Development and Application of Teaching Evaluation System in Higher Vocational Colleges Based on BP Neural Network

Yue Liu[(✉)]

Shandong Institute of Commerce and Technology, Jinan 250103, Shandong, China
`578439353@qq.com`

Abstract. This paper takes the teaching evaluation of higher vocational colleges as the research object, comprehensively utilizes the functional advantages of network information technology, computer application technology and artificial intelligence technology, completes the construction and training of the teaching evaluation model of higher vocational colleges with the help of class libraries such as Numpy and Matplotlib in Python environment, and uses PyTorch framework as the calling engine to form a method class that can support Web Server calling. At the same time, combined with Django framework, the construction of Web Server is completed under Pycharm tool, and the definition and deployment of functions and data interfaces are improved, so as to generate a Web-based teaching evaluation system in higher vocational colleges. The overall design of the system chooses B/S architecture, which supports users to complete data collection, index selection, weight calculation and evaluation prediction of teaching evaluation with concise and efficient interactive operation. It not only effectively improves the accuracy of teaching evaluation in higher vocational colleges, but also makes a useful attempt to promote the reform of teaching evaluation system in colleges and universities.

Keywords: BP neural network · Higher vocational colleges · Teaching evaluation system · Python · computer application

1 Introduction

The essence of teaching evaluation is the process of analyzing and evaluating daily teaching activities and their implementation effects through a series of established standards and means. Teaching evaluation covers the evaluation of students' learning effect and the evaluation of teachers' teaching work [1]. However, in the process of practical application, many higher vocational colleges still adopt the traditional teaching evaluation system, showing some problems, such as low evaluation degree, outdated and fixed evaluation standards, single evaluation subject and complicated process, which leads to the lack of scientificity and effectiveness of teaching evaluation results [2]. In view of this, this paper holds that higher vocational colleges should recognize the educational order and form under the new situation, insist on innovation-driven, actively exert the

application advantages of network information technology, computer application technology, nology and artificial intelligence technology, and build a Web-based teaching evaluation system for higher vocational colleges. The construction of the system will comprehensively promote the deepening reform of the teaching evaluation system, and upgrade and optimize the evaluation function, evaluation tools, evaluation content and evaluation process, which not only greatly improves the efficiency of teaching evaluation, but also leads the intelligent transformation of teaching evaluation paradigm [3].

2   Development Process

First, the underlying operating system is Windows10.0 x86-64bit, and the compiler is Visual Studio 2019. Pyton 4.2.0 is selected as the development environment, and Anaconda integrated distribution can be selected for installation and deployment to shorten the time [4]. In addition, the installation of Numpy and Matplotlib needs the help of PyCharm tool, and after verification and configuration, the configuration of development environment can be completed. Secondly, import the required class library under PyCharm, define the activation function of BP neural network, and complete the initialization of the model and the construction of BP neural network model. The key code is shown in Fig. 1 [5] After the model is constructed, the training data set will be introduced for simulation training. When the error between the output value and the expected value tends to a reasonable range, the neural network is encapsulated to form a method class, which is convenient for the call of Web Server [6].

Finally, Django framework and Python are selected as the development language for the system Web Server. The Web server is Nginx server, the version is Nginx/Windows −1.12.2, and the database is MySQL5.5. After the whole system is developed, it will be packaged and published on the server side. After the corresponding ports are configured, users can use the system from the client browser [7]. Through the introduction of the above key technical theories, the overall environment of system development, the running process of related software and tools are determined, and the technical feasibility of the overall project of teaching evaluation system in higher vocational colleges is also clarified.

```
class BPNetModel(torch.nn.Module):
    def __init__(self,n_feature,n_hidden,n_output):
        super(BPNetModel, self).__init__()
        self.hiddden=torch.nn.Linear(n_feature,n_hidden)
        self.out=torch.nn.Linear(n_hidden,n_output)
    def forward(self,x):
        x=Fun.relu(self.hiddden(x))
        out=Fun.softmax(self.out(x),dim=1)
        return out
```

Fig. 1. Key code of BP neural network implementation

3 Detailed Function Realization

3.1 User Login

According to the actual needs of systematic teaching evaluation in higher vocational colleges, teaching evaluation is divided into two parts: teaching evaluation and learning evaluation, and a subsystem for evaluating students' learning effect and a subsystem for evaluating teachers' teaching work are developed respectively [8]. The system presupposes three user roles: student, teacher and administrator, and supports users to complete account registration by submitting information, and to log in and use the system with unique identification information. Different user roles have different system permissions and can use the system to complete teaching evaluation in higher vocational colleges from multiple dimensions.

3.2 Teaching Evaluation Index Data Input

According to the specific situation of various educational and teaching activities in higher vocational colleges, the teaching evaluation system is set up, that is, the determination of various evaluation indexes, levels and data types. Table 1 is the evaluation index of students' learning effect.

When users with different roles enter the evaluation system, they will score each evaluation index according to their own authority, with scores ranging from 1 to 10. After the score is entered, the system will initialize the evaluation data to meet the data input requirements of BP neural network. After the normalization function processing, the initial test data will be linearly changed, and the original meaning will be retained. The normalization formula is shown in Formula 1. M is the input value of BP neural network, N is the original data, Nmin is the minimum input value, and Nmax is the maximum input value [9].

$$M = \frac{N - N_{\min}}{N_{\max} - N_{\min}} \tag{1}$$

Table 1. Evaluation indicators of students' learning effect

Primary index	No.	Secondary index		
		Manager evaluation	Student self-evaluation	Teacher evaluation
Learning process	B1	High attendance	Consciously autonomous	High participation
	B2	Teachers and students cooperate	Efficiency improvement	Attention concentration
Personal emotion	B3	Serious and lively	Optimistic and cheerful	Correct attitude
	B4	Full of youthful spirit	Passionate	Honesty

Table 2. Evaluation results of BP neural network model

	B1	B2	B3	B4
Manager evaluation	0.85	0.76	0.58	0.95
Student self-evaluation	0.64	0.55	0.73	0.67
Teacher evaluation	0.77	0.74	0.53	0.69
…	…	…	…	…
BP network calculation results	0.7751	0.7714	0.6762	0.8257
Manual evaluation score	0.7947	0.7711	0.6768	0.8263

3.3 Output of Teaching Evaluation Results

Under this function module, the system will calculate the evaluation results according to the input values of various indicators in the teaching evaluation system. After the BP neural network model is trained, the learning rate is set to 0.5, and the minimum error is 0.001. The final output results are shown in Table 2 [10]. Taking the evaluation of students' learning effect as an example, the error between the calculated result of BP neural network and the score of manual evaluation is within an acceptable range, which indicates that the design of teaching evaluation mode in higher vocational colleges under BP neural network is reasonable and effective.

4 Conclusion

In order to promote the reform of teaching evaluation system in higher vocational colleges, this paper comprehensively utilizes the functional advantages of network information technology, computer application technology and artificial intelligence technology, and builds a Web-based teaching evaluation system in higher vocational colleges with BP neural network as the core. It reshaped the implementation process of teaching evaluation with systematic, convenient and efficient visual interaction, and made a beneficial attempt to promote the reform of teaching evaluation mode in colleges and universities, and at the same time made a beneficial attempt for the networking, informatization and intelligent construction of higher education.

References

1. Lv Bing, Wang Bingqing, et al. Teaching Evaluation in Colleges and Universities Should Combine Teaching Evaluation with Learning Evaluation.[J].Journal of Yangzhou University(Higher Education Study Edition).2022.10.
2. Chen Miaoyu, Lv Xiaorong. Present Situation and Improvement Countermeasures of Teachers' Teaching Evaluation in Higher Vocational Colleges[J].Invention and Innovation (Vocational Education).2019.06.
3. Liu Zhuo. Establish and Improve the Teaching Evaluation System in Colleges and Universities in the New Development Stage.[J].China Higher Education.2022.04.
4. Ge Shurong. Discussion on programming characteristics and application based on Python language[J]. Network Security Technology & Application.2021.10.
5. Zhou Meng, Lv Zhigang, et al. BP Neural Network Modeling Based on Small Sample Data[J].Science Technology and Engineering.2022.03.
6. Fu Yu, Li Qian et al. Research and Application of Improved BP Neural Network Algorithm[J].Computer & Digital Engineering.2019.05.
7. Bai Changsheng. Python Web Development Based on Django[J]. China Computer & Communication(Theoretical Edition).2019.12.
8. Liu Lianqiu. Development and Application of Curriculum Teaching Evaluation System in Higher Vocational Colleges[J]. Scientific Consultation (Educational Research).2022.01.
9. Zhang Lei, Fang Zheng et al. Research and Application of Course Quality Evaluation System Based on BP Neural Network[J].Journal of Chifeng University (Natural Science Edition).2020.01.
10. Qian Yu. Construction of Course Quality Evaluation System Based on BP Neural Network[J].Logistics Engineering and Management.2021.10.