

Research Article

Convolutional Neural Network-Based Mining of Civic Science Elements and Teaching Practice

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Received 2 June 2022; Revised 12 July 2022; Accepted 2 August 2022; Published 2 September 2022

Academic Editor: Le Sun

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In the context of the big data era, a model for mining Civics elements using convolutional neural networks is proposed to address the problems of poor interaction between teaching practice and Civics elements. The use of this model for the mining and teaching practice of Civics elements allows teachers to make changes to the design of teaching contents in real time in order to maximize the integration of lecture contents and Civics elements. In addition, in order to improve the effectiveness of the model, an improved model with A-Softmax algorithm and softmax output layer fusion is proposed, and the experiment proves that the improved model has a certain degree of improvement in performance.

1. Introduction

The report of the 19th National Congress of the Communist Party of China (CPC) clearly puts forward the need to comprehensively implement the educational reform policy, to implement the fundamental task of establishing moral education, and to cultivate comprehensive quality talents. With the advent of the era of data and Internet+, more and more data information is being mined and used by people to discover and obtain certain laws, predict trends, or classify a certain matter, so that they can achieve the purpose of improving the quality of life or gaining more profits.

The same is true for curricular changes. Using the literature analysis method, a direct keyword search on CNKI for Civic Science elements reveals that there are few studies on how to combine Civic Science elements with curriculum teaching practices, with a total of 14,962 articles [1]. For example, in May, the latest Yanhe and Xiaolian proposed the application of the excavation and implementation of the Civic Science and Political Science elements to the curriculum of functional experimental teaching, and the authors proposed the integration of seven elements: family and nation feeling, professional ethics, legal education, integrity education, life education, teamwork spirit, and the integration of innovation education [2]. The authors propose to

integrate these seven elements into different teaching methods: traditional classroom teaching, online teaching, and practical teaching, which can not only better promote the teaching and instruction of relevant knowledge, but also cultivate the unification of students' professionalism and values [3]. In order to further subdivide the literature, combined with the content of this paper is the excavation and teaching practice of Civics elements, you can find 1271 records in the system while checking the main theme Civics elements and secondary theme Civics teaching in CNKI according to the time. The most recent paper in May is the one proposed by Chengcheng and Erzheng on the condensation and teaching practice of the Civic Science elements in the curriculum and the teaching activities through the course Food Microbiology; in the paper, the authors proposed a new curriculum objective after adding Civic Science elements to Food Microbiology [4]. In the thesis, the author proposes a new course objective after adding the Civic Science element to Food Microbiology and discovers the target content of Civic Science education through the excavation of the Civic Science element and proposes suggestions on the problems of Civic Science education and explores the teaching mode of Civic Science in the course. The thesis has certain reference significance for the study of Civic Education [5]. In addition to the integration of the

curriculum with the elements of thinking and politics, there are also scholars who combine the test questions with the elements of thinking and politics, such as Liwei who points out the penetration of the elements of thinking and politics in the English test questions of the Chinese examination in his research and tells how the English test questions of the Guangdong Provincial Chinese examination in recent years have integrated the elements of thinking and politics into the test questions, thus summarizing the revelation of the combination of the test questions and the elements of thinking and politics, which provides certain directions and ideas for the subsequent test questions [6]. This will provide some directions and ideas for the subsequent questions.

Through compiling and reading the above related papers, it is easy to find that the research scholars of Chinese education in the past decade have never stopped their research perspectives on how to better integrate the Civic and Political Science elements into curriculum teaching. But all the orientation should be combined with the background of the times, and moreover, it is necessary to keep up with the times in order to provide a better development direction for education reform. Since the outbreak of the new crown epidemic in December 2019, online classes have become the norm for areas with frequent outbreaks [7]. However, the effectiveness of online classes has been frequently criticized because teachers in online classes do not notice the emotional changes of students, and naturally the efficiency of students' learning and the quality of teachers' lectures have deteriorated [8].

In the era of unrelenting epidemic prevention and control, the design and construction of teaching platform systems have also emerged, and the development of network and teaching platforms has led to an explosion of data and information about students' learning [9]. There are many methods and approaches on how to use these data to improve certain research or achieve certain purposes; and with the deepening of the Internet era, deep learning has also become a hot spot for research. The purpose of this paper is to use text classification to excavate and apply Civics elements to teaching practice, so as to achieve the purpose of improving the teaching methods of Civics education and to provide some new ideas and methods for the subsequent Civics education. In this way, we can achieve the purpose of improving the teaching methods of the curriculum and provide some new ideas and methods for the subsequent research.

2. Civic Education Elements of the New Era Curriculum

2022 is the year of the new era, the year of burying one's head in the sand and persevering against the epidemic [10]. Can you tell from the first sentence the ideological elements it contains? If you can, it is because you are a researcher and have more knowledge than the average student [11]. But for the students, it is not necessarily so. Maybe they can only see the spirit of struggle in it, but is it really only the spirit of struggle?

The answer is inevitably no, because in addition to hard work, there is also the spirit of overcoming the epidemic and the spirit of persevering in the beginning, cultivating, and working hard even in the year of trials and tribulations. These spirits can be fully combined with the current era, the century-long history of the struggle of the Communist Party of China, the promotion of the core values of socialism with Chinese characteristics, and the background of the era when China rose from standing up to becoming rich, which is the ideal and belief education that should be reflected in the curriculum education and is the ideological and political education that is in line with the current education reform [12], and it is the integration of ideological and political elements in line with the current educational reform. Next, the author will discuss the following four aspects of the ideological and political elements, in order to provide the theoretical basis and experimental principles for the fourth part of the study [13].

2.1. The Connotation and Problems of the Ideological and Political Elements. The element of Civic and Political Science is designated as the element contained in the ideological and political education of the curriculum, which can be understood as truth, goodness, and beauty in the current natural society and is all the elements that shape students' souls and cultivate their sentiments and is about the depth and width of knowledge in addition to the educational content of the curriculum. Education for human development: However, due to various reasons, it is difficult to integrate Civic Education with professional education in China [14].

There are several reasons why it is difficult to integrate Civic Education with professional education: firstly, the concept is not well understood. In some colleges and universities, schools do not carry out special training, and many teachers have vague concepts and ideas about what is curriculum thinking politics and how to promote curriculum thinking politics, so that the shadow of thinking politics education is not seen in classroom teaching; secondly, teachers do not pay enough attention to education for human development [15]. Many teachers only aim at how to explain this issue and principle clearly to students when they teach but do not pay any attention to the construction of students' thinking and political education, which leads many students to only linger on the surface of positive energy and beautiful things, without thinking about the things themselves and in a deeper direction and lacking the ability to think about social and current affairs, international politics, etc. The third problem is that some education authorities are not interested in political issues. Thirdly, some education authorities only require formal and utilitarian evaluation of the indicators of political and political education and focus only on the appearance but not on the inside, which makes teachers unable to carry out soulful ideological and political education.

To sum up, it is inevitable to grasp the excavation and education practice of political thinking elements in the context of the times [16].

2.2. Principle of the Excavation of Ideological and Political Elements. In the previous discussion, it is known that the study of curriculum thinking political education has always been the teeth and hot research direction of education practice and reform. But at the same time, we also found some problems in the current thinking and political education, the most prominent of which is that the above-mentioned thinking and political education is not combined with the current context but is theoretical discussion; therefore, in this paper, in order to better integrate the thinking and political elements into the practical education, combined with the current widely researched and popular deep learning combination, from the perspective of algorithms to discuss how to dig the thinking and political education, for this reason, this paper proposes the following basic principles on the mining of Civic Education elements [17].

2.2.1. Combining Domestic and International Current Affairs and Politics for Mining. Students of the new era should not be old-fashioned memorizers or nerds but should be concerned about current affairs and politics and be enthusiastic about social participation [18]. As a teacher, it is more important to fully explore the Civics element in the curriculum and integrate it with current politics and the current situation, so as to train students' thinking skills in the subject and teach them to look at the changes in the current situation with a dialectical and developmental perspective, instead of stubbornly teaching the knowledge in the textbook, so that students do not know anything about what is happening in the outside world. Tapping into current affairs and politics at home and abroad will help students gain a deeper knowledge and understanding of the world and can foster national and cultural confidence in students [19].

2.2.2. Integrating with Specific Teaching Contents. It is not a simple process, but rather a process of raising students with a sense of patriotism and social responsibility and a consistent outlook. As the guide of students, teachers must strictly follow the general goal of talent cultivation of the school, and after excavating the elements of Civics and Politics, they can reunderstand and reorganize the course structure and syllabus and then creatively and skillfully integrate the elements of Civics and Politics into the teaching content, teaching design, and teaching methods in a silent way, so as to achieve the following. The course structure and syllabus are sorted out, and then the Civic Science elements are creatively integrated into the teaching contents, teaching design, and teaching methods in a subtle way to achieve the organic unification of actual teaching contents and valuable and meaningful Civic Science elements [20].

2.2.3. Tapping into the Professionalism Requirements of Students' Future Work Development. In the education of students, teachers should take what kind of person to train as the basic goal and integrate what kind of position the student

will hold in the society as the general goal [21]. Professionalism refers to the requirements and norms inherent in the profession, specifically the comprehensive ability of the practitioner in the process of work in terms of spirit, mind, and ability to work. Nowadays, the requirements of professionalism for talents vary greatly from one university to another, but in general, for teachers, cultivating students' basic professionalism is the basic requirement of what kind of people to cultivate, so that the practicality and relevance of the curriculum can be enhanced and improved by targeting the ideological elements of professionalism contained in the curriculum. In order to enhance the practicality and relevance of the curriculum, it is beneficial to enhance students' career development ability in future employment [22].

In summary, this section proposes three basic principles for the excavation of Civic and Political elements, which will be implemented in the whole teaching practice. In this paper, the comments on whether the teaching practice is integrated with Civic and Political elements will be crawled through the crawler technology as the data source and then analyzed using the deep learning method to provide some experimental basis for teachers' subsequent teaching content design. The data is then analyzed using deep learning methods, which provides a certain experimental basis for teachers' subsequent teaching content design.

3. Convolutional Neural Network

3.1. Overview of Convolutional Neural Network. Convolutional neural networks, also known as CNNs, are one of the most widely used neural networks and the feedback they use is forward feedback [6]. With the development of the times, convolutional neural networks have received unprecedented attention, compared to traditional text processing [23]. Compared to traditional machine learning methods for graph processing, convolutional neural networks under deep learning are able to greatly accelerate the convergence of models due to the use of local connections and shared weights [24]. And the advantage of convolutional neural network is that it can automatically extract the features of the target and discover the regular features in the sample set, which solves the problems of inefficiency of manual feature extraction and low accuracy and precision of classification, so convolutional neural network is widely used in target detection, image classification, natural language domain, text analysis, sentiment analysis, and other fields [25].

For example, in the field of target detection, many research scholars have proposed a number of studies based on it. Yuan then proposed the use of target detection algorithms to detect and identify the items that need to be taken for the disabled people in China to address the problem of difficulties in obtaining the necessities of life, which can eventually facilitate the life of the disabled people; in this paper, the author conducted this machine for the model of YOLOv3 and also proposed two other lightweight target detection models [26]: YOLOv3-ShuffleNetv2 and tiny-YOLOv3-ShuffleNetv2; for the reason that software alone becomes slower, the authors used FPGA for acceleration,

and applying hardware to deep learning is a better innovation [8].

The main technique used in this paper is text analysis technique. Text analysis has text classification, text sentiment analysis, short text classification, etc. With the in-depth research of deep learning, text analysis techniques based on convolutional neural networks and text analysis techniques based on optimized convolutional neural networks have been greatly developed [27]. Lino et al. proposed a multitype pooling convolutional neural network for text classification, which firstly extracts the feature information of short text by CNN, and then the obtained feature information is filtered by various types of pool operations and finally obtain the classification results [28]. In the text sentiment analysis, convolutional neural networks are also applied. In response to the problem that the current research on sentiment classification is based on machine learning methods and sentiment lexicon methods, Fan proposes to apply convolutional neural networks to Chinese short texts for sentiment category determination of nearly 2.19%.

In summary, thanks to the many breakthroughs in various fields of deep learning, various algorithms for deep learning are being studied more and more deeply [29]. For this study, convolutional neural networks will be used to analyze and evaluate the degree of students' incorporation of Civics elements in the classroom; for the research results, this paper will use the theoretical knowledge of convolutional neural network textual height analysis to capture students' textual information about whether Civics elements are incorporated in the university language classroom and their negative and positive attitudes toward the incorporation of Civics elements through web crawler technology. The data obtained are then trained by convolutional neural networks, and the experimental results are finally analyzed in order to provide some new ideas for the next excavation of the ideological elements. Therefore, in this paper, we will talk about the principles of convolutional neural network and the principles of text sentiment analysis [30].

3.2. Principle of Convolutional Neural Network. Convolutional neural networks belong to the broad category of deep learning, which is closely related to various types of neural networks, and artificial neural networks (ANNs) are the basis of convolutional neural networks.

3.2.1. Artificial Neural Networks. Artificial neural network, also known as neural network in English, or ANN for short, is a mathematical model that simulates the thinking process in the neural network of human brain. The basic unit of a neural network is a neuron, which corresponds to a neuronal cell in the human body and has the same information processing mechanism, but the information transmitted by the neuron is determined by the excitation function, the weights (between neurons), and the corresponding threshold value. The basic artificial neuron structure is shown in Figure 1.

In Figure 1, x_1, x_2, \dots, x_N represent the input signals to the neuron, W_i represents the weight of each input signal,

which can also be called weight, connection weight, which is equivalent to the size adjustment amount located in the route of each input signal, and $\sum x_i w_i$ represents the summation of the multiplication of the input signal and the weight, f represents the activation function, and b represents the bias amount, adding the bias amount in neural network cannot be ignored, which is equivalent to the intercept of the function part. The neural network with bias amount has a more complex network structure and can also achieve better fitting effect. Modeling the neuron using the method in Figure 1 then yields the output y as

$$y = f\left(b + \sum x_i w_i\right). \quad (1)$$

From equation (1), the input is x , the output is y , and the connection between the neurons is the weight w . When the input data in this paper is passed to each connection, we multiply that value by the weight of that connection. The bias b is a special weight that can be continuously corrected for the above process. It can be seen that the output of an artificial neural network is determined by the way the network is connected, the weights, the activation function, and the structure of the network, which is a result of these factors together; and the essence of a neural network is the approximation of a function by continuously calculating and updating the weights, so it can be evaluated using evaluation indexes such as loss rate and correctness rate. For artificial neural network, it is a nonlinear, adaptive, and non-programmed way of information processing, which can be understood mathematically as the training and validation of a certain model. The idea is to imitate the process of information processing in the human brain at different levels and to different degrees; therefore, the neural network model under deep learning has the characteristic of intelligence.

3.2.2. Convolutional Neural Network. The biggest difference between the convolutional neural network and the artificial neural network mentioned above is that the convolutional neural network adds a new convolutional layer and a pooling layer and uses these two layers to form a feature extractor. The following figure shows the basic flowchart of the convolutional neural network model training, as shown in Figure 2:

In Figure 2, the basic flow of convolutional neural network for model training is firstly, the extraction of feature information is done by convolutional layer and pooling layer, and secondly, a fully connected layer is used as the feature output to complete the training of the whole model. In the convolutional layer of a convolutional neural network, a neuron is connected to only some of the neighboring neurons in the layer, and the weight shared in the CNN is the convolutional kernel. The initial value of the convolutional kernel is usually done by a random fractional matrix, and the kernel gets reasonable weights by learning during the training of the network. The inclusion of convolutional kernels in CNNs enables them to reduce the connectivity between the layers of the network and also reduces the risk of overfitting. The pooling layer, which can also be called

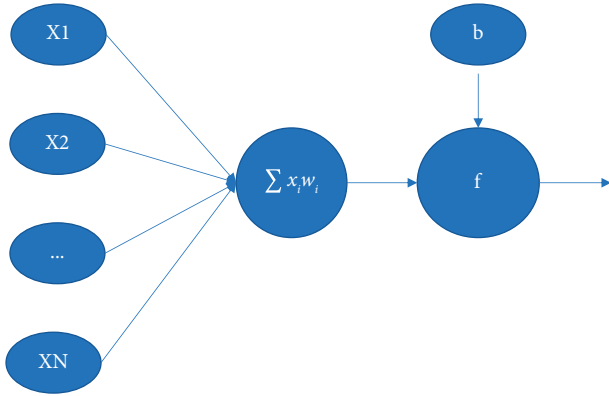


FIGURE 1: Basic neuron structure.



FIGURE 2: Basic flow chart of convolutional neural network.

subsampling, is a reprocessing of the feature information sampled by the convolutional layer. There are generally two ways to implement subsampling: one is maximum subsampling and the other is mean subsampling; the pooling layer can also be seen as a special convolutional process. Due to the introduction of pooling and convolution layers, the CNN network model can reduce the parameters associated with the model, thus greatly reducing the complexity of the model. The role of each layer is described separately next.

(1) *Input Layer.* CNNs were first applied in the field of image processing. Therefore, if we want to use CNN in this paper to process the obtained Civic elements, we need to process them in a certain way to make them behave in the same format as the images. During the text processing, word vector techniques are used, and this part will be analyzed in Section 4.1.

(2) *Convolutional Layers.* Several convolutional units form a convolutional layer, and the parameters of each convolutional unit can be optimized by a backpropagation algorithm. The purpose of the convolution operation is to extract different feature information of the input signal, and as the number of convolution layers deepens, the feature information extracted becomes richer. However, for different models, the number of convolutional layers has a certain threshold, so the number of convolutional layers should be adjusted and optimized according to the specific conditions of the model.

(3) *Pooling Layer.* In this paper, the feature information obtained from the textual information of Civic elements after convolutional layer processing is of high dimensionality, so it is necessary to reduce the dimensionality of such feature information. If the feature information with high dimensionality is not processed in the model training, the model will be easily overfitted. The role of the pooling layer is

to continue the process of feature extraction from the high-dimensional feature maps obtained in the convolutional layer, in which these feature maps are cut by the maximum subsampling or minimum subsampling method mentioned above to obtain new, smaller-dimensional feature information.

(4) *Fully Connected Layer.* In CNN, softmax classifier is generally used in order to achieve classification of the processed feature information. In this layer, the main purpose is to change all the previous local features into global features, and by calculating the scores or probabilities of different texts belonging to different categories, respectively, then the texts are classified into the class with the highest probability value according to the probability, where the sigmoid function used in logistic regression is formulated as follows:

$$\sigma(t) = \frac{1}{1 + e^{-t}} \quad (2)$$

In the logistic regression function, you can see that this is an exponential value function with a numerator denominator form. When its input value tends to negative infinity, the output y tends to 0. When its input value tends to positive infinity, the output y tends to 1.

(5) *Output Layer.* The last layer in the CNN network is the output layer, which is connected to the fully connected layer. In fact, the fully connected layer here can also be considered as the output layer, because the fully connected layer has already done the work of classifying the text information and so on. Among them, in addition to the use of sigmoid function in CNN, tanh function, ReLU function, and Leaky ReLU function are also of the more popular activation functions. Their formulas are specified as follows:

$$\tanh(x) = \frac{\sinh(x)}{\cosh(x)} \quad (3)$$

$$\text{Relu} = \max(0, x), \quad (4)$$

$$\text{leakyRelu} = \max(0.01\alpha, x). \quad (5)$$

As can be seen from equation (3), the tanh function consists of the $\sinh(x)$ function and the $\cosh(x)$ function, respectively. Compared with the sigmoid function, it can overcome certain gradient disappearance problem, but the function value is more difficult to implement, so it is not recommended. For equation (4), which is one of the very popular activation functions, its output value is not 0 until it is greater than 0, and 0 when it is less than 0. It usually refers to the ramp function in mathematics. And equation (5) is an optimized function of equation (4), with better convergence performance and convergence speed.

3.3. *Convolutional Neural Networks and Text Sentiment Analysis.* Sentiment analysis, also known as opinion mining, is the process of analyzing the information contained in

a text to uncover the sentiment information contained in it. The text sentiment analysis studied in this paper is a type of sentiment analysis.

In 2006, some scholars introduced CNN into text classification. Li first used convolutional neural networks to construct pattern classifiers and used them for image segmentation, text segmentation, and text detection, but [14] all the text information in his experiments was derived from images, which did not completely break the application field of CNN networks. For example, in order to improve the performance of text classification, Guifeng et al. proposed a differential evolutionary convolutional neural network, in which the CNN structure parameters were first set randomly, and then the differential evolutionary algorithm was used to optimize the parameters. In this method, the parameters of the CNN structure are first set randomly, and then the parameters are optimized by using the differential evolution algorithm, and in order to enhance the advantage of differential evolution, the evolution algebra is associated with the scaling factor, and then the convolutional neural network is trained with the differentially optimized weights and thresholds for text [15]. For example, in text sentiment analysis, Kexun et al. used text convolutional neural network and bidirectional coding converter for text sentiment classification analysis of microblog comments, in which the authors used BERT-Text CNN model, utilized the bidirectional coding converter of BERT alone attention mechanism to dismiss, and then obtained the word vector of global vector. Then, in order to convert the global feature vector into local feature vector, it is input into Text CNN, and the fine-grained sentiment analysis of microblog comments with high accuracy is achieved by combining the contact of discourse order and contextual connection.

In the face of text sentiment tendency analysis, there are mainly sentiment lexicon based analysis methods and deep learning based methods. However, due to the diversity of text information in the Internet and the diversity of language expressions in today's new media context, such methods are no longer suitable for people's needs, while deep learning methods have achieved better accuracy and stronger generalization ability of the model in text sentiment analysis after recent years of development.

Therefore, this paper will use the convolutional neural network model to analyze the sentiment category of the comments on Civic and Political elements in the information platform of colleges and universities and propose some optimization and improvement for the problem of low stability of the model in the traditional CNN applied to text sentiment analysis, so as to improve the accuracy of text sentiment classification and provide some reference basis for teachers to integrate Civic and Political elements in teaching practice.

4. Experimental Analysis

After the above analysis and the elaboration of relevant concept theories, in order to make the curriculum thinking and political elements better integrate with teaching practice activities, this paper will convolve the comments on a university platform about whether teachers integrate thinking and political elements in the teaching stage by using

convolutional neural network and then provide certain reliable messages for the interpenetration of today's curriculum thinking and political elements and teaching practice activities; on the other hand, it can supplement the gap of deep learning in the field of education and provide some theoretical value and reference basis for the subsequent research in the field of education.

4.1. Data Acquisition and Processing. According to the above, this paper will crawl the comments on the information technology teaching platform to obtain the test set and training set required for convolutional neural network training. The raw data used for this experimental test is crawled using Web Scrapy technology, and after data preprocessing, it is input into the convolutional neural network model, and the classification results are subsequently output using the softmax classifier. One of the basic flowcharts of sentiment analysis is that shown in Figure 3.

After the original data is obtained, it needs to be pre-processed. In this paper, word vector technology is used to preprocess the data, and the reason for preprocessing is that the text obtained from the network is not standardized, so it needs to be trained by text normalization, word separation, and deactivation. In the word vector training, Word2Vec is used to transform the word vectors, which provides the data basis for the input of the convolutional neural network model. In this paper, the process of data preprocessing is as shown in Figure 4.

In this paper, the evaluation criteria in the evaluation text were processed in a hierarchical manner, in which about 5,000 comments related to the discussion of the Civics element of the course were screened out from the comments of the information technology platform using the Scrapy framework, and the data were labeled, in which they were expressed in the program as shown in Table 1.

4.2. Loss Function Activation Function. In this experiment cross entropy is used as the loss function, which is named Cross Entropy Loss in English and is a loss function for classification problems very commonly used in deep learning.

Cross entropy comes from Shannon information theory, which is a very important concept in information theory and is mainly used to measure the difference between two probability distributions. Therefore, this paper uses cross-entropy as the loss function in model training and uses it to evaluate the loss rate of the model.

In this paper, the ReLU function is used in the convolution layer in order to get better convolution effect. Because the linear composite function has the problem of limited fitting ability, this paper chooses the ReLU function for finding the maximum value as the activation function, and this function can eliminate the problem of gradient dispersion on the positive interval greater than 0. Moreover, it only requires whether the discriminant is greater than 0. Using the ReLU function as the activation function can improve the calculation speed and convergence speed of the model and enhance the generalization

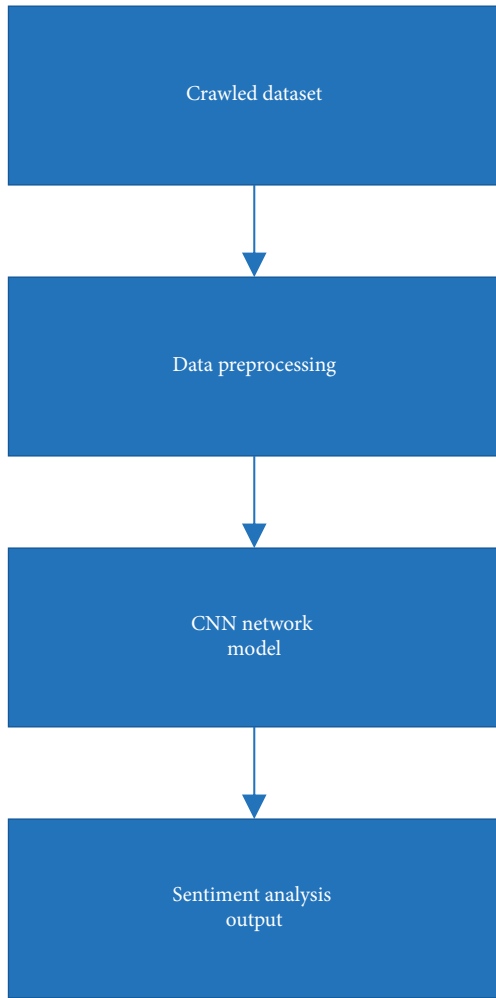


FIGURE 3: The basic flowchart of sentiment analysis.

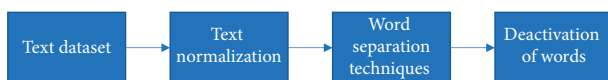


FIGURE 4: Preprocessing process of text data set.

ability of the model. In order to mine the effective features of more Civic elements, this paper chooses the activation function as ReLU function and the loss function as cross entropy loss function.

4.3. Convolutional Neural Network to Build the Model of Civic Elements Mining

4.3.1. Selection of Data Parameters. After the above operations of data preprocessing and text format normalization, the number of sequence annotations for the dataset in this paper is shown below, which is divided into three levels, namely, positive, general, and negative, of which the number is about 1600, 2000, and 1400, respectively, as shown in Figure 5.

Where the word vectors obtained from the above dataset are transformed into data and divided into a test machine and a training set, the number of comments accounted for by the tags in the test set is shown in Figure 6.

4.3.2. Training and Prediction of the Traditional Convolutional Neural Network Model. After the above experimental parameters are set, the word vector data from the training set is fed into the CNN model for training until the model converges, which means the training is finished. Then the converged model is verified by the test set, and the final experimental results are shown in Figure 7.

From Figure 7, it can be seen that the ACC accuracy increases with the number of training sessions and then decreases once between 400 and 500 sessions, which may be due to the instability of the model during the training process, or an error in one of the weight iterations, which requires reestimating the gradient direction, or an error in the output of the softmax layer. The accuracy of the model decreases. However, overall, the model smoothed out after 900 training sessions, and the accuracy of the model was stable at about 95%.

4.4. Optimization of the Softmax Layer. In the construction of the above model, which is mainly based on the process in Figure 3, the output layer used is the traditional softmax layer. Although the traditional softmax layer is very friendly to learn information between classes of samples, the reason why it has such an advantage is that it uses an interclass competition mechanism; i.e., it only cares about the accuracy of the prediction probability of correct labels. Therefore, the traditional softmax layer tends to ignore the variability of other noncorrect labels, resulting in a trained model that is not very portable and the learned features are very sparse and loose.

In order to solve this problem and improve the correctness and portability of model training, this paper tries to combine the traditional convolutional neural network with the A-Softmax algorithm to propose an improved model of convolutional neural network. The new model will add the A-Softmax algorithm to the softmax output layer to process the combed text data on top of the original model and finally complete the training of the whole model.

The flowchart of the improved model proposed in this paper is as shown in Figure 8.

The performance of A-Softmax algorithm is mainly influenced by the cosine variable m . Meanwhile, it has been verified by relevant experiments that the size of m value is related to the check accuracy rate, check completeness rate, and $F1$ value (reconciled average) of the model, and the larger the m value is, the higher the above value of the model decreases. Therefore, it is crucial to choose a good m value in model training, and it even affects whether the whole model can converge. In this paper, the value is set to 1 in the model training.

Adopting the same value setting as the classical one above for the improved convolutional neural network model and setting the value of m in the new A-Softmax algorithm to

TABLE 1: Label description.

Tags	Description
0 negative	In the comments, the course has nothing to do with the Civics element, usefulness for shaping students' values, etc.
1 average	In the comments, the course is considered to be generally related to the Civics element, useful for shaping students' values, etc.
2 positive	In the comments, the course is considered to be very related to the Civic studies element, useful for shaping students' values, etc.

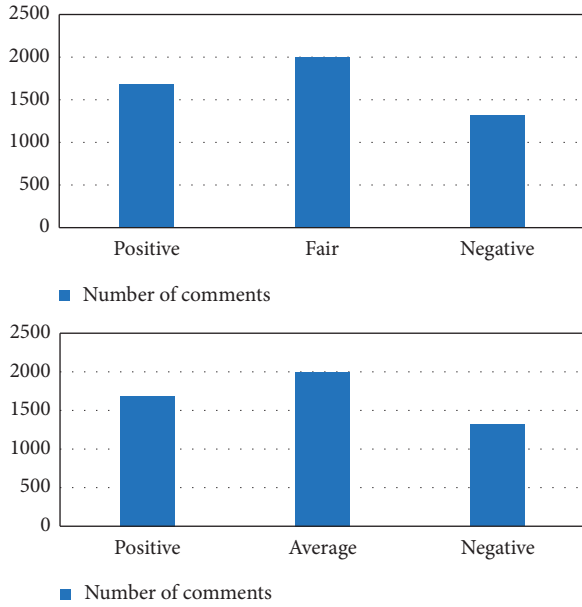


FIGURE 5: The number of comments for each level of the dataset.

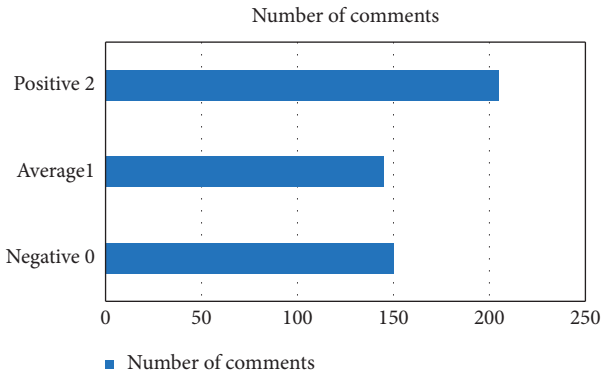


FIGURE 6: The number of comments accounted for by the labels in the test set.

1 can not only make the model get better convergence effect but also improve the computing power of the computer and reduce its burden.

In order to better verify the effectiveness of the improved model, the above data sets are applied to the classical CNN model and the improved CNN model for training and comparison. Finally, the ACC curves are tested and compared with the ACC accuracy curves of the classical CNN model mentioned above as in Figure 9.

From Figure 9, it can be seen that the accuracy of the improved convolutional neural network model proposed in

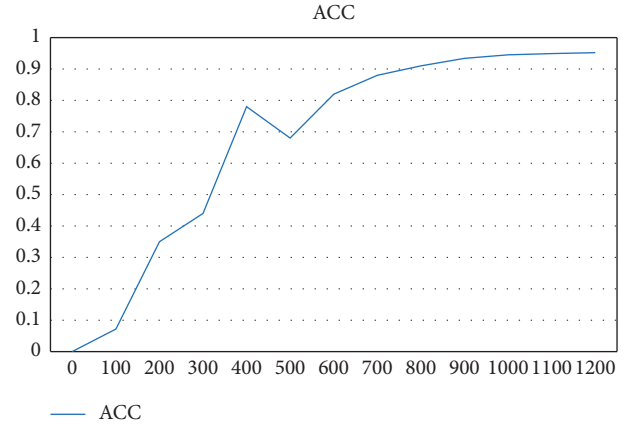


FIGURE 7: ACC accuracy curve with the increase of training times.

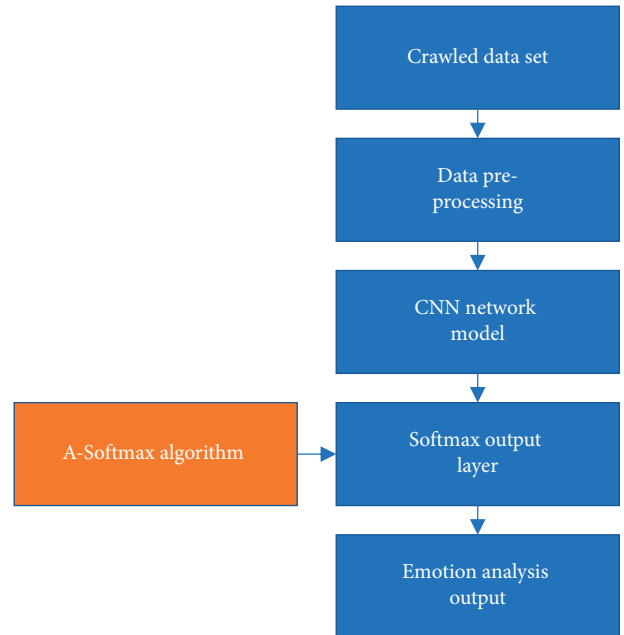


FIGURE 8: Improved convolutional neural network model based on text sentiment analysis.

this paper is higher than that of the classical convolutional neural network model, about 1.5% higher. More dominantly, compared to Figure 7, the ACC curve shows a decrease in the degree of decline in the number of iterations between 400 and 500, further illustrating that the improved convolutional neural network is able to further improve the correctness of the model.

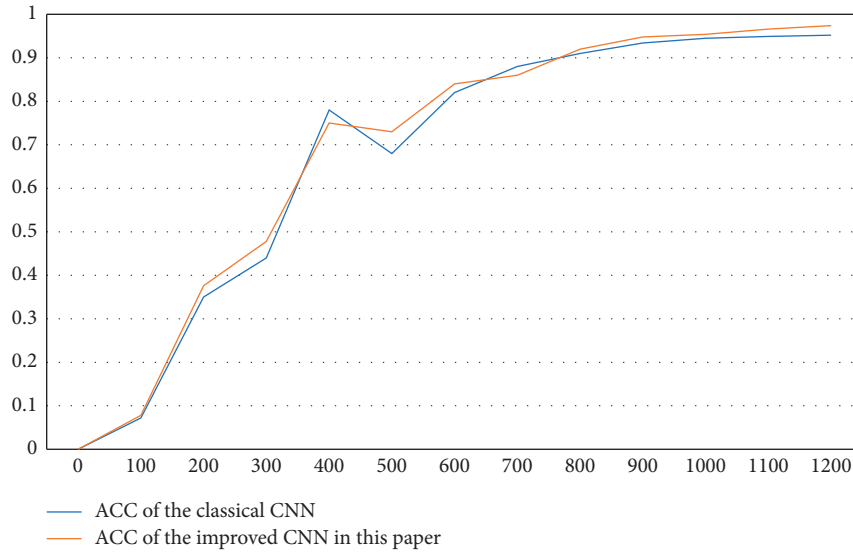


FIGURE 9: Accuracy variation curves of classical CNN compared with the improved CNN in this paper.

TABLE 2: Comparison of classical CNN and the improved metrics of this paper.

Model	Precision rate	Recall rate	F1
Classical CNN	93.32	93.12	93.25
Improved CNN in this paper	95.54	95.59	95.57

In order to further illustrate the superiority of the improved model in this paper after the mining of Civic elements, this paper finally uses the precision rate, recall rate, and summed average as the comparative performance metrics to measure the performance performed by the two different models on the test set. In general, the higher the precision rate, the lower the recall rate, while the $F1$ value, i.e., the harmonic mean, is the result of a comprehensive consideration, which includes both the recall rate and the precision rate. In this paper, after experiments, the final experimental results of the above three are obtained as in Table 2.

From the above table, it can be seen that the improved CNN network model in this paper is higher than the classical CNN network model in terms of accuracy, recall, and $F1$ measurement values. Then, summarizing the above comparison of ACC accuracy change curves, it can be seen that the improved CNN model in this paper is obviously superior to the classical CNN in terms of performance.

5. Conclusion

In this paper, we have proposed a convolutional neural network model with improved softmax layer, which integrates the requirements of excavation and interpenetration of political science elements and teaching practice and proposes some principles for teachers' reference in teaching practice activities. The improved CNN model is experimentally proven to be superior and can advance the research

progress of text sentiment analysis and teaching practice activities in deep learning to a certain extent.

Data Availability

The labeled dataset used to support the findings of this study is available from the corresponding author upon request.

Conflicts of Interest

The author declares that there are no conflicts of interest.

Acknowledgments

This paper was supported by Aba Science and Technology Bureau (19YYJSYJ0091) and the 13th five year plan of Educational Informatization Construction in Sichuan Province (Chuan Jiao Guan 2019-142).

References

- [1] S. Jiang, S. Mishal, and A. Muhammad, "Application of intelligent education using interactive modeling in higher ideological and political education platform," *Security and Communication Networks*, vol. 2022, Article ID 2088437, 2022.
- [2] R. Zhang and J. Liu, "Using social issues case teaching method to promote the integration of ideological and political education into statistics courses," *International Journal of Social Science and Education Research*, vol. 5, no. 5, pp. 188–191, 2022.
- [3] D. Chen, P. Ren, and P. Liu, "Research on ideological and political education under the background of modern apprenticeship," *International Journal of Social Science and Education Research*, vol. 5, no. 5, pp. 330–337, 2022.
- [4] L. Li, "The countermeasures of ideological and political education into primary school English class," *International Journal of Social Science and Education Research*, vol. 5, no. 5, pp. 689–693, 2022.

- [5] W. Chen and H. M. Farukh, "The construction of ideological and political education in higher vocational schools based on smartphone carriers," *Wireless Communications and Mobile Computing*, vol. 2022, Article ID 2353835, 2022.
- [6] Q. Sun and V. Narasimhan, "Ideological and political education reform using mobile phones as a carrier in the context of artificial intelligence," *Wireless Communications and Mobile Computing*, vol. 2022, Article ID 5230215, 2022.
- [7] H. Wang and C. Chin-Ling, "Optimization of Ideological and Political Education Management Strategies under K-Means Algorithm in Big Data Environment," *Security and Communication Networks*, vol. 2022, Article ID 6120230, 2022.
- [8] X. Zhou, X. Lao, and Q. Wang, "Exploration and practice of ideological and political education and teaching reform of Engineering Mechanics course," *International Journal of Education and Teaching Research*, vol. 3, no. 2, 2022.
- [9] Y. Wang, "On the cultivation path of craftsman spirit in ideological and political education in colleges and universities," *International Journal of Education and Teaching Research*, vol. 3, no. 2, 2022.
- [10] D. Zheng, "Research on the innovative path of integrating the spirit of northeast resistance union into ideological and political education in colleges and universities," *International Journal of Education and Teaching Research*, vol. 3, no. 2, 2022.
- [11] J. Ge, "An analysis of the path of course ideological and political education in engineering specialty teaching," *International Journal of Higher Education Teaching Theory*, vol. 3, no. 2, 2022.
- [12] X. Wu and B. Xue, "Exploring the integration of qi Jiguang's spirit into ideological and political education in colleges and universities in the new media era," *International Journal of Higher Education Teaching Theory*, vol. 3, no. 2, 2022.
- [13] Y. Zhu, "Research on new ways of ideological and political education in colleges and universities in we-media era," *International Journal of Higher Education Teaching Theory*, vol. 3, no. 2, 2022.
- [14] L. Sun, "Higher vocational colleges use ideological and political education to improve the professional quality of college students," *International Journal of Education and Economics*, vol. 5, no. 2, 2022.
- [15] A. Qixin, "On the strategy of integrating four self-confidence education into college students' ideological and political education," *International Journal of Social Sciences in Universities*, vol. 5, no. 2, 2022.
- [16] L. Mei, "Analysis on the ways of combining theory and practice of ideological and political education in higher vocational colleges," *International Journal of Social Sciences in Universities*, vol. 5, no. 2, 2022.
- [17] Y. Meng, "Research on college students' ideological and political education from the perspective of new media," *International Journal of Social Sciences in Universities*, vol. 5, no. 2, 2022.
- [18] C. Wu, "Research on the integration and development of ideological and political education and student management work in universities in the background of the Internet," *International Journal of Social Sciences in Universities*, vol. 5, no. 2, 2022.
- [19] X. Zhao, S. Liu, J. Wang, and L. Wang, "College music teaching and ideological and political education integration mode based on deep learning," *Journal of Intelligent Systems*, vol. 31, no. 1, pp. 466–476, 2022.
- [20] X. Bu, "Research on the path of integrating regional culture into the ideological and political education of visual communication design curriculum from the perspective of core literacy," *Higher Education of Social Science*, vol. 22, no. 1, 2022.
- [21] Y. Peng, Y. Zeng, and N. Jan, "A mobile teaching method of ideological and political education in colleges and universities based on android platform," *Mathematical Problems in Engineering*, vol. 2022, Article ID 9948451, 2022.
- [22] H. Wu, L. Ma, and A. Muhammad, "The Construction of Online Course Learning Model of Ideological and Political Education for College Students from the Perspective of Machine Learning," *Security and Communication Networks*, vol. 2022, Article ID 4674468, 2022.
- [23] Z. Yan, "Methods and paths of ideological and political education for college students in the hotan teachers' college during the pandemic period: based on the perspective of "sanjin lianglian yijiaoyou"," *Scientific and Social Research*, vol. 4, no. 1, pp. 194–198, 2022.
- [24] Y. Yang, P. Anand, and K. Cheung Simon, "Research on basketball sports neural network model based on nonlinear classification," *Journal of Intelligent & Fuzzy Systems*, vol. 40, no. 4, pp. 7567–7576, 2021.
- [25] Q. Zeng, G. Yang, and Y. Wu, "Research on the optimized retrieval of network teaching platform in medical colleges and universities based on deep neural network," *Basic Clinical Pharmacology & Toxicology*, vol. 127, 2020.
- [26] Q. Yuan, "Network education recommendation and teaching resource sharing based on improved neural network," *Journal of Intelligent and Fuzzy Systems*, vol. 39, no. 4, pp. 5511–5520, 2020.
- [27] G. Zhou, H. Moayedi, and L. K. Foong, "Teaching-learning-based metaheuristic scheme for modifying neural computing in appraising energy performance of building," *Engineering with Computers*, vol. 37, no. 4, pp. 3037–3048, 2020.
- [28] A. Lino, A. Rocha, and A. Sizo, "Artificial neural networks; new findings from university of Coimbra in the area of artificial neural networks described (virtual teaching and learning environments: automatic evaluation with artificial neural networks)," *Computers, Networks & Communications*, vol. 22, no. 3, pp. 7217–7227, 2020.
- [29] K. A. Thamer, "Method of artificial neural networks teaching," *Webology*, vol. 17, no. 1, pp. 43–64, 2020.
- [30] M. Learning, "New findings from argelander institute for astronomy describe advances in machine learning (weakening shear measurement with machine learning teaching artificial neural networks about feature noise)," *Computers, Networks & Communications*, vol. 621, p. A36, 2019.