Construction of Management Model of Vocational Education Based on Data Analysis

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Abstract. Due to the strong self-organization and self-adaptive ability of DEEP LEARNING network, this paper constructs a prediction model of management deep learning level of vocational education based on DEEP LEARNING network, using nsse-china 2013 questionnaire as the source of data, taking the five comparable indicators between vocational colleges as the input of the network, and the management level of vocational education as the output of the network, and simulating in MATLAB. The experimental results show that the prediction model overcomes the complexity and subjectivity of the traditional evaluation of deep learning vocational education management, has the characteristics of fast convergence speed and high prediction accuracy, and has good applicability.

Keywords: DEEP LEARNING network · Vocational education management deep learning level: NSSE China · Prediction model

1 Introduction

Vocational education refers to the education that enables the educated to obtain the professional knowledge, skills and professional ethics needed by a certain occupation or production labor, including primary vocational education, secondary vocational education and higher vocational education (college level vocational education, undergraduate level vocational education and graduate level vocational education). Vocational education and general education are two different types of education, which have the same important position. Vocational education is a type of education, not a level of education.

Vocational education includes vocational school education and vocational training. Vocational school education includes various vocational and technical schools, technical schools, vocational high schools (vocational middle schools), etc. Vocational school education is academic education, which is divided into primary, secondary and higher vocational school education. Vocational training is non academic education, including pre employment training for workers, re employment training for laid-off workers and other vocational training [1–4].

Vocational education is an important part of the national education system and human resource development. It is an important way for the majority of young people to open the door to success. It shoulders the important responsibilities of cultivating diversified

talents, inheriting technical skills, and promoting employment and entrepreneurship. Since the eighteen Party's Congress, general secretary Xi Jinping has made important instructions on developing occupation education for many times, demanding that "we must attach great importance to and accelerate development". In recent years, a series of major measures have been taken to promote vocational education to a new level, such as the "national vocational education reform implementation plan", the pilot project of jointly building innovative development highland of vocational education by Ministry and province, and the implementation of the East West cooperation action plan of vocational education [5–8].

According to the statistics, there are 11300 vocational schools and 30.88 million students in China, which has built the largest vocational education system in the world. From the perspective of industry distribution, in the fields of modern manufacturing, strategic emerging industries and modern service industry, more than 70% of the new frontline employees come from vocational colleges. It can be said that since the 18th National Congress of the Communist Party of China [9], vocational college graduates have become the main source of China's industrial forces, and the main force supporting the aggregation and development of small and medium-sized enterprises, the transformation and upgrading of regional industries, and the development of urbanization. At the same time, whether it is through vocational education to cut off the root of the intergenerational transmission of poverty, or a large number of ex servicemen, laid-off workers and migrant workers have acquired skills, vocational education has also played an increasingly important role in serving employment and improving people's livelihood [10–15].

At present, the 14th five year plan starts. In the new journey of building a socialist modern country in an all-round way, vocational education has a bright future. With China's entering a new stage of development, industrial upgrading and economic restructuring continue to accelerate, the demand for technical and skilled personnel from all walks of life is becoming more and more urgent. Especially in the new round of scientific and technological revolution and industrial change, the deep application of artificial intelligence, Internet of things, big data and other technologies puts forward higher requirements for the quality of workers. To adapt to the high-quality development stage of our country, it is urgent to have a high-quality labor force and build a grand industrial workers team.

According to the public data, in 2020 [16–18], the gap of skilled talents in key fields in China will exceed 19 million, and the data is still expanding, and it is expected to be close to 30 million in 2025. How to make vocational education better light up the life of workers and serve the needs of national development? How to increase the supply of vocational education and build a high-level and high-level talent training system? The key is to thoroughly implement general instructions of general secretary Xi Jinping, uphold the occupation of virtue, optimize the type and speed up the construction of modern vocational education system. We should not only further promote the reform of education mode, school running mode, management system and guarantee mechanism, but also increase institutional innovation, policy supply and investment, improve the quality of education by relying on reform, and consolidate the foundation of development through system.

The outline of the 14th five year plan proposes to "enhance the adaptability of Vocational and technical education". In recent years, the undergraduate level vocational education has taken a substantial step forward. 27 vocational colleges have independently held undergraduate level vocational education, and the "ceiling" of vocational education has been gradually broken. Facing the future, aiming at the direction of technological change and industrial optimization and upgrading, steadily improving the quality and level of vocational education, and constantly enhancing the recognition and attraction of vocational education, will be able to provide strong talents and skills support for the comprehensive construction of a socialist modern country.

2   The Connotation of Deep Learning

Generally speaking, the typical deep learning model refers to the neural network with "multiple hidden layers", where "multiple hidden layers" represent more than three hidden layers, and the deep learning model usually has eight or nine or even more hidden layers. When there are more hidden layers, there will be more parameters such as neuron connection weight and threshold. This means that deep learning model can automatically extract many complex features. In the past, when designing complex models, we would encounter the problem of low training efficiency and easy to fall into over fitting. After obtaining a better feature representation, we need to design a corresponding classifier, and use the corresponding features to classify the problem. Deep learning is a learning algorithm of automatic feature extraction. So to sum up, deep learning has the following three advantages compared with traditional machine learning.

(1) High efficiency: for example, using traditional algorithms to evaluate the merits of a chess game may require professional players to spend a lot of time studying every factor affecting the chess game, and it is not necessarily accurate. Using deep learning technology, as long as we design a good network framework, we don't need to consider the tedious feature extraction process. This is also the reason why alphago of deep mind company is so powerful that it can easily beat professional human chess players. It saves a lot of feature extraction time and makes things that are not feasible become feasible.

(2) Plasticity: when using traditional algorithms to solve a problem, the cost of adjusting the model may be to rewrite the code, which makes the cost of improvement huge. Deep learning can change the model only by adjusting the parameters. This makes it have a strong flexibility and growth, a program can continue to improve, and then close to perfect.

(3) Universality: neural network is to solve problems through learning, and can automatically build models according to the problems, so it can be applied to all kinds of problems, rather than limited to a fixed problem.

After years of development, deep learning theory includes many different deep network models, such as classic deep neural network (DNN), deep belief network, con-

volutional neural network (CNN), deep Boltzmann machines (DBM), recurrent neural network, etc., they all belong to artificial neural networks. Different network structures are suitable for different data types, such as convolutional neural network for image processing, recurrent neural network for speech recognition, etc. At the same time, there are a number of different variants of these networks.

3   Building Prediction Model

The data used in this paper comes from the Chinese version of the "vocational education investment survey" (NSSE China) of a vocational college in 2013. The in-depth learning scale is formed by selecting topics. To examine the relevant influencing factors of the level of deep learning in vocational education management and build a prediction model. The prototype of NSSE China questionnaire is the "national survey of student engagement" (hereinafter referred to as NSSE) questionnaire developed by Indiana University. NSSE is an annual survey of high-level learning activities and development of vocational college students nationwide in the United States. The l5lnsse China project was launched in 2007. After a series of cultural adaptation and pre testing, it was first tested nationwide in 2009. The questionnaire specifically measures several indicators, including five comparable indicators of Vocational Colleges (specifically lac of academic challenge, ACL of active cooperative learning level, SFI of student teacher interaction, EEE of educational experience and SCE of campus environment), nine indicators of Vocational Colleges diagnosis, DL indicators and social desirability indicators.

Through the SPSS software, the five comparable indexes and deep learning indexes of each student are calculated. According to the analysis of data, the distribution range of students deep learning index is 9.09. In this paper, the level of deep learning is divided into three levels: excellent, good and unqualified. The classification standard is shown in Table 1:

Table 1. Classification Standard

Comprehensive score DL	Evaluation level
$DL \leq 40$	Unqualified
$40 < DL \leq 70$	Good
$70 < DL \leq 100$	Excellent

3.1   DEEP LEARNING Network Model Structure

Deep learning network is a multilayer feedforward neural network. The most basic deep learning network consists of input layer, hidden layer and output layer. Each layer has many unconnected neuron nodes. The adjacent two layers of nodes are connected by connection weight. Its topology is shown in Fig. 1.
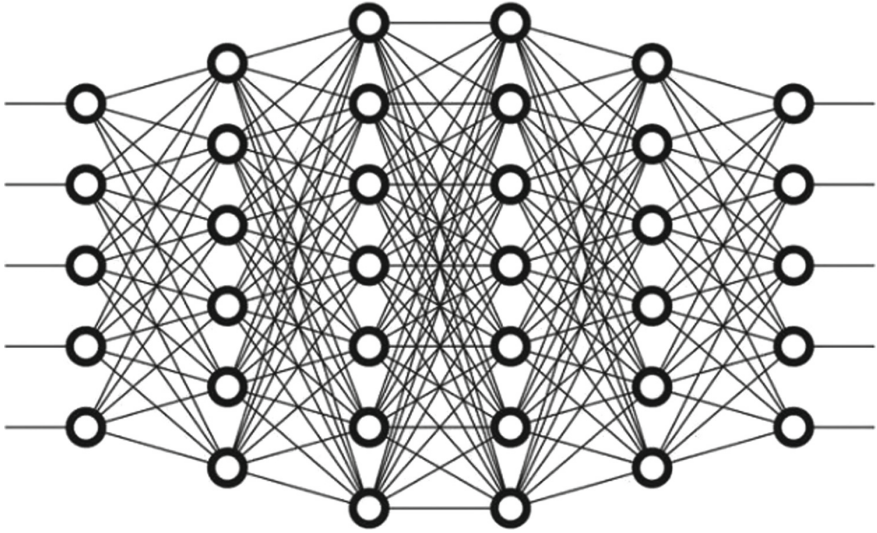
Fig. 1. Structure of deep learning network

(1) Determination of input layer nodes

There are 5 layers in the deep learning system with the vocational colleges, so n = 5, where x_1 means academic challenge, which includes the meaning of students individual and Vocational Colleges organization. It not only reflects students learning behavior performance in their studies, but also indirectly carries out academic requirements, academic standards and academic support through student's behavior performance and self-report Evaluation, to reflect the quality of education in Colleges and universities. x_2 represents the level of active cooperative learning. x_3 refers to students and teachers. It evaluates the frequency of interaction between students and teachers, their initiative and the quality of interaction. x_4 represents educational tasks. It represents teachers teaching practice, including organized teaching activities, clear knowledge explanation. It evaluates the quality of interpersonal communication in campus and the support degree of school for promoting students learning and development.

(2) Determination of output layer nodes

We use the deep learning to evaluate the college students. Therefore, the quantitative value of management deep learning level of vocational education is taken as the output of deep learning.

(3) Determination of the number of hidden layers

At present, there is no certain standard to calculate the number of neurons in the hidden layer, but the approximate range of the number of neurons in the hidden layer can be calculated according to the following formula, and then the best number of neurons in the hidden layer can be determined by trial and error method. Since the number of input layer neurons is 5 and the number of output layer neurons is l, on the basis of the reference empirical formula $l < n - 1, l < \sqrt{(m+n)} + a, l = \log_2 n$ (where, is the number of input layer nodes; l is the number of hidden layer nodes:

m is the number of output layer nodes; a is the constant between 0–10), a relatively small number of hidden layer nodes is preliminarily selected for training, if the specified training times are reached or within the limited training timesIf there is convergence, stop training, and then gradually increase the number of hidden layer nodes. The number of hidden layers of the network is two, and the number of each hidden layer is 25 and 20 respectively.

3.2 Data Preprocessing

Data processing refers to the technical process of analyzing and processing data (including numerical and non numerical). That is, the process of data acquisition, storage, retrieval, processing, transformation and transmission, and the conversion of data into information.

Data is an expression of facts, concepts or instructions, which can be processed by manual or automatic devices. Data can be in the form of numbers, text, graphics or sound. Data becomes information after being interpreted and given a certain meaning. The basic purpose of data processing is to extract and deduce valuable and meaningful data for certain people from a large number of data that may be disordered and difficult to understand. Data processing is the basic link of system engineering and automatic control. Data processing runs through all fields of social production and social life. The development of data processing technology and the breadth and depth of its application greatly affect the process of human social development.

Data processing cannot do without the support of software. Data processing software includes various programming languages and Compilers for writing processing programs, file system and database system for managing data, and application software packages for various data processing methods. In order to ensure data security and reliability, there is also a set of data security technology. It includes the analysis, arrangement, calculation and editing of various original data. It is more meaningful than data analysis.

3.3 Content of Data Processing

Computer data processing is a technology that uses computer to collect and record data and produce new forms of information through processing.

Data sorting: arrange data in order according to certain requirements.

The process of data processing is divided into three stages: data preparation, data processing and data output. In the data preparation stage, the data is input offline to punch card, punch tape, tape or disk. This stage can also be called data entry stage. After data entry, it is necessary for the computer to process the data. For this reason, the user should program and input the program into the computer in advance. The computer processes the data according to the instructions and requirements of the program. Processing refers to the combination of one or more of the above eight aspects. The final output is a variety of text and digital tables and reports.

4   Matlab Simulation Implementation

4.1   Learning Process of DEEP LEARNING

According to the network prediction model and the setting of function parameters, the network is trained. The specific training process is as follows: (1) normalize the training data so that it is distributed between [0,1], and normalize the prediction input data in the same way. (2) The normalized data is input into the network model, the network is trained according to the learning algorithm of DEEP LEARNING network, and finally the predicted output is de normalized. (3) The predicted output and expected output are divided into three categories according to the score interval, i.e. excellent, good and unqualified, and the accuracy of the network model is calculated. (4) Draw DEEP LEARNING network prediction output graph and deep learning prediction error percentage graph.

4.2   Result Analysis of DEEP LEARNING

The learning of DEEP LEARNING belongs to supervised learning. A set of learning samples with known target output is needed. Therefore, this paper selects 1000 groups of data required by the prediction model from the NSSE China questionnaire of a vocational college in 2013, and randomly selects 900 groups of data as training samples, the rest 100 groups of data as test samples, input them into the network model, and get the DEEP LEARNING network learning and training process curve as shown in Fig. 2. As can be seen from the figure, when the number of training iterations reaches 5, the network has.
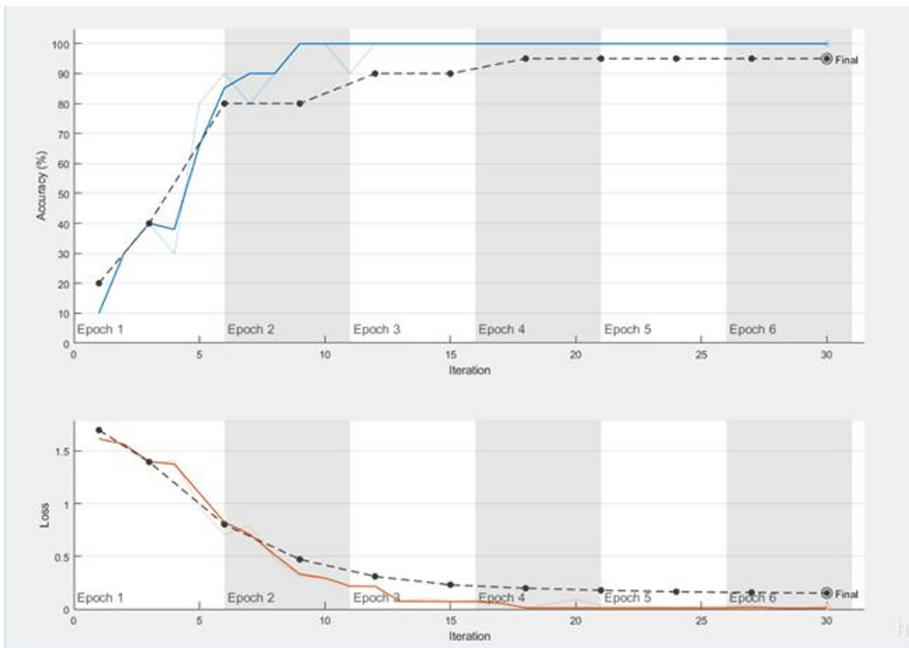

Fig. 2. Learning and training process of DEEP LEARNING network

The prediction accuracy of the network reaches the target value. After the training meets the requirements, 100 groups are selected as test samples. The results of the above network model are consistent with the results of the evaluation level of vocational education management deep learning shown in the questionnaire, and the relative error between the predicted output and the expected output is small. For example, as shown in Table 2, due to the large number of test samples used to test network accuracy, only 10 groups of randomly selected data from the test samples are listed in Table 2 for comparison.

Table 2. Data comparison

Sample serial number	Desired output	Predictive output	Evaluation level
1	45.45	44.9	Good
2	48.48	45.8	Good
3	69.70	63.91	Good
4	63.64	61.43	Good
5	51.52	50.16	Good
6	100.00	99.51	Excellent
7	48.48	48.99	Good
8	54.55	54.64	Good
9	36.36	38.09	Unqualified
10	60.61	61.08	Good

Among the 100 test samples, 88 samples' predicted output value is consistent with the expected output value. The prediction accuracy is as high as 88%, and the overall prediction error is strictly controlled within 20%. Therefore, it is proved that the prediction model of management deep learning level of vocational education constructed in this paper has high prediction accuracy. In order to test the fitting degree of the predicted output to the expected output, the regression analysis of the predicted output is carried out in the process of DEEP LEARNING network training. The linear regression equation is $y = 0.18 \times +0.13$, and the correlation coefficient $R = 0.897$. Generally, the closer the correlation coefficient r is to 1, the better the fitting degree of the network is. Therefore, according to the regression analysis, the prediction output of the model is explained Effective. Because the input and output values of the network are randomly selected, the results of each training are different to some extent. In this paper, the network is trained 10 times, and the average accuracy is 85.3%. It can show that the accuracy of the network is relatively ideal, and it can predict the level of deep learning of college students according to the five comparable indicators among vocational colleges, which has a certain application value.

5   Conclusion

DEEP LEARNING network has similar shape input. The prediction accuracy and scientificity of this method depends not only on the number of training samples, but also on the quality of training samples. The more the number of training samples, the higher the quality, the more accurate the prediction of College Students deep learning level. At the same time, DEEP LEARNING network has strong self-organization and self-adaptability. Therefore, using DEEP LEARNING network algorithm to build the prediction model of vocational education management deep learning level can make its prediction results more accurate and reasonable. The prediction model of management deep learning level of vocational education constructed in this paper has the characteristics of high prediction accuracy and fast learning speed. Through this prediction model, not only can college students grasp their learning situation in time, but also can teachers evaluate their learning situation and improve their own teaching strategies more conveniently. At the same time, it can also provide scientific guidance for school teaching reform. Therefore, the prediction model of deep learning level of Vocational Education Management Based on DEEP LEARNING network algorithm has certain practical value and wide application prospect in the field of learning analysis and education reform.

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