreign employment work through a large amount of data have analyzed, which can be used as the basis for government departments to make college students' employment policy [8]. The second is to provide market information for the adjustment of discipline and specialty structure.

At present, it has enriched the theoretical research on the employment of college graduates. The statistical analysis methods and relevant conclusions proposed in this thesis are of certain significance to promote the theoretical research on the employment [9, 10].

This study aims to understand the development trend of the unidirectional flow of college graduates from the city to the labor market, in order to provide new ideas and directions for solving the practical problems such as the difficulty of employment of college students and the mode of talent training in colleges and universities. In order to achieve this goal, it is planned to find out the development trend of the labor market choice of college graduates through comparative analysis of the statistical data of employment destination of college graduates in China, make a reasonable explanation of this phenomenon by using relevant economic theories, and analyze the causes and reasons behind this new trend. It predicts the influence of this trend on the employment of college graduates in the future.

2. Related Work

Due to the historical development stage and reality, there are few direct studies on the issue of college graduates in foreign countries, and most of the studies regard them as a special group of employment in the rural labor market and place them in the urban-rural mobility of the population [11]. College graduates facing the rural population flow from urban to rural employment is a special performance, and rural population in urbanization is opposite in the direction of the flow from the countryside to city, as a result. Foreign researchers regard the employment of college students as a common phenomenon and explain it with the following four theories:

(1) *Dual economic theory*. The core point of the dual economic theory is that the modern national economic development system can be divided into two sectors: one is the industrial sector represented by high productivity and marginal rate of return; the other is the agricultural sector represented by the traditional production mode and low marginal rate of return.

(2) Push and pull theory. The core of the push-pull theory is to emphasize the existence of a certain thrust and a certain tension in the process of population flow [12]. The push force is composed of negative factors, including the high cost of living, low-income level, high unemployment rate, and harsh living environment while the pull force is composed of positive factors, including stable employment opportunities, high level of economic income, excellent working environment, complete social welfare and security, and good development prospects.

(3) Individual labor supply decision theory. According to decision-making theory, the total time of an individual is limited, and within this limited time, the individual time is divided into the working time and leisure time in order to maximize practical utility [13].

College graduates are the precious human resources of the country and the important fresh force of the modernization construction. It is an important work to study and practice the scientific development concept and build a harmonious socialist society to rationally allocate and develop the human resources of college graduates. The employment of college students is not only closely related to universities and graduates but also directly affects the development of society and economy. Since 1999, the enrollment in higher education has been increased [14]. From 2001 to 2008, the number of college students in China has grown rapidly, and college graduates have attracted more and more attention from all walks of life. With the increase in the number of college graduates, there are many problems in the employment, including the contradiction between supply and demand, unreasonable employment structure and imperfect employment mechanism, incomplete employment policies, unequal quality of graduates and the requirements of employers, and high expectations of graduates. Especially since 2008, influenced by the international financial crisis, the employment situation has been very serious in our country, the employment of university graduates pressure, according to university students' employment problem, in the new economic situation, to

research and explore new methods [15]. Therefore, actively promoting the full and harmonious employment of college graduates is an important measure taken by the government to solve the livelihood problems of the people, and it is also a unshirkable responsibility [16].

In recent years, some domestic experts and scholars have studied the employment of college students from two perspectives: the structure of personnel training and the setting of disciplines [17]. They think the university education system reform and graduate employment system reform of institutions of higher learning are not synchronized, autonomy is relatively small, and admission pipe and professional setting and employment market demand eventually form the situation of college graduates market supply and demand imbalance, the serious influence college students' employment. Some scholars, from the perspective of college students themselves, believe that contemporary college students' employment concept is backward, the professional knowledge system needs to be improved, employment psychology is not mature, and practical operation ability is relatively low, which needs to be further improved [18]. Since the beginning of the twenty-first century, China has formulated a series of employment policies and management measures to encourage college students to work at the grassroots level and in the central and western regions. The state has carried out projects such as "Selecting and hiring college graduates to work in Villages," "Supporting education, agriculture, medical services and poverty alleviation," "College students volunteer to serve the western Region," and "Rural compulsory education stage school teacher position plan." At the same time, college graduates are encouraged and supported to find jobs in small and medium-sized enterprises and start their own businesses [19].

Foreign experts and scholars have conducted a series of studies on the employment of college students. Western employment theory was formed under the conditions of a mature and market economy. Employment is not only an economic problem but also a technical problem, social problem, and political problem. The economic and scientific strength of the United States has been significantly improved, and the country's comprehensive strength has jumped to the forefront of the world [20, 21].

First, a study on the employment intention of graduate students in rural areas is carried out. In order to solve the problem of the structural surplus of urban talents, the feasible way is to introduce policies to guide talents to return home; third, the study of rural employment of college graduates, the influence of the traditional planning system mode on the way of examination and employment, and the influence of the government financial fund guarantee are the negative factors that affect the rural employment of college graduates [22]. Fourth, the promotion measures for rural employment of college graduates are necessary. In order to make college graduates actively seek jobs, it is necessary to carry out comprehensive reforms in talent selection, education, and training [23].

The above domestic and foreign research results have laid a foundation for this paper to study the rural employment of college graduates, but the existing results still have the following deficiencies [24, 25]. First, the research perspective is relatively single. Most of the existing studies are conducted from a macro perspective through the description of phenomena to make subjective feelings and empirical summaries. The mechanism and essence behind are not studied from the theoretical level, so the proposed suggestions lack practical pertinence [26–28]. Second, the research content is not systematic. Third, intelligent algorithms, including deep learning algorithms, are rarely used to predict employment trends.

Based on the above discussions, the contribution of this paper is given as follows:

(1) For the first time, the deep learning model is used to predict the employment index of college students

(2) This paper not only has certain theoretical significance but also provides policy support and method reference for the employment of college students in real life

3. The Proposed Employment Index Trend Prediction Method

In recent years, the CNN model is often used to solve complex image recognition problems. On the basis of the traditional full-connection layer neural network, CNN convolution layer, and pooling layer, which is given in Figure 1, pooling operations are generally divided into average pooling and maximum pooling.

The function of the convolution layer lies in the extraction of image features. The essence of the convolution kernel is a filter matrix, which can produce many different effects on the original image. The calculation process of convolution is shown as follows:

$$x_i = \text{act}\left(x_{i-1} \otimes k_i + b_i\right). \tag{1}$$

Then,

$$f(x) = \frac{1}{1 + e^{-x}}. \tag{2}$$

The mathematical expression of tanh function is

$$f(x) = \frac{e^x - e^{-x}}{e^x + e^{-x}}, \tag{3}$$

$$f(x) = \max(0, x).$$

The mathematical expression of the LeakyReLu function is

$$f(x) = \begin{cases} x, & x \geq 0, \\ \alpha x, & x < 0. \end{cases} \tag{4}$$

Therefore, the efficiency of the entire network operation can be improved to a certain extent.

The output layer adopts the softmax function to normalize the output value, and the probability value in the corresponding category is shown in the following formula:
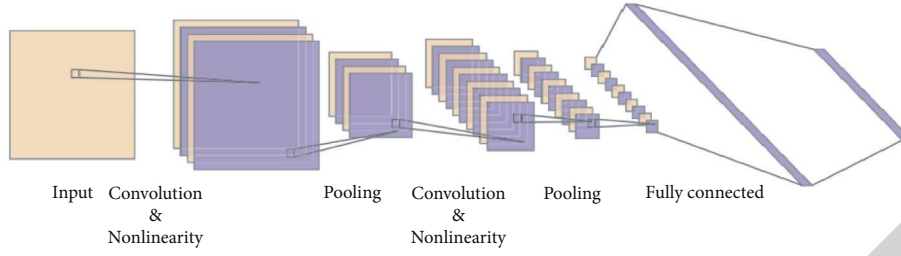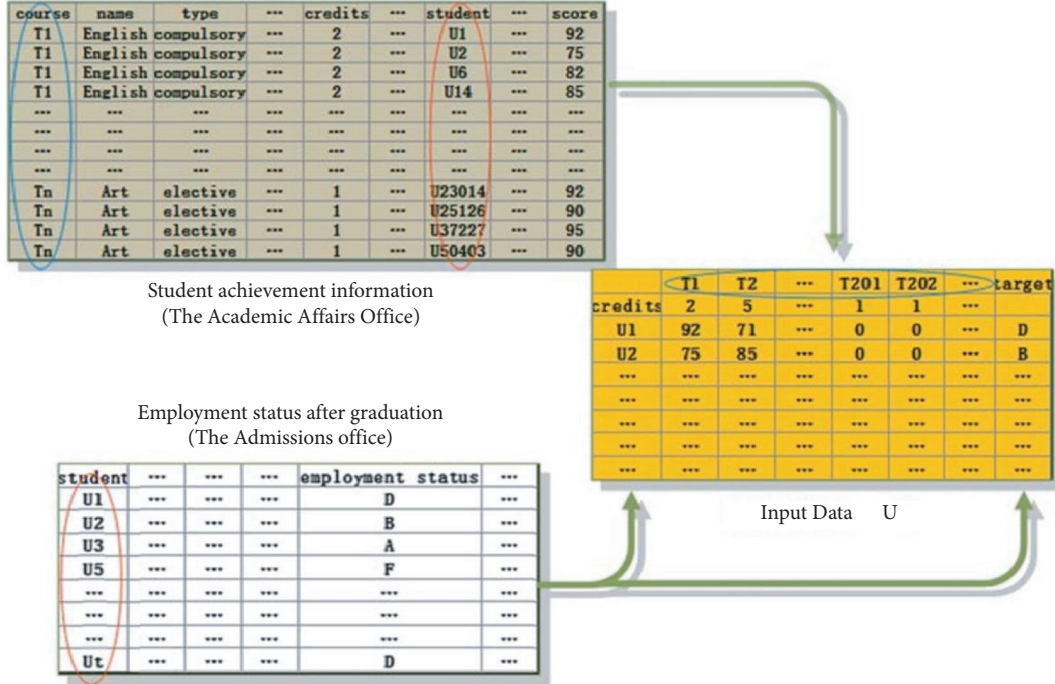
FIGURE 1: The structure of CNN.

FIGURE 2: The process of data preprocessing and merging.

$$h_{w,b}(x_i) = \begin{bmatrix} p(y_i = 1|x_i; w, b) \\ p(y_i = 2|x_i; w, b) \\ p(y_i = 3|x_i; w, b) \\ \cdots \\ p(y_i = n|x_i; w, b) \end{bmatrix} = \frac{1}{\sum_{j=1}^{n} e^{w_j x_i + b_j}} \begin{bmatrix} e^{w_1 x_i + b_1} \\ e^{w_2 x_i + b_2} \\ e^{w_3 x_i + b_3} \\ \cdots \\ e^{w_n x_i + b_n} \end{bmatrix}. \quad (5)$$

In classification tasks, it is a common method to use cross-entropy. The cross-entropy formula is as follows:

$$\text{loss} = -\frac{1}{m} \sum_{j=1}^{m} \sum_{i=1}^{n} y_{ji} \log(\hat{y}_{ji}). \quad (6)$$

The error from the cross-entropy function needs to be calculated by back propagation, so as to realize the updated back propagation of model parameters. The original form of the gradient descent method is shown as follows:

$$\theta := \theta - \alpha \frac{\partial}{\partial \theta} J(\theta). \quad (7)$$

In the experiments of the following chapters, this paper also verifies that the use of Adam has faster convergence than SGD (stochastic gradient descent). The mathematical expression of a common Adam optimizer is as follows:

$$m_t = \beta_1 m_{t-1} + (1 - \beta_1) g_t,$$
$$v_t = \beta_2 v_{t-1} + (1 - \beta_2) g_t^2. \quad (8)$$

Therefore, the updating rule of gradient descent is as follows:

$$\theta_{t+1} = \theta_t - \frac{\alpha}{\sqrt{v_t + \epsilon}} m_t. \quad (10)$$

4. Experimental Results and Analysis

4.1. Experimental Data Collection and Design. In the present work, 20 comprehensive colleges and universities are selected along with 30 medical colleges and universities.

4000 questionnaires were distributed this time, and 3812 valid questionnaires were recovered. In terms of gender,
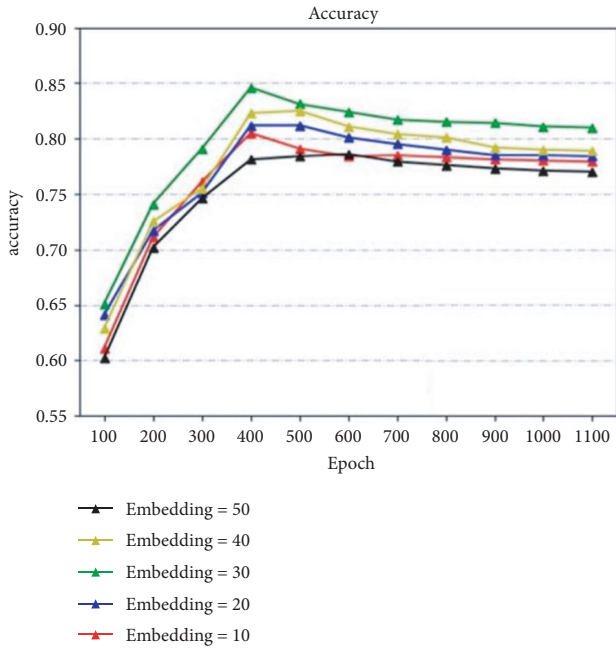
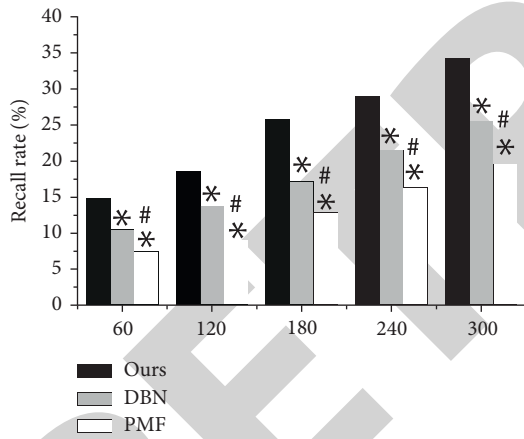Figure 3: The relationship between embedding dimension and prediction accuracy.

Figure 5: Statistical results of influencing factors of college students.

Figure 4: Recall rates under different data sizes by different methods.
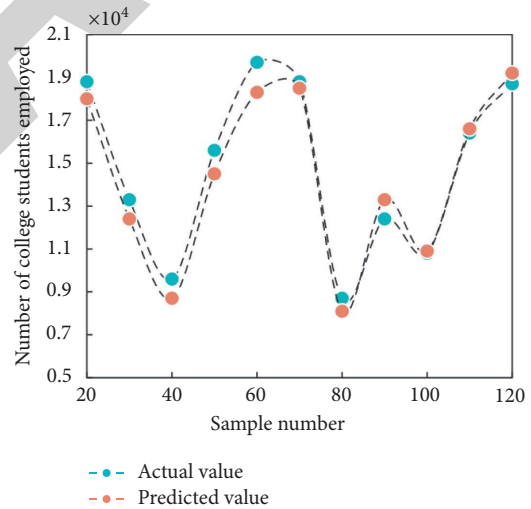
Figure 6: Prediction results of university student employment number by CNN model.

there were 1,536 boys, accounting for 28.71%, and 2,331 girls, accounting for 71.29%. In terms of student sources, 6.82% of students come from first-tier cities, 25.21% from small and medium-sized cities, 27.27% from ordinary cities, and 41.62% from rural areas. In this study, the literature method, questionnaire method, interview method, and statistical analysis method were used comprehensively.

Then, students' performance data and graduation employment data are merged into the academic performance data as the input of the CNN model. This process is shown in Figure 2. Then, the score data set is updated according to the employment situation, and finally, the employment information is added to the score data for the subsequent employment index prediction.
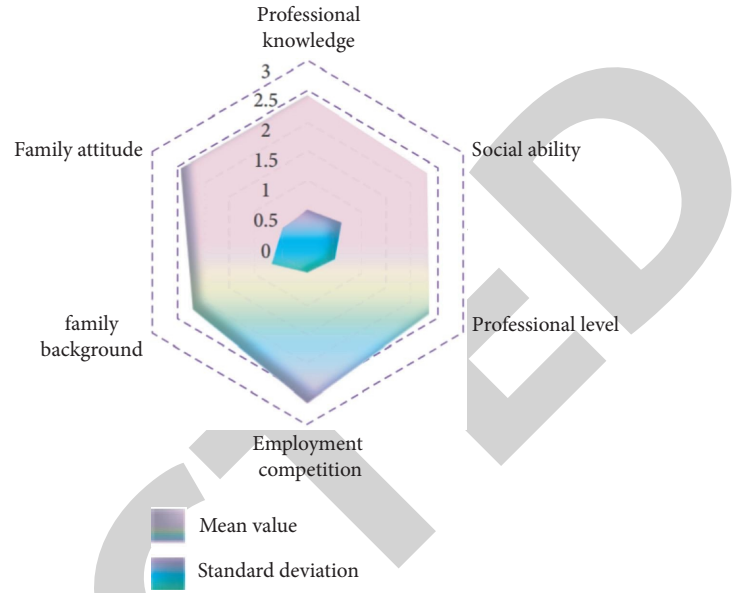
4.2. Experimental Results. Entrepreneurship is not simply about making a living, but about the pursuit of entrepreneurial goals and higher ideals in a certain field. To carry out entrepreneurial activities, it is necessary to have a deep understanding of the activities, and professional knowledge is the summary of the development rules in a certain field. The more professional knowledge you master, the more effective entrepreneurial activities will be carried out. Therefore, college students must learn professional knowledge well in school.

In order to show the selection process of relevant hyperparameters of the model in this paper, the relationship between embedding dimension and prediction accuracy is presented in
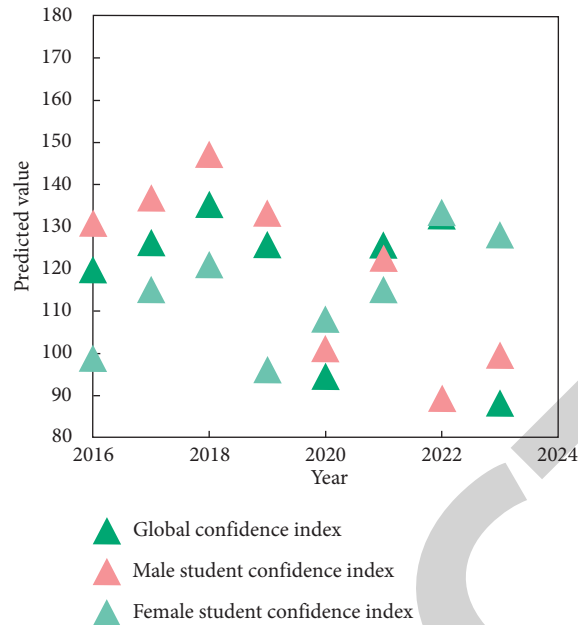
Figure 7: Predictions by a different gender.

Figure 3. As can be seen from the figure, under the conditions of different embedding dimensions, the prediction accuracy shows a trend of increasing first and then decreasing as the number of iterations increases. The prediction accuracy reaches a stable state after 1100 iterations. In addition, it can also be seen from the figure that when the embedding dimension is set to 30, the prediction accuracy of the CNN model is good no matter how many iterations it takes, because the embedding dimension of the CNN model in this paper is set to 30. And the best prediction was about 81%.

In addition to the prediction accuracy of the employment index, this paper also uses other indicators to verify the effectiveness of this method. Figure 4 presents Recall rates of different methods, compared with the DBN model and PMF method. The abscissa in the figure represents the number of students, and the ordinate is the quantitative result. It can be seen from the figure that the proposed method has achieved good prediction performance in sample sets of different sizes (60, 120, 180, 240, 300). Moreover, with the increase in data volume, the prediction performance of this paper gets better.

In addition to some objective quantitative indicators mentioned above that can describe the prediction effect of the model, some subjective factors of students themselves will also have a great impact on the prediction of employment trends, such as students' professional level, social ability, and family background. The specific statistical results are shown in Figure 5. As can be seen from the figure, the mean values of most indicators are in a relatively stable range, but the variable of market competitive pressure varies widely, which means that the employment index of college students is not evenly distributed, so it is easy to predict it.

In order to further verify the effectiveness of the proposed method, the prediction results of the number of

college students' employment based on the CNN model are presented in Figure 6. As can be seen from the Figure, with the increase in the number of samples, the proposed method can still maintain a high prediction accuracy, thus demonstrating the effectiveness of the proposed method.

As can be seen from the figure, with the increase in the number of data sets, the predicted values obtained by the method in this paper can well fit the real number of students' employment, and the fitting effect will not be affected by the increase of data. Thus, the effectiveness and stability of the proposed method are illustrated.

Colleges and universities should focus on the cultivation of students' employment ability, strengthen the awareness of practical education, strengthen practical teaching links, formulate practical teaching plans reasonably, and improve the practical teaching system; the state should increase investment; schools should strengthen the relationship with enterprises and other employing units and strengthen the construction of practical training base. Figure 7 shows the prediction results of employment indicators for boys, girls, and the whole population. It can be seen from the figure that the prediction results of the method in this paper for different genders are also satisfactory.

Generally speaking, information is the basis of career choice, but also a bridge to the employer, who can collect first-hand employment information, and will gain the initiative in employment. Figure 8 shows that prediction results are consistent with the real situation, no matter in the training set or the test set.

Finally, the relationship between the prediction loss and iteration times of the proposed method is compared. It can be seen from Figure 9 that both the training set and the test set maintain relatively low prediction loss, especially the test data set, which indicates that the CNN has strong generalization performance.
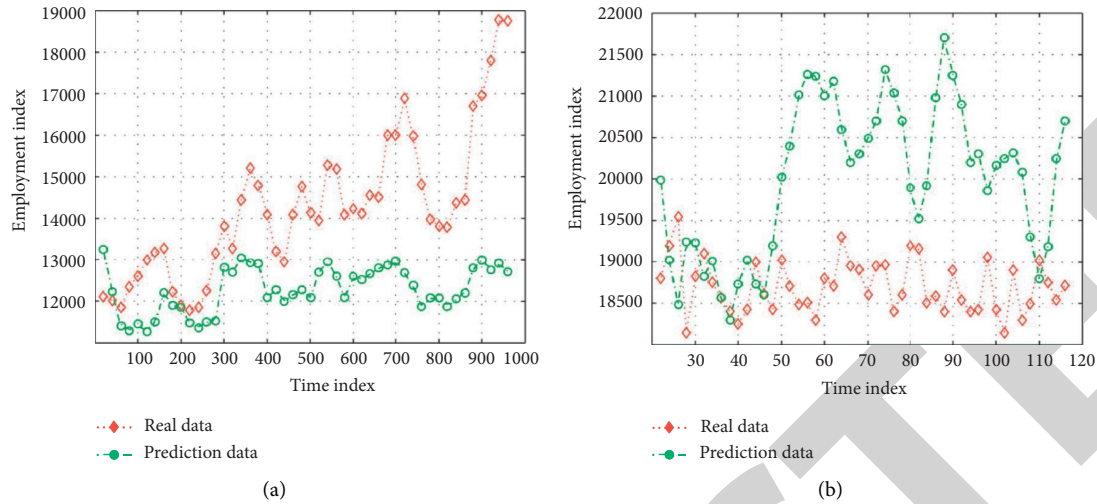
Figure 8: (a) CNN prediction result (training set). (b) CNN prediction result (testing set).
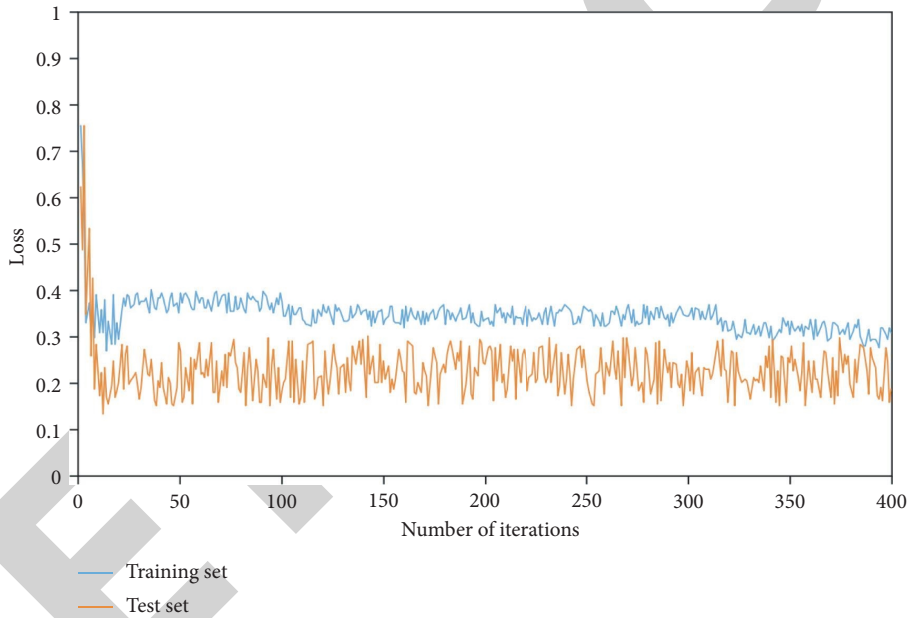

Figure 9: Prediction accuracy of the training set and test set.

5. Conclusions

In recent years, the state and local departments at all levels have issued a series of policies to promote the employment of college students.

In this paper, on the basis of analysis and research, the relevant theories of university students' employment were established through the graduates' demand forecasting model, used the CNN model to predict the market for graduates, and discussed how to reduce the search costs and save search time, achieving better employment problem. In the future, factors such as gender and family background should be added to suggest the employment index prediction model for college students, so as to improve the accuracy of prediction.

Data Availability

The 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.

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