

# Evaluation of Teaching Reform Effect of Computer Vision Specialty Based on Deep Learning

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**Keywords:** Deep Learning, Computer Vision, Educational Reform, Specialty, Effect, Assessment.

**Abstract:** Most of the conventional evaluation methods for teaching reform effect are designed based on the principle of K-modes algorithm, with limited scope of application, large deviation of evaluation results, and unable to obtain more accurate teaching reform effect. This paper introduces the principle of deep learning method, and takes the computer vision specialty as an example, puts forward the evaluation research on the teaching reform effect of computer vision specialty based on deep learning. First, select the data set required for evaluation, and preprocess the data set to reduce the repeatability and redundancy of data. Secondly, establish the evaluation index system of the teaching reform effect of computer vision specialty, analyze and find out the potential internal links in the data, as the theoretical basis for the evaluation of the teaching reform quality effect. On this basis, hierarchical nesting is used to characterize the affiliation of deep learning and evaluate the effect of teaching reform. It can be seen from the application test results that after the application of the new evaluation method, the average score evaluation result of the computer culture basic application skills test is closer to the actual score, with small deviation and significant advantages in evaluation effect.

## 1 INTRODUCTION

Reforming education and teaching has a significant impact on enhancing the quality of talent development. As a crucial focus of higher education, it serves as a powerful driving force for developing education and teaching in the current era (Ni Z, 2022). In a narrow sense, it includes the reform of teaching methods, teaching models, teaching means and other aspects (Steinberg, 2021). With the development of university reform and the deepening of the people, emphasizing the value orientation of people centered management is to focus on the student groups that play a decisive role in improving the quality of education, which helps to improve the quality and efficiency of university management (Armstrong, 2021). According to the development of higher education in China, the undergraduate teaching reform in local colleges and universities has always been the focus of attention of the whole society and the Ministry of Education (Gao H. Reform, 2021). In recent years, the scale of higher education in China has been constantly expanding, with many universities and majors. This rapid expansion of scale and content has indeed met the expectations of society, enterprises and every

family for higher education, accelerated the speed of talent cultivation to a certain extent, and made up the demand gap of social and economic development for college graduates (Li W. Role, 2021).

According to the current situation of undergraduate teaching reform in local colleges and universities, many colleges and universities only stay at the superficial level, often focusing on the content and methods, and ignoring the "teaching structure" (Chen X. Study, 2022). That is, under the guidance of specific educational concepts and theories, a stable teaching and research model (Hui Y. Evaluation, 2021) suitable for specific teaching environment has gradually formed. Deep learning refers to the process in which learners actively participate in learning activities, critically learn new knowledge, and integrate new knowledge into the existing knowledge structure under the guidance of understanding (Feng W., 2022). It shows that learners have reached the level of knowledge transfer on the basis of understanding, and can effectively solve the complex problems in the evaluation of teaching reform effect under the new situation (Wu X., 2022). Deep learning focuses on understanding, emphasizes transfer, can take their knowledge and experience as a kind of thinking

activity, better understand the connection and essence of things, and will learn professional knowledge and skills for use in the relevant environment (Ensminger, 2021).

When higher education institutions implement reforms, students are one of the primary groups evaluated for the effectiveness of the reforms. However, due to the modifications in teaching content, methods, and goals, evaluating the effectiveness of teaching reforms faces certain challenges (Liu, 2022). In order to improve the applicability and feasibility reform effect, this paper introduces the principle of deep learning method, selects computer vision specialty as the research goal, and puts forward the research on the evaluation of teaching reform effect of computer vision specialty based on deep learning, which provides reference suggestions for promoting the smooth progress of various education and teaching reforms in local colleges and universities.

## 2 EVALUATION OF TEACHING REFORM EFFECT OF COMPUTER VISION SPECIALTY BASED ON DEEP LEARNING

### 2.1 Data Set Selection and Pre-Processing

In the evaluation method of teaching reform effect of computer vision specialty based on deep learning designed in this paper, firstly, the data set needed for this evaluation needs to be selected and preprocessed. After the data is captured, the corresponding database is established, and the acquired data is injected into the database<sup>[Guo J., 2021]</sup>. According to the design requirements, eight tables are set in the database, which are: teacher information table, teacher education table, teacher professional title table, teacher timetable, student information table, student curriculum table, teacher evaluation table and student employment table (Zhang, 2021). The data will lay a solid foundation for future data mining work (Li, 2021).

To realize data integration, data integration is actually data consolidation. In the process of consolidation, heterogeneous data can be consolidated and disposed. The general processing methods include entity identification, redundancy processing and data conflict processing (Cahyadi,

2021). The specific steps and descriptions are shown in Table 1.

Table 1: Heterogeneous data processing methods and steps for teaching reform of computer vision specialty.

Processing method	Explain	Step
Dataset entity recognition	It refers to the situation where an entity corresponds to multiple data sources.	Implement entity differentiation and classification through pattern integration of the initial data from the experimental object database or data warehouse.
Dataset redundancy	Refers to the phenomenon of multiple occurrences of data with the same attributes in the selected evaluation data.	Use filtering algorithms to filter out redundant parts within the dataset.
Dataset detection and processing of data value conflicts	It refers to the phenomenon that when there is an entity corresponding to multiple data sources in the evaluation dataset, there are multiple different attributes between the data, resulting in conflicts between the data.	Implement data analysis using redundancy detection algorithms to eliminate duplicate parts.

The data set is integrated and processed according to the heterogeneous data processing method shown in Table 1. The necessity of data integration is mainly reflected in two aspects: one is to stagger the composition errors of data in the framework; The second is to avoid and reduce the duplication and redundancy of data. Data integration enables more physical storage space for data (Zhang J., 2021).

### 2.2 Establish the Evaluation Index System of Teaching Reform Effect

After completing the selection and pre-processing of the evaluation data set of the teaching reform effect, the next step is to establish the evaluation index system of the teaching reform effect of computer vision specialty, which provides an important reference basis for the subsequent evaluation of the teaching reform effect. First of all, in the indicator system, a computer vision professional teacher information table is established to multi-dimensional reflect the relevant data information of teacher quality indicators, as shown in Table 2.

Table 2: Information of Computer Vision Teachers.

Field Name	Field Description	Type	Length
JS-GH	Teacher ID	Int	8
JS-MM	Password	Varchar	64
JS-XM	Full name	Varchar	20
JS-XL	The highest education level	Varchar	20
JS-ZC	Title	Varchar	20
JS-GL	Working years	Datetime	4

As shown in Table 2, there are certain differences in the attribute fields corresponding to each attribute item. The evaluation information of the teaching reform effect comes from each semester, and the students evaluate and grade the teachers of the specialty through the school system, and generate the evaluation information table of the teaching reform effect, as shown in Table 3.

Table 3: Evaluation Information of Teaching Reform Effect.

Field Name	Field Description	Type	Length
PJ-ID	Course ID	Int	8
PJ-GH	Teacher ID	Varchar	8
PJ-JS	Course acceptance	Varchar	20
PJ-HD	Course interactivity	Varchar	20
PJ-YY	Language expression ability	Varchar	20
PJ-CY	Student engagement	Varchar	20
PJ-KH	Assessment method	Varchar	20
PJ-ZH	Comprehensive evaluation	Varchar	20

Through the evaluation information table of teaching reform effect of computer vision specialty in Table 3, analyze and find out the potential internal relations in the data as the theoretical basis for the evaluation of teaching reform quality effect.

### 2.3 Evaluation of Teaching Reform Effect Based on Deep Learning

The next step following the establishment of the teaching reform evaluation index system is to utilize a comprehensive and multi-dimensional in-depth learning approach to evaluate the effectiveness of computer vision teaching reform. Firstly, an analysis of the membership relationships within deep learning will be conducted, with hierarchical nesting used to characterize these relationships, as depicted in Figure 1.

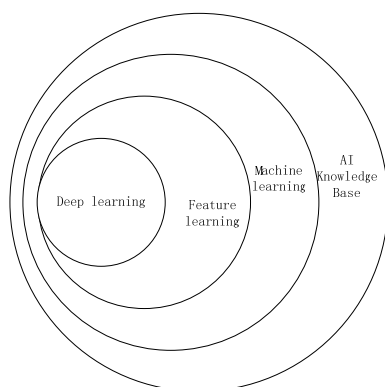


Figure 1: Schematic diagram of deep learning membership relationship.

As shown in Figure 1, the depth of the deep learning model does not have a standard value, and its abstract features are calculated from relatively less abstract features (Hong, 2021). On this basis, a teaching reform effect evaluation team led by the president and members of the school staff was established to make an objective and correct assessment of the teaching reform effect of all teachers (Cui, 2022). According to the mid-term or final examination results, the teachers will conduct two evaluations every school year, sometimes a person by person contest (Wang, 2021). The average value of the two evaluation results is the final evaluation result of the school year (the average value of four evaluations can be used in junior high school) (Chamorro-Atalaya O, 2021). The central school will report the assessment results (Chen Y. Evaluation, 2021) to the school and teachers themselves in the form of briefing. The evaluation process of teaching reform effect of computer vision specialty based on deep learning designed in this paper is shown in Figure 2.

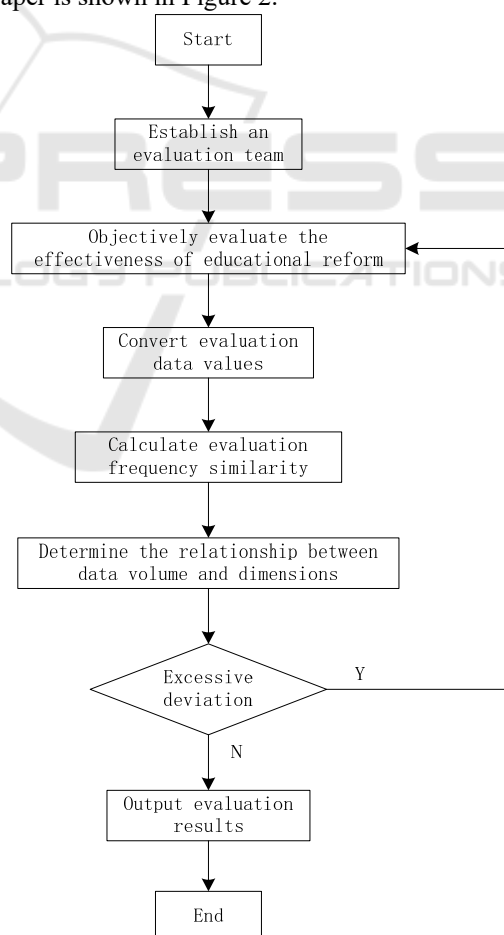


Figure 2. Evaluation process of teaching reform effect of computer vision specialty based on deep learning.

As shown in Figure 2, after the establishment of the assessment team, the evaluation data value of the teaching reform effect is converted, and each different sub type data is assigned a rank (Zhang, 2022) that matches its value. Set the transformation function of the evaluation value of teaching reform effect as  $f(x)$ , the expression is:

$$f(x) = \begin{cases} 5, & x = \text{Excellent} \\ 4, & x = \text{Good} \\ 3, & x = \text{Moderate} \\ 2, & x = \text{Pass} \\ 1, & x = \text{Fail} \end{cases} \quad (1)$$

Among them,  $x$  represents the evaluation value of the original teaching reform effect. Secondly, calculate the similarity of evaluation frequency of teaching reform sample data, and the formula is:

$$AVF(x_i) = \frac{1}{m} \sum_{j=1}^m f(x_{ij}) \quad (2)$$

Among them,  $x_i$  represent the sample data of teaching reform effect evaluation of computer vision specialty;  $m$  represents the sample data dimension;  $f(x_{ij})$  indicates that the sample data is in the attribute  $j$  frequency on (Xie, 2021). Through calculation, the similarity of sample data evaluation frequency is obtained, and the similarity is used to judge the relationship between sample data volume and sample data dimensions, and then test whether there is deviation in the evaluation of teaching reform effect (Luo, 2021). If the evaluation frequency of sample data is too similar, it means that there is a large deviation in the assessment results, and vice versa. Through the above steps, the goal of the reform effect assessment of computer vision specialty (Wang, 2022) can be achieved.

### 3 APPLICATION TEST

#### 3.1 Test Preparation

The above content is the whole design process of the evaluation method for the teaching reform effect of computer vision specialty proposed in this paper by using the principle of deep learning method. Before putting forward the evaluation method for use in the actual teaching reform work, it is necessary to make an objective test of the feasibility and evaluation effect of the method to ensure the effectiveness of its evaluation results and avoid losses caused by direct

use. Through the "multi-stage stratified sampling" method, that is, first determine the survey area, then conduct random cluster sampling with the teaching class as a unit, and finally determine the survey students. Students from Computer Science College of S University were selected as the research goal, and some students from 2020 and 2021 were randomly selected for the wake up test to simulate the computer vision professional skills test. In the process of learning assessment, only 52% of the schools carried out learning assessment strictly in accordance with the five areas, and 48% of the schools did not use the five areas of the new curriculum standards to evaluate. The reason is that 9% disapprove of the new curriculum assessment, 22% think the assessment system is too complex and the workload is too heavy, 19% think the assessment is subjective, and 60% do not have the objective conditions of the school. In fact, even though teachers are highly recognized subjectively, the objective conditions of the school also limit the establishment and improvement of the new evaluation system. In order to describe the effect of online teaching from the perspective of students' in-depth learning, this paper gives a simple total score for each dimension, and then obtains its average value to compare each dimension more accurately and effectively.

Table 4: Scoring Standards for Application Skills Test of Computer Basic Courses.

Question number	Sampling point	fraction
Windows operation questions (10 points)	Can create a folder named after the student ID.	4
	Able to establish 3 correctly named subfolders of the same level.	6
Word operation questions (10 points)	Insert text material into document 1.	2
	Set fonts, paragraphs, shading, borders, table row height, table column width, and drop caps as required.	5
Excel operation (20 points)	Add document naming, title, table file naming.	3
	Create an Excel workbook with the correct name and rename the worksheet correctly.	10
	Able to input worksheet content.	5
Powerpoint operation questions (20 points)	The calculation of growth rate and evaluation growth rate is correct.	5
	Can set slide layout, font, title, background, and switching methods.	10
	The presentation is named and stored in the correct location.	5
Network operation questions (20 points)	Can complete animation settings as required.	5
	Can summarize according to the search information and requirements.	6
	Able to write the content of the letter as required.	4
	Can compress completed files and send them to the specified email.	10

### 3.2 Test Results

Set the evaluation method of computer vision teaching reform effect based on deep learning proposed in this paper as the experimental group, and set the traditional evaluation method of teaching reform effect as the control group, obtain the evaluation results of computer vision teaching reform effect of the two methods, and compare them to make the application test results more convincing. First of all, select the basic course of computer vision application skills course as the basis for this application test, and set the scoring criteria for the basic course of computer application skills test, as shown in Table 4.

As shown in Table 4, it is the scoring standard of computer vision teaching reform for this application test. 145 students participated in the computer culture basic application skills test. Among them, 72 are from Grade 20 and 73 are from Grade 21; There are 55 boys and 90 girls. The average scores of science, arts, sports and art students are 87, 85, 84 and 79 respectively. The Windows operation question, Word operation question, Excel operation question, Powerpoint operation question and network operation question are labeled with R1~R5 respectively. Use the above two methods to evaluate the average score of computer culture basic application skills test, and compare it with the actual average score. The results are shown in Figure 3.

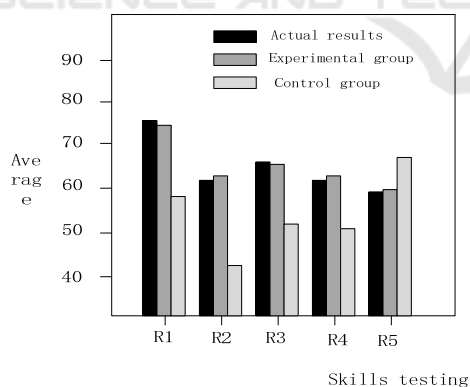


Figure 3: Evaluation Results of Computer Culture Basic Application Skills Test.

It can be seen from Figure 3 that after the application of the two methods, there are obvious differences in the results of performance evaluation. Among them, after the application of the assessment method proposed in this paper, the average score evaluation result of the computer culture basic application skills test is more close to the actual score with less deviation, which indicates

that the assessment method proposed in this paper has higher accuracy, more accurate evaluation results and higher feasibility.

## 4 CONCLUSION

An effective and rational method for evaluating the impact of teaching reforms has a significant influence on enhancing the standard of education and pedagogy. In conclusion, to address the limitations and deficiencies of conventional evaluation methods employed in professional education and teaching reforms, a more comprehensive approach must be implemented in practice, this paper introduces the principle of deep learning methods, and proposes an all-round research on the computer vision professional teaching reform effect evaluation based on deep learning. Through the research in this paper, the accuracy of the evaluation results of professional teaching reform effect has been effectively improved, and the teaching reform effect of computer vision specialty has been mastered from a deeper level, which provides an important guarantee for talent cultivation, and has important research significance in helping higher institution promote the innovative development of education and teaching.

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