

AI and Art Design: A Case Study of Space Opera House

Ruo Chen Sun *

Department of School of Design and Art, Henan University of Technology, Henan China

* Corresponding author: 1497909342@qq.com

Abstract. With the rapid advancement of artificial intelligence (AI) technology, AI painting, as an emerging technique, is gradually showcasing its unique charm and broad application prospects in the field of art design. This paper takes the representative AI painting *Space Opera House* as an example to conduct an in-depth analysis of AI painting from the perspectives of visual language and aesthetic expression. It explores the challenges and opportunities AI presents to traditional art design and further examines the current application and future development directions of AI in art design. The research results indicate that AI painting offers significant advantages in enhancing artistic creation efficiency, enriching artistic expression methods, and achieving personalized design. However, it also faces challenges in terms of originality and aesthetic diversity.

Keywords: AI painting; visual language; aesthetic expression; *Space Opera House*; art design.

1. Introduction

With the rapid advancement of technology, artificial intelligence (AI) is gradually permeating various fields. In particular, its application scope and influence in art and design are expanding significantly. AI painting, as an innovative application of AI technology, simulates human painting behavior through computer algorithms, creating unique artistic works. *Space Opera House*, as a representative piece created by AI, demonstrates the innovative potential and broad application prospects of AI technology in artistic creation with its unique sense of space and color use. Research by Wang Xiangyi points out that AI has profoundly impacted the daily lives and work of university students, showing strong capabilities in artistic creation. This article will conduct a detailed analysis of the visual language and aesthetic expression of *Space Opera House* to explore the impact of AI painting on traditional art and design. Combining the latest research and data, it will also look ahead to its future development directions and potential. Through this in-depth analysis, the article aims to reveal the unique role of AI technology in art and design and its enormous potential in promoting artistic innovation and transformation.

2. AI and AI Painting

2.1. Concepts of AI and AI Painting

Artificial Intelligence (AI) is a discipline that simulates human behavior and thinking patterns through computer algorithms. With technological advancements, AI has gradually penetrated various industries based on big data, deep learning, and enhanced computing power, as well as the prevalence of digital life. AI painting technology creates artwork by utilizing computer algorithms and big data to learn from and synthesize previous paintings using keywords. The representative work of this technology, *Space Opera House*, brings a new perspective to the public on painting and artificial intelligence with its strong sense of space, color, and unique fuzzy aesthetics.

AI painting is an emerging technology that generates art using artificial intelligence. Through complex algorithms and big data analysis, AI can mimic the creative process of human artists, even producing artworks with unique styles and depth. The core of AI painting lies in using machine learning and neural networks to analyze and generate images. These technologies enable AI to learn from a vast number of artworks, thus mastering various artistic styles and techniques.

2.2. The Development History of AI Painting

The history of AI painting can be traced back to 1973 when British artist Harold Cohen developed the machine painting program Aaron, the world's first computer art program. Although early AI painting works were primarily created by machine devices on canvases, modern AI painting has evolved to be entirely computer-generated. Through algorithmic learning and big data processing, it produces artworks with distinctive styles. In 2022, an AI-created painting, *Space Opera House*, won the digital art category at the Colorado State Fair, marking AI painting's official entry into the public eye and gradually becoming known to the masses.

During the creative process, AI painting breaks through human cognitive patterns and knowledge limitations, freeing itself from regional, technical, and tool constraints, momentarily surpassing historical and cultural backgrounds and social value systems, thereby integrating a broader perspective into painting. AI painting works typically feature intense and vibrant color contrasts and unorthodox spatial structures. The scenes are often abstract, while the human figures are relatively figurative. However, since AI painting relies solely on algorithms and synthesis, it lacks subjective understanding and creativity. The depiction of subjects often defies conventional logic, making it difficult for viewers to directly resonate with the works, usually requiring interpretation through their social values and thought processes.

As AI technology continues to develop in mimicking, learning, creating, and widely disseminating human painting skills, AI painting has progressed from initially depicting vague objects and simply piling up colors and spaces in decorative paintings to more figurative representations, even mimicking individual artists' styles. Human artists have increasingly protested against AI painting and its creators for unauthorized use of human works for algorithm learning and image synthesis for profit, thereby squeezing the living space of artists and infringing on creators' rights. On the art display platform ArtStation, an anti-AI wave quickly rose, resisting AI-created artworks. Shortly after, a creator was banned for having a style too similar to AI painting works. These events stem from the lack of legal clarity on AI painting copyright issues, the ambiguous definition of painting styles, and the insufficient understanding of painting subjectivity. This has sparked urgent discussions and research needs regarding the styles, formal languages, and aesthetic expressions of AI painting, as well as the debate over the subject-object relationship between AI and painting.

3. Visual Language and Aesthetic Expression of Space Opera House

3.1. Visual Language Analysis

3.1.1. Color Expression.

In terms of color expression, *Space Opera House* presents an overall warm tone of reds and yellows. The use of color is similar to the Impressionist style, focusing more on the overall feeling when viewed from a distance. The clever use of light and shadow in the painting enhances the sense of spatial hierarchy, with colors transitioning from warm to cool, creating a distinct sense of space and order. Additionally, although the elements in the painting may appear unrelated, their careful arrangement and ingenious composition create a harmonious visual unity. This sense of visual balance not only enhances the artistic value of the painting but also enriches the viewer's aesthetic experience. Through this approach, AI painting can not only exhibit complex visual effects but also convey profound artistic ideas and emotions.

3.1.2. Image Expression and Spatial Structure.

The painting style of *Space Opera House* embodies both construction and deconstruction, filled with randomness and ambiguity, akin to the Impressionist style. It overlooks the concreteness of the overall image, focusing on the depiction and effects of momentary light and color, and portrays abstract light and color images. The painting's fuzzy aesthetics best interpret the popularity of AI painting. In this fuzzy aesthetic, illusion and reality, figuration and abstraction, universality and individuality

intertwine and merge. Due to its unique characteristics, the painting does not have a specific meaning, allowing viewers to ascribe their own core interpretations. The creator surpasses the limitations of technology and materials, fully expressing personal aesthetics. Viewers analyze and understand the image through the form of objects, balancing familiar objects with abstract expressions, making AI painting more accessible to the public.

In *Space Opera House*, the grand opera scene projects a warm yellow halo through large circular windows, with light streaming through the illusory audience seating onto the stage. The performers strike various poses, but their specific shapes are indistinguishable. The light sources on both sides of the image are dim and hazy. Details such as the decoration above the circular window bear a resemblance to Mayan stone reliefs. The scene seems traceable yet is chaotic and drifting, depicting both certainty and uncertainty.

In early Western painting, the pursuit of realism was evident, such as in Ancient Greek pottery paintings where clear and specific lines were used to standardize the contours of forms. Later, during the Renaissance period, Leonardo da Vinci's concept of sfumato gradually emerged, emphasizing the fusion of the overall composition with the edge lines, and the depiction of spatial relationships through the blending of solid and void forms, resulting in more precise spatial representation in the artwork. Lines serve as the refinement of the picture and a direct expression of form structure and space. As the primary language of painting, the role of lines extends beyond composing the picture or distinguishing between background and objects; it lies in bridging the relationships between them, thus creating a cohesive whole within the artwork. In the painting *Space Opera House*, the several cuboid structures on the far left appear to depict deep spatial depth like hollow walls, yet also resemble casually stacked wooden boxes. In this portion, the lines are disorderly, unclear, obscured, compressed, and intricately overlapped, blurring the distinctions between individual entities. However, it is precisely this intertwined and seemingly ambiguous uncertainty that provides viewers with boundless imagination and a dreamlike quality. Amidst the continual conflict and softening, the artwork forms a sense of ambiguous beauty, undefined and intertwined.

While using the focal perspective painting method, the piece diverges from the realism of the Renaissance period, featuring ambiguous spatial positions and contradictory spaces. Except for the relatively figurative stage figures, other objects are hard to discern. The floating color blocks weaken the sense of depth but emphasize the sense of space. The compression, stacking, and blending of color blocks create a complex and elusive fuzzy space. The colonnade space in the upper part of the painting is ambiguous, with columns extending downward but gradually becoming void, presenting a contradictory spatial language that breaks the rules of perspective composition, allowing different spatial objects to coexist from left to right. Through dislocation, some objects are recombined, creating a three-dimensional space in a two-dimensional world, naturally integrating paradoxical objects into the painting and adding a bizarre, dreamlike effect.

3.2. Aesthetic Expression Analysis

Due to the characteristics of AI painting, its works are usually synthesized by data algorithms. Even when creating figurative works, they often contradict common values held by the public, generating peculiar arrangements in the intricate and repetitive details of the images. For example, disproportionate human figures, items placed in defiance of gravity, or distorted details of hands. Therefore, AI painting tends to manifest as abstract rather than concrete, creating a fleeting sense of reality. The term image has existed since ancient times, with the Book of Changes stating establish images to exhaust meanings. In painting, images and objects complement each other and cannot be discussed independently. Objects devoid of images appear dull and ordinary, while images detached from objects appear ethereal and elusive. To enhance the expressiveness and appeal of the image, AI painting often combines keywords related to daily life scenes or current events in its creation, forming works with a painting language and aesthetic appeal. When generating AI artworks, creators do not provide specific definitions for the details and connotations of the images, except for a few key words and adjustments, allowing viewers to discuss and interpret them freely.

Similarly, in the painting *Space Opera House*, apart from the title, any object in the image carries an ambiguous quality and has never had a clear definition. The work utilizes the common stage performance form as creative material, detached from reality yet derived from it. Giacometti once said, Abstract painting only has a single sense of form. Abstract paintings transcend the real world, testing the viewer's appreciation ability but are difficult to resonate with ordinary viewers in the real world. Figurative painting is too specific; although viewers can appreciate the intuitive objects and painting techniques, they may also be limited by its framework. AI painting technology spreads rapidly among the masses not only because of its commercial value or low requirements for creative tools but also because it integrates concrete, abstract, and imagery together. It provides both figurative depictions of tangible objects and a unique sense of abstract aesthetic, presenting beauty based on life yet surpassing life. This allows viewers to combine their own perceptions and feelings for creation, no longer constrained by the level of painting techniques or materials but truly exploring their own definition of beauty.

4. Era Transition and AI Painting

The transition of eras profoundly impacts artistic creation, as technological advancements and the development of societal culture continuously change the ways artists create and audiences experience art. AI painting, as a product of the new era, not only reflects technological progress but also results from changes in societal demands and cultural backgrounds. In the post-pandemic era, the development of the digital economy and virtual world has driven artistic creation from traditional forms towards digital forms. Artists explore new ways of expression through AI technology to adapt to the constantly changing social environment and the aesthetic needs of the audience. AI painting technology, through data analysis and algorithm generation, can rapidly respond to changes in the era and create artworks with characteristics of the times. *Space Opera House* not only showcases AI's innovation in color and spatial processing but also reflects contemporary people's boundless fantasies and desires for exploration of technology and the future. This artistic creation achieved through technological means satisfies the contemporary audience's demand for novel visual experiences while providing artists with new tools to break through traditional creative bottlenecks.

However, AI painting also faces challenges in artistic originality and aesthetic diversity. Although AI can imitate various artistic styles, its creative process relies on a large amount of existing data, inevitably leading to a certain degree of homogenization. As Engels pointed out, the theoretical thinking of an era is a historical product, with its form and content completely different in different eras. How to extract unique artistic elements from massive data and create truly individual and innovative works is a problem that AI painting needs to solve in the future. Moreover, AI painting's rapid replicability also poses a challenge to the scarcity and value of traditional artworks, requiring the art market to reassess and redefine the value of AI-created artworks.

Despite this, AI painting still brings new possibilities and opportunities to artistic creation. With AI technology, artists can explore various directions of creation more freely and break through the limitations of traditional art forms. AI technology can not only improve creative efficiency but also help artists discover new artistic expression methods, enhancing the expressiveness and appeal of their works. For example, the painting *Father* by artist Luo Zhongli reflects the influence of era changes on artistic creation by adding modern elements to traditional peasant images. Similarly, AI painting can combine traditional and modern elements to create artworks with characteristics of the times and innovation. In the future, with the continuous development of AI technology, artistic creation will become more diversified and personalized, and artists and audiences will witness together the development and maturity of this new art form. AI painting not only reflects the changes of the times and the progress of technology but also opens up new fields and directions for artistic creation, promoting the deep integration of technology and art.

5. Application and Innovation of AI Painting in Design Education

Space Opera House won the championship in the digital art category at the Colorado Art Exhibition due to its high creativity and visual impact. The key to its success lies in the innovation and complexity demonstrated by AI painting technology, which generates complex visual effects and unique artistic styles through algorithms. AI painting, by learning from and imitating a large number of artworks, creates works with high visual impact and aesthetic value. This technological advantage holds great potential and prospects in design education.

The advanced feature of AI painting lies in its algorithms' ability to rapidly generate diverse design concepts and provide instant visual feedback, greatly enhancing creative efficiency and stimulating students' creativity and innovative thinking.

In design education, AI technology can serve as an auxiliary tool to help students better understand and master complex design principles. For example, through AI-generated design sketches, students can intuitively see the relationships and effects among different design elements, facilitating better creation and modification. AI technology can rapidly generate diverse design sketches according to students' design needs, enabling them to obtain multiple design concepts in a short time, choose and optimize the best ones, thus improving design efficiency and effectiveness. Furthermore, AI can analyze students' design works in real-time and provide instant feedback and improvement suggestions. This interactive learning method not only enhances learning efficiency but also helps students better understand design principles and techniques.

For instance, in 2018, students from the Rhode Island School of Design (RISD) used the AI painting tool DeepArt in their design courses. Through this tool, students could apply different artistic styles to their design works, exploring new creative directions and expression forms. The tool not only helped students generate multiple design concepts in a short time but also provided instant visual feedback, promoting students' understanding and application of design elements and styles.

Through the application of AI technology, students can explore more innovative design ideas and methods, break the limitations of traditional design thinking, and stimulate their creativity and imagination. AI technology can also provide personalized learning paths and resources based on students' learning progress and interests. For example, AI can recommend design cases and resources related to students' current learning content, helping them learn and practice more targetedly. In these ways, AI painting technology can not only enhance the effectiveness of design education but also cultivate students' innovation and practical abilities. As AI technology continues to develop, its application in design education will become more widespread, providing powerful support and guarantee for cultivating talents in the new era.

6. Conclusion

As an emerging technology, AI painting, despite its controversies, has undeniable prospects in the field of artistic design. Through the analysis of the formal language and aesthetic expression of *Space Opera House*, we can see the tremendous potential of AI painting in breaking through the limitations of traditional art design and enriching the forms of artistic expression. In the future, with the continuous advancement of technology and the improvement of laws, AI painting will further promote the innovation and development of artistic design, becoming an indispensable tool in artistic creation. Through continuous exploration and application of AI technology, artists and designers will be able to create more creative and aesthetically valuable works, injecting new vitality and momentum into artistic design.

References

- [1] Zhang, G., & Yang, Y. (2023). Formal Language and Aesthetic Expression of AI Painting Art: A Case Study of "Space Opera House". *New Aesthetics*, (09), 22 - 24.
- [2] Wang, S. (2022). Discussion on Subjectivity of Painting in the Digital Age. *Sichuan Drama*, (09), 157 - 159.

- [3] Mao, X., & Mi, G. (2021). Development and Reflection on AI Empowering Digital Media Art. *New Observation of Media Integration*, (01), 58 - 60.
- [4] Wang, X. (2019). Analysis of the Impact of Artificial Intelligence on the Development of Art Design. *Chinese Artists*, (09), 92+94.
- [5] Cheng, X., & Li, M. (2018). Art and Era: A Case Study of Luo Zhongli's Oil Painting "Father". *Beauty and Era*, (05), 25 - 27. DOI: 10.16129/j.cnki.mysdz. 2018. 05. 012.
- [6] Meng, F., & Gou, M. (2017). Art Creation and Free Will Cannot Be Replaced by Machines: Zhai Zhenming Talks about "The Future of Artificial Intelligence and Art". *Art Observation*, (10), 5 - 8.
- [7] Chen, J. (2017). Does Artificial Intelligence Make Art Cheap? *Art Observation*, (10), 10 - 12.
- [8] Liu, Z. (2016). On the Timeliness of Painting Creation. *Beauty and Era*, (01), 25 - 26. DOI: 10.16129/j.cnki.mysdz. 2016. 01. 008.
- [9] Li, Y. (2012). Research on the Situation of Contemporary Painting under the Impact of Photography Art. *Popular Literature and Art*, (15), 121.