

Into the Black Box: The Work of Art in the Age of Artificial Intelligence

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Abstract: This paper explores the profound implications of Artificial Intelligence (AI) in contemporary art, focusing on its application to creative processes, copyright issues, and cultural impact. AI has not only transformed traditional methods of artistic creation but also challenged conventional understandings of "creativity" and "originality." The study examines the collaborative dynamics between artists and AI, unveiling new paradigms of human-machine interaction that shape the perception and reception of AI-generated art. Through systematic analysis, the paper reveals the expanded boundaries of artistic innovation and the public's evolving acceptance of AI in art within an ever-changing cultural context. Furthermore, this research redefines the essence of art in the AI era, offering guidance for future academic inquiry and practical endeavors. By delving into the dynamics of human-machine collaboration, the study paves the way for deeper integration between art and technology.

Keywords: AI art, creativity, originality, human-machine collaboration, digital culture.

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Introduction

The rapid advancement and widespread application of Artificial Intelligence (AI) technology has made it an indispensable tool for society and many contemporary artists. However, the rise of AI in art has also sparked highly controversial ethical and creative debates.

Technological shifts triggering transformations in the art world are not new; historically, each technological revolution has been accompanied by the emergence of new artistic forms. However, the intervention of AI in the realm of art heralds an unprecedented transformation. This change is particularly significant because AI has not only altered traditional methods of artistic creation but has also profoundly challenged the conventional human understanding of "creativity" (Rafner, et al., 2023) and "originality" (Gulya, 2023)." The collaborative relationship between artists and AI has become increasingly complex as technology evolves, so AI and human artists can be considered partners (Mazzone & Elgammal, 2019). This complexity pertains to the melding of technological innovation and artistic inspiration and sensitive areas such as intellectual property and creative ethics. For contemporary artists, these represent core issues that demand confrontation and deep contemplation. Thus, a thorough analysis of these issues will aid in comprehensively

understanding the dynamics and inherent potential of human-machine collaboration in art.

Furthermore, including AI has sparked discussions on new paradigms of human-machine interaction. Key questions worth exploring include how artists collaborate with AI and how such collaboration affects the perception and reception of artworks since many people tend to have a negative disposition toward AI art (Millet, et al., 2023). These questions relate not only to artists' creative processes but also to how artworks interact with audiences and their place in the ever-changing cultural context. Moreover, the application of AI has given rise to new artistic forms and expressions (Schneider & Rea, 2018). These new forms have changed how artists create and expanded the boundaries and possibilities of art (Marche, 2022). However, the blurred lines between artists and AI have led many artists to feel confused and uncertain about when and how to use AI in artistic creation (Shaffi, 2023).

This research aims to delve into the application of AI in the art world and its profound implications for the artistic creative process, copyright of artworks, and cultural impact. Through this study, I aspire to provide valuable insights and guidance for academic inquiry and practical endeavors in art and AI while also defining the concept of "AI Art." With the continual progression of

AI technology, its role in the art world is set to expand further, and this research aims to provide a clear understanding and direction for this significant transformation in the field.

Chapter 1: Driving the Algorithm: Forces behind Automated Decision-Making

In 2014, humanity created the first mature artificial intelligence image generation technology, the Generative Adversarial Network (GAN). However, the event that marked the application of artificial intelligence in the field of art and brought it to public attention occurred in 2022, when a painting named "Space Theater" won first prize. This would have been a normal occurrence, but the shock came from a statement released by the artist after the competition, revealing that the artwork was created using the most popular AI painting software of the time, mid journey. This software had been around for a while and was well-known for its ability to rapidly produce exquisite AI paintings, making it popular among many users. However, the fact that an image generated by it won a major prize in an art competition was a first in the art world. As a result, people began to engage in deep discussions about the artistic and ethical aspects of AI-generated paintings. Some artists even voiced the opinion that art is dead in the face of the powerful capabilities of artificial intelligence.

Coincidentally, 2022 was also my first year at Alfred, and in this context, I began to attempt to push the boundaries of artificial intelligence technology, striving for high-definition and detailed images, trying to create a new form of art from a visual perspective. During this period, I created two pieces, "Deus ex Machina" and "Who am I," which respectively represent my explorations of the limits of AI technology in the fields of image processing and text understanding feedback.

Due to computational power limitations and the pursuit of efficiency, early artificial intelligence software often produced images that were unclear, leading them to adopt a very strong abstract style in an attempt to "explain" this phenomenon, but this could not hide the blurriness brought about by insufficient computing power. Moreover, due to the instability of the programs, demanding too high a clarity often led to failures in image generation. Therefore, I began to explore and attempt to challenge the creation of AI-generated art images with the highest clarity and most detail.

In my ongoing exploration of artificial intelligence in the realm of art, a novel term has emerged: "Prompt engineering." In the early stages of AI generated imagery, nearly everyone sought to articulate their desired image content as precisely as possible, giving rise to commonplace prompts like "photorealistic." This particular piece, "Deus ex Machina", was meticulously crafted, with a deep exploration of the fundamental principles of the underlying code. It consumed nearly a month of my time, as I continually generated, adjusted, and iterated each pixel and minuscule "noise" to unveil AI's infinite potential in handling details. This has been a magical expedition into the intersection of art and technology, akin to a heartfelt poem, delving deep into the artistic potential of AI.

However, my curiosity ventured towards a different path, pondering whether AI, as a component of the creative process, could possess a degree of selfawareness or a form of "control" over content. Consequently, departing from the conventional approach, I refrained from inputting descriptive terms such as "white shirt,"

"lotus," or "abstract." Instead, I repeatedly posed a question to AI: "Who are you?"

Initially, AI either faltered or conjured enigmatic swaths of colors, but through successive iterations, the response gradually clarified, unveiling an abstract self-portrait. This prompted me to contemplate a fundamental question: In the act of creation, AI engages in a collaborative partnership with the artist, rather than adhering to a master-servant relationship.

Chapter 2: Game theory: A tug-of-war of domination with AI

Everything at its inception is chaotic and unordered, much like how photography was when it was first invented. Some photographers would deliberately make their photos resemble oil paintings to gain academic recognition in the arts. The early AI art was most questioned about the issue of copyrights, as artists relied almost entirely on content generated from prompts' descriptions. In the environment of the Closed-source Big Model, these prompts could be used by others in a "grandiose manner", creating content with styles, compositions, and more that were almost identical. In this context, how to embody the artist's creativity and how to embody the uniqueness in the art created by the artist, I started my new artistic practice from two perspectives: the transformation of media and the recompilation of algorithms.

The transformation of media is the first method I can naturally think of. Previously, AI art was presented either in pure digital form or as digital printmaking. Based on my prior experience in art, I transformed a series of images generated by artificial intelligence into an artist book, creating the "Prehistory of the Future: Matter and Consciousness" series. This book unfolds across five chapters, akin to the mathematical and physical principles that underpin the universe: "Dust," "Artifact," "Ascension," "Alien," and "Infinity." As the manuscript reaches its zenith in the chapter "Infinity," it encapsulates the scientist's musings on humankind's quest to explore the frontiers of science and technology: the culmination of scientific and technological inquiry inevitably converges towards the profound comprehension of the fundamental laws governing the cosmos.

The "Poincaré Recurrence Theorem" in physics imparts a fascinating insight: within a closed system, given a sufficient expanse of time, the fundamental particles constituting matter will inevitably reassemble into their original configuration. This concept captivates me, provoking contemplation: could the very "inspirations" we hold dear be concealed within information carried by particles from the distant past? My musings transport me to the era of Leonardo da Vinci in the Middle Ages, where his manuscripts bore remarkable foresight, transcending his time. This leads me to wonder if the knowledge and information we generate in our contemporary world could be encoded by particles, transmitted into the future, such that these particles might coalesce into the mind of a future "Da Vinci," echoing with novel "inspirations"

Through the medium of artificial intelligence, a vessel capable of carrying the collective wisdom of humanity, I have crafted this transcendent collection, with an aspiration to depict humanity's intersection with technology and visionary imaginings of the future. Regardless of the incredible advancements we witness in the present world, for the future, the now eternally remains the "Middle Ages." Hence, this collection also serves as a timeless

dialogue across the chasm of time, linking me to my distant future self.

This series of works achieved tremendous success in 2023, not only being exhibited in national art galleries but also causing a significant reaction and receiving high praise from the public, leading me to a period of complacency in my exploration and excavation of AI art. Fortunately, this issue was later addressed, and I will elaborate in detail in Chapter 3.

Interestingly, in the process of artistic practice through media transformation, my identity seemed to shift from an artist to a blacksmith, as I processed and transformed the content obtained from AI to create new content. This "process" of material processing did not fully satisfy me because I could never truly control those raw materials in a real sense; I could not subjectively control the content generated by AI to a personalized extent. Against this backdrop, I began to attempt to re-edit the algorithms, aiming to gain greater control in this "creative game."

Meanwhile, I further explored the possibility of more transformations. During this period, I learned about ceramic 3D printing and liquid ceramic casting techniques from the ceramic artist Jason Green. Against this backdrop, I had a bold idea: why not try to transform two-dimensional AI images into three-dimensional objects? Thus, I used Rhino software to edit the images, extracting the characteristic values of each pixel, transforming them from 2D images to 3D models. Using the profound landscapes created by AI, through digital technology transformation, they became exquisitely detailed models of varying elevations. Then, by casting with liquid ceramics for the work's "body" and applying colorful glazes for its "soul," this piece was perfectly materialized and presented in the real world.

"The Giant River," this piece, is based on the image of a river formed by the melting snow mountains created by generative AI, transformed into an elevation model with varying heights, and then rendered with different colored glazes. This allows it to be viewed from above, at eye level, or from a distance, becoming an AI ceramic work that is exquisitely detailed from every angle.

As an individual artist, I naturally couldn't compete with the companies behind these generative artificial intelligence models in terms of computational power and financial resources. In the beginning, I used Python programming to make some adjustments and creations on AI programs. My first piece was "APEX," an AI video art piece that interprets the laws of physics through pixel art lines. The reason for choosing this style was also because, on the basis of insufficient computational power, abstract pixel content could run smoothly.

Amidst my academic journey in the realm of mathematics, a focal aspect of my research has been the study of "partial differential equations" — a veritable tapestry of equations that can articulate nearly any trend or transformation. Within the context of Chinese culture, the concept of "potency" resonates with a parallel significance. Therefore, I found inspiration in the mathematical realm, notably in the concept of "vector fields" from advanced calculus, a concept capable of representing an infinite array of physical scenarios.

Conventionally, one can perceive the physical objects themselves, yet remain unable to grasp the enigmatic "potency" that envelops them. To reveal this, I applied the artificial intelligence algorithms to disentangle these objects from their

physical confines, rendering these elusive "potencies" visually tangible. I endeavored to use colors and lines as an artistic medium to depict the "immaterial," all the while orchestrating a renaissance of the "tangible" facets of the real world through the visualization of the intangible.

Although the work "APEX" was interesting, it required a tremendous amount of energy because the software limited me to creating content in this specific visual style, and I was unwilling to produce a piece of work from scratch by writing the underlying code myself. At this time, the software Stable Diffusion appeared, capable of supporting different artificial intelligence models and even training one's own AI models. On this basis, for the first time, I truly had the autonomous "production" rights over these content materials. Simultaneously, my interface for AI creation shifted from the traditional chat-style user UI interaction to a purely programming console, bringing me closer to the essence of AI.

Following Stephen Hawking's renowned publication, "A Brief History of Time," there exists a subsequent literary opus bearing the title "The Universe in a Nutshell," which delves into the intricate tapestry of an infinite continuity and divisibility that characterizes our world within the confines of contemporary physics.

The atom was conceived as the indivisible cornerstone of matter, yet the passage of time unveiled the existence of "quarks," and later, "elementary particles" shrouded in enigmatic internal structure. However, one cannot help but ponder whether even within these "particles," deemed the quintessential building blocks by humanity, another vast and boundless cosmos may reside. The catastrophic collision of two universes could conceivably transpire from the gentle friction of two leaves stirred by a zephyr in the external world.

The Work "INFINITUS" was born from this inspiration, employing the faculties of artificial intelligence, I harnessed technology to manifest the ceaseless scaling and iteration of the artwork's content, thereby symbolizing these profound physical concepts and conjectures that unveil a landscape within a landscape, a civilization within a civilization, and a universe within a universe. This endeavor provided me with a splendid opportunity for practical exploration, where I delved into the manipulation of imagery, algorithmic logic, iteration frequencies, and motion functions among various parameters. Through experimentation and adjustment of these elements, I sought to discover and refine the method most suited to express the artistic ideology I envisioned. This process was not just about leveraging artificial

intelligence for its computational capabilities but also about forging a deeper connection with the artistic essence of the work, allowing me to navigate through the intricate interplay of technology and creativity to mold an expression that resonates with the complexity and multi-dimensionality of the concepts I aimed to explore.

During the same period, I also created the AI video work "Ashes to ashes". In the creation of this piece, I found myself immersed in contemplation of the notion of the "time loop" within the realm of physics. Could it be that reality, in fact, does not unfold as a linear journey with a distinct beginning and end, but rather, as a cyclical phenomenon where past, present, and future intertwine? In the realm of mathematics, apart from the notion of a "straight line," there exists another geometric figure known as the

"loop" which encapsulates such a condition. This work elucidates that both individuals and civilizations, as well as the cosmos itself, are integral components of the intricate tapestry of the "time loop." Just as history repeats itself, even the most magnificent epic narratives may be mere repetitions within a seemingly endless and ultimately purposeless cycle.

At the time of creating this series of works, I naively believed I had achieved great success because I had smoothly entered the "black box" and began to tame AI from a decision-making level, generating an art style and content uniquely my own. However, in retrospect, this still isn't an ideal state, or rather: my obsession with control was too profound. My identity seemed to undergo another transformation, no longer the blacksmith who hammers and processes raw materials a second time, but rather a rider attempting to tame a wild horse. Sadly, this battle with AI as a temperamental, powerful wild horse is constant. I must spend over 90% of my energy to control it, such as when I want to test a style, it requires a considerable amount of time and effort, because even making a display video lasting 10 seconds could consume at least two or even more than four hours of computational power. Moreover, many adjustments may not achieve the effects I envisioned. At the same time, I also had to make certain compromises, because the same commands, the same algorithms, but extending their temporal dimension could produce unexpected effects, which I need to accept these effects and coexist with them.

Chapter 3: We are one: Human-Machine Integration

All the works and practices mentioned in the first two chapters were completed over the year from August 2022 to August 2023. The process of creating these works was very time-consuming and could be described as "hardcore." Naturally, this led to some laziness on my part after returning to Alfred in September. What snapped me out of this lethargy was a critique session where I was enthusiastically introducing the printmaking works "Prehistory of the Future: Matter and Consciousness," mentioning that they represented version 2.0 of AI art. My mentor, Professor Andrew Deutsch, immediately countered by suggesting that instead of viewing these works as the correct version 2.0 of AI art, I should consider them as the erroneous version 1.0 of AI art. His words struck me like a thunderbolt because my background in mathematics from my undergraduate studies had led me to approach creative exploration with a kind of mathematical, additive thinking. In other words, I always assumed that future works would be built upon the foundation of previous ones, and the same would apply to ideas and methodologies. However, this principle does not hold in art creation, where creativity knows no bounds, and especially when a new art form emerges, many conjectures and attempts may be wrong due to the limitations of the era and

technology narrowing people's perspectives. At the same time, while learning about electronic music creation, I read extensively about the creative thoughts and experiences of the electronic music artist John Cage, who greatly inspired me with his concept of "not trying to control." Previously, my relationship with AI was either very distant or competitive, but all this stemmed from my strong desire for subjective control as an artist. Therefore, embracing the idea of "not overly controlling," I embarked on a new journey of creation.

As an exceptionally unique species, humanity's journey from primal existence to reliance on the edifice of the Information Age

is not merely rooted in corporeal faculties. Rather, it stems from the awakening of profound thought and the emergence of self-awareness. The pondering of self-awareness among humans traces its origins in philosophy, reaching back to the fundamental triad of inquiries proposed by the ancient Greek philosopher, Socrates: "Who am I? Where do I come from? Where do I go?"

Within the field of psychophysics, a branch of psychology, scientists have endeavored to employ biometric signal analysis to quantify the intricacies of human thought. Yet, irrespective of the methods utilized, the ethereal nature of human "thought" eludes precise representation. In my perception, the realm of human thought parallels the Pythagorean tree, extending infinitely within finite space, flickering faint yet resolute amidst the vast expanse of the cosmos.

In an endeavor to capture the multifaceted essence of human cognition, I collaborated with a psychological research institute, employing a biometric interaction approach. Through the artistry of artificial intelligence algorithms, I orchestrated a symphony of shifting light and shadow to reenact the internal workings of the human brain. With the biometric signals of the audience as pigments and artificial intelligence as brush, composed a magnificent bloom of ideas in the dark space.

The creation of "The Prophet" marks a revisitation to the logical methodology I applied during the development of "APEX," wherein I dedicated a considerable amount of resources, energy, and computational capacity to the endeavor. However, this venture diverges significantly in that it diminishes the influence of human cognition and governance more profoundly. The essence of human dominion is transitioned away from being the focal point, transforming humans into mere components of the artwork itself. In this setup, the artificial intelligence engages in the interpretation of diverse biological signals emanated by varying individuals across different moments, allowing it to manifest its existence in a distinct manner—breathing, leaping, and sustaining itself. By relegating humans to the roles of either spectators or integral elements of the artwork, it opens up a broader spectrum for artistic exploration and potentialities.

Following the creation of "The Prophet," my journey in exploring artificial intelligence in art did not pause. Intrigued by the potential of AI to reshape our understanding of creativity and expression, I was determined to push the boundaries of this exploration further. This determination stemmed from a desire to not only challenge the conventional parameters of art but also to explore how AI can extend the canvas of human imagination to unprecedented domains. The realization that AI could serve as both a medium and a collaborator in the artistic process led me to ponder the next leap in my creative journey.

"The Prophet" transcends a mere alteration in the mode of creation; it embodies a profound emancipation in my conceptualization of art, challenging traditional paradigms and inviting a more inclusive interplay between technology and human essence. This endeavor not only redefines the boundaries of artistic creation but also prompts a reevaluation of the role and impact of human intervention in the age of digital artistry.

It was during this period of contemplation and exploration that I reconnected with a friend from my mathematics department days, who had since become a shareholder in a rocket company. Our conversations, a fusion of art, science, and technology, sparked

the idea of a space art project. This ambitious project would not only encapsulate the essence of my AI art exploration but also symbolize the infinite possibilities that lie at the intersection of human creativity and technological advancement.

Seeing this as an opportunity to extend the dialogue of AI art beyond the terrestrial confines, I embarked on this new venture. The space art project represented a bold step into the unknown, mirroring the spirit of exploration inherent in both art and science. By considering the vast expanse of space as a canvas, I aimed to challenge the traditional boundaries of artistic expression and engage with a broader, cosmic audience. This project, rooted in my continuous exploration of AI art, was a testament to the evolving relationship between humanity, technology, and the cosmos. It signified a departure from conventional artistic mediums and settings, venturing into a realm where art could exist and be appreciated on a galactic scale.

When planning for this work, my inspiration came from an article titled "ChatGPT is a Fuzzy Image of the Internet" by Ted Chiang, which delves deeply into how large model manufacturers use internet information to train their models. This reminded me of the concept of "circular reasoning" discussed in my mathematics studies, closely aligning with the potential outcomes of large models trained through internet information. In the modern era, as more AI-generated content is uploaded to the internet, the human ability to distinguish between reality and fiction may gradually blur, especially for future generations who grow up with generative AI content. I try warn that this phenomenon could eventually bind human cognition and knowledge networks in a circular reasoning of "questioning AI" and "training AI with the internet."

During the conception of "Ba Huang," I was deeply influenced by my mentor's friend, bio-artist Eduardo Kac, and his space art projects. Eduardo's work not only pioneered a new field at the intersection of art and science but also represented a revolutionary challenge to traditional art forms. Contemplating how to express my concerns about AI potentially turning the world into a vast "information cocoon," I had a flash of inspiration: why not follow in Eduardo's footsteps and send my artwork into space?

While studying AI algorithms at MIT, I deeply realized the difficulty of breaking the "information cocoon" from within. This realization prompted me to view "Ba Huang" as a unique artistic practice - sending it off Earth into space. This idea critiques the existing technology and information environment and innovates in artistic expression. Thus, the space journey of "Ba Huang" becomes a unique space-floating archival document, artistically recording and reflecting on the current technological milieu.

Sending "Ba Huang" into space is not merely an extreme display of its artistic value, but also a profound reflection on the role of artificial intelligence in human civilization. Through this act, I hope to spark a broader dialogue and contemplation about how artificial intelligence shapes our worldview, and how we find our place in an era profoundly influenced by AI.

Embarking on the "Ba Huang" space art project not only pushed the boundaries of my artistic exploration but also deepened my engagement with the concept of "Human-Machine Integration." This idea transcends the mere use of technology as a tool, envisioning a future where humans and machines collaborate to create new forms of expression and understanding. The journey of "Ba Huang" into the cosmos serves as a metaphor for this

integration, highlighting the potential for AI to not only augment human creativity but also to become an intrinsic part of the artistic process itself.

As I reflect on this endeavor and look towards the future, I am inspired to further explore the symbiosis between human intuition and artificial intelligence in my art. The "Human-Machine Integration" concept will guide my future works, as I seek to explore how AI can not only mimic human creativity but also contribute its own unique perspectives and insights. This involves not just a technical melding of human and machine but a philosophical inquiry into what it means to create and perceive art in an increasingly digitized world.

In my upcoming projects, I envision a process where AI algorithms are not merely tools but apart of artist's body. Artificial Intelligence should serve as an artist's second brain and third hand, because it can access a vast amount of information that humans cannot reach in a lifetime, and it also possesses a distinct and unique underlying logic of generative content.

The "Human-Machine Integration" in art is not an endpoint but a beginning, a launchpad for endless possibilities where art and technology coalesce to redefine the boundaries of what is possible. As we venture further into this uncharted territory, I remain committed to exploring these themes, ensuring that the dialogue between human and machine continues to evolve, enriching our collective experience of art and technology.

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