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Computer-Aided Design AND APPLICATIONS

Art Teaching Innovation Based on Computer Aided Design and Deep Learning Model

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Abstract. As an important part of cultivating students' aesthetic ability, creativity and practical ability, art teaching is facing the challenge of reform and innovation. This article sorts out and assesss the Deep learning (DL) models in art teaching, and innovatively constructs an art instructional system based on CAD and DL models. The system can automatically extract the characteristics and styles of artistic works, and classify and predict them, thus providing students with more objective and accurate aesthetic guidance. Moreover, the system integrates various teaching resources, supports various learning methods, combines artistic practice and introduces evaluation mechanism, which improves the quality of art teaching. The results show that the system can effectively improve learners' work quality, skill mastery and learning effect. It can get the utmost out of the advantages of computer technology and Artificial intelligence (AI) to help students improve design efficiency, expand creative ideas and cultivate talents with more innovative consciousness and practical ability. This study provides new ideas and methods for artistic creation, teaching and research.

Keywords: Computer Aided Design; Deep Learning; Artificial Intelligence; Art Teaching; Art Design; Innovate
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1 INTRODUCTION

Art teaching is a teaching activity that pays attention to practice and creativity. Traditional art teaching often adopts the way of master with apprentice, that is, learning through demonstration and imitation. With the rapid development of internet technology, large-scale online open courses (Moocs) have become a popular learning method. However, due to various reasons, many learners choose to drop out of school before completing the course. This not only wastes learners' time, but

also affects their efficiency in acquiring knowledge. Therefore, predicting the dropout risk of learners can help them better plan and manage their learning. Basnet et al. [1] explored how to use deep learning and machine learning techniques for MOOCs dropout prediction. After collecting the raw data, we need to perform feature engineering to transform the raw data into features that machine learning models can process. For example, we can convert learners' registration time, learning duration, grades, etc. into numerical or categorical features. These features will serve as inputs to the model to help us predict the dropout risk of learners. This art teaching method often focuses on theoretical teaching and skill training.

The field of medical education is no exception, and AI is gradually changing the traditional mode of medical education, providing more opportunities for medical students to learn and develop. Chan and Zary [2] reviewed the aim of providing reference for future research. In medical education, students' personal information and learning data are very important and require strict protection. However, the application of AI requires a large amount of data support, and how to ensure data privacy and security has become an important issue. The application of AI technology requires professional technical personnel and maintenance costs, and these resources may not be sufficient in the field of medical education. Although AI technology can provide support for personalized teaching, it may also exacerbate the unfairness of education. Some students may be at a disadvantage due to a lack of technical equipment or abilities. Among them, the application of CAD and DL model in the field of art has attracted extensive attention. CAD is a design tool aided by computer technology. The implementation of these technologies not only changes students' learning methods, but also improves the quality of education, bringing unprecedented changes to higher education. Ilić et al. [3] Conduct demand and performance analysis these technologies in higher education. Deep learning under artificial intelligence algorithms can be combined with augmented reality and virtual reality technologies to provide students with a more immersive learning experience. For example, students can observe the design process of 3D models through virtual reality technology, or combine virtual elements with real scenes through augmented reality technology to better understand knowledge. With the support of big data, deep learning technology can process a large amount of data, including students' learning data, teachers' teaching data, etc. By analyzing these data, deep learning can help teachers better understand students' learning situations and adjust teaching strategies; It can also help students better understand their learning situation and adjust their learning methods.

Deep learning can analyze a large amount of building material data to find more environmentally friendly and efficient building materials. For example, by analyzing information such as material performance, cost, and sustainability, select the material that best meets the requirements of green building. Jin and Yang [4] established a structural optimization model by analyzing a large amount of building structural data to improve the stability, safety, and energy efficiency of buildings. Deep learning can simulate the building environment, including indoor and outdoor air circulation, temperature changes, lighting distribution, etc., to evaluate the comfort and energy utilization efficiency of the building environment. Post construction operation and maintenance monitors the operational status and performance of buildings by analyzing building operation and maintenance data. For example, by analyzing equipment failure modes and maintenance records, predicting the future maintenance needs and lifespan of equipment, and improving operation and maintenance efficiency. By analyzing urban data and spatial information, establish urban planning models to improve the sustainability and livability of cities. Deep learning can analyze natural environmental data to monitor the state and changes of the natural environment. For example, by analyzing information such as climate change and environmental pollution, reference can be provided for environmental protection measures. wind direction simulation, and energy consumption prediction, providing scientific basis for designers. Computer aided design software supports collaborative work among multiple people, enabling real-time updates and sharing, and improving work efficiency. Computer aided design software can quickly generate material lists and engineering budgets, which helps designers control costs. In the field of art, CAD technology is widely used in painting, sculpture, fashion design and other fields, providing artists with convenient creative tools and broad creative space. DL model is a machine learning algorithm in AI field. It automatically extracts features and establishes complex nonlinear relationships by learning a large quantity of data. The multi-scale

design and multifunctional performance of functionally gradient materials and structures are currently a hot research topic. At the micro scale, the composition and microstructure of materials can change to achieve gradient changes in physical properties such as thermal expansion coefficient, conductivity, hardness, etc. At the macro scale, the shape and structure of materials can also change to achieve gradient changes in mechanical properties such as strength, toughness, and corrosion resistance. In the past decade, the development of functionally gradient materials (FGM) and structures, as well as their potential in various applications, has attracted widespread attention. Li et al. [5] reviewed the research progress in achieving functionally gradient to the challenges and prospects of multifunctional performance. Although additive manufacturing provides powerful tools for manufacturing functionally gradient materials and structures, there are still many challenges. In addition, new standards and experimental methods need to be established for the performance testing and evaluation of functionally gradient materials and structures.

With the rapid development important tool for contemporary art creation. However, how to effectively utilize computer technology to cultivate design talents with innovative spirit and artistic expression is an important challenge faced by current art education. Liu and Yang [6] explored the construction and practice. In teaching, emphasis is placed on cultivating students' innovative thinking and encouraging them to explore new forms and techniques of artistic expression using computer technology. Through practical courses and projects, students can master the practical skills of computer-aided design and cultivate their hands-on and problem-solving abilities. Encourage students to collaborate across disciplines, combine computer technology with disciplines such as art, technology, and humanities, and cultivate their comprehensive qualities and innovative abilities. How to use CAD and DL model to improve the quality of art teaching has become a hot issue in current research. This article will introduce the basic principles and applications of CAD and DL models, analyze their application status and development trend in art teaching, and verify their effectiveness through experiments.

The innovation of this article is mainly reflected in the following aspects:

A. This article introduces CAD technology into art teaching. Through CAD technology, students can master design details and skills more accurately, and improve design efficiency and work quality.

B. In this article, DL model is applied to art teaching, and its powerful learning and classification ability is used to help learners improve their appreciation and judgment of art works. DL model can automatically extract the characteristics and styles of artistic works, and make classification and prediction, thus providing students with more objective and accurate aesthetic guidance.

C. This article innovatively constructs an art instructional system based on CAD and DL model, and organically integrates CAD and DL model into art teaching. The system can realize the functions of personalized teaching, automatic evaluation and feedback, and improve the effect of art teaching.

Firstly, by analyzing related literature and practical cases, this article expounds the function and value of CAD and DL model in art teaching, and discusses the basic principles and applications of CAD and DL model. Then an art instructional system based on CAD and DL model is constructed. Finally, the results of this article are summarized, the contribution and limitations of the research are pointed out, and application prospect are prospected.

2 RELATED WORK

With the rapid development of internet technology, online education continues to be popularized globally. Especially in English learning, online platforms provide learners with rich learning resources and convenient learning methods. However, how to effectively monitor and manage learners' learning progress and quality has always been an important issue faced by educators. In recent years, artificial intelligence technology based on machine learning has provided new solutions to solve this problem. Lu et al. [7] explored how to use machine learning technology to build an intelligent English online teaching monitoring system, as well as its applications in learner management, personalized teaching, and predictive analysis. By utilizing the predictive analysis

function of machine learning, the English online teaching monitoring system can predict learners' learning progress and grades. For example, using linear regression models to predict learners' final exam scores can provide reference for teachers and learners. In addition, predictive analysis can also help educational institutions predict the loss rate of learners, in order to take timely measures to reduce loss. In the current information age, digital transformation has become a core issue for enterprises and social organizations. With the increasing demand for personalized experiences from consumers, intelligent customer service has become an important bridge between enterprises and consumers. Through technologies such as natural language processing and speech recognition, intelligent customer service can understand and answer consumer questions, providing 24-hour uninterrupted service. This not only improves customer satisfaction, but also provides valuable market information for enterprises through data accumulation and analysis. Predictive maintenance has become increasingly important in the fields of manufacturing and logistics. Malik et al. [8] took measures in advance to reduce unexpected downtime and costs by collecting and analyzing equipment operation data. With the advancement of digital transformation, network security issues are becoming increasingly prominent. Artificial intelligence and machine learning have extensive applications in the field of network security, such as intrusion detection, vulnerability scanning, malware analysis, etc., helping enterprises protect network security and reduce risks. With the rapid development of AI and ML technology, enterprises need to constantly update their technology and cultivate or introduce talents with relevant skills. Enterprises need to adapt culturally to digital transformation, adjust organizational structure, and optimize processes. By applying AI and ML technologies, enterprises can achieve data-driven decision-making, automated processes, personalized services, and predictive maintenance, thereby improving efficiency, reducing costs, optimizing services, and enhancing competitiveness. Digital art education, as a comprehensive education that integrates technology and art, has also been influenced. The traditional evaluation of art education is usually conducted by teachers, which is highly subjective and requires a lot of time and effort. Artificial intelligence can provide students with more objective, accurate, and efficient learning evaluations through intelligent learning assessments. For example, computer vision and deep learning technologies can be used to automatically classify, recognize, and evaluate artistic works, helping teachers to quickly understand students' learning progress and level. Artificial intelligence is also widely used in fields such as music creation and painting. For example, generative adversarial networks (GANs) can generate a large number of high-quality art works in a short period of time, providing artists with creative inspiration and support. In addition, AI can provide support in music production, arrangement, mixing, and other aspects to assist musicians in achieving higher quality works. These technologies can help students gain a deeper understanding and mastery of the techniques and methods of artistic creation. Munir et al. [9] helping students find suitable learning paths. Machine learning algorithms can transfer one artistic style to another. For example, the painting style of a famous painter can be transferred to a student's work, so that the student's work has the style of a famous painter. This style transfer technology can not only improve students' artistic level, but also enhance their creativity and imagination. The concept of the metaverse is receiving increasing attention from people. The metaverse is a virtual environment that simulates the real world, with a high degree of interactivity and realism.

Introducing the metaverse into the learning environment will bring significant changes to education. Rospigliosi [10] explores how adopting the metaverse in a learning environment can promote the application and development of deep learning artificial intelligence. Which can be used to train deep learning models. By analyzing these data, deep learning models can better understand human learning behavior and habits, thereby providing a basis for personalized teaching. Thereby providing personalized teaching plans for each student. Through deep learning technology, personalized teaching algorithms and strategies can be further optimized to improve teaching effectiveness. How to select content suitable for each learner from a vast amount of learning resources has always been a challenge faced by e-learning. Salau et al. [11] conducted a survey on the current research status of deep learning based electronic learning recommendation systems, with the aim of understanding their development status, main technologies, advantages, and challenges. A method of implementing recommendations using deep neural network (DNN) technology. It

analyzes learners' historical behavioral data, establishes user profiles, and uses this information to predict learners' interest in future resources. Compared with traditional collaborative filtering recommendation algorithms, recommendation systems based on deep learning can better handle complex user behavior patterns and provide more accurate recommendations. A recommendation system based on computing resources and professional technical support, which increases the cost and complexity of its implementation. With the continuous increase of user behavior data, recommendation systems need to update models in real-time and provide scalable services. Feature visualization is a technique that converts data or model output into easily understandable images. In automated design evaluation, feature visualization can help us better understand and interpret evaluation results. For example, we can visualize the evaluation results as a set of images, each representing a specific design solution, and display the performance indicators of that solution in the images. In this way, we can intuitively compare the performance differences between different design schemes, thereby better understanding which factors affect the results of design evaluation. Schnhof et al. [12] utilized interpretable artificial intelligence (XAI) methods for automated design evaluation.

Among them, feature visualization is a key technology that can help us better understand and interpret the results of design evaluation. This article will explore how to use XAI methods for feature visualization in automated design evaluation. Computer assisted process planning manufacturing systems, and its application categories. These application classifications provide manufacturing enterprises with multiple options to choose appropriate computer-aided process planning techniques based on their own production needs and characteristics, thereby improving production efficiency and quality, reducing costs, and enhancing the competitiveness of enterprises. Flexible manufacturing system is a manufacturing system with high flexibility and adaptability. It can achieve functions such as equipment automation, production process optimization, and production plan scheduling through computer technology, thus adapting to the production needs of multiple varieties and small batches. Intelligent manufacturing is a method of applying, and big data to the manufacturing process. It can achieve automation, intelligence, and optimization of the production process through functions such as intelligent perception, intelligent decision-making, and intelligent execution, thereby improving production efficiency and quality [13]. Embroidery art is a traditional culture with a long history and exquisite craftsmanship, and its complex and delicate needlework makes each piece full of unique artistic charm. However, the production process of embroidery art often requires a lot of time and effort, and requires extremely high levels of craftsmanship from the producer. With the advancement of deep learning technology, we have the opportunity to use computer technology to automate or semi-automatically complete the production of embroidery artworks. Wei and Ko [14] explored how to use deep learning convolutional neural network (CNN) technology to segment and synthesize embroidery art images, in order to improve the production efficiency and quality of embroidery art. After completing image segmentation, we can use synthesis technology to combine different segmentation regions to create new embroidery artworks. This synthesis process can be completed using convolutional neural networks. We first use the segmented image region as input to the network, and then gradually restore the details and structure of the original image through multi-layer convolution and up-sampling operations. In the current digital era, multimedia information processing has become an important direction for technological development. Asia, as one of the largest regions in the world, has a rich culture and history, which provides broad application space for multimedia information processing.

Xu and Jiang [15] explored the development of multimedia Asian information processing and how universities can utilize artificial intelligence for art design and teaching. Through data analysis and machine learning technology, universities can provide personalized teaching recommendations for students. In terms of artistic creation and innovation, artificial intelligence technology can also help students realize their ideas and creativity. For example, using generative adversarial network (GAN) technology, students can generate new works of art and explore new creative styles and techniques. This technology can help students broaden their artistic horizons, improve their creative abilities and innovative thinking. Students can create innovative works of art based on existing artistic styles. The non-realistic rendering method of 3D mountain models based on Chinese ink painting style has

extensive application value in heritage science. For example, in the protection of ancient buildings, three-dimensional modeling and rendering of the surrounding mountains can be used to present the artistic conception of ancient landscape paintings, thereby better showcasing the landscape value and historical and cultural connotations of ancient buildings. In addition, this method can also provide decision-makers with more intuitive and visual analysis tools in urban planning, tourism development, and other aspects. Yan et al. [16] explored a non-realistic rendering method for 3D mountain models based on Chinese ink painting style and its application in heritage science. Chinese ink painting is an art form that expresses objects with simple lines and ink colors, characterized by concise brushstrokes, elegant ink strokes, and strong expressive and artistic appeal. By combining Chinese ink painting style with 3D mountain models, non-realistic rendering techniques can be used to preserve the basic form of 3D mountain models and render and express them in the form of Chinese ink painting, thus presenting a unique Chinese ink landscape effect.

Deep learning technology simulates the working mode of human brain neural networks to achieve automated learning and understanding of knowledge. In the field of education, deep learning technology provides strong support for personalized teaching, intelligent recommendation, automatic evaluation, and more. Yun et al. [17] utilizes this technology to achieve intelligence and personalization. This platform collects data on students' learning behavior and habits, uses deep learning algorithms for data analysis. At the same time, the platform also has an automatic evaluation function, which provides objective and fair evaluation and feedback by intelligently analyzing students' learning outcomes. The learning effectiveness of students is the core indicator for measuring the quality of teaching. Art design, as an art discipline that covers various aspects such as painting, sculpture, architecture, etc., needs to constantly keep up with the times to adapt to new technologies and demands. Zhang and Rui [18] delved into the application. The modeling techniques in computer graphics can help students create various shapes and objects, and achieve realistic visual effects through rendering techniques. This helps students better understand the structure and lighting effects of objects. The color theory and material library in computer graphics can help students choose appropriate colors and materials to achieve their design concepts. The animation and special effects techniques in computer graphics can help students create dynamic visual effects, enhance the expressiveness and attractiveness of designs. Image assisted design software can assist students in layout design and layout to achieve beautiful and effective visual communication effects. Deep learning is an artificial intelligence technology that simulates human brain neural networks for learning and understanding. In the field of music perception, analyze, and understand emotions, styles, and structures in music. Zhang and Li [19] explored how to utilize AI and HIR based on deep learning methods to play a role in music perception education. By training neural networks to learn a large amount of music data, we can achieve tasks such as music classification, music sentiment analysis, and music recommendation. By simulating the sounds and performance techniques of various instruments, AI can generate virtual instruments for students to practice and play on computers or intelligent devices. HIR can recognize students' gesture movements, provide real-time performance guidance and evaluation, and help students improve their performance skills and sense of rhythm. AI can assist students in music creation, such as automatically generating music melodies, chords, and rhythms. HIR can serve as a collaborative tool between students, creating and performing music through gestures and actions, promoting the cultivation of students' teamwork and innovation abilities.

It can be seen that the use of CAD and DL model in art teaching has achieved certain results. This article further explores and studies the application of CAD and DL model in art teaching, and innovatively constructs an art instructional system based on CAD and DL model. It can provide more powerful support for the development of art education.

3 BASIC PRINCIPLE AND APPLICATION OF CAD AND DL MODEL

The application of CAD and DL model in the field of art has gradually deepened, providing artists and designers with brand-new creative tools and methods. This section will introduce the basic principles,

application fields and implementation methods of CAD and DL models in detail, and provide theoretical support and technical guidance for the subsequent art teaching innovation.

3.1 Basic Principle and Application of CAD

CAD help designers design and develop products. It mainly includes 2D drawing, 3D modeling, rendering and animation. In art teaching, the application of CAD: (1) 2D drawing: 2D drawing is one of the most basic and important technologies in CAD. It can input and edit graphic elements, such as points, lines and faces, through the graphical interface, thus generating various types of plane graphics. In art teaching, 2D drawing technology can help students master basic painting skills and methods, and improve the quality of painting. (2) 3D modeling: 3D modeling is another important technology in CAD. It can simulate the shape, size, material and other properties of an object by establishing a 3D model. In art teaching, 3D modeling technology can help learner objects and provide important reference for subsequent artistic creation. (3) Rendering and animation: Rendering and animation are advanced technologies in CAD. It can simulate the shadow, reflection and other effects caused by light irradiation on objects, thus generating realistic images. Moreover, animation technology can also transform static images and shapes into dynamic videos or animation works. In art teaching, rendering and animation technology the methods of visual expression, and improve their aesthetic ability and creative level.

3.2 Basic Principle and Application of DL Model

DL model is a machine learning algorithm in AI field. It learns and classifies by simulating the working mode of human brain neural network. In the field of art, DL models are mainly used in the following aspects: (1) Image recognition and classification. DL model can learn and analyze a large quantity of image data, thus automatically extracting image features and labels. Through the classification and recognition of images, DL model can help artists better understand the content and style of images and provide important reference and support for subsequent artistic creation. (2) Generative adversarial networks (GAN). GAN is a special DL model. In art teaching, GAN can be used as an innovative tool and method to help students improve their artistic creation skills and abilities. By training these two networks, GAN can generate highly realistic works of art, such as painting and music.

In this article, a deep convolution GAN model will be constructed to support the art instructional system. The following is a detailed description of the construction process:

⊖ Determining the model structure: Firstly, we need to determine the structure of the deep convolution GAN model, including the network structure of generator and discriminator. For the generator, this article adopts the structure of deep convolution network. For the discriminator, the network structure is also adopted, and the full connection layer is added to make classification judgment. The deep convolution GAN model is shown in Figure 1.

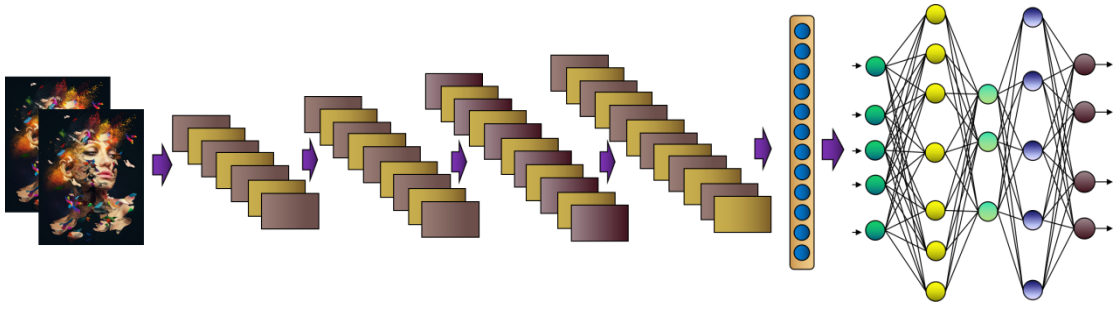

Figure 1: Deep convolution GAN model.

Represent the output feature map in a layer, then:

$$F_j^n = \sum_i w_{ij}^n * F_i^{n-1} + b_j^n \tag{1}$$

$$F_j^{n+1} = f\ F_j^n \tag{2}$$

$$y_i = \gamma \hat{x}_i + \beta \tag{3}$$

$$\hat{x}_i = \frac{x_i - E_M\ x_i}{\sqrt{Var_M\ x_i + \varepsilon}} \tag{4}$$

⊜ Preparation of data set: In order to train the GAN model, a large-scale data set of works of art needs to be prepared. The source of this data set is open art database, art website, art museum and so on. This data set contains works of different styles, different periods and different artistic forms, so that the model can learn more artistic features.

⊛ Data preprocessing: the collected data are cleaned, labeled and classified to facilitate the subsequent data analysis and model training. In the preprocessing process, this article normalizes the image data so that the model can learn the image features better.

④ Training GAN model: In the training process, the loss function and gradient are calculated and the network parameters are updated. In this article, random gradient descent method is considered for optimization. First, find the average value of data in small batches:

$$u_B = \frac{1}{m}\sum_{i=1}^{m} x_i \tag{5}$$

m is the quantity of each batch in the random gradient descent algorithm. Then we need to find the variance of small batch data:

$$\sigma_B^2 = \frac{1}{m}\sum_{i=1}^{m} x_i - u_B^{\ 2} \tag{6}$$

Perform normalization operation on each element in the batch:

$$\hat{x}_i = \frac{x_i - u_B}{\sqrt{\sigma_B^2 + \int}} \tag{7}$$

Finally, scale scaling and migration operations are performed to transform the data back to the original distribution:

$$BN_{\gamma,\beta\ x_i} = \gamma \hat{x}_i + \beta \tag{8}$$

Among them, γ and β are two trainable parameters.

⑤ Model evaluation and adjustment: In the training process, the GAN model is assessed regularly, and the differences between the generated works of art and the real works of art are compared to judge the performance of the model.

⑥ Model application: After the training is completed, you can use the GAN model to generate new works of art and provide creative inspiration and support for students. Moreover, GAN model can also be integrated into art instructional system as an auxiliary teaching tool. Students can upload their own creative needs and sketches through the system, and the system can generate realistic works of art by using GAN model to provide reference and support for students.

3.3 Realization Method

In order to effectively apply CAD and DL models in art teaching, this article needs to adopt the following methods: (1) Teaching with actual cases: By explaining actual cases, students can understand the application methods and skills of CAD and DL models in artistic creation. Moreover,

students can also operate the software to practice and explore. (2) Establishing database and model base: In order to support the application of DL model, a large quantity of data sets and model bases need to be established. These data sets and model bases can provide important reference and support for students, and help them to do artistic creation and study better.

⊖ Establish a database:

Data collection: First, collect a large quantity of data of artistic works, including works of different styles, different periods and different artistic forms. These data can come from open databases, art museums, art websites and so on.

Data preprocessing: the collected data are cleaned, labeled and classified to facilitate subsequent data analysis and model training.

Data storage and management: store the preprocessed data in the database, and design an appropriate data structure and management mode to facilitate data query, retrieval and management.

Data sharing and opening: open the database to students, so that they can get the data of these works of art anytime and anywhere, so as to facilitate their study and creation.

⊖ Establish a model base:

Collection model: collect the trained DL models from the open model base, including various convolutional neural networks, cyclic neural networks, etc.

Model evaluation and selection: assess and select the collected models, and select models suitable for specific art teaching tasks, for example, models for different fields such as painting, architectural design and fashion design. After comprehensive consideration, this article adopts the deep convolution GAN model constructed above.

Model adjustment and optimization: according to the needs of art teaching, the selected model is adjusted and optimized to improve the performance and adaptability of the model.

Model base management: design appropriate model base management methods, including model storage, retrieval and call, so that students can use these models conveniently in the learning process.

(3) Develop innovative teaching software and tools: According to the characteristics of art teaching, we can develop some innovative teaching software and tools, such as virtual reality technology and interactive multimedia platform. These software and tools can provide students with a more realistic creative environment and experience, and help them better master the skills and methods of artistic creation. (4) Strengthen practical teaching: Art teaching should focus on practicality and innovation. Therefore, practical teaching links can be strengthened in teaching, such as organizing students to participate in art competitions and carrying out innovative experimental projects. These practical activities can help students to better apply CAD and DL models for artistic creation and learning.

4 CONSTRUCTION AND IMPLEMENTATION OF ART INSTRUCTIONAL SYSTEM

The design ideas of art instructional system mainly include the following aspects: (1) Student-centered. System design should be student-centered, fully consider students' needs and characteristics, provide personalized teaching resources and guidance, and help students learn and create better. (2) Integrating teaching resources. Integrating teaching resources is one of the important functions in the art instructional system. The system needs to be able to integrate various types of teaching resources, including course materials, teaching videos, artists' works, etc., so that students can obtain the required learning resources anytime and anywhere. Among them, course materials are indispensable teaching resources in art teaching. The system can provide the management and storage function of course materials, classify and store the course materials uploaded by teachers, and students can access the course materials through the system for learning and downloading. Moreover, teaching video is also a common teaching resource in art teaching. The

system can provide the function of uploading and managing teaching videos, classify and store the teaching videos uploaded by teachers, and students can watch teaching videos through the system for learning and practice. In addition, artists' works are also one of the important teaching resources in art teaching. The system can provide the collection and storage function of artists' works, classify and store artists' works, and students can appreciate artists' works and learn from them through the system. (3) Combining with artistic practice. The system should combine artistic practice and provide creative tools and methods for students to learn and grow in practice. (4) Introducing evaluation mechanism. The system should introduce an evaluation mechanism to assess and feedback students' works, so as to help students understand their own learning progress and shortcomings.

The functional modules of the art instructional system are shown in Table 1.

Functional module	Describe
User management	Information used to manage students and teachers, including user registration, login, rights management, etc.
Teaching resource	Integrate various types of teaching resources, including course materials, teaching videos and artists' works.
Authoring tool	Provide creative tools and methods, including CAD software and DL model.
Learning management	Support different learning methods, including autonomous learning, collaborative learning, inquiry learning, etc.
Evaluation feedback	Evaluate and feedback students' works to help students understand their learning progress and shortcomings.
Systems management	Used to manage the configuration and operation of the system, including database management, system settings, etc.

Table 1: Functional modules of art instructional system.

The above functional modules are the basic modules of the art instructional system, which can help realize the overall management of art teaching and improve the teaching efficiency.

In addition, in order to realize the art instructional system, this article adopts the following technologies: development language and framework: the system is developed with Python and other programming languages, and the system architecture is built with Web frameworks such as Django. Database technology: The system uses relational databases such as MySQL to store and manage user information, teaching resources and other information. Creation tool integration: the system can integrate common CAD software and DL model library, such as AutoCAD and TensorFlow. Front-end technology: The system uses HTML5, CSS3, Java Script and other technologies for front-end development, which makes the user interface more beautiful and easier to use. Security technology: the system uses SSL and other security technologies to ensure the security of user information and data.

5 SYSTEM EXPERIMENTAL SIMULATION AND RESULT ANALYSIS

5.1 GAN Model Performance Experiment

In this experiment, the speed of network modeling is tested to assess the modeling speed of GAN proposed in this article. In the experiment, the GAN model was run several times and the modeling time of each run was recorded. The specific situation is shown in Figure 2.

The experiment uses a large image data set, which contains 100,000 images with a resolution of 64×64. After many experiments, the modeling speed of GAN is shown in Figure 3, and the image generation accuracy of GAN model is shown in Figure 4.

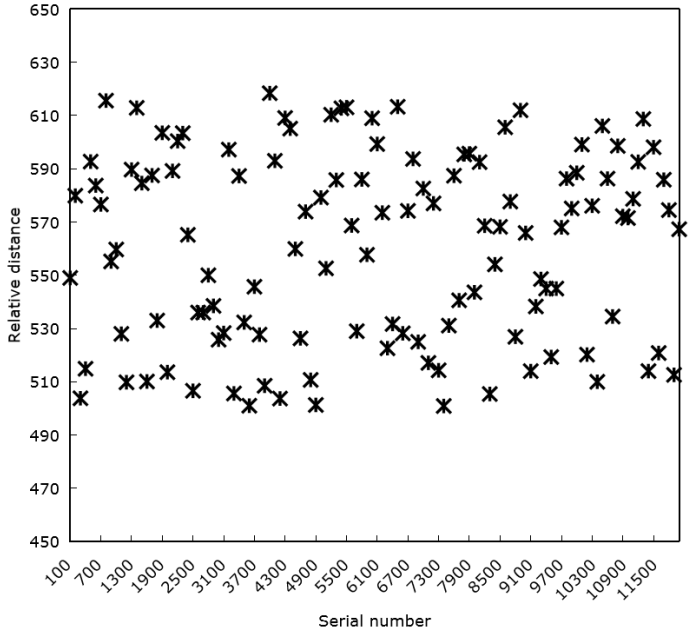

Figure 2: Data outlier removal processing.

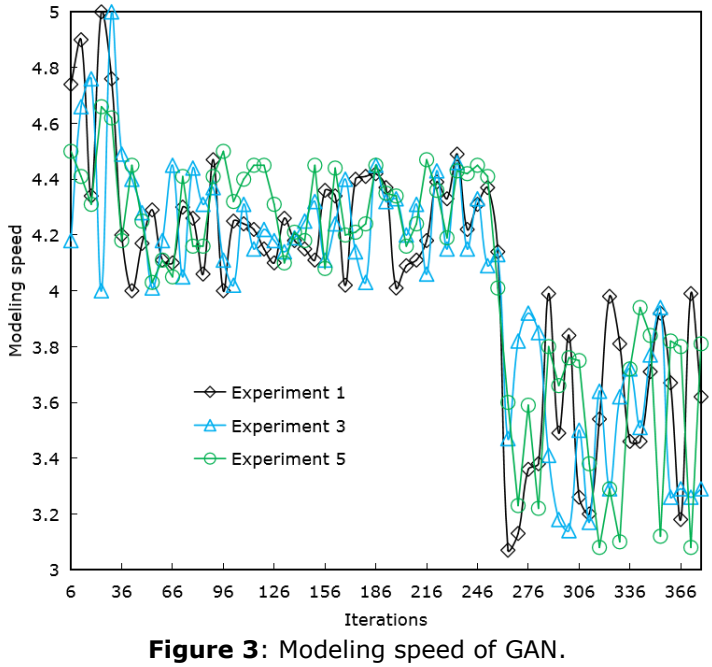

Figure 3: Modeling speed of GAN.

The modeling speed of GAN in this article is faster. This is because the depth convolution network structure is adopted in the construction of GAN model, which enables the model to learn image features quickly. In addition, GPU is used to accelerate the calculation in the experiment, which further improves the modeling speed.

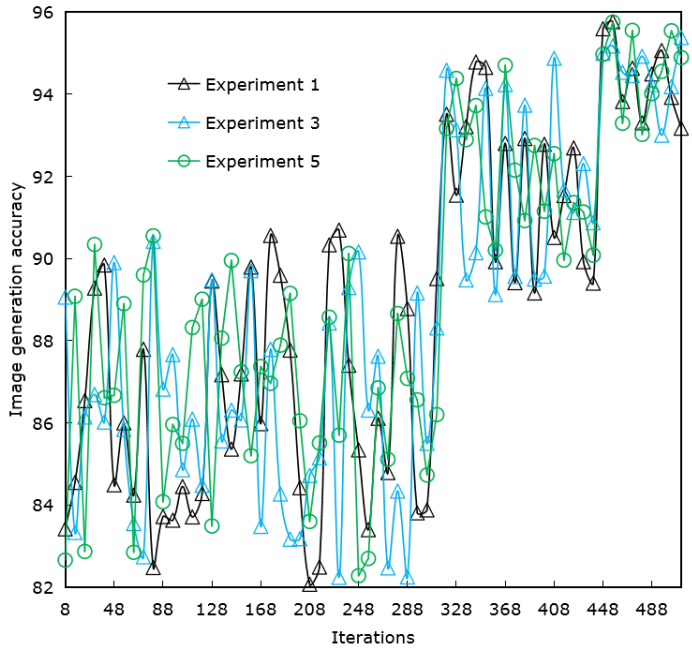

Figure 4: Image generation accuracy of GAN model.

With the increase of iteration times, the accuracy of the GAN model is gradually improved. After 50,000 iterations, the accuracy of the GAN model tends to be stable. This shows that the depth convolution GAN model can gradually learn the characteristics of the image and generate realistic images during the training process. The results confirm the effectiveness and practicability of the GAN model in this article. In this section, the modeling speed of GAN model based on deep convolution is tested and the image generation accuracy of GAN model is assessed.

5.2 Experimental Analysis of Instructional System

The purpose of this experiment is to assess the teaching effect of art instructional system based on CAD and DL model. The experiment selected 285 learners as the experimental objects, who came from different art majors and had a certain artistic foundation. The learners in the experimental group use the art instructional system based on CAD and DL model to study. In this article, three art majors, painting, architectural design and fashion design, are selected as experimental contents, including the quality of works, the mastery of skills and the learning effect. Figure 5 shows the students' work quality, skill mastery and learning effect score before using the art instructional system. As shown in Figure 6, the quality of students' works, the mastery of skills and the evaluation of learning effect after using the art instructional system are shown.

The quality of students' works, the mastery of skills and the evaluation of learning effect have all been improved after using the art instructional system based on CAD and DL model. This shows that the system has a certain teaching effect. Specifically, the reason why the quality of learners' works is improved after using the system is that the system can provide personalized teaching guidance and help learners better master the skills and methods of artistic creation. Moreover, the system integrates various teaching resources, including course materials, teaching videos, artists' works, etc., which provides students with rich learning materials and practical opportunities. In terms of skill mastery, the skill level of students has also improved after using this system. In order to assess the performance of GAN model in the generation of artistic works, this section uses three different data sets for experiments, namely, painting, architectural design and clothing design.

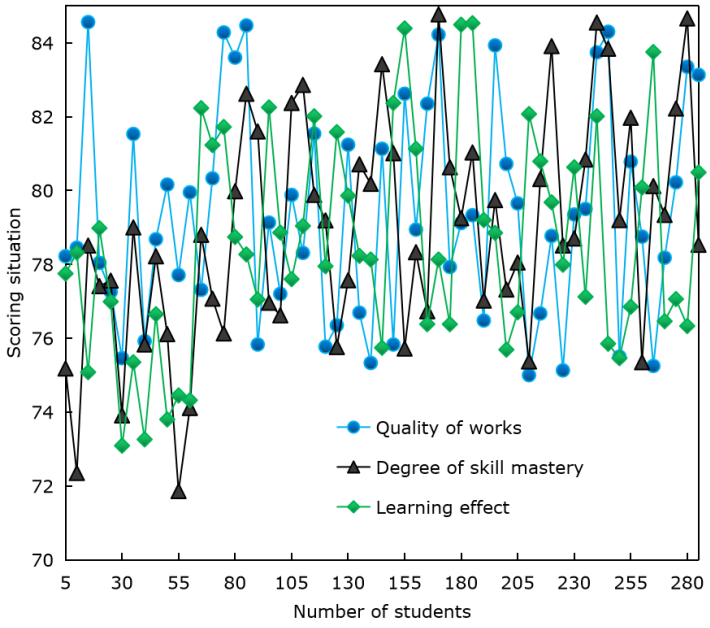

Figure 5: Grading before using the art instructional system.

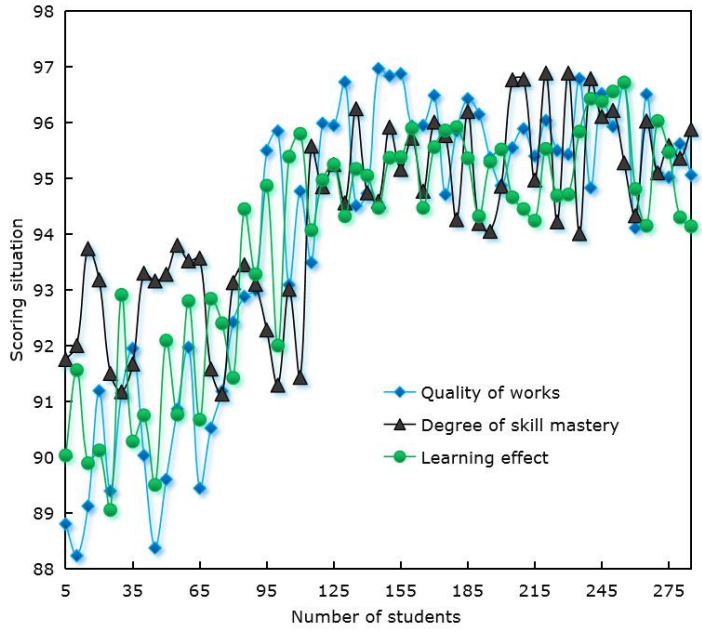

Figure 6: Grading after using the art instructional system.

Each data set contains a large quantity of professional works of art, which are used to train and test the GAN model in this article. Firstly, three different GAN models are constructed for painting, architectural design and clothing design, including two networks: generator and discriminator. Figure 7 shows the image generation effect of the system model in this article on three types of works: painting, architectural design and fashion design.

Generation effect of painting design

Architectural design generation effect

Generation effect of clothing design

Figure 7: The artistic works generated by the system model.

As can be seen from Figure 7, different kinds of works of art generated by using the GAN model in this article are highly realistic and innovative. This is because the depth convolution network structure is adopted in the construction of GAN model, which enables the model to quickly learn the characteristics of works of art and generate realistic works of art. Moreover, random noise input is adopted in this article, which enables the model to generate innovative works of art.

Generally speaking, the art instructional system based on CAD and DL model can generate highly realistic art works, and at the same time, it can effectively improve students' work quality, skill mastery and learning effect.

6 CONCLUSIONS

In today's information society, the development of computer technology and AI is changing with each passing day, which constantly promotes innovation and progress in various fields. These technologies also play an important role in artistic creation, artistic appraisal and artistic teaching. In this article, CAD and DL model are introduced into art teaching, and a new art instructional system is constructed. This shows that the system is effective and practical, and it has a certain degree of intelligence and adaptability, and can carry out personalized teaching according to learners' learning needs and characteristics. In addition, the system also has the advantages of integrating teaching resources, supporting various learning methods, combining art practice and introducing evaluation mechanism. Future research can further optimize the function and performance of CAD and DL models, and improve the intelligence and adaptability of the system. Various types of teaching resources and technical support can be further integrated to improve the comprehensiveness and comprehensiveness of the system. Through continuous research and improvement, the system is expected to provide more efficient, personalized and innovative teaching methods and platforms for art teaching.

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