www.cad-journal.net
Computer-Aided Design AND APPLICATIONS

Improvement of Creativity and Expressiveness in Advertising Art Based on Neural Network

Luolan Shen[1] and Yun Hu[2]

[1]School of Fine Arts, Suzhou Vocational University, Suzhou, Jiangsu 215000, China, shenluolan@jssvc.edu.cn
[2]Youli Youpin Creative Design (Shanghai) Co., Ltd., Shanghai 200000, China, huyun1212@gmail.com

Corresponding author: Luolan Shen, shenluolan@jssvc.edu.cn

Abstract. With the development of information technology and modern commercialization, advertising is no longer a single carrier of information and product value but an industry that caters to various needs, such as art, marketing, and communication. Advertising art design and creativity have gained new development opportunities in the context of information technology, such as computers, presenting rich and diverse forms of expression, but at the same time, they have also been affected and hindered by various factors. The increasingly frequent dissemination of culture and art has made the artistic creativity and expressive power of advertising more in line with the aesthetic tendencies of the new era. This article analyzes advertising art creativity based on neural network algorithms and CAD computer-aided design technology from the above background, explores the changes in click-through rates after optimizing advertising art, and deeply improves its expressive characteristics. Firstly, the core content of neural network algorithms was analyzed, and suitable means for advertising art analysis were selected based on the current development status of neural network algorithms and CAD technology. Study the creative features in advertising art and predict its click-through rate using neural networks and attention mechanisms. Secondly, analyze the effect changes of advertising art creativity optimized by CAD technology after pushing users and explore the expressive characteristics of advertising images. Finally, with the assistance of neural network algorithms and CAD technology, the expressive power of advertising artistic creativity is improved, and the research results are analyzed. Research has shown that advertising art creativity optimized using neural networks and CAD technology has received unanimous praise from the public, and its expressive power is more advanced and prominent, reflecting modern aesthetic styles and fashion interests.

Keywords: Neural Network Algorithms; CAD Technology; Advertising Art; Creativity; Expressive Power
DOI: https://doi.org/10.14733/cadaps.2024.S25.171-186

1 INTRODUCTION

The meaning of the word advertising comes from the translation of Latin, which represents the meaning of attention and advertising. In the process of advertising creation, shape design often occupies a crucial position. The shape not only affects the visual impact of advertising but also directly relates to the communication of advertising information and the audience's acceptance. With the continuous development of technology, computer-aided design (CAD) technology has become an important tool for advertising shape art creation. The automatic updating of parameterized CAD models provides new possibilities for optimizing advertising shape art creation. By adjusting these parameters, Agarwal et al. [1] achieved rapid modification and optimization of the model shape. Automatic updating technology can automatically adjust these parameters in real-time according to design requirements so that the model shape can automatically adapt to different design scenarios and target audiences. In advertising shape art creation, designers can more efficiently design and optimize shapes by automatically updating the parameterization of CAD models. Therefore, advertising is a comprehensive art discipline that not only reflects economic, political, and social development issues but also reflects the evolution process of historical culture and artistic aesthetics. In today's increasingly popular digital marketing, online advertising, as an important channel for brand communication and product sales, its artistic processing and precise placement are particularly crucial. Traditional advertising production and delivery methods often rely on human experience and intuition, making it difficult to achieve personalized and intelligent advertising. Based on neural network algorithms and CAD overwhelming target selection technology, a new solution is provided for the artistic processing and precise placement of online advertising. In the artistic processing of online advertising, neural network algorithms can automatically extract the associations and patterns between advertising elements by learning a large number of advertising samples, thereby generating more creative and attractive advertising content. Ahmadi et al. [2] used neural network algorithms to perform style transfer or colour optimization on advertising images. This makes advertising more in line with the aesthetic preferences of the target audience. Only by conducting in-depth research on the relationship between artistic and cultural characteristics and advertising can we truly understand the connotation of advertising as a discipline and thus maximize the role of advertising in social communication. Colour and texture are some of the most intuitive and prominent features in advertising art images. Colour can convey the emotions and atmosphere of an image, while texture can reflect the details and texture of an advertising image. Therefore, integrating colour and texture features into image retrieval systems can more comprehensively describe the content of images and improve the accuracy of retrieval. Asadi et al. [3] analyzed a novel content-based image retrieval system that integrates colour and texture features. In this system, first, colour feature extraction methods such as colour histograms and colour moments are used to quantify the colour information of advertising art images. These colour features can capture the overall tone and colour distribution of an image, providing basic data for subsequent retrieval. At the same time, texture feature extraction methods such as grayscale co-occurrence matrix and wavelet transform are used to extract and analyze the texture information of advertising images. These texture features can describe the local structure and details of the image, further enhancing the accuracy of retrieval. Advertising art and creativity are the ways of expression and expression in product sales, and they are also unique individuals separated from the field of modern art. Advertising art and creativity are practical forms of creative development and dissemination of ideas with clear objectives and under numerous constraints. With the rapid development of information technology and technology, the information age has brought changes in our lives and has also given us a deeper understanding of news, media, and information dissemination. CAD (Computer Aided Design), as an important tool for advertising creation, can accurately draw advertising floor plans, providing a reliable basis for subsequent processing and production. However, traditional CAD floor plans can only display advertising effects in a two-dimensional form and cannot fully demonstrate the three-dimensional and spatial sense of advertising. Virtual reality technology can transform CAD floor plans into three-dimensional virtual scenes, presenting advertisements to audiences in a more realistic and vivid form. Barreto et al. [4] imported CAD floor plans into a virtual reality creation system. By

processing the system, convert the floor plan into a 3D model, and construct and layout it in a virtual scene. Designers can adjust the size, material, lighting and other parameters of the model as needed to create a virtual environment that fits the advertising theme. A decade ago, advertising was only meant to promote products and their functions. It not only helped products sell quickly but also increased their value. Today, more than a decade later, the demand for modernization has led people to pay more attention to the advertising attributes of products, and the functions and quality of products are showcased in advertising art and creative promotion. It can be seen that advertising has penetrated into every aspect of our lives, influencing our choices with its unique practical art and aesthetic expression. As an important tool in product design, CAD models contain precise geometric information and spatial relationships of objects. Ben and Cengiz [5] combine CAD models with binocular vision technology to provide more detailed and accurate target object information for industrial robots, thereby achieving more accurate directional guidance. In terms of advertising direction guidance, industrial robots can obtain information such as the position and posture of billboards or displays through binocular vision technology and combine it with CAD models for comparison and matching. Through this method, robots can accurately identify target advertisements and guide them in a targeted manner based on preset trajectories and actions, attracting the attention of the audience and improving the effectiveness of advertising dissemination.

Traditional advertising art does not pay much attention to creativity and creativity, they blindly pursue the intuitive expression of advertising, ignoring the artistic attributes of advertising. In fact, the forms of advertising can involve many fields, including literature, history, photography, art, music, and so on. Comparing advertising art and creativity with a single art form can lead to development, as both bear a more important responsibility of selling the product itself and showcasing its unique cultural connotations. Gabor filter is a widely used linear filter in image processing, which can effectively extract directional and frequency features in images. The optimal Gabor filter is a set of Gabor filters with the best performance selected through optimization algorithms, which can better adapt to different image features and processing needs. In terms of art advertising image inspection, the technology based on optimal Gabor filters can achieve an accurate evaluation of image quality. Boluki and Mohanna [6] perform Gabor filtering on images to extract texture, edge and other feature information and then analyze quality indicators such as image clarity and contrast. Compared with traditional image quality evaluation methods, the technology based on optimal Gabor filters is more accurate and objective and can better meet the needs of advertising image inspection. From this, it can be seen that creativity and expressiveness in advertising art are not only a marketing tool but also bring significant profits and benefits to enterprises, making it highly purposeful. Advertising is not like pure art, which cannot freely express artistic aesthetics. It focuses more on the impact of expressive power on consumers. In this process, the creativity of advertising art should not only accurately disseminate the content, functions, and detailed information of the product but also conform to the theme of the product itself, making it easier for consumers to accept and understand and arousing their interest and desire to purchase the product. Computer advertising art graphics processing technology can achieve precise processing of advertising graphics. Through the powerful functions of computer software, designers can freely edit, modify, and optimize advertising graphics, such as adjusting colours, embellishing details, and adding special effects. This refined processing makes the advertising graphics more exquisite and vivid, which can attract the audience's attention and enhance the attractiveness of the advertisement. Computer advertising art graphics processing technology can also achieve the dynamic and interactive design of advertising graphics. By utilizing multimedia elements such as animation and videos, advertising graphics can present more vivid and interesting dynamic effects, increasing the fun and interactivity of advertising. Meanwhile, with the help of interactive design technology, advertising graphics can intelligently respond to audience feedback and behaviour, bringing a more personalized advertising experience to the audience [7]. Therefore, when expressing the advertising theme, in addition to choosing appropriate colours and designs, it is also necessary to choose appropriate ways of expression to make it more eye-catching and prominent. For example, when designing mechanical advertisements, a calm and simple design style should be used more to give consumers a sense of reliability and stability, while advertising for high-tech products should emphasize modernity and

applicability. We found that neural network algorithms and computer-aided design CAD technology play a good role in the development of advertising art when studying the improvement of creativity and expressiveness in advertising art. Virtual reality technology has brought a new way of experiencing art advertising therapy. Traditional art advertising therapy is often limited by physical space and expressive forms, making it difficult to fully present the essence and connotation of advertising creativity. Virtual reality technology, on the other hand, constructs a three-dimensional, three-dimensional virtual world, allowing audiences to experience the information and emotions conveyed by advertisements firsthand. This immersive experience not only enhances the attractiveness of advertising but also enables the audience to understand and accept the advertising content more deeply. Virtual reality technology provides richer forms of expression and creative space for art advertising therapy. Kaimal et al. [8] use virtual reality technology to create various unique scenes and effects, presenting advertising creativity in a more vivid and vivid way. This creative expression not only enhances the artistic and creative nature of advertising but also makes it more targeted and personalized, better meeting the needs and preferences of the audience. Especially computer-aided design technology can transform the flat advertising design style into a more multi-dimensional presentation form. Therefore, this article focuses on exploring the role of neural network algorithms and CAD technology in advertising art in the research.

2 THE CURRENT DEVELOPMENT STATUS OF NEURAL NETWORK ALGORITHMS AND CAD TECHNOLOGY

Advertising, as an important means of information dissemination, is not only influenced by disciplines such as history and art but also promoted by disciplines such as journalism and communication. In the process of advertising design and production, colour and texture are the two core elements that play a crucial role in the visual effect and conveyed information of advertisements. With the continuous development of computer technology, more and more algorithms are being applied to feature extraction and analysis of advertising images. Among them, neural network algorithms and CAD (computer-aided design) technology have shown unique advantages in the comparative study of advertising colour and grayscale co-occurrence matrix features. In the comparative study of advertising colour and grayscale co-occurrence matrix features, neural network algorithms can automatically recognize and extract colour and texture features in images through training and learning and classify and recognize them. This method has high adaptability and accuracy and can handle complex image data [9]. The size of the advertising board, media elements, artistic creativity, and other information can all bring help to the corresponding products and enterprises. Analyzing advertising images, themes, and features can, to some extent, expand the creativity and expressive power of advertising art. 3D immersive virtual reality technology provides a three-dimensional and vivid display platform for advertising art. Traditional advertising forms are often limited by two-dimensional space, making it difficult to fully showcase the details of the product and the creativity of the advertisement. 3D immersive virtual reality can present advertising content in a three-dimensional and three-dimensional form, allowing the audience to have a more intuitive and in-depth understanding of the product and feel the information and emotions conveyed by the advertisement. Meanwhile, 3D immersive virtual reality has also brought a new model for advertising art consumption. Traditional advertising consumption is often passive, and the audience can only accept the transmission of advertising information and cannot engage in in-depth interaction with it. Virtual reality technology breaks this limitation, allowing audiences to actively participate in the process of advertising creation and consumption. Kim and Lee [10] have customized and modified their advertisements according to their preferences and needs, making them more in line with their aesthetic preferences and needs.

Neural network algorithms, as the main means of analyzing data in information technology in recent years, have good information computing power and fitting ability, which can serve as the core support for advertising art creativity analysis. The selection and application of machine learning algorithms are crucial in the construction of intelligent advertising recommendation systems. Common machine learning algorithms include collaborative filtering, deep learning, and so on. Liu

[11] has established an efficient anomaly advertising monitoring system. By analyzing the historical behaviour and preferences of users, identify other users who are similar to them, and then recommend advertisements based on the preferences of these similar users. Deep learning algorithms learn and process massive amounts of user data by constructing complex neural network models in order to discover potential patterns and patterns hidden in the data and achieve more accurate recommendations. By training machine learning models to recognize the features and patterns of abnormal advertisements, automatic detection and filtering of abnormal advertisements can be achieved. This system can monitor and analyze multi-dimensional data such as advertising content, sources, and user feedback. It promptly detects and handles abnormal advertisements, ensuring the normal operation of the advertising industry and the legitimate rights and interests of users. Neural network algorithms can not only solve complex problems but also process the data information of regression and classification attributes according to specific rules, dividing the data content into several combinations. The artistic design of marine environmental advertising is an important stage for its application. The marine environment, as one of the most mysterious and spectacular natural landscapes on Earth, has always been a beloved creative theme for advertising art designers. The introduction of virtual reality technology has brought unprecedented innovation and development to the art design of advertising in marine environments. In the art design of advertising in marine environments, the application of virtual reality technology not only enhances the artistic and creative nature of advertising but also makes it more targeted and personalized. Shi and Niu [12] adjusted the colour, lighting, sound effects, and other elements of the virtual ocean environment based on the theme and target audience of the advertisement to create different atmospheres and emotions. This personalized expression makes the advertisement more in line with the brand image and audience preferences, improving the attractiveness and dissemination effect of the advertisement. Virtual reality technology also provides richer interactive methods and possibilities for advertising art design in marine environments.

Unlike traditional data analysis, neural network algorithms can automatically find patterns of the research object, complete data fitting without specifying targets, and predict unknown data. Common problems such as image segmentation, image processing, and automatic recognition and classification are all solved using neural networks. In the wave of digital marketing, online advertising not only carries the mission of transmitting information but also becomes a stage to showcase the artistic creativity and expressive power of advertising. In order to effectively measure and enhance the artistic value of advertising, it is particularly important to use balanced user click data for data sampling strategies. This strategy aims to explore the artistic connotations of advertising through scientific data analysis, guide advertising creation, and enhance the dissemination effect of advertising. Based on such data, Sisodia and Sisodia [13] objectively analyzed the role of each element in attracting user attention, thereby discovering the potential patterns of advertising artistic creativity and expressive power. Layered sampling can be used to stratify users based on their different characteristics in order to reveal the differences in preferences for advertising elements among different user groups. At present, neural network algorithms have gradually been applied in fields such as image recognition, text analysis, market prediction, and decision optimization, not only achieving good application results but also promoting the development of various fields. Driven by the wave of digitization and informatization, new media scenes emerge endlessly, providing broad space for the integration and innovation of visual communication technology and art. As an important tool in the era of new media, computer-aided technology not only provides technical support for visual communication but also plays a role as a bridge and link in the interaction between art and technology. Wang [14] analyzed the computer-aided interaction between visual communication technology and art in new media scenarios. In the context of new media, visual communication technology is undergoing unprecedented changes. Traditional visual communication methods are often limited to print media or static images, while new media breaks through these limitations, allowing visual information to spread and interact on a broader dimension. Through computer-aided technology, designers can create visual works that are more dynamic, interactive, and immersive, bringing audiences a brand-new sensory experience.

With the advancement of computer technology, CAD computer-aided design functions are becoming increasingly important in disciplines such as graphic design. This technology can solve the tedious drawing needs in the engineering field and also has more accurate and beautiful design renderings, making it stand out in the art and design industry. The core of interactive visual communication advertising art design based on CAD technology lies in combining CAD technology with advertising art to achieve precise positioning and personalized display of advertisements. Through CAD technology, Wei and Han [15] accurately drew the graphics, images, and 3D models required for advertising and customized designs based on the theme and style of the advertisement. This design approach not only makes advertisements more vivid and vivid but also allows for flexible adjustments and optimization based on the preferences and needs of the audience. When implementing interactive visual communication advertising art based on CAD technology, we also need to pay attention to the interactive experience with the audience. By introducing interactive design elements such as touch screens, sensors, etc., advertisements can respond and change in real time based on audience operations and feedback. This interactive display method not only increases the fun and attractiveness of the advertisement but also allows the audience to have a deeper understanding of the information and concepts conveyed by the advertisement. Art-related design software has gradually replaced manual hand-drawn design, and CAD computer-aided design has become a tool for most designers to complete their creations. The application of CAD technology in advertising art design not only provides a more professional perspective but also changes the presentation level of design results and expands design thinking. Driven by the digital wave, the advertising industry is undergoing unprecedented changes. Computer-aided design technology, with its powerful functionality and flexibility, provides strong support for the implementation of advertising creativity. Visual communication and expression centred on advertising creativity, with the assistance of computer-aided design, can be presented to the audience more accurately, vividly, and efficiently. Yang and Liu [16] analyzed computer-aided design with creativity as the core of visual communication expression. Advertising creativity is the soul of advertising, which determines whether an advertisement can attract the audience's attention and convey effective information. Visual communication and expression are important carriers for the presentation of advertising creativity. Through visual elements such as graphics, colors, and text, it transforms advertising creativity into a form that the audience can perceive intuitively. The application of computer-aided design technology makes the visual communication and expression of advertising creativity more precise and efficient.

Designers create a three-dimensional dynamic artistic design environment in CAD systems, helping them observe their design works from multiple perspectives and appreciate the aesthetic effects brought by the design content. This authentic design style and spatial variation cannot be provided by graphic design works, and advertising art creativity mainly based on CAD technology has become a popular aesthetic trend. In the field of advertising art, texture, as one of the important visual features of images, plays an irreplaceable role in expressing product texture and conveying emotional information. Therefore, accurate classification of advertising art texture images is of great significance for improving advertising effectiveness and enhancing user experience. In recent years, with the rapid development of computer vision and machine learning technology, advertising art texture image classification technology based on new information fusion methods has gradually attracted people's attention. The new information fusion method is a technology that effectively integrates information from different sources and forms to obtain a more comprehensive and accurate representation of information. In advertising art texture image classification, the new information fusion method can effectively fuse multiple feature information of the image, thereby improving the accuracy and stability of classification [17]. In addition, from the development of computer-aided design both domestically and internationally, many countries attach great importance to it. Japanese scholars believe that CAD technology has a broader development space, and they have applied it to mechanical design and drawing, using this drawing software that transcends time and space constraints to complete many three-dimensional mechanical parts manufacturing. American researchers also believe that applying CAD computer-aided design technology in modelling has good effects. It cannot provide reliable parameters for modelling and can

also allow 3D modelling to be displayed in a virtual environment, making it convenient for researchers to process and adjust details. Based on the above research status, it is known that neural network algorithms and CAD computer-aided design technology play a more important role in creative analysis and expressive enhancement in advertising art.

3 RESEARCH ON ADVERTISING ART CREATIVITY AND EXPRESSION ENHANCEMENT BASED ON NEURAL NETWORK ALGORITHMS AND CAD-ASSISTED TECHNOLOGY

3.1 Analysis of Advertising Art Creativity and Click-through Rate Prediction Based on Neural Network Algorithms

The creative expression of advertising art includes not only the display of design style and the dissemination of design patterns but also a way for products and brands to choose to reflect their cultural value when facing consumers. We analyze the degree of purposefulness presented by consumers during the purchasing process and explore the purchasing differences between men and women. As shown in Figure 1:

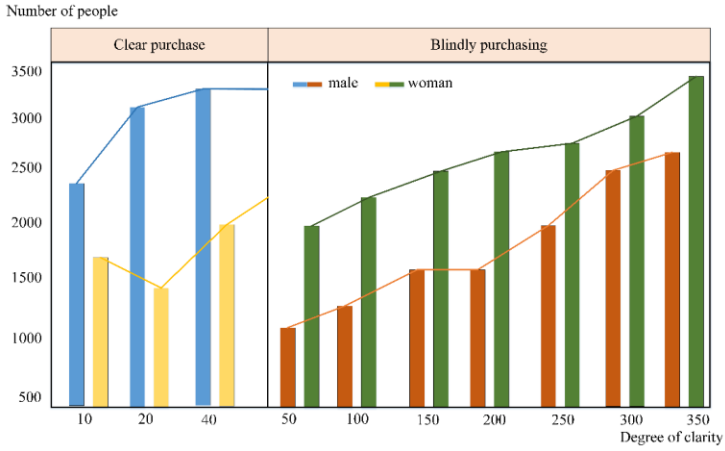

Figure 1: Purpose level analysis.

As shown in Figure 1, in the results of big data statistics, only 20% of consumers have a clear purpose when reaching the target store for shopping and consumption, with males having a more obvious purpose. The rest of the population has a more blind purchasing demand, and this type of population has a higher acceptance of advertising. Advertising information and creativity can stimulate their purchasing desire. In the era of information media, the dissemination of advertising art is passively accepted, and most people cannot fully understand the entire advertising content from beginning to end. Consumers also lack the energy to pay attention to the information presented in advertisements, and advanced and difficult-to-understand advertising ideas are difficult to circulate. In summary, the artistic design of advertising should first meet the current aesthetic needs of consumers and also make consumers more interested and able to focus on it. This depends on various aspects; in addition to making the advertising content easy to remember, it also needs to evoke predictive associations and feelings, combined with visual guidance, to attract attention.

The design core of print advertising art lies in innovation, using the best creativity to integrate artistic thinking into text and images in order to promote products and concepts. In the new era of rapid commercial development, advertising can be seen everywhere. Some people have a mediocre response to advertising, while others have developed some boredom. Creative advertisements not only attract the public's attention but also their desire to purchase this product. From this, it can be

seen that creativity is the focus and charm of advertising art. Modern graphic creativity can meet people's emotional needs in advertising. Although cultural, regional, and racial differences hinder communication between most people, the externalization of graphic creativity in this type of advertising can achieve spiritual communication in artistic aesthetics. This article uses neural network algorithms to deeply analyze the impact of creative changes in advertising art. A neural network is a model that mimics animal behavioural characteristics for classification or simultaneous data processing. The combination of neural network algorithms and computer technology has shown good performance in information systems, prediction research, and other fields. The core technology is mathematical modelling, which utilizes data computation and computer software and hardware to meet requirements. The unit data model formula for neural networks is as follows:

$$y = a(w_1 x_1 + w_2 x_2 + ... + w_n x_n + b) \tag{1}$$

The formula a represents the activation function of each neural unit. We have chosen a genetic neural network algorithm that can support both input and output for the diversity of advertising art types. It differs from ordinary neural network algorithms in that it is a multi-layer processing network technology, mainly characterized by the direction of signal transmission, which outputs accurate information and error information in reverse. Each layer of neural unit data can only affect the processing structure of the next layer. If the predicted output does not match the actual evaluation effect, reverse error adjustment will be made. This allows the genetic neural network algorithm to continuously meet the expected output predictions in each iteration, helping us quickly analyze the requirements. Due to the variety of creative types in advertising art, which also affect many consumer characteristics, this special input-output mode is suitable for selecting neural network algorithms for research. We will present the neural network analysis flowchart as follows:

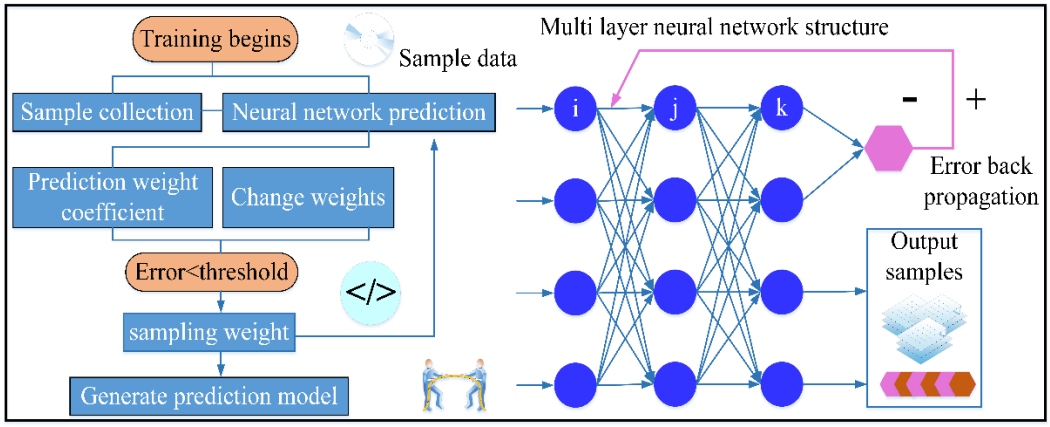

Figure 2: Neural network analysis flowchart.

As shown in Figure 2, the neural network has a higher number of iterations. In addition to adding corresponding data training samples, attention should also be paid to the impact of sample weight changes on the results before and after. In order to improve the practicality of evaluating advertising art creativity, we take user preference features as input samples and set sub-neural units as age, gender, hobbies, income status, etc. The hidden layer consists of a total of 8 neural nodes, and the output layer is the type of popularity for advertising art creativity. In order to make the output results more consistent with the actual prediction situation, we choose the S function as the calculation formula:

$$Y = 1/(1+e^{(-x)}) \tag{2}$$

Reduce the number of iterations of the activation function for the hidden layer and adjust the function formula:

$$\tanh(x) = (e^{x} - e(-x)) / (e + e^{(-x)}) \tag{3}$$

By training the independent variables and predicted outputs, the neural network algorithm is reverse activated, where the actual output of the hidden layer neural network unit is:

$$y(p) = sigmoid[\sum_{i=1}^{8}(x(p)w_{ij}(p) - \theta_{j})] \tag{4}$$

The output layer neural network formula can also be obtained as follows:

$$y_{k}(p) = sigmoid[\sum_{i=1}^{7}(x_{jk}(p)w_{jk}(p))] \tag{5}$$

By constantly changing the weights and limits corresponding to the calculated independent variables, the different impacts of advertising art creativity on consumers can be obtained, and the relationship between advertising art creativity types and users can be analyzed. Due to the need to consider multiple factors for the creative source of each advertising art, we adopt fuzzy evaluation and decision prediction models to explore the impact of multiple main factors, such as advertising click-through rate, consumer purchasing power, and advertising playback time. Firstly, create a set of possible impacts as indicators, represented as:

$$U = (u_{1}, u_{2}, u_{3}, u_{4}) \tag{6}$$

Assuming there are four evaluation levels, denoted as:

$$V = \ v_{i}, v_{i+1}, v_{i+2}, v_{i+3} \tag{7}$$

$$i = 1,2,3,4 \tag{8}$$

Among them, V establish an evaluation matrix for the following multiple influencing factors, representing the number of times advertising artistic creativity is played during different time periods:

$$R = \begin{bmatrix} R_{1} \\ R_{2} \\ R_{3} \\ R_{4} \end{bmatrix} = \begin{bmatrix} r_{11}, r_{12}, r_{13}, r_{14} \\ r_{21}, r_{22}, r_{23}, r_{24} \\ r_{31}, r_{32}, r_{33}, r_{34} \\ r_{41}, r_{42}, r_{43}, r_{44} \end{bmatrix} \tag{9}$$

Determine the weight vector that affects advertising evaluation:

$$w = y(1 + \frac{1}{n}) \ \ w_{1}, w_{2}, w_{3}, w_{4} \tag{10}$$

Using appropriate calculation formulas, connect the fuzzy comprehensive evaluation results with decision-making:

$$B = W \bullet \delta R \tag{11}$$

Form the final advertising evaluation matrix:

$$B = (B_{1}, B_{2}, B_{3}, B_{4}) \begin{bmatrix} W_{1} \\ W_{2} \\ W_{3} \\ W_{4} \end{bmatrix} = \begin{bmatrix} r_{11}, r_{12}, r_{13}, r_{14} \\ r_{21}, r_{22}, r_{23}, r_{24} \\ r_{31}, r_{32}, r_{33}, r_{34} \\ r_{41}, r_{42}, r_{43}, r_{44} \end{bmatrix} = (b_{1}, b_{2}, b_{3}, b_{4}) \tag{12}$$

In the formula, b_{1} representing the clock frequency of each advertising creative, combined with logical thinking to view the effectiveness of advertising artistic creativity in terms of influencing consumer click viewing, the output of logistic regression calculation is the reliable probability of the sample. The mathematical formula for logical calculation is:

$$f(x) = \frac{1}{1+e^{-x}} \tag{13}$$

In neural networks, for the prediction problem of click-to-view, it is assumed that there is a certain correlation between advertising art features and user preferences. Set a function weight for each feature during the training process to represent the importance level, as shown in the formula:

$$f(x) = \sum_{i}^{k} w_i x_i + b \tag{14}$$

Using feature weight numerical training to derive the objective function:

$$l(o) = \prod_{i=1}^{m} (h_o(x_i))^y (1 - h_o(x_i))^{1-y_i} \tag{15}$$

According to the analysis of the creative effect of advertising art based on neural network algorithms, it is found that the factors that affect the choice and love of the masses are not only the aesthetics of advertising art but also the value and potential meaning of the product itself. Advertising creativity can, to some extent change the purchasing coefficient of consumers. Among the most basic elements of advertising art, creativity, graphics, colours, and display methods are the most eye-catching. In the future, we will conduct in-depth research on the expressive power and visual elements of advertising art.

3.2 Research on the Expressive Power of Advertising Art Images Based on Neural Networks and Computer-Aided Design CAD Technology

Graphic expression in advertising art creativity can highlight the visual form, allowing design ideas to be visualized and displayed. It can also be said that the expressive power of advertising design graphic creativity can intuitively help the audience understand advertising content, potentially affecting consumer psychological activities. The expressive power of advertising design should not only have creative conceptual design but also meet one's own expressive needs, not only bold but also novel and attractive ideas to attract the masses. Reflecting the formal sense of advertising art from multiple aspects, combined with unique personalized advertising design ideas, it provides people with visual impact and enjoyment. The commonly used methods in most advertising art creativity are restructuring, deconstructing, and replacing themes. When facing more expressive design ideas, we need to leverage the similarities in each design feature. Therefore, advertising artistic creativity is an abstract process of expression, and abstract artistic techniques use points, lines, and other means to leave a deep impression on people in advertising. At the same time, we calculated the different styles and degrees of creative expression in advertising art, as shown in Figure 3.

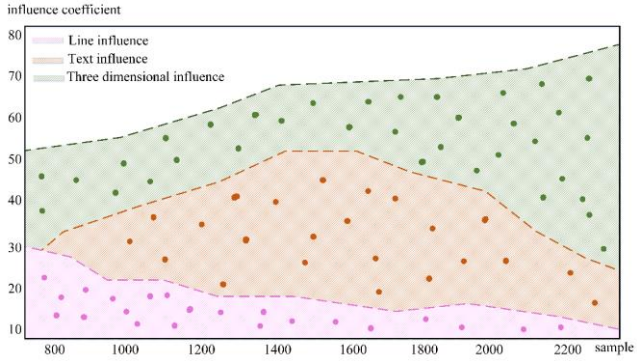

Figure 3: The different styles and degrees of creative expression in advertising art.

From Figure 3, it can be seen that in advertising art creativity, flat lines and text have a relatively small impact on expressive power, while three-dimensional expressive graphics can enhance the degree of influence on expressive power. Therefore, we use CAD computer-aided design technology and digital means to improve advertising creative production, meeting the expressive needs of advertising art creativity from multi-dimensional spatial conditions. CAD-assisted graphic design is not only a digital artistic expression but also allows advertising creators to retain their creative ideas more, improve the presentation effect, and present the designer's works in the best display effect. The introduction of CAD technology into advertising art and creative design has changed the traditional graphic design approach, utilizing three-dimensional forms of expression to efficiently enhance the effectiveness of advertising itself. In our research, we construct an evaluation framework and pre-processing process for the expressive power of advertising art creativity, as shown in Figure 4:

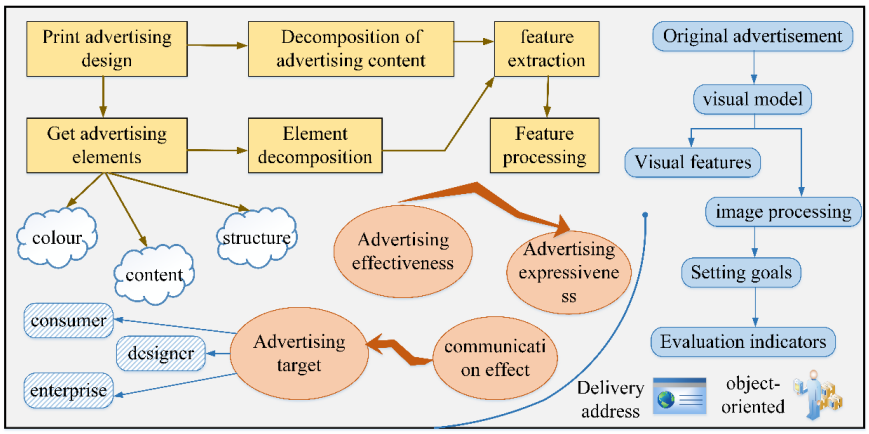

Figure 4: The evaluation framework for the expressive power of advertising art creativity.

As shown in Figure 4, we explore the original advertising art design, focusing on the visual types and feature types of advertisements. Summarize evaluation indicators based on feature extraction and image processing. Select appropriate advertising expression methods based on different advertising targets and work effects, and finally obtain corresponding advertising elements to form a creative advertising plan assisted by CAD technology. According to the complete framework of expressive power, it can be concluded that factors with characteristic concretization are the expressive elements of advertising creative design. We divide it into graphic representation, colour representation, and textual representation. There are fuzzy forms of expression in the graphic elements, and a vague expression technique is used to make consumers want to explore the hidden information of the advertisement itself, thereby enhancing the attractiveness of the advertisement after placement. The asymmetry and irregular creativity of advertising design can also arouse the curiosity of the audience. In the elements of colour expression, the different expressive effects generated by colour matching, unity, and contrast can all present an overall echo, allowing advertising viewers to receive clear prompts from them. The interactivity and arrangement of content in the elements of textual expression are the main means for advertising creativity to reflect the product itself. Some consumers who are more concerned about the product's function are obviously more receptive to this way of expression. Finally, in our research, we also found that CAD computer-aided design technology can combine the training mode of neural network algorithms to reorganize complex professional design thinking and express it in a simple, intuitive, and vivid way. Advertising art uses these three-dimensional special effects to present professional content and functions that are difficult to understand to consumers.

4 ANALYSIS OF RESEARCH RESULTS ON ADVERTISING ART CREATIVITY AND EXPRESSIVE POWER IMPROVEMENT BASED ON NEURAL NETWORK ALGORITHMS AND CAD TECHNOLOGY

4.1 Analysis of Advertising Art Creativity and Click-Through Rate Prediction Research Results Based on Neural Network Algorithms

Advertising artistic creativity is the use of abstract and concrete means to express artistic concepts and ideas. Simple line patterns and text can leave a deep impression on the audience of advertising. Therefore, the creativity of advertising art has greatly promoted the development of advertising design. Artistic advertising creative products not only stand out in practicality but also have their own unique aesthetic characteristics. It can be said that creativity and expression techniques in advertising art effectively disseminate the content of advertising products, maximize their social benefits, and achieve the goals of advertising art media. When exploring the role of creativity in advertising art, we use neural network algorithms to predict the audience's click-through rate of advertising creativity. By conducting a random sampling survey, a neural network prediction comparison was conducted on the number of clicks on advertisements by people with different levels of creativity, as shown in Figure 5.

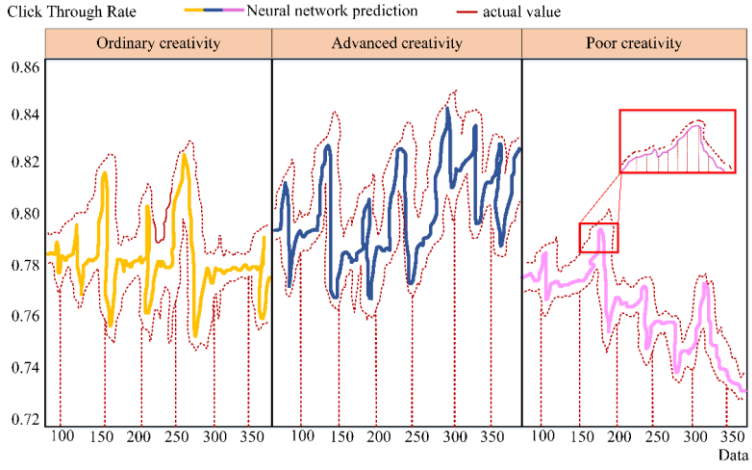

Figure 5: The number of clicks on mass advertisements with different levels of creativity.

As shown in Figure 5, we divide the types of advertising creativity into three levels: ordinary, advanced, and poor. The predicted click-through rate by the neural network algorithm matches the actual click-through frequency. At the same time, we also found that among the high-level creative effects of advertising art design, the click efficiency of the masses is the highest. This also indicates that creative expression in advertising art can stimulate public interest in advertising content. In the study, we added a fuzzy evaluation model to optimize the accuracy of neural network algorithms in predicting results. We compared the changes in prediction accuracy and feedback of neural network algorithms on the same sample data before and after adding fuzzy evaluation coefficients, as shown in Figure 6.

As shown in Figure 6, the training error of the model decreases as the fuzzy evaluation function is added. Faced with a large amount of advertising art data elements, the optimized algorithm of the neural network significantly improves its accuracy and also improves the feedback efficiency of the prediction model. In addition, the improvement of advertising artistic creativity also needs to be reflected in innovation and rationality, taking into account the pursuit of modern aesthetics by the masses and ensuring that they have a pleasant feeling after watching advertisements.

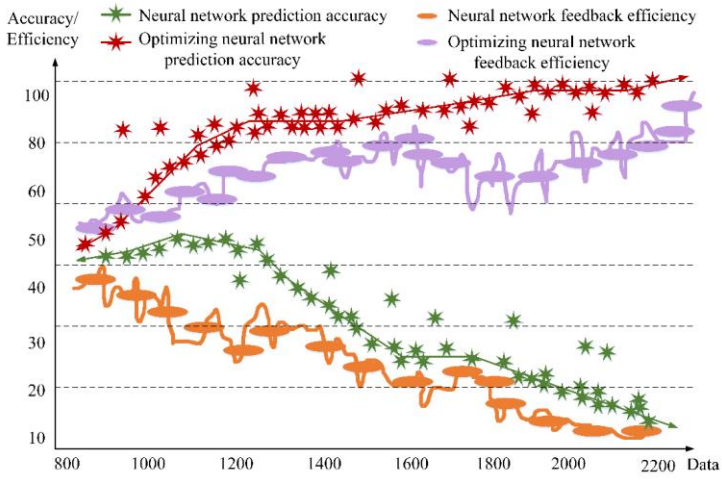

Figure 6: Changes in prediction accuracy and feedback of the same sample data.

The lack of aesthetic advertising creativity can not attract the attention of the masses and even has a certain chance to cause the audience's plan. The expressiveness of advertising also needs the bearing of creative aesthetics to play its role. Aesthetic art has a demand for expressive effects and reflects the designer's intentions, and the expressive layer of advertising art can also make the audience pay more attention to the meaning conveyed by their own products. For example, some advertising ideas can create a sense of pleasure for the public, both physically and mentally. Within a short period, while watching an advertisement, the gorgeous advertising interface and colourful advertising forms all give the audience a new experience. This is when the expression level of art reaches a certain level through unique personality creativity, abstract lines, and beautiful patterns, allowing deep artistic effects to be displayed in advertising content.

4.2 Analysis of Research Results on the Expressive Power of Advertising Art Images Based on Neural Networks and CAD Technology

Advertising art design, as a way to meet certain needs and transmit information to consumers through multimedia, means such as computers, not only includes traditional text and image promotion but also includes visual aesthetic experiences. With the influence of modernization, people are paying more attention to the influence of visual expression. Traditional print advertising art has a relatively monotonous content and a single form of expression, which is gradually being phased out by the times. The three-dimensional advertising art expression achieved by CAD computer-aided design can display the appearance, material, function, and other perspectives of products, which is significantly different from traditional advertising art. The three-dimensional representation of the product itself is more interactive, which also shifts the product attributes from material to personal characteristics. Emotional and valuable works of expression allow the audience to experience a sense of immersion. We compare the creative performance of advertising between graphic design and CAD technology-assisted design in terms of changes in consumer spending on advertising products, as shown in Figure 7.

From Figure 7, it can be seen that the advertising communication performance presented by traditional print advertising design is significantly inferior to the advertising artistic creative expression optimized by CAD technology. In the experiment, we divided consumers into two age groups to optimize the comparison results. Both young and elderly people prefer creative advertising with tension, and such advertising also has higher sales revenue. It can be seen that advertising creativity with stronger three-dimensional expression provides more meaningful assistance for the dissemination and role of advertising art.

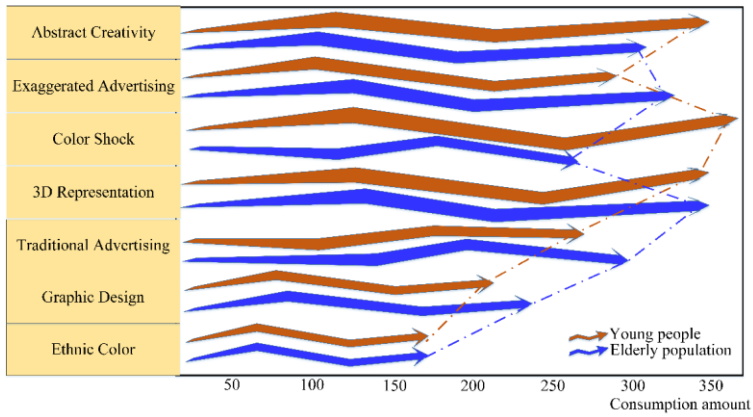

Figure 7: Comparison of advertising creative performance effects assisted by CAD technology in design.

This rich creative form and expression style also inject vitality into advertising products, making them more attractive and impactful. We also found that the improvement of creativity and expressiveness in advertising art can affect the changes in viewing time and stickiness of the public. Some viewers of advertisements tend to overlook the content of subsequent types of advertisements when they only look at relevant types of advertising information once. Advertising products with unique, expressive power can attract the audience's expectations for advertising creativity and increase their stickiness during the advertising broadcast period. From this, it can be seen that the process of enhancing the expressive power of advertising art creativity can not only affect the viewing time and click-through rate of advertisements but also affect the process of visual perception of the eyes. The public obtains the structure, colour, and form of things through vision and spiritual experiences for themselves. Therefore, in the creativity of print advertising art, the evaluation and improvement of expressive power can effectively ensure the attraction effect of advertising and increase the revenue of advertising placement.

5 CONCLUSIONS

The improvement and analysis of creativity and expressiveness are important carriers in advertising art design and also the best way to reflect the promotional effect of advertising design. With the continuous development of information technology and multimedia means, advertising art creativity has also been impacted by high-tech. More and more advertising audiences are paying attention to the artistic beauty and personal feelings conveyed by advertising art products. This article analyzes the creative changes in advertising art based on neural network algorithms and CAD computer-aided design technology and further explores the impact of advertising art expression on various aspects of advertising design communication. Using data analysis and statistics, identify the main factors that affect the transformation of advertising art creativity. Combining neural network algorithms to predict the relationship between advertising creativity and audiences, analyze the future development direction of advertising art creativity. Using fuzzy evaluation decision optimization neural network algorithm to improve the accuracy and feedback efficiency of the algorithm in analyzing data. Using CAD computer-aided technology to enhance the expressive power of advertising art, improve traditional print advertising design ideas, and form a three-dimensional interactive advertising communication effect. Finally, based on the results of neural network algorithm analysis, combined with CAD technology-optimized advertising art expression products, the final effect of advertising art creativity and expression changes are evaluated and detected. Research shows that the optimization of advertising artistic creativity and expressive power using

neural network algorithms and CAD technology can affect the effectiveness of advertising design, making it more in line with the aesthetic needs of the public.

6 ACKNOWLEDGEMENTS

The project is sourced from the Jiangsu Provincial Academy of Social Sciences, Research on the Positive Role of Digital Applications in the Protection of Intangible Cultural Heritage, 2023SJYB1588; Suzhou Vocational University, Innovative Research on Digital Communication of Intangible Cultural Heritage in the Jiangsu Section of the Grand Canal, SVU2021YY09.

Luolan Shen, https://orcid.org/0000-0002-7001-7882
Yun Hu, https://orcid.org/0009-0009-0211-5139

REFERENCES

[1] Agarwal, D.; Robinson, T.-T.; Armstrong, C.-G.; Kapellos, C.: Enhancing CAD-based shape optimisation by automatically updating the CAD model's parameterisation, Structural and Multidisciplinary Optimization, 5(9), 2019, 1639-1654. https://doi.org/10.1007/s00158-018-2152-7
[2] Ahmadi, I.; Abou, N.-N.; Skiera, B.; Maleki, E.; Fladenhofer, J.: Overwhelming targeting options: Selecting audience segments for online advertising, International Journal of Research in Marketing, 41(1), 2024, 24-40. https://doi.org/10.1016/j.ijresmar.2023.08.004
[3] Asadi A.-S.; Mohammadpoory, Z.; Nasrolahzadeh, M.: A novel content-based image retrieval system using fusing color and texture features, Journal of AI and Data Mining, 10(4), 2022, 559-568. https://doi.org/10.22044/jadm.2022.12042.2353
[4] Barreto, J.-C.-D.-L.; Cardoso, A.; Lamounier, J.-E.-A.; Silva, P.-C.; Silva, A.-C.: Designing virtual reality environments through an authoring system based on CAD floor plans: A methodology and case study applied to electric power substations for supervision, Energies, 14(21), 2021, 7435. https://doi.org/10.3390/en14217435
[5] Ben, Y.; Cengiz, K.: Research on visual orientation guidance of industrial robot based on CAD model under binocular vision, Computer-Aided Design and Applications, 19(S2), 2022, 52-63. https://doi.org/10.14733/cadaps.2022.S2.52-63
[6] Boluki, M.; Mohanna, F.: Inspection of textile fabrics based on the optimal Gabor filter, Signal, Image and Video Processing, 15(7), 2021, 1617-1625. https://doi.org/10.1007/s11760-021-01897-3
[7] Fan, M.; Li, Y.: The application of computer graphics processing in visual communication design, Journal of Intelligent & Fuzzy Systems, 39(4), 2020, 5183-5191. https://doi.org/10.3233/JIFS-189003
[8] Kaimal, G.; Carroll, H.-K.; Berberian, M.; Dougherty, A.; Carlton, N.; Ramakrishnan, A.: Virtual reality in art therapy: a pilot qualitative study of the novel medium and implications for practice, Art Therapy, 37(1), 2020, 16-24. https://doi.org/10.1080/07421656.2019.1659662
[9] Khaldi, B.; Aiadi, O.; Kherfi, M.-L.: Combining colour and grey-level co-occurrence matrix features: a comparative study, IET Image Processing, 13(9), 2019, 1401-1410. https://doi.org/10.1049/iet-ipr.2018.6440
[10] Kim, Y.; Lee, H.: Falling in love with virtual reality art: A new perspective on 3D immersive virtual reality for future sustaining art consumption, International Journal of Human–Computer Interaction, 38(4), 2022, 371-382. https://doi.org/10.1080/10447318.2021.1944534
[11] Liu, B.: Based on intelligent advertising recommendation and abnormal advertising monitoring system in the field of machine learning, International Journal of Computer Science and Information Technology, 1(1), 2023, 17-23. https://doi.org/10.62051/ijcsit.v1n1.03

[12] Shi, H.; Niu, D.: Application research of virtual reality technology in ocean environmental art design, Journal of Coastal Research, 104(SI), 2020, 296-301. https://doi.org/10.2112/JCR-SI104-054.1
[13] Sisodia, D.; Sisodia, D.-S.: Data sampling strategies for click fraud detection using imbalanced user click data of online advertising: an empirical review, IETE Technical Review, 39(4), 2022, 789-798. https://doi.org/10.1080/02564602.2021.1915892
[14] Wang, R.: Computer-aided interaction of visual communication technology and art in new media scenes, Computer-Aided Design and Applications, 19(S3), 2021, 75-84. https://doi.org/10.14733/cadaps.2022.S3.75-84
[15] Wei, X.; Han, Y.: Design and implementation of interactive visual communication teaching system based on CAD technology, Computer-Aided Design and Applications, 19(S7), 2022, 56-66. https://doi.org/10.14733/cadaps.2022.S7.56-66
[16] Yang, K.-K.; Liu, F.-G.: Computer-aided design of visual communication expression with creativity as the core, Computer-Aided Design and Applications 19(S3), 2022, 65-74. https://doi.org/10.14733/cadaps.2022.S3.65-74
[17] Zitouni, A.; Benkouider, F.; Chouireb, F.; Belkheiri, M.: Classification of textured images based on new information fusion methods, IET Image Processing, 13(9), 2019, 1540-1549. https://doi.org/10.1049/iet-ipr.2018.6256