The Mutual Journey of New Technology and Aesthetics: The Rational Aesthetics of AI Painting

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Abstract. In April 2023, the rapid advancement of Artificial Intelligence (AI) technology is bringing about a profound transformation in the realm of art, signaling the acknowledgment and dissolution of the sub-dimensional wall between text and visual representation. This shift is leading numerous companies to reevaluate their talent requirements, pivoting from traditional painters to the burgeoning field of artificial intelligence. The duality of AI technology becomes apparent, as it not only streamlines conventional human labor, but also spawns fresh employment prospects, fostering elevated levels of productivity, efficiency, and overall economic expansion. Through the utilization of a technique termed the "diffusion model", AI engages with human-provided information and embarks on the creative process. Within this model, the AI progressively eliminates extraneous details and colors, progressively aligning the remaining components with the coherent interpretation of the input text. Iteratively refining the composition, the AI expunges superfluous elements until it deems the residual components in perfect harmony with the provided text. Consequently, the conventional barrier between textual description and visual representation is transcended, ushering in a seamless integration of the two. These advancements signify a departure from conventional artistic practices, as the sub-dimensional wall that once demarcated the realms of textual and visual representation is now acknowledged and crossed, indicating a transformative era in the convergence of technology and artistic expression.

Keywords: AI painting; rational aesthetics; new technologies; aesthetics.

1 Introduction

With the rapid development of science and technology, new technologies are increasingly integrated into our lives, leading mankind into an unprecedented era. In the context of this era, the interaction between technology and aesthetics has become unprecedentedly close and complex. Artificial Intelligence (AI), as an important technological innovation, is gradually penetrating into various fields, among which, the application of AI in the field of painting creation has triggered widespread attention and discussion. AI painting not only breaks through the creation mode of traditional painting to a certain extent, but also challenges the boundaries of human aesthetics. However, the question that arises is whether AI painting can have the ability of rational aesthetics? What kind of relationship exists between technology and aesthetics behind AI painting? In this process full of explorations and challenges, we urgently need in-depth thinking and research. The purpose of this paper is to explore the rational aesthetics of AI painting, i.e. the interactive relationship between paintings and

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aesthetic values realised through technological means. Specifically, it will take the user evaluation on the microblogging platform as an entry point to explore the users' rational aesthetic attitude towards AI paintings, and analyse the aesthetic characteristics of AI paintings as well as the challenges they face, in order to be able to better understand the mutual journey between new technologies and aesthetics. Through an in-depth study of this issue, we hope to provide new perspectives and insights into the development trend of AI painting, explore the mutual influence of technology and aesthetics in contemporary society, and bring richer possibilities for artistic creation and aesthetic experience. At the same time, it will also provide certain references for a better understanding of the interaction between human and technology, as well as the far-reaching impact of technological innovation on the field of aesthetics.and references.

2 Literature review

With the keyword "AI painting" on CNKI (China National Knowledge Infrastructure), articles mainly focus on the research fields of art, computer science, and education. The earliest article dates back to 2020, titled "A Paradigmatic Framework for Digital Humanities and Intelligent Study of Painting Artifacts Using AI" by Tong Yin. The author, employing an interdisciplinary approach, constructs a paradigmatic framework for digital humanities, conducting AI analysis on images of ancient paintings and artifacts. The aim is to create an innovative platform for artists' research and reimagining of ink paintings, utilizing AI for generative purposes. Wu Mingshu refers to AI painting as "artificial intelligence painting", focusing on AI systems with internal feedback mechanisms capable of generating diverse visual artworks. Zhang Weiheng views AI painting as a method utilizing artificial intelligence technology to create images.[1] The underlying logic of AI painting is imitation learning, as AI itself lacks inherent "creative" ability, progressing rapidly by learning from vast datasets of human artworks.[2] Throughout current domestic literature, there is often a lack of distinction, mixing "AI painting" and "artificial intelligence painting". This article asserts that AI painting is a tool employing artificial intelligence technology to generate artistic works.

AI painting is a scientific tool that generates visual images without the need for human creation. Supported by vast information databases, it can automatically produce novel and non-repetitive computer-generated artworks based on key information.[3] It represents the development of human artistic skills through computer intelligence technology, imitating and learning from human painting art through machine language. This leads to the creation of autonomous, independent, and creative painting skills as well as the artworks themselves. AI painting works simulate the creative process of humans through algorithms.[4] The purpose of AI painting technology is to enhance artificial intelligence's visual recognition capabilities.[5] E.-M. Papia and others analyze AI and human-created paintings across various artistic genres from a mathematical perspective, discovering differences not only in representational forms but also in color variations.[6] When objects lack well-defined shapes, AI painting styles become more complex. Salvatore G. Chiarella and colleagues use implicit psychological measurement methods, revealing that negative biases toward AI products can be manipulated and overturned, as people "educate" themselves about what they are observing (Chamberlain et al., 2018).[7] This highlights the need to increase focus on the positive potential of AI and the human-AI relationship. Lu Li's analysis, based on over 1000 hours of operation in nearly

three months, led to the creation of more than 1200 artworks.[8] The study explores the characteristics and pros and cons of AI art creation, exemplified by Disco Diffusion, and examines the impact of current AI art creation, including software like DALL·E2 and Dream by WOMBO, on artists and contemporary art.

The aforementioned literature primarily focuses on popularizing underlying technologies and engages in theoretical and speculative discussions on topics like "Will AI painting replace human artists?" and "The artistic value of AI painting". These articles often approach AI painting from a singular perspective, be it artistic or technological, which can lead to insufficient depth in analysis. This study centers on AI painting as its main subject and employs content analysis and questionnaire surveys to delve deeper into the research. Within the current Chinese society, this research aims to investigate and answer questions such as: What is the public's awareness, attitude, and assessment of AI painting, and what factors influence these perceptions? Additionally, it explores the challenges faced by the development of AI painting and proposes potential solutions. The intention of this article is to explore and address these inquiries.

3 Research Design

3.1 Approach

This study employs a content analysis approach to systematically and quantitatively analyze Weibo articles related to AI painting within the mass media. The aim is to provide an overarching depiction of the evaluative tendencies expressed by the mass media towards AI painting. Subsequently, a questionnaire survey is conducted to address the general awareness and perceptions within the mass media, further elucidating whether disparities exist between media perceptions and societal realities.

3.2 Content Analysis Design for Weibo

Firstly, sampling of media news. To ensure the feasibility of the study and comprehensive access to media materials, the sample for this analysis is drawn from Sina's news search system. The specific steps are as follows: In the Sina news search system, the keyword "AI painting" is selected, with the query limited to headlines and set to include all news sources from Sina. The search is conducted until May 7, 2023. The search yielded "147 articles found", out of which 25 were deleted and 10 were irrelevant to the topic, leaving a total of 112 articles. The results also contained 20 duplicate articles, such as "NetEase LOFTER Responds to 'Questioning AI Painting Function'" and "QQ Music Officially Launches AI Painting Function", which had slightly varied titles but identical content. Based on this, each result was reviewed and screened individually. According to the research objectives, only articles that described, discussed, or evaluated AI painting were selected as analysis samples. After this filtering process, a total of 92 articles were identified that met the criteria, serving as the final sample for the content analysis in this study.

3.3 Initial Stage of User Rational Aesthetics: Overall Evaluation of AI Painting on Weibo Platform

Analyzing the evaluations of AI painting expressed in news headlines and content, the results in Table 1 indicate that, both in news headlines and content, negative evaluations by Weibo users towards AI painting outweigh positive ones. A predominant stance is neutral, encompassing content such as image and video displays of AI painting, technological explanations, and event announcements. Positive evaluations concentrate on statements like "The emergence of AI painting tools exponentially expands the scope of AI applications" and "AI painting taking center stage is an established fact". Negative evaluations focus on concerns such as "Can only produce variations based on existing data, unable to compensate for missing data", "Privacy exposure", "Over half of AI-generated images comprise sexually suggestive female images", and "Anxiety about AI replacing human artists".

Table 1. Media Evaluation Reflected in News Headlines and Content.

News Headline			News Content	
Media Evaluation	Frequency	Percentage	Frequency	Percentage
Positive	9	9.8	7	7.6
Neutral	67	72.8	74	80.4
Negative	16	17.4	11	12.0

Additionally, leveraging the "Dissemination Analysis" tool on the Qingbo Public Opinion Platform for data validation, a new scheme titled "Public Attitudes towards AI Painting" was established. The primary keywords included "AI painting" and "artificial intelligence painting". The earliest news publication date traced back to February 8, 2023. Up until May 11, 2023, a total of 1,776,273 pieces of information were retrieved. Among these, 70,002 (3.94%) were categorized as positive, 1,625,970 (91.54%) as neutral, and 80,301 (4.52%) as negative in terms of emotional attributes. The overall distribution of emotional attributes aligns with the Weibo analysis results, showing no significant discrepancies.

In conclusion, it is apparent that users are currently at an early stage of engaging with the ramifications of this new technology. Their discussions largely focus on the surface-level outcomes stemming from AI painting, with only a limited grasp of its deep-seated impact on aesthetics. While a portion of users acknowledge the shifts AI painting introduces to their personal and professional spheres, a minority truly comprehend its potential influence on artistic expression and aesthetic perspectives. The users' capacity to demonstrate rational aesthetic discernment remains in its initial phases.

According to the statistics of popular topics, "AI" and "painting" accounted for 34% of the total, followed by "avatar" (2.32%), "microblogging" (2.07%), "technology" (1.72%), "wallpaper" (1.69%), "comics" (1.61%) were not very different in terms of share. The

distribution of popular themes reflects the diverse aspects and focal points of user interest in AI painting. Every two weeks, sentiment analysis is performed on 10,000 relevant theme-related "AI painting" messages from the Qingbo Public Opinion backend. This aims to observe changes in public attitudes towards AI painting and their trends, as depicted in Figure 1. Although negative attitudes towards AI painting among the public outweigh positive attitudes, a slight fluctuating growth (36.7%) in positive attitudes is evident, while negative attitudes experience a substantial fluctuating decline (90.4%). Overall, neutral attitudes exhibit a minor fluctuating growth (9.4%).

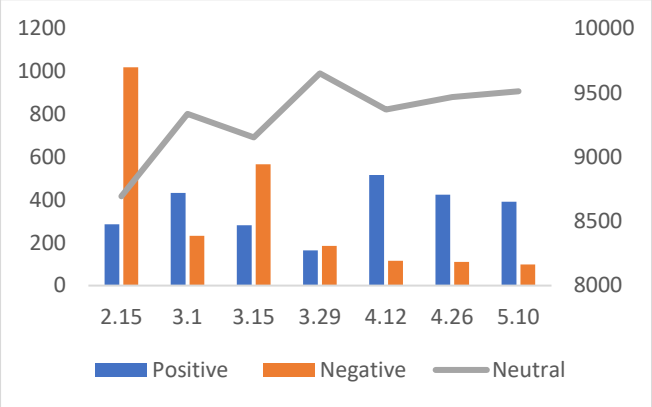

Fig. 1. Trend chart of the public's emotional attributes towards AI paintings.

4 Aesthetic Concepts and Challenges of AI Painting

4.1 Rational Aesthetics of AI Painting

What are the actual attitudes of users towards AI painting in the context of societal reality? Do they align with the aforementioned findings? These questions are analyzed through survey questionnaire data and specific survey results. In May 2023, a random sampling method was employed to distribute questionnaires, with a sample size of 235. The actual number of valid questionnaires collected was 235, resulting in a 100% response rate. Of the respondents, 86 were male (36.6%), and 149 were female (63.4%). The survey was conducted using the QuestionStar platform.

Survey participants primarily consisted of teachers (14.5%) and students (56.6%), with additional involvement from professionals in fields such as design and business management. Among the participants, 83 held a bachelor's degree (35.3%), 93 held a master's degree (39.6%), and 54 held a doctoral degree (23.0%). The majority of participants (196) were from humanities and social sciences, constituting 83.4% of the total. The survey, developed using the questionnaire titled "Survey on Audience Perception and Aesthetics of AI Painting", encompassed demographic information, perceptions of AI painting, and evaluations of AI painting.

To ensure the authenticity and validity of the questionnaire, the purpose and significance of the survey were explained to participants prior to questionnaire distribution. It was emphasized that the survey responses would be collected anonymously. The survey results were analyzed using the SPSS software for descriptive analysis.

4.1.1 Audience Perception of AI Painting

The extent to which 235 survey participants were familiar with AI painting revealed that 21.3% had (very) little knowledge, 42.1% had a general understanding, and 36.6% were (very) knowledgeable. An independent sample T-test yielded a p-value > 0.05, indicating that there is no significant difference in the level of familiarity with AI painting among different genders or educational backgrounds. Audience members progress from awareness to utilizing AI painting tools through a gradual process. The results in Table 2 indicate that, the proportion of participants who have never used AI painting tools such as Midjourney, Stable Diffusion, DALL·E, Disco Diffusio, and Wenyi Yiyu for creative purposes ranges between 60% and 90%. This indirectly reflects the relatively high popularity of Midjourney, as its non-usage rate is lower compared to other AI painting tools.

Agree and Strongly Agree combined, the audience who believe that AI painting tools will alter traditional human aesthetic perspectives constitutes 37.2%, surpassing the general agreement (28.5%) and (strong) disagreement (33.9%) from the audience. 44.3% of the audience leans towards the viewpoint that "AI painting tools will induce human aesthetic convergence." Regarding the use of AI painting tools for creation, the works produced by the audience predominantly focus on genres such as landscapes, female figures, comics/cartoons, and science fiction. Notably, there is a significant gender-based discrepancy in the choice of creating female figures ($p < 0.05$).

Table 2. Frequency of Creating Artworks Using AI Painting Tools (Percentage).

AI Painting Tool	Never Used	1-2 Days/Week	3-4 Days/Week	5-6 Days/Week	Every Day
Midjourney	62	24.9	6.8	4.5	1.8
Stable Diffusion	79.6	13.1	3.6	2.3	1.4
DALL•E	87.8	9.0	2.3	0.5	0.5
Disco Diffusion	87.3	8.6	3.2	0.5	0.5
ERNIE Bot	75.1	19.9	2.7	0.9	1.4
Others	88.7	7.7	2.3	0.9	0.5

4.1.2 AI Painting Creation Through the Lens of Male Gaze Theory

The Male Gaze theory was originally introduced in 1975 by British film theorist Laura Mulvey.[9] She posited that film's cinematography, shot selection, and visual narrative are all rooted in a male perspective and aesthetic, thereby influencing the audience's visual experience through a dominant male viewpoint. This theory was subsequently extended to other artistic realms, including painting, photography, advertising, and media. The "Male Gaze" represents a manner of depicting and perceiving women that, while empowering men, simultaneously sexualizes and diminishes women, portraying them as passive objects and props.[10] The concept goes beyond how women's bodies are utilized to fulfill male fantasies; it also delves into how the act of gazing impacts women's self-perception.[11]

Bartky (1990) introduced the concept of sexual objectification, wherein a woman's body, body parts, or sexual functions become detached from her identity and are reduced to mere instruments or symbols representative of the female individual. Fredrickson and Roberts (1997) put forth the theory of sexual objectification, explaining how, within Western socio-cultural contexts, women's bodies are subjected to scrutiny, evaluation, and sexual objectification through various avenues, including media and social interactions. Women who have been objectified in a sexual manner often internalize this treatment, resulting in a self-objectification intimately tied to their physical selves. Self-objectification refers to the internalization of external evaluations, with self-definition and assessment predominantly based on observable physical attributes, often accompanied by continuous monitoring of one's own body and appearance.[12]

Accompanied by Women Recognizing Their Appearance as Social Capital, They Begin to Adopt the Male Observer's Perspective, Habitually Monitoring Their Own Bodies (Appearance, Physique), in an Effort to Avoid Devaluation (Fredrickson & Roberts, 1997). This Process is Referred to as "Self-Objectification". Women Are More "Willing" to Be Observed by Women. In Calogero's Experiment, Female Participants Were Informed That They Were Being Observed by Men (Women). The Study Found That, Compared to Participants Expecting Female Gaze (or No Gaze), Anticipating Male Gaze Increased Young Women's Self-Objectification, Leading to Greater Body Shame and Social Physique Anxiety.[13] Tara Well Mentioned That One Feasible Method to Break Free from Self-Objectification is "Mirror Gazing", which Involves Looking at Oneself in the Mirror. During the Process of Mirror Gazing, One Needs to Practice Detaching from Cultural Beauty Standards or Male Gaze Interference, Focusing More on Inner Sensations and Values, and Reducing Excessive Attention to Appearance. Survey Results Indicated that Female Audience Members Creating Artworks Using AI Painting Tools Tend to Create More Female-Centric Artworks Compared to Their Male Counterparts. This Trend May Reflect a Preference Among Female Audience Members for and Resonance with Female-Related Artworks, including Resonance with Personal Experiences, Preference for Female Visual Expression, and Support for Female Creators.

Female creators may be inclined to use AI drawing tools to create female characters. Through their own creative process, female artists can actively take control of the creation process, expressing their understanding and aesthetic viewpoints of female images. The creative process can offer an alternative to the male gaze, enabling women to independently present and imbue female images with depth, freeing them from the pressure of external scrutiny and

objectification. Additionally, female users creating female characters may explore and express women's experiences, challenge societal stereotypes about women, and promote gender equality and women's empowerment issues. Through character creation, female users can shape images that embody diversity, autonomy, and intrinsic value, reflecting and advocating for the real needs and rights of women. Thus, the increased use of AI drawing tools by female audiences to create female characters may serve as a response to the male gaze theory, indicating that women are inclined to redefine and empower female images through autonomous creation, while conveying their own values.

Building upon this foundation, subsequent scholars have conducted numerous studies in an attempt to delve deeper into the impacts and limitations of the Male Gaze theory. Researchers argue that the Male Gaze theory oversimplifies the audience's visual experience and overlooks the influence of individual experiences and cultural backgrounds. As a result, they advocate for incorporating factors such as audience identity, gender, race, and class to gain a more comprehensive understanding of visual culture. Some scholars approach the Male Gaze theory from a diverse perspective, recognizing that the male viewpoint is not the sole perspective, and that female groups possess their own viewpoints and aesthetics. Furthermore, certain researchers have connected the Male Gaze theory to emerging fields like modern technology and digital culture, exploring the influence of digital technology on visual culture and social relationships. These studies contribute to a better comprehension of the relationship between visual culture and technological advancement, as well as how to address potential gender and power imbalances.

4.2 Rational Aesthetics of AI Painting

4.2.1 AI Painting Creation Through the Lens of Male Gaze Theory

Based on the questionnaire survey results, audience perspectives on issues related to AI art were examined. These include concerns about varying artwork quality (37.3%), potential for non-compliant images (24.5%), and copyright issues (34.4%). The proportion of respondents who "agree" or "strongly agree" that AI art tools might infringe upon others' copyrights and privacy is 58.4%. AI art technology is still in its developmental stage, and artwork quality may vary due to different algorithms, datasets, and training processes. While AI can produce astonishing artworks, it may occasionally yield results that are less accurate or fail to meet expectations. This could be due to limitations in the model's understanding of the complexity of artistic creation and aesthetics. With ongoing technological advancements and algorithm refinements, the quality of AI-generated art is expected to improve.

The algorithms behind AI art creation learn from vast amounts of image data to generate artworks. Instances of non-compliant or inappropriate image content may arise from the presence of improper or controversial images within the dataset, or from limitations in the algorithm's understanding and application of ethical guidelines. Ensuring that AI-generated artworks adhere to ethical and legal standards poses a significant challenge, requiring continuous efforts in both technological development and regulation. Given that AI art algorithms create new works by learning and analyzing existing ones, concerns about originality and intellectual property rights are raised. 45.7% of the public express doubts about the originality of artworks generated by AI art tools.

Determining the ownership of AI-generated artworks and safeguarding the rights of creators presents a complex issue that necessitates further legal and ethical research and regulation. To address these concerns, stakeholders including technology developers, artists, legal professionals, and societal groups must collaborate to find solutions. This involves enhancing AI algorithms and training processes to ensure both artwork quality and adherence to ethical guidelines, establishing appropriate legal frameworks to address copyright matters related to AI creations, and raising public awareness regarding AI technology and its potential issues. Through ongoing research and collaboration, these challenges can be gradually addressed, facilitating the advancement and responsible application of AI art technology.

Based on the survey results, motivations for using AI painting tools in creative endeavors include curiosity (30.6%), seeking artistic inspiration (25.1%), image creation needs (22.3%), and academic research requirements (15.0%). The results in Table 3 indicate that, when comparing data from different societal professions, there are discernible variations in public perceptions regarding which occupations could potentially be replaced by AI-generated art. More respondents believe that the roles of photographers, art teachers, and painters are less likely to be substituted by AI painting. 58.4% of participants opine that photographers are unlikely to be replaced due to the involvement of capturing light, composition, and emotions. Professions like art teachers and painters encompass human qualities of artistic creation, creativity, and individual style that are complex and challenging for AI painting technology to fully replicate. By contrasting the data, it becomes evident that public perceptions regarding the potential replacement of different professions by AI-generated art vary. Distinct occupations involve differing skills, creativity, and human emotions, showcasing the varying impact of AI technology on different fields. This underscores the significance of human creativity, emotional expression, and individual uniqueness in the realms of art and design, aspects which remain challenging for AI painting to completely reproduce.

Table 3. Public Timeframe Perception for AI Painting Replacement in the Following Professions (Percentage).

Occupation	Will Not Be Replaced	1-2 Years	2-5Years	More Than 5 Years
Designer	52.0	17.2	19.5	11.3
3D Modeler	35.7	16.7	29.9	17.6
Cartoonist	43.4	23.5	20.8	12.2
Photographer	58.4	11.3	18.1	12.2
Art Teacher	70.1	7.2	9.5	13.1
Painter	68.3	7.2	10.4	14.0
Digital Artist	46.6	18.6	16.3	18.6

Public preference for psychological trainers (7.8%) is significantly lower than other professions, which can be attributed to the following three factors. First, the knowledge and skill requirements. The role of psychological trainers entails a deep understanding of user behavior and responses, along with designing systems to meet user needs and expectations. This demands expertise in fields such as psychology and user experience. In contrast, other professions tend to emphasize technological and artistic domains. Second, target audience.

The development of AI painting primarily focuses on the needs of the technological, artistic, and commercial sectors. Professions such as linguistic trainers, restoration experts, and AI art agents have closer ties to this development. Third, occupational awareness and exposure. The field of psychological training in AI painting is relatively new, resulting in limited public awareness and exposure. This has led to fewer individuals being acquainted with opportunities in this occupation. However, real-world situations may be even more intricate.

The survey results indicate that the proportion of agreement (29%) with the concept that "artificial intelligence-generated artworks are artistic creations" is higher than the opposing voices (23%). The emergence of AI painting tools has merged art and technology, triggering discussions about the definition and boundaries of art. There is controversy and varying viewpoints regarding whether artworks generated using painting tools can be considered as genuine artistic creations. As early as 2018, Li Feng explored the relationship between artificial intelligence and artistic creation.[14] Artworks should exhibit creativity and expressiveness. This viewpoint suggests that works generated using painting tools may be seen as imitations or simulations by machines, lacking genuine creativity and expression. Artworks should be expressions of an artist's unique thoughts, emotions, and creativity, rather than mere repetition, imitation, or technical proficiency; machine-generated works often lack human subjectivity. Looking at the survey results regarding the impact of AI painting tools on artists' creations, 33.5% of the public expressed uncertainty, followed by those who believe the benefits outweigh the drawbacks. The role of technological tools is related to the artistic and creative process and outcome. It encompasses not only individual subjective expression but also how artists utilize tools to create results. This perspective asserts that painting tools represent a new medium for modern artistic creation, opening up new realms of creative possibilities.[15]

Expressionism is an art movement that emphasizes emotion and inner experience, highlighting how artworks convey emotions and inner worlds through intuitive, intense, and personalized expression. Expressionism and emotional communication. Expressionism places a strong emphasis on the emotional expression and emotional resonance of artworks. The public's satisfaction with AI-generated artworks is rated as "average" (53.8%), exceeding 50%, reflecting their expectations for the artworks to demonstrate a certain level of emotional and inner experiential expression. These emotions encompass a range of feelings, including: Joy: As an emotion, joy can be depicted in artworks through bright colors, lively brushstrokes, and cheerful themes. It conveys optimism and happiness, evoking a sense of well-being and contentment in the audience. Sorrow: Sorrow is often portrayed through muted tones, blurred edges, and somber themes. It communicates feelings of loss, pain, and grief, eliciting empathy and resonance from viewers. Anger: Anger can be expressed through bold colors, sharp lines, and confrontational subjects. It conveys intense emotions and dissatisfaction, potentially arousing alertness and resonance in the audience. Surprise: Surprise is typically conveyed through sudden visual effects, unconventional compositions, or unexpected subjects. It triggers astonishment and curiosity among viewers, prompting them to pause and closely observe the artwork. Fear: Fear can be depicted through a dark atmosphere, distorted shapes, and menacing elements. It conveys a sense of tension and unease, eliciting a feeling of apprehension and resonance in viewers. Human artists' creative processes are often influenced by personal experiences, emotional states, and thoughts, imbuing artworks with unique emotional colors and expressive qualities. However, the expressive capacity of artworks

generated by AI painting tools is constrained by the limitations of algorithms and data. While AI can imitate and generate similar styles and forms by learning from a vast number of artworks and images, the emotional expression and emotional resonance of artworks produced by AI painting tools are subject to certain limitations, as they cannot fully capture the emotional depth and personal experiences conveyed by human artists through their creations. Emotion is a uniquely human experience involving complex psychological and physiological processes. 55.2% of the public believes that AI-generated artworks lack emotional expression, indicating that AI still faces challenges in understanding and conveying emotions. This perception underscores the need for further advancements in enhancing AI's ability to comprehend and depict complex emotions in artworks. However, this does not imply that AI painting tools are incapable of producing valuable and attractive artworks; rather, there is room for improvement and development in the realm of emotional expression and emotional resonance.

Expressionism emphasizes the intuitive and intense forms of artistic representation. Aesthetic theory underscores the aesthetic value and creativity of artworks. Artworks generated by AI painting tools often lack uniqueness and originality from an aesthetic perspective, potentially resulting in a prevailing “average” level of public satisfaction. The public’s expectations for artworks encompass factors such as innovation, the artist's personal style, and exploratory aspects of the creative process, areas where AI-generated artworks have certain limitations. 73.3% of the public holds a positive outlook on the “future development of AI painting”. With continuous technological advancements and innovations, AI painting tools possess the potential and room for progress in the realm of artistic creation.

5 AI Painting Aesthetic Characteristics

5.1 Aesthetic of Information: Balancing Data Processing and Aesthetics

This paper summarizes the data processing procedure of AI painting tools into the following steps. First, text or image input. Users upload text, raw images, or sketches, completed through computers or mobile devices. Second, style selection. Users choose one or multiple styles for processing, such as artistic styles featuring oil painting, sketching, or watercolor. Third, model training. Different deep neural network models are employed for training in text-to-image and image-to-image processes. These models learn features from input images and selected styles to generate new painting effects. Fourth, style transfer. Neural network models in text-to-image and image-to-image processes separate content and style from input images, then synthesize the content from the original image with the chosen style, resulting in a new painting effect. Fifth, output of painting. The processed painting results are outputted by text-to-image and image-to-image processes, which users can save on computers or mobile devices.

The technical characteristics of Text-Generated Images and Image-Generated Images are different. Text-Generated Images employs techniques based on Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs) to learn and analyze input images and textual descriptions, generating artistic effects that align with the given descriptions. On the other hand, Image-Generated Images utilizes techniques based on Generative Adversarial Networks (GANs) to learn the relationship between input images and chosen styles through the interaction of two neural network models. This process results in the generation of new

images with distinct artistic styles. Both approaches are AI-based drawing tools implemented using deep learning techniques, capable of automatically producing art-style images based on user-provided images and styles.

The information representation of AI painting includes text and images. Zhu Jun's research on multimodal generative models has achieved mutual transformation between arbitrary modes. He proposed a probabilistic modeling framework, UniDiffuser, designed for multimodal purposes. Using a transformer-based architecture, U-ViT, and training on the large-scale image-text dataset LAION-5B, a model with a billion parameters was developed. This empowers the underlying model to achieve high-quality performance across various generative tasks. Beyond unidirectional text-to-image generation, the model also encompasses functions such as image-to-text, combined image-text generation, unconditional image-text generation, and image-text rewriting. This enhances the production efficiency of textual and visual content and expands the creative applications of generative models. Leveraging the characteristics of information dissemination on social media platforms, the Sketches system automatically generates relevant artistic works based on user-generated content and facilitates interactive communication with others. The intelligent artistic approach within social networks enhances user engagement and generates a greater number of artworks on social media.

Currently, many AI drawing tools utilize OpenAI's open-source CLIP model to generate images based on textual descriptions. NVIDIA's StyleGAN2-ADA model is widely applied for generating high-quality, realistic facial images. The PGGAN model can perform tasks like image style transformation. Google's BigGAN model is capable of generating high-resolution images of natural scenes, animals, and more. AI drawing handles more intricate image data, with the StyleGAN2-ADA algorithm adapting to different scenes and objects while generating high-resolution images. AI drawing captures and presents more detailed and complex image information, resulting in diverse and personalized artistic creations. It masters and applies various drawing techniques and styles, achieving distinct artistic effects. The CycleGAN algorithm transforms images from one artistic style to another, such as converting photographic images to cartoon-style or sketch-style to watercolor-style images. AI drawing encompasses a variety of artistic styles and effects to meet the artistic needs of different audiences. The application of technology expands the boundaries of artistic creation, offering a more convenient and innovative way for ordinary individuals to create art. However, AI drawing also faces challenges such as information overload and a lack of originality.

When dealing with complex scenes and images rich in detail, AI-generated images often contain a vast amount of information that might exceed the limits of human cognitive processing. Processing information-dense images requires significant cognitive resources in the human brain, including attention, working memory, perception, and language comprehension, leading to challenges in understanding such images. To address these issues, information pruning is a viable solution. It involves controlling the generation process by specifying constraints during image generation, such as image color, shape, texture, etc., to manage the amount of information in the generated image.

5.2 Intelligent Aesthetics: AI-driven Creation and Innovation

AI drawing, as a manifestation of intelligent creativity, can be seen as a process of creation and production within the cultural industry, encompassing the production and dissemination of

cultural products. AI drawing systems utilize vast amounts of data and employ technologies like machine learning to automate the generation of artworks. The creativity of these systems does not stem from human creators but rather from algorithms and rules embedded within their programming. Lev Manovich introduced the concept of “cultural computing”, wherein computers gradually become the primary means of cultural production and dissemination. Human interpretations of AI-generated artworks may vary based on prior cultural experiences and backgrounds, potentially influencing audience cultural cognition and aesthetic standards. The relationship between AI drawing and human culture can be seen as an intertwined process. In other words, AI drawing is both influenced by human culture and contributes to the production and creation of culture. This interplay can be understood as a complex ecosystem, where AI drawing functions as a novel cultural producer, participating not only in the production and creation of cultural art but also engaging in bidirectional interactions with humans.

In artistic creation, humans tend to rely on their sensibility and subjective judgment to select and create artistic elements and techniques. The creative process is influenced by various factors such as culture, history, social environment, personal experiences, and preferences. These factors affect human understanding and creation of art, and can also lead to biases and limitations in artistic creation. AI drawing tools possess intelligence and computational capabilities that surpass the human brain. Their creative process involves an intelligent, efficient, and extensive process of recreation. Imagine the large model as an extensive database containing a plethora of artistic elements, styles, and creative techniques. Utilizing vast amounts of data and computation, meaningful artistic elements are unearthed and extracted, and they are then combined automatically to generate new artworks. Compared to traditional artistic creation, AI-generated artworks tend to be more abstract and intricate, imbued with a futuristic and technological essence. Text-Generated Images utilizes semantic analysis and modeling of input text, automatically generating a diverse and expressive array of artworks based on predetermined artistic elements and style templates. Image-Generated Images, on the other hand, employs semantic analysis and image recognition on input images, automatically transforming them according to different artistic style templates, resulting in diverse and complex works characterized by intricate structures, textures, unique color palettes, and forms.

AI drawing tools can also be continuously layered and undergo iterative processing, with the generated artworks considered as new artistic elements and techniques. These can be input into the algorithm for the next round of creation. The process of continual layering enables AI drawing tools to leverage deformations, rotations, cropping, and other methods to continuously create, provide feedback, and improve within an automated environment. This helps avoid the inertia and limitations of human creation, continuously enhancing and advancing its own creative capabilities. However, human subjective judgment and emotive understanding remain indispensable in artistic creation, giving rise to emotionally rich and expressive artworks. Therefore, humans and AI drawing tools can each contribute their strengths in the creative process, mutually supplementing and fostering each other, collectively driving the evolution of artistic creation. AI drawing tools can assist in completing laborious or technical tasks, such as sketching and coloring, allowing human creators to focus more on creative and emotive expression, thereby producing more uniquely distinctive artworks.

The development and application of AI in drawing constitute not only technological innovation but also innovative practices spanning various fields such as culture, art, and commerce. AI drawing extends the boundaries of art, facilitating the preservation and evolution of culture through learning and emulation of historical and cultural contexts. It assists humanity in better understanding and inheriting cultural heritage. Furthermore, there is an increasing focus on the potential commercial value of AI drawing. Advances in deep learning and neural network technologies enable computers to autonomously learn and master various drawing techniques and styles. In comparison to traditional image processing techniques, deep learning better simulates the human brain's approach to processing visual information, allowing computers to perform more accurate and comprehensive image data processing.

5.3 Rational Beauty: Optimization of Logic and Patterns

AI possesses the creative capacity of logic, offering innovative and unique solutions through data-driven learning and creative problem-solving. More than half (52%) of the public holds a neutral and observant stance on the impact of AI drawing tools on artistic development. Humans need to adopt an inclusive attitude towards AI, optimizing the fusion of logic and intuition through a balance between reason and intuition, human-AI collaborative creation, and enhancing explainability and transparency. Ultimately, this optimized fusion will elevate the experience of aesthetics and creativity, fostering advancements in human culture and art.

5.3.1 Data-Driven Logical Generation

Through the amalgamation of deep learning and neural networks, AI is capable of uncovering patterns and rules from extensive datasets. By training on large volumes of data, AI comprehends and leverages patterns to generate novel ideas and innovations. Data-driven logical generation introduces a novel mode of thinking, propelling advancements in scientific research and technological innovation. AI does not merely execute instructions in a linear fashion; it can also flexibly employ logic and patterns to creatively solve problems. By delving into the understanding and analysis of problems, it offers multiple potential solutions, evaluates and optimizes based on rules and constraints.

AI drawing is also a form of cultural product, and the information and values it presents hold significant importance. DeepDream, a neural network algorithm developed by Google, processes images through deep neural networks to enhance patterns and structures recognized by the network, resulting in heightened visual effects and increased artistic appeal. However, this algorithm may also amplify certain specific elements in images, such as eyes or mouths, thereby reinforcing human biases related to race and gender. Hence, in the design and application of AI drawing, careful consideration should be given to the selection and expression of information and values to prevent any adverse societal impacts.

The rational beauty of AI drawing primarily manifests in the creative process. Traditional artistic creation often involves non-rational factors such as intuition, experience, and aesthetic consciousness. In contrast, AI drawing relies on algorithmic analysis and data processing for creation, characterized by efficiency, precision, and repeatability. It can generate more accurate and standardized artworks. However, this mechanized approach to creation also presents challenges. AI drawing's creative process is often determined by predetermined

algorithms and data, often decided by programmers and designers. Consequently, the creative expression in AI-generated artworks is often constrained and may not entirely reflect the artist's intent.[16] The originality and uniqueness of certain AI-generated artworks have been questioned and even accused of plagiarism.

To overcome these challenges, researchers have engaged in creative artistic endeavors utilizing Generative Adversarial Networks (GAN) technology. Unlike traditional machine learning models, GANs simulate the human creative process in generating artworks, resulting in more innovative and distinctive pieces (Elgammal et al., 2017). Within the framework of Generative Adversarial Networks, two independent neural network models are trained adversarially—referred to as the Generator and the Discriminator. In the context of generating digital images, for instance, the Generator learns to create lifelike images, functioning akin to an "artist", while the Discriminator learns to distinguish real from fake images, operating like an "art critic". Throughout the training process, the Generator progressively creates images more closely resembling real scenes, while the Discriminator becomes more adept at discerning between genuine and artificial images. When the Discriminator can no longer differentiate between the generated and real images, a dynamic equilibrium is reached. In addition to the creative "from scratch" process, GANs can also simulate a "one thing leads to another" transfer process. Notably, the StyleGAN architecture and its improved version, StyleGAN2, represent notable research achievements in image style transfer in recent years. This new architecture enables autonomous learning and unsupervised separation of high-level attributes (e.g., pose and identity in facial training) and random variations in generated images (e.g., freckles, hair), while also allowing for intuitive, fine-grained control over synthesis.

5.3.2 Critical Acceptance and Rational Examination

Firstly, the Balance between Rationality and Intuition: Logic serves as an orderly and systematic thinking approach, aiding in problem analysis and resolution. However, an excessive pursuit of logic might curtail the development of creative thinking. Hence, it is essential to introduce intuition and imagination atop a foundation of logic, breaking free from established patterns and rules to create solutions that are more creative and aesthetically pleasing. Secondly, Human-AI Collaborative Creation: The fusion of human creativity with AI's logical capabilities can yield higher levels of artistic creation and design. Human-AI collaborative creation can stimulate creativity on both sides, offering novel perspectives and possibilities. In the realm of music composition, for instance, AI can generate new melodies and harmonies based on extensive music data, while human artists undertake the selection, interpretation, and refinement of these creative outputs, resulting in unique and delightful compositions. Thirdly, Explainability and Transparency: In the optimization of logic and patterns, explainability and transparency are vital components. Human understanding and acceptance of AI decisions and generated outcomes require AI systems to possess the capability to explain their logic and rules. This renders their decision-making process comprehensible to humans, making it subject to scrutiny and acceptance.

In addition to technical means, researchers such as Wen Jirong, Lu Zhiwu, and Song Ruihua have incorporated humanistic elements like culture, history, and philosophical ideas into AI drawing creation.[17] They have developed a large-scale Chinese multimodal pretraining model called "Wenlan", which combines text and image generation techniques, to create an AI drawing generation model that understands traditional Chinese culture. After pretraining with

650 million weakly related Chinese text-image pairs, the model learns Chinese semantic comprehension and establishes a connection between Chinese semantics and visual information, capturing implicit semantics from the text and abstract concepts from images. The Wenlan painting model generates images corresponding to input classical Chinese poems, with the generated images aligning harmoniously with the content and artistic conception of the poems.

6 Conclusion and Prospects

By delving into the rational aesthetics of AI drawing, this study has thoroughly explored the interplay between new technology and aesthetics. Initially, through literature review and content analysis, user evaluations of AI drawing on the Weibo platform were examined, revealing the nascent stage of users' rational aesthetics. Concurrently, this paper delved into the aesthetic concepts and challenges faced by AI drawing, spanning from audience perceptions to conflicting values, further unraveling the intricacies of aesthetics in the AI era. When examining the aesthetic attributes of AI drawing, three aspects were highlighted: Informational Beauty, Intelligent Beauty, and Rational Beauty. These emphasize the balance between data processing and aesthetics, intelligent creation and innovation, and the optimization of logic and patterns. These attributes not only enrich aesthetic experiences but also provide robust directions for the future development of AI drawing. However, this study does carry some limitations. The Weibo platform as a data source might possess constraints; therefore, future investigations could consider broadening the data scope and delving deeper into user aesthetic viewpoints. Additionally, the development of AI drawing may encounter unforeseen challenges, necessitating ongoing monitoring and research. Future explorations might delve into the cross-disciplinary applications of AI drawing, expanding its creative domains. As technology advances, there's an expectation that AI drawing can resonate more deeply with human aesthetics, yielding artworks of greater depth and innovation. In summation, the ongoing journey of technology and aesthetics will continue to inspire reflections on creativity and aesthetic values, ushering in more possibilities and opportunities for the field of aesthetics.

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