Predictive Analysis of Class Attention Based on CNN Model

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Abstract. As the current classroom teaching reform has been integrated into every class of higher vocational colleges, modern artificial intelligence, deep learning, big data and other high-end technologies are integrated into the classroom, and classroom teaching has become more and more diverse. But the attention of modern vocational and technical students to the classroom has also received widespread attention from the society. This article uses artificial intelligence and big data technology to analyze class attention, and then uses the CNN model to predict the overall class attention. This article discusses the core literacy strategies for cultivating the efficiency of vocational and technical students in the classroom, and proposes methods such as setting suspense to guide independent inquiry, organizing learning to discover learning rules, and in-depth exploration of students' independent learning ability, so as to increase the attention of the classroom. Based on the current popular CNN target detection algorithms can be divided into two categories. The first category is a two-stage detection algorithm, which divides the detection problem into two stages. First, generate candidate regions, and then classify the candidate regions. The typical representative of these algorithms is the R-CNN series algorithm based on region proposal. The other type is the 1-stage detection algorithm, which makes predictions for every part of the image, that is, it does not need to generate candidate regions. On this basis, a target prediction system based on the CNN model is designed and implemented, which predicts and analyzes the class attention of higher vocational colleges, uses a deep learning framework, and uses PyQt5 as an interface development framework combined with python. Experimental research results show that the designed CNN-based classroom attention model in higher vocational colleges can effectively predict and analyze students, and the effect of the practical experiment is good.

Key words: CNN model, classroom attention, target prediction system, artificial intelligence
1. Introduction

CNN (Convolutional Neural Network) is a feed-forward neural network. The essence of its model is a multilayer perceptron. It was not proposed by a computer professional at first, but a biologist is studying the visual cortex. When proposed [1], CNN artificial neurons can respond to a part of the surrounding cells in the coverage area, including convolutional layers and merged layers [2]. CNN uses local connections and weight sharing to reduce the number of weights, making the network easier to optimize, reducing the main complexity of setting up a model, and reducing the risk of fitting. It is in the processing of two-dimensional images, especially in Recognizing displacement, scaling and other forms of distortion and non-deformation applications, it has good computing efficiency, and also has excellent performance in large-scale image processing. It is one of the most successful areas of deep learning algorithm application [3].

In order to help students modify their own bad habits in class, overcome electronic products drugs, they can truly learn their own professional knowledge and skills in class, and become useful talents for social construction [4]. No matter what method the teacher adopts in the course of class, it is not as attractive as the colorful entertainment tools. In the process of teaching, the teacher is not only to please students, but also to impart knowledge [5]. Knowledge needs to be accumulated continuously in the classroom and can only be learned by working hard. Those students with poor self-control did not pay enough attention to the content taught by the teacher in the classroom, and gave up listening to the class when they encountered difficulties in learning [6]. And it is precisely because some external factors are more attractive than the knowledge in the classroom, such as mobile phones, games, novels and other external factors that reduce the students' attention to the classroom, so that the academic performance is reduced. Therefore, some high-tech methods can be used to manage the classroom, and some characteristics of artificial intelligence technology can be used to restrain students, urge them to improve their attention in class, and urge them to increase their attention in the classroom [7].

Because the teacher made the teaching plan and teaching goals without understanding the students in the class. Facing students with uneven learning foundations, in order to complete the teaching content prepared before class, we must speak slowly and end the class in a charming way, which completely turns the classroom into student rather than teacher as teaching for the center [8]. And how many students attending the class, how many students have accepted the class, do not know, it is difficult to grasp the degree of students' absorption of knowledge in the course. The students' attention to the curriculum is not high, and the teacher is trying to change this situation. In order to increase students' attention to the classroom, they ask questions in the classroom, make students think about problems, and encourage students to learn with questions [9]. This traditional method of increasing class attention is not perfect because of the large number of students in the class. The teacher’s supervision is not in place, it can assist high-tech means to analyze the expressions and movements of the students in class, obtain the students' attention to the subject, and timely feedback to the teacher, prompting the teacher to change the teaching method and content, and increase the attention and mastery of knowledge. This requires a large collection of students’ facial expressions, movements and other data in class. The collected data has impurities, and the data must be cleaned into information. The information is summarized and stored in the database for artificial intelligence to call for subsequent analysis [10].

2. Method

2.1 Design of convolutional neural network based on CNN model

Convolutional neural network has the characteristics of local connection, weight sharing and local acceptance field, so it has certain translation, scaling and tilt invariance. A typical convolutional neural network model includes input layer, convolution layer, pooling layer, complete connection layer and output layer.

The convolutional layer is the most important part of the convolutional neural network model. The
The essence of its operation is that the convolution kernel and the input features do impetus, which is expressed as follows:

\[ y_{ij} = \sum_{v=1}^{m} \sum_{u=1}^{n} k_{uv} x_{i-u+1,j-v+1} \]  

(1)

In the above formula, \( x_{i-u+1,j-v+1} \) is the input feature, \( k_{uv} \) is the convolution kernel, and \( y_{ij} \) is the corresponding feature after the convolution kernel. \( m \) is the height of the convolution kernel, \( n \) is also the height of the convolution kernel, and can satisfy \( 1 \leq i \leq m \), \( 1 \leq j \leq n \). If there are multiple channels in the input feature, and the convolution kernel also contains multiple channels, then the formula of the process is:

\[ Z^{l+1} = [Z^{l} \oplus W^{l+1}] (i, j) + b = \sum_{k=1}^{K} \sum_{x=1}^{f} \sum_{y=1}^{f} [z_{k}^{l} w_{k}^{l+1} (x, y)] + b \]

\[ L_{t+1} = \frac{L_{t} + 2p-f}{s_{0}} + 1 \]  

(2)

Among them, the operation of summation is equivalent to a crossover operation. \( b \) is the deviation, \( K \) is the parameter of the characteristic data, \( f \) is the size of the convolution kernel, and \( p \) is the filling parameter.

In the convolutional neural network model, after multiple layers of convolution, one layer can usually be connected to multiple layers or fully connected layers. The entire connection layer is essentially a multi-layer sensor, and each neuron in the fully connected layer is connected to the upper neuron. It can be considered as a linear transformation during the fully connected operation. The formula is as follows:

\[ y = W_{X} \]  

(3)

The BP model is divided into input, implicit and output layers, and data analysis is completed through forward and reverse signal propagation. In the process of backpropagation, the weight and threshold adjustment of each neuron in the hidden layer directly affects whether the feedback error meets the requirements, so dynamic adjustment is required, that is, multiple iterations.

\( E_{m} \) is the error between the estimated value and the actual value, reflecting the overall error of the result; the error percentage of a single sample of \( E_{c} \) is shown in the following formula:

\[ E_{m} = \frac{\sum_{i=1}^{n}(d_{i} - o_{i})^{2}}{N-1} \]

\[ E_{C} = \frac{O_{i} - d_{i}}{d_{i}} \times 100\% \]  

(4)

Normalization processing:

\[ d_{i} = \alpha \frac{d_{i} - d_{\min} + \beta}{d_{\max} - d_{\min} + \beta} \]
\[ u(k + 1) = \sigma(k) - [J^T J + uI]^{-1} J^T e \]
\[ b(k + 1) = b(k) - [J^T J + uI]^{-1} J^T e \]

The improved BP neural network model first determines the value through the coefficients, arranges the performance indicators in ascending order, and then divides them into different clusters. The center sample of each category is the initial center point of the category. The LM method is used to calculate the minimum value of the error function in the back propagation process, and the weights and thresholds of the standard BP neural network model are iteratively adjusted to improve the calculation accuracy.

2.2 Training of classification network

When the classification network design is completed, it is necessary to use effective algorithms to effectively update the parameters in the network. This network calculates the error between the predicted value of the model and the true value, and propagates the error back to the middle layers of the model. Then use the gradient descent algorithm to update the parameters of the CNN model.

The CNN model is trained using BP algorithm. First, the weights of the network need to be initialized before training. Because the weight initialization method has an important impact on the performance of the model, the currently widely used Gaussian initialization method is used to initialize the parameters. The initialization parameters are generated by the normal distribution of the mean, and the initialized weights are uniformly distributed in:

\[ \left[-\frac{6}{\sqrt{\text{fan}_{\text{in}} + \text{fan}_{\text{out}}}}, \frac{6}{\sqrt{\text{fan}_{\text{in}} + \text{fan}_{\text{out}}}}\right] \]

3. Experimental research methods and generalizations for improving class attention

3.1 Reasonable use of group teaching mode in the classroom

The new teaching concept requires that the classroom be returned to the students so that the students become the main body of the class, which can fully and effectively increase the students' attention to the classroom. Every class requires the participation of all students, so it is very important to allocate groups appropriately. Because reasonable group teaching can fully mobilize students' learning enthusiasm, enhance their sense of cooperation and competition, thereby promoting the overall development of all students, and can also improve students' autonomous learning ability and increase their attention to classroom teaching. Secondly, reasonable group teaching can not only cultivate students' good habits of independent thinking, but also cultivate students' team spirit of unity and cooperation. Let the students appreciate the teacher's serious care and earnest expectations, and get full respect and affirmation in the teacher's appreciative eyes and encouraging words, so as to have fun from the bottom of their hearts. As long as students have self-confidence, realize their value and gain the recognition of teachers, I believe that every child can understand themselves comprehensively and accurately, know their shortcomings and areas that require hard work. In order to think more positively and learn more actively, Be more attentive and get the best results.

3.2 Innovation of the training model of class attention in higher vocational colleges based on the CNN model

First of all, we need to have a new understanding of the concept of the CNN model in the "high vocational and technical classroom attention training model". The attention of the teaching curriculum is not achieved overnight, but various auxiliary materials with the main frame of the curriculum syllabus. It is a three-dimensional teaching resource library, including various reference textbooks (materials), pre- and post-class electronic materials, and case studies, Collection, exercise database,
real business of various companies, vocational qualification certificates or vocational skill level certificates, etc. It is one of the most important problems that need to be solved at present by investigating the school's teaching activities over the years, combining with the current artificial intelligence background in higher vocational colleges' classroom attention training model to innovate and compiling appropriate teaching materials.

3.3 Experimental research methods and research design
First of all, the investigation and research method is adopted, and detailed investigation and research, research data, research rules, and refinement and summary after mastering the first-hand information are necessary for specific cases. This paper takes a software technology major in a higher vocational college as an example, and conducts a practical investigation and research from the aspects of student enrollment, teaching training process and employment after graduation. In this article, a total of 120 experimental investigation reports were issued in the link of experimental investigation reports. Secondly, using the case analysis method, this article analyzes the current situation of the vocational college English major classroom attention training model, and needs to analyze its advantages and disadvantages, which requires a lot of specific materials to support. On the basis of the data analysis in this article, the comparative analysis method is used to analyze and compare at different levels; specifically, different classroom attention training models at home and abroad, as well as teaching methods, teaching effects and other aspects are also compared and analyzed. Find the difference in comparison and seek the best training model.

3.4 Experimental research objects
The subject of this article is a software technology major in a higher vocational college, and 100 students and 30 teachers are selected for experimental investigation. After the first quarter of experimental teaching, they will be tested for knowledge and a classroom based on the CNN model. The questionnaire of the attention training mode will further complete the intelligent teaching mode, increase students' attention to classroom teaching, and understand the current status of the teaching mode of vocational universities and the problems existing in the teaching mode.

| Questionnaire issuance and recovery | Teacher representative | Student Representative | Total |
|-----------------------------------|------------------------|------------------------|-------|
| Issue                             | 30                     | 100                    | 130   |
| Recycle                           | 29                     | 98                     | 117   |
| Effective                         | 29                     | 98                     | 115   |
| Efficient recycling               | 96.7%                  | 96.7%                  | 98.2% |

Table 1. Questionnaire survey report

4. Results

4.1 Experimental research findings
Figure 1. The surveyed vocational college English majors’ satisfaction with traditional teachers’ teaching methods

According to the data shown in Figure 1, we can use the data shown in the picture to solve the problem of the rapid development of artificial intelligence technology. Most universities still use the traditional education link for teaching. Education method is the traditional education mode. The traditional education mode is for students. I believe the traditional education mode can greatly improve the learning efficiency and learn more professional knowledge. It can be seen from the picture data that the rate of satisfied students is as high as 78.23%. 7.1% of the students were dissatisfied with animation major. Through the face-to-face questionnaire survey, they think that the network education mode has a low degree of professional knowledge acquisition for students, so the network education mode is very harmful to students.

Figure 2. Feature map of factors influencing classroom attention of modern education technology based on artificial intelligence

At the same time, in order to confirm that it is more complete and reasonable than researchers, the author tests the factor level tilt chart in the whole questionnaire as shown in Figure 2. The steep slope chart here is mainly helpful for the author to verify. Test whether the number of influencing factors is correct and whether the questionnaire is reasonable. Abscissa is the characteristic value of Title item, variable quantity and vertical coordinate. The standard of confirming steep slope is to delete the factor of relatively gentle slope, considering the factor of steep line rising rapidly. From the fourth factor, we can see that there is no special factor extracted. Therefore, it is appropriate to maintain three factors in this study. This is consistent with the author's formulation of the number of initial elements. When deciding the factors that affect learning input, the author considers three main factors: internal factors
(including four observed variables, namely learning motivation, learning strategy, learning objectives and attributes), curriculum factors and school factors.

5. Conclusion
With its powerful feature extraction capabilities, CNN has been widely used in the field of computer predictive analysis in recent years, and target analysis is an important research direction in the field of computer technology. Through the research on CNN and target detection, it has found targets based on deep learning. Detection algorithms have become a mainstream trend. In the field of target detection, there is still a lot of unknown knowledge worthy of our exploration. I believe that with the continuous progress of deep learning technology, the application of artificial intelligence in the field of computer vision will be further developed. Modern education technology based on artificial intelligence makes students pay more attention to the classroom. It also demonstrates that the CNN-based classroom attention model is very useful in practical applications and can be widely used.

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