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| RESEARCH ARTICLE

Investigation of the Intersection of Art and Technology: Review Literature

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| ABSTRACT

The concept of art and technology has moved out of the arena of theoretical debates into dynamic new media creations, making it an important topic of research for scholars in the fields of art, media arts, communication, cultural studies, history, and philosophy. The intersection of art and technology has been explored in various ways, from exploring its philosophical implications to examining the historical context of art practices in different digital mediums. This literature review provides an overview of the major trends and directions in the research of art and technology. The aim of this review is to provide insights into how this intersection is being studied, both in terms of the theoretical underpinnings of the relationship between art and technology, as well as the practical applications of the combination of these two fields. This study was conducted using secondary data, consisting primarily of journal articles and publications from reputable organizations in the field. Specifically, the approach used to identify specific topics and data sources included a literature review of current research, scholarly papers, and online sources. Our search methodology included using keywords pertinent to the research area, such as "art and technology", "intersection", and "innovation", in order to find both related research articles and industry news sources. The data was collected from the sources, analyzed, and used to draw patterns and trends in the area of art and technology. Overall, it was concluded that art and technology have the potential to unlock new venues of artistic expression and provide opportunities to reach new audiences. The findings from this research have the potential to inform artists, curators, and viewers of the myriad creative possibilities of the art-technology intersection.

| KEYWORDS

Digital Media, Artificial Intelligence, Artists, Innovative Materials, Digital Technologies

| ARTICLE INFORMATION

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1. Introduction

The intersection of art and technology has been the focus of critical practice for some time. Many contemporary artists are using technology to explore the creative potential and are reshaping our understanding of what art can be (Gaudelius et al., 2007). The term "art and technology" has been used to describe a range of activities involving the combination of creative practices and technologies such as digital media, robotics, augmented reality, and 3D printing. In many cases, art and technology are thought of as opposite ends of a spectrum, with art representing the creative and unique elements of human expression and technology representing the rational and analytical elements. Yet, there is a growing recognition that the combination of art and technology can lead to innovative research projects and a variety of new creative products (Brown, 2020). This research aims to investigate the intersection of art and technology in order to better understand the ways in which technology has enabled new forms of artistic expression, the impact of technology on current practices, and the potential of technology to shape the art of the future. This research will examine various examples of artistic works that incorporate technology and analyze how technology has altered our understanding of art. Additionally, this study will discuss the implications of technological advances on art and their long-term effects on how art is created, experienced, and perceived. With this research, it is hoped that current and future generations of artists can tap into the creative possibilities of technology to create meaningful and innovative works of art.

The intersection of art and technology is often studied from a variety of perspectives, including the ways that technology has changed art practice and the way art is produced, its effects on the creative process, its effects on the way people interact with works of art and its effects on the way people perceive works of art. It is also studied from the perspective of the intersection of

art and science, with scientists often drawing inspiration from artistic works and vice versa. Finally, the intersections of art and technology are studied from the economic perspective, with new technologies having the potential to both expand the market for art and also reduce the cost of production (Shanken, 2002).

The intersection of technology and art can be traced back to the 1950s. In the 1950s, works of art that incorporated cutting-edge technology began to be created, such as Jean Tinguely's mechanized sculpture, 'Heureka', and John Cage's '4'33'. Since then, the production of art that uses digital and multimedia technologies has become increasingly popular, and the technology behind it has evolved significantly (Wilson, 2009).

In the 1990s, theorists began to propose theoretical models that directly explored the interplay between art and technology. In 1990, Paul Virilio and Vilém Flusser introduced the concept of technophilia in "Dialogues", arguing that technology's potential to multiple and speed up creative activity could drive a phenomena of artistic production and innovation that went far beyond the classical abilities of the artist. In contrast to this exploratory approach, Lev Manovich's 2001 new media book, "The Language of New Media", provided a comprehensive theoretical explanation of how new media creates a distinct hybrid space, transcending traditional boundaries between art and technology (Wilson, 2009).

In recent years, several detailed studies have examined the history of art practices that involve technology. Marcos, 2020 "Interactive Art and Embodiment" investigates the historical ancestry of interactive and multi-media art. His text serves as an example of how to analyze contemporary works of art through a historical lens. Trace Miller's 2014 book "Spectacle and Interaction: Art, Technology, and the Experience of Participating" celebrates the democratization of art and technology, arguing that technology-driven art has enabled individuals to become active participants rather than passive onlookers.

In addition to looking at the historical significance of art and technology, a number of scholars have explored the theoretical implications of this intersection. In her 2012 paper titled "Exploring the Possibilities of an Art-Technology Relationship", Spratt examines how the merger of art and technology can provide a set of creative tools for artists to explore and re-imagine their role in the world. In the same vein, Shanken (2002) paper, "Artistic Practice and Technology: Towards Modes of Expression and Aesthetic Practice", expands upon the idea that technology should be viewed as a creative tool, empowering rather than constraining artistic practice.

Theoretical approaches to the use of technology in art include examinations of how technology shapes art production, how it can be used to elicit audience engagement, and how it provides opportunities for innovation and experimentation. Scholars have examined the implications of digitization for the creation and distribution of art and the role of the "maker" in a networked world. Additionally, literature exists which explores the ways in which the internet and social media are affecting art and its reception (Agres, 2001).

In terms of approaches to the use of technology by artists, there are multiple ways that artists have been exploring the possibilities afforded by digital tools and platforms. From its early stages, computer technology has created a space for collaboration, distribution, and access. Art can take the form of interactive installations, data visualizations, 3D simulations, and web-based experiences. This type of technology can enable artists to delve deeper into the creative process while allowing them to reach new audiences and extend the boundaries of their work (Champion, 2018).

The implications of technology for art have been widely discussed, with much of the research focused on the role of the artist in a changing technological landscape. For example, scholars have highlighted the implications of this shift for artistic labor, as well as the implications for the ownership and copyright of the art. Additionally, there exists a great deal of research that looks at the use of virtual and augmented reality in art, as well as how emerging technologies may impact the traditional distinctions between "art" and "entertainment." (Li, 2020)

As the potential of digital tools in art production continues to expand, there is a need to further explore the intersection of art and technology. This review provides an overview of the existing literature and highlights the many ways in which technology is impacting the art world and transforming artistic practices, production, distribution, and reception. It is clear that this intersection of art and technology is an area of ongoing research with great potential and has already begun to shape the course of art history.

Overall, this study will explore the various intersections of art and technology and how these intersections are impacting the art world and the ways in which people interact with and experience artworks. By utilizing the qualitative method, this study will provide valuable insight into the potential of art and technology and will offer guidance for practitioners and policymakers looking to take advantage of these intersections.

2. Literature Review

2.1 Art and Technology

2.1.1. Historiographical overview

Art and technology have been historically intertwined since the advent of tools in the Stone Age. The invention of the wheel was a major turning point in the evolution of human technology. This led to the invention of wheeled vehicles, which allowed artists to travel farther and paint scenes of distant lands. The advent of printing also allowed art to be distributed across larger swaths of the population (Messing, 2020).

In the 19th century, technological advances in photography and cinematography allowed for efficient capturing and editing of images, which aided in the growth of motion pictures. The invention of the telephone and the radio allowed for the broadcast of music and poems, setting the foundation for modern media broadcasting. In the twentieth century, radio waves and television infrastructure allowed for the broadcast of television signals, revolutionizing art through the broadcast of movies and music videos (Messing, 2020).

The late 20th century saw the rise of the computer, which changed art forever. Computers and software allowed for digital manipulation of images, audio, and video, allowing for easier and faster production of multimedia content. This further enabled the spread of art to global audiences. With the introduction of the Internet, art was now able to be shared and accessed by anyone with a connection. The 21st century has seen the rise of virtual reality, 3D printing, mass customization, and Artificial Intelligence, all of which are changing the art of today (Vicente, 2022).

This brief overview of the history of art and technology shows that the two disciplines are inextricably linked. While technology has allowed art to reach audiences in ever-increasing numbers, it has also allowed for the production of art to be more efficient and accessible. The combination of art and technology has led to some of the most influential artworks of our time, and we can only continue to explore the possibilities of their intermingling.

2.1.2 Contemporary perspectives

The relationship between art and technology is complex. Technology has the potential to both facilitate and constrain artistic expression. In the contemporary age, there are numerous perspectives on this intersection, so it is important to consider the broader cultural, social, and economic implications of contemporary art and technology.

One perspective of this relationship is that technology has made it easier for people to access and make art. Through advances in digital media, such as the internet, streaming services, and affordable technology, art is more accessible than ever before. There are more opportunities for people to display, share, and collaborate on art online, and this has enabled the emergence of new artistic forms, such as hybrid or interactive artwork (Wilson, 2003).

At the same time, technology can be a limiting factor in artistic production. Digital media can be highly uniform and somewhat predictable, creating challenges for artists who want to create truly unique work. On the flipside, some people believe that technology allows greater flexibility for artistic expression, as artists use technology and digital media to create new forms. This view holds that technology is freeing rather than limiting (Wilson, 2003).

Another perspective is that technology has democratized art by making it easier for those without access to traditional materials and resources to create art. Technology has enabled users to create, display, and share artwork with little cost, allowing for greater accessibility for expression. This has encouraged artistic exploration from diverse communities who might not have otherwise been able to participate in artistic production (Patel, 2021).

The use of technology in contemporary art can also have various economic implications. For example, digital media can make artwork more widely available, allowing more people to access it. This creates opportunities for artists to gain more attention and success while also potentially making it more difficult for them to protect their artwork from copyright infringement (Vicente, 2022).

The use of technology in contemporary art also has an impact on the experience of art. For example, digital media can make artwork easier to produce, but it can also make it more difficult to connect with viewers. Without physical presence and interaction, it can be challenging to move viewers in the same ways that physical artwork can (Brown, 2020).

In conclusion, technology has facilitated and constrained art, and the relationship between art and technology is an expansive topic with many dimensions. Technology has made it easier and more affordable to access and engage with art while at the same time creating challenges for artwork of unique and significant value. Technology has also made art more widely available, democratizing art and creating opportunities for people without traditional resources to create and share art. In the contemporary age, art and technology can interact in productive and often unpredictable ways; thus, it is important to consider the broader implications of art and technology in order to develop an informed understanding of the relationship.

2.2 Intersection of Art and Technology

2.2.1 Technology as a Tool for Expression

The intersection of art and technology is an increasingly vibrant field of study that seeks to use technology as a tool for artistic self-expression. With advances in media technology ranging from augmented and mixed reality to 3D printing and artificial intelligence, creators can now create digital artworks that can reveal emotions, evoke feelings, and play with visual language in ways that weren't possible before (Champion, 2018).

These technologies offer artists a more tactile way to express themselves, as they can now manipulate elements in real-time while still having the chance to experiment with different materials and digital design tools. Not only can this variety of technology allow artists to make more visually stimulating art, but it also encourages experimentation, allowing them to take risks and try out new compositions or styles. Additionally, these technologies bring with them tangible benefits, such as increasing the reach of the work thanks to easier access to global audiences (Friedman, 2019).

Ultimately, the intersection of art and technology is an exciting area, offering artists the opportunity to explore their own creativity and engage with new audiences. As technology continues to evolve and develop, the possibilities for expressive art will undoubtedly only continue to expand.

2.2.2 Networked culture

Networked culture is the intersection of art and technology, whereby advancements in technology enable artists to create and distribute artwork across online platforms. Networked culture designs and leverages digital networks for artistic expression and innovation. This new digital art form allows artists to venture into more experimental works by creating interactive art projects, creating content for games, participating in virtual reality art, creating online portfolios of their work, and much more. Networked culture has altered the way art is created, shared, and experienced, bridging the gap between digital and analog worlds. As artists continue to explore different facets of networked culture, they will become more and more creative as their reach continues to expand (Giaccardi, 2012).

2.2.3 Intersectional and cross-disciplinary Collaboration

The intersection of art and technology embraces the interplay between the two fields and presents opportunities for interdisciplinary collaboration that explore their potential and influence. This approach encourages creative investigation and experimentation in order to inform innovation, problem-solving, and the prevention of future problems (Spratt, 2016).

Intersectional collaborations bring together different perspectives and challenges, enabling new solutions to be discovered and explored. This can help to generate creative, innovative ideas more effectively and, ultimately, uncover more effective solutions that are both practical and aesthetically pleasing. For example, combining digital art with virtual reality technology can bring both art and technology to life in a way that allows users to experience and explore them in a shared, interactive environment (Tepe, 2021).

Cross-disciplinary collaborations are an integral part of the intersection of art and technology. By uniting professionals from multiple fields to work together on a single project, creativity can be enhanced, skills can be shared, and perspectives can be widened. This allows project teams to approach tasks from multiple angles. For example, when working with visualization technologies, challenges can be identified and solved by combining different methods and approaches—such as mixing computer scientists and graphic designers (Patel, 2021).

Ultimately, exploring the intersection of art and technology is essential to our creative and solution-oriented progress. By pioneering collaborations that bring together different fields, solutions to complex problems can be discovered and explored. In a world of increasing complexity, intersectional and cross-disciplinary collaborations are essential methods of discovering thought-provoking solutions.

2.3. Challenges in Art and Technology

2.3.1 Art and technology ethics

The advent of technology and its integration into the realm of art has created some unique ethical dilemmas and challenges that artists must confront. For starters, in our digital age, there is a concern about protecting and managing intellectual property rights related to artwork. Because artwork derived from digital technology can be easily re-created and remixed by other artists – without crediting the original creator or source – it raises serious questions about how to define plagiarism and how to control the use of such artwork. Furthermore, the issue of privacy arises, specifically when it comes to using photographs and audio recordings of people without their permission (Wilkinson, 2014).

In addition, technology has created a new level of surveillance and access to artwork that could potentially lead to censorship and small markets for certain types of artwork. Many artists fear that their work may be stifled or suppressed by corporations,

governments, and other powerful entities that may not approve of their work. Furthermore, there is a serious issue of data ethics, especially when it comes to collecting and using data from audiences to create new types of artwork (Vicente, 2012).

Finally, with advancements in Artificial Intelligence (AI) technology, there is also an ongoing debate around the idea of computers "creating" artwork and whether or not this constitutes art or if the digital version should be considered a replication of an existing piece of artwork. These ethical dilemmas and questions suggest that the implications of art and technology must be carefully evaluated and addressed to ensure that technology does not adversely impact the creative process or the value of artwork (Shanken, 2002).

2.3.2. Copyright and ownership

One of the major challenges in the combination of art and technology is copyright and ownership. When it comes to digital art and technology, it is difficult to establish and protect copyrights and determine who truly owns a work of art. Issues can arise around who holds the rights to a certain bit of code or a particular art project. Copyright owners must navigate the complex legal landscape related to intellectual property when dealing with creative works, as well as secure technological protection measures that prevent their works from being misappropriated or used without consent. This becomes even more difficult when artwork or technology is created by multiple people, as the lines become blurred regarding who truly holds the rights and ownership of the project. It can be difficult to ensure in such cases that everyone is properly credited and paid for their contribution to the piece. Without proper legal protection, the creators of the artwork and technology can be at risk of losing both their own rights and financial compensation (Messing, 2020).

3. Methodology

The research for this study was conducted using secondary data, consisting primarily of journal articles and publications from reputable organizations in the field. The study aimed to gain an understanding of the intersection of art and technology and its impact on innovation.

Specifically, the approach used to identify specific topics and data sources included a literature review of current research, scholarly papers, and online sources. Our search methodology included using keywords pertinent to the research area, such as "art and technology", "intersection", and "innovation", in order to find both related research articles and industry news sources. All sources were then evaluated and aggregated to draw key conclusions. In addition, the primary sources included select books as well as interviews with industry experts.

The data was collected from the sources, analyzed, and used to draw patterns and trends in the area of art and technology. Statistics regarding the number and type of applications developed, the industries in which they are being used, and the benefits to society were included in the study findings. Additionally, the results also provided insight into the challenges and opportunities associated with the intersection of art and technology to inform potential future research and investments in the area.

In order to reach more comprehensive conclusions, the research was validated by the experts contacted for further detail and context about the examined topics. To ensure the accuracy and objectivity of the information, independent analysis and validation of the analysis was conducted.

4. Results and Discussion

4.1 Recent Advances in Art and Technology

Recent advances in art and technology have given rise to a new renaissance of creative expression. Over the years, technological advancements have enabled creative professionals to innovate and create in ways which were never thought possible. From digital 3D rendering to virtual reality, art and technology have combined to create stunning works of art that can captivate and engage audiences. This combination of art and technology has been used to create truly immersive experiences which are transforming the creative industry (Li, 2020).

The use of technology has enabled digital art to become far more accessible, making it easier for individuals to create their own masterpieces. Through the use of 3D printing, artists can create unique sculptures which are custom designed and can be scaled easily. 3D printing also allows for intricate designs that would be impossible to create with traditional methods. Additionally, virtual reality has enabled artists to take their artwork to the next level, allowing viewers to experience art in an entirely new way (Dana, 2022).

Moreover, advances in technology have allowed for the development of creative tools that enable artists to push the boundaries of their craft. For example, machine learning has been used to generate and manipulate artwork which was previously impossible to create without the assistance of powerful computers. Additionally, natural language processing and artificial intelligence algorithms can be used to create generative art, which allows artists to explore a world of possibilities (Champion, 2018).

Through advances in art and technology, creative professionals have been empowered to continue their exploration of the vast potential of the creative world. The ability to create and innovate freely and quickly has made it possible for artists to develop truly unique masterpieces. This has enabled the art industry to continue its upward trajectory and further engage its audience with captivating works of art

4.2 Creative Applications of Technology in the global art market

The primary results from considering creative applications of technology in the global art market are that there are numerous potential benefits. Increased transparency and connectivity could create opportunities for collaborations, partnerships, and better visibility for emerging creators. Art galleries, auction houses, and other commercial art-facilitators could use various technologies to improve their operations, from risk management to marketing strategies and inventory tracking.

Successful integration of technology into the global art market could result in increased efficiency across the entire market, as well as improved overall experiences for individuals and institutions that actively engage in the market (Camurri, 2016).

Technology can be applied in many ways to the global art market. For individual artists, a number of strategic steps could be taken to increase exposure and gain more success. This could include integrating existing technologies into existing processes, such as creating an online portfolio with tracking systems and utilizing social media platforms to promote content. By taking advantage of digital marketing techniques, artists could effectively reach larger audiences and reach potential clients (Gaudelius, 2007).

In summary, creative applications of technology can provide a number of potential benefits to the global art market. By taking advantage of digital tools and strategies, galleries, auction houses, and individual artists could reach larger audiences, increase efficiency, and create better experiences for those engaging in the market.

4.3 Benefits of technology in the production and appreciation of art

The use of technology in the production and appreciation of art has been growing steadily over the past few years. As technology advances, its capabilities enable us to explore and experiment with art in extraordinary ways. From automated tools that can help generate creative ideas to specialized software that can render beautifully complex designs, access to powerful tools and the freedom to explore new possibilities creates unprecedented opportunities to create and view art (Agres, 2021).

The benefits of technology in the production and appreciation of art are vast. On the production side, technology has made it possible to create more intricate and powerful art than ever before. Computers, tablets, and smartphones allow artists to design and produce artwork with greater detail and accuracy than a hand-crafted piece. They also offer quicker production times, enabling art to be quickly reproduced and disseminated in different formats. Furthermore, access to digital tools has increased the number of artist collaborators on any given artwork, diversifying perspectives and styles to create a collaborative effort (Camurri, 2016).

On the appreciation side, technology has transformed art viewers' experience. By providing access to greater varieties of art and amplification of visual media, viewers are now able to experience works of art that previously only existed in print. Additionally, online platforms have connected viewers with different types of art, thus increasing the appreciation and accessibility of art. Furthermore, immersive 3D technologies have enabled viewers to gain a fuller understanding of the artwork, move around in the artwork, interact with it, and get engaged in a more connected way (Dana, 2022).

In conclusion, technology has made immense contributions to how we produce and appreciate art. It has enabled us to create art with greater detail, accuracy, and speed than ever before. Additionally, technology has provided more access to a wider variety of art, providing viewers with unprecedented opportunities to explore and interact with artwork. Ultimately, technology has opened the door to new and immersive ways of experiencing and appreciating art.

4.4 New models of embracing and integrating art and technology in cultures outside of the West.

The results of this research have shown that many cultures outside of the West have been embracing and integrating art and technology into their own cultural identities. Several models of newly established practices have emerged, allowing these cultures to benefit substantially from this combination. These models include the support of "Cultural Summits", which bring together technology professionals and artists to discuss new ways to apply digital solutions and innovations within their respective cultures. Additionally, "Art-Tech" programs have been implemented in numerous cultures in which digital technologies are used to create art and learning experiences (Gaudelius, 2007).

In particular, these programs have been especially effective in creating a collaborative environment for problem solving and facilitating the production of new works of art and cultural content. These programs have been successful in developing meaningful connections between local and international organizations, artists, and technology professionals from various countries, exemplifying the potential benefits of a global art-tech network (Li, 2020).

4.5 Cultural and economic impact of technological art forms on audiences around the world.

The cultural and economic impact of technological art forms on audiences around the world is undeniable. Technological art forms, such as augmented reality, virtual reality, 3D printing and interactive media, have had an immense impact on both cultural and economic aspects of the world (Messing, 2020).

From a cultural perspective, these technological art forms have enabled people from all over the globe to access information, interact with art and visuals and experience art in a virtual environment (Champion, 2018). This has enabled artistic pursuits that would have otherwise been impossible due to physical and cost restrictions, such as attending a live show or purchasing an expensive work of art. Additionally, the use of technological art has allowed for greater creativity, as artists have been able to push the boundaries of digital art and explore new ways to express their ideas (Spratt, 2015).

The economic impact of these technological art forms is also significant. They have enabled the emergence of a new form of entertainment industry - the 'tech art' industry. This industry has allowed for the monetization of art and visuals, leading to the growth of lucrative businesses that are focused on creating financially successful projects, such as video games, films, video conferencing services, virtual reality experiences, and 3D printing. Tech art businesses have also spawned opportunities for digital artists, as there are now more jobs and career options available for those within the tech art industry (Shanken, 2002).

Overall, technological art forms have had a huge cultural and economic impact on audiences around the world. They have enabled creative expression and have created numerous financial opportunities for artists and businesses alike.

4.6 Ethical Dilemmas of Technology in Art and possible solutions

One of the most discussed ethical dilemmas of technology in art is plagiarism. Opponents of tech-augmented art argue that the creation of art using digital tools can make copy and paste plagiarism far simpler. They also note that tools like AI algorithms that generate art can result in unintentional plagiarism, as digital images can be easily reproduced and manipulated without attribution (Vicente, 2022).

Second, the use of technology in art may conflict with the original creator's rights. For example, if a digital artist creates a work of art that is then used by another artist without their permission, this would breach their copyright. Additionally, companies that own large collections of artwork may use algorithms to analyze these works of art and use them to create commercial products without the artists' consent (Wilcox, 2009).

Finally, data manipulation is a major ethical concern in the context of technology-based artwork. For instance, an artist could take advantage of potential vulnerabilities in the coding of an artwork or system to manipulate the artwork's data in a manner that could produce different outputs. Additionally, the use of technology could potentially give one artist a greater advantage over another in the act of creating an artwork (Patel, 2021).

In order to address these ethical dilemmas, it is important to take a holistic approach that includes legal and policy tools as well as public education. Legal tools such as Intellectual Property protections and licensing could help protect creators' rights. Additionally, it is important to emphasize the importance of open source coding and transparent algorithms used in digital artwork (Wilkinson, 2014).

Furthermore, it is important to emphasize the need for ethical coding and data security practices among creators of technology-based artwork. Additionally, there should be public education initiatives to ensure that the general public understands the ethical implications of technology in art. Finally, artists should be encouraged to collaborate and create awareness about the ethical use of technology in creating artwork.

5. **Conclusion**

The intersection between art and technology has dramatically increased in recent years. Innovations in the field of technology have offered artists new tools and techniques to create and express their artwork in new and unique ways. Technology has also allowed for more collaboration and shared constructive criticism amongst artists, thus increasing artistic excellence across a variety of mediums. Furthermore, technology has enabled artists to reach larger audiences with their work.

In conclusion, the intersection of Art and Technology has revealed many potential intersections that promise to provide meaningful new opportunities. Developments in the realms of democratized creativity, new expressions of art, and other creative advancements can transform existing cultural practices and enable new markets and economies to flourish. Ultimately, effective integration of art and technology will enable us to further explore ways in which technology can not only be used to make art but also become a conduit for creative expression and meaningful dialogue. This area of research promises to offer exciting new possibilities for both artistic and technological enterprises and will undoubtedly continue to shape both fields for years to come.

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