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Understanding the Influence of Artificial Intelligence Art on Transaction in the Art World

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Abstract

This dissertation was written as part of the MSc in *Master of Arts (MA) in Art, Law and Arts Management* at the International Hellenic University.

Artificial Intelligence (AI) Art is a field at the juncture of artificial intelligence and creative expression. AI art is a fusion of technology and artistic endeavour. It involves a symbiotic relationship between the human artist and computer-generated art. The field has emerged in the last decade. High-profile sales at prestigious auction houses highlight the growing recognition of AI-generated art, while online platforms dedicated to AI art democratize access, fostering a global community of creators and collectors. As we navigate the evolving landscape of AI art's influence on transactions in the art world, the narratives of collaboration, redefined authenticity, and evolving legal frameworks converge..AI art's transformative potential extends beyond traditional practices' and confines, reshaping how transactions unfold. In this context, understanding the influence of AI art on transactions becomes an exploration of the delicate balance between technological innovation, artistic expression, and the intricate dynamics of the art market. As technology advances, the narratives of AI art and transactions intertwine, inviting us to engage in a thoughtful and adaptive dialogue that paves the way for a new era in the intersection of creativity and commerce.

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Keywords: Artificial Intelligence, AI Art, Art Market, digital art, Artwork transaction

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Preface

In the ever-evolving landscape of contemporary art, the profound impact of Artificial Intelligence (AI) has become an undeniable force, reshaping not only the creative process but also the very foundations of the art market. As a visual artist and art educator with a background deeply rooted in the realm of artistic expression, my journey has been enriched by six years of active involvement in the curation and organization of exhibitions. Serving as the Assistant Art Director at T.I.F. HELEXPO for the Art-Thessaloniki International Contemporary Art Fair, I've witnessed firsthand the dynamic shifts within the art world.

The impetus for this dissertation emerged organically from the growing presence of AI in recent years and, more notably, the transformative role it has assumed in the creation of AI-generated art. My dual roles as a visual artist and an educator have fueled my curiosity to comprehend the nuances of this burgeoning intersection between art and technology.

This research endeavor has been a meticulous exploration, grounded in a methodical examination of scholarly papers, articles, and dissertations. It seeks to unravel the multifaceted layers that define the symbiotic relationship between AI, and AI art, and their profound influences on the art market. In navigating this expansive terrain, my goal is to contribute to a deeper understanding of the implications and potentials that AI holds for the future of artistic expression and the commercial aspects of the art world.

As an artist and curator immersed in the traditional ethos of the art scene, this undertaking is both a personal and professional odyssey. It reflects my commitment to grasping the essence of AI art, not merely as a technological marvel but as a transmogrifying agent that challenges conventional paradigms. Through this exploration, I aspire to provide insights that bridge the realms of creativity and technology, fostering a dialogue that enriches the discourse surrounding AI's impact on the art ecosystem.

This dissertation stands as a testament to the evolving nature of art and the imperative to adapt, comprehend, and engage with the technological currents shaping its trajectory. It is my sincere hope that this work contributes meaningfully to the ongoing conversation about AI in art and serves as a guide for fellow artists, educators, and enthusiasts navigating this dynamic intersection.

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Introduction

In our exploration of AI-generated art and its impact on the art market, we've navigated the convergence of technology and creativity. Examining the progression of AI-generated pieces, we've witnessed their integration into esteemed auctions, sparking discourse on authenticity and value. This phenomenon, contextualized within the broader art landscape, prompts consideration of its implications for artists, audiences, and the market. My background as a visual artist and art teacher, combined with six years of experience curating exhibitions, uniquely positions me to scrutinize these transformative shifts. This study seeks to comprehend the profound influence of AI on the traditional art world, leveraging a foundation of scholarly research.

The investigation addresses the following questions: How does the escalating prevalence of AI-generated art impact the traditional art market, posing challenges of authenticity and value? This study investigates the shifting dynamics and assesses the implications for artists, collectors, and the broader art ecosystem, considering how artificial intelligence profoundly transforms both artistic creation and commercial aspects within the art world.

The primary hypothesis posits that the increasing recognition of AI-generated art presents both challenges and opportunities for artists, collectors, and the art market, necessitating a nuanced understanding of its role in shaping the contemporary art landscape. The study relies primarily on existing literature, encompassing papers, articles, and dissertations. Limitations include the dynamic nature of AI developments, potential biases in available sources, and evolving perspectives in the rapidly changing field of AI art. The dissertation is structured, commencing with an introduction to AI in art, followed by an exploration of AI art's historical context, societal implications, and its role in the art market. The study concludes with insights drawn from an extensive literature review, providing a comprehensive perspective on AI's influence on the art world.

Artificial Intelligence (AI) Art

In the realm of AI art, a dynamic convergence of technology and creativity unfolds. Delving deeper, we examine the precise definition of AI art in this evolving landscape. AI art challenges conventional norms, merging artificial intelligence with creative expression. Defining its essence unveils a complex interplay between technology and artistic innovation.

How is AI Art Defined?

AI art, a burgeoning field at the intersection of artificial intelligence and creative expression, defies easy categorization. It embodies a fusion of technology and artistic endeavour, challenging traditional notions of authorship and pushing the boundaries of what can be considered "art." The term encapsulates a broad spectrum of artistic creations generated or influenced by artificial intelligence systems, ranging from visual art and music to literature and beyond. AI Art describes the capability of computers to execute various cognitive functions resembling human activities, such as engaging in chess and Go games, identifying content in images, language translation, and assessing job candidates based on their CVs. This conventional understanding of artificial intelligence (AI) can be expanded to encompass the realm of the arts. In line with this perspective, "AI arts" involves individuals programming computers to autonomously generate new artifacts or experiences, which are subsequently acknowledged by art professionals as belonging to the realm of "contemporary art." (Manovich, L. 2019 p.1).

At its core, AI art leverages the capabilities of machine learning algorithms to generate new, often novel, content based on learned patterns. That is specifically achieved with Generative models, algorithms that learn structures and patterns from data. In the context of AI art, these models are trained on vast datasets of existing artworks, enabling them to produce new, algorithmically generated pieces that bear the imprint of both the training data and the underlying algorithms. Once trained the AI can generate new art by taking input or prompts from users (Creswell, 2018). The generative process involves the model synthesizing novel content based on the learned patterns, often leading to unexpected and innovative results. The artist or user may have control over certain parameters or provide high-level guidance, influencing the direction of the generated artwork.

AI art, however, extends beyond mere automation or replication of existing artistic styles. It involves a symbiotic relationship between the machine and the human artist, where the algorithm acts as a collaborator or tool rather than a replacement. In this dynamic interplay, the artist's original intentions, driven by human creativity, undergo a transformative process through creative coding by the computer. The result is an artwork that not only challenges and modifies the artist's initial vision but also influences and alters the underlying creative coding itself. This iterative and infinite loop of playful interaction continuously shapes both the artist's intentions and the creative coding, fostering a symbiotic relationship between the human and the computer in the artistic creation process. (Poltronieri, 2022, pp. 29-41). This

collaboration raises profound questions about authorship and the creative process, challenging traditional notions of the solitary artist toiling away in a studio.

In addition to visual art, AI has made inroads into other creative domains. For example, AI-generated music has gained attention, with algorithms like Google's Magenta¹ composing pieces that challenge traditional notions of melody and structure (Yang, 2017).

Similarly, AI has been employed in the realm of literature to generate coherent and contextually relevant text, poetry, stories, and even entire articles, blurring the lines between human and machine-generated content with algorithms such as GPT-3². This application of AI in literature prompts contemplation on the evolving role of the author and the potential for collaborative storytelling between humans and algorithms.

Insights on Creativity

"Creativity," as an artistic term, encompasses a rich and multifaceted concept, viewed through various perspectives. It involves the ability to generate novel ideas or solutions that possess value (Csikszentmihalyi, 2015). The significance of the creative process lies in achieving a state of flow, where artists experience intense focus and immersion in their work.

Unlike AI-generated art, traditional artists have subjective agency, infusing their work with unique perspectives and human emotions. They draw inspiration from cultural influences, personal narratives, and societal contexts (Zhang, B., 2023). The act of creation involves direct physical interaction with materials, whether it's paint on canvas, clay, or other mediums. Traditional artists often rely on their intuition and skill, refining their craft over time through practice and experimentation.

In the realm of art history and theory, creativity is often associated with originality and the ability to break away from established norms. Modernist movements, for instance, celebrated artists who challenged traditional forms and experimented with new techniques (Morris, 2010). The surrealist movement, led by figures like Salvador Dalí and René Magritte, embraced the irrational and subconscious, redefining creativity in the context of dreamlike, fantastical imagery.

Cultural perspectives on creativity vary across societies. Some cultures emphasize collective creativity, where artistic expression emerges from communal endeavors, while others champion individual innovation. In the contemporary art scene, particularly with the advent of AI art, questions arise about the nature of creativity when machines contribute to the creative process. This challenges conventional notions of the artist as the sole creator, prompting a reevaluation of authorship and originality.

When and how did AI Art appear?

The emergence of AI art can be traced to the convergence of advancements in artificial intelligence and the creative aspirations of artists. While the roots of computational

¹Magenta is an open-source research project by Google that explores the intersection of artificial intelligence and creativity, specifically focusing on music and art generation. It encompasses a suite of machine learning tools and models designed to aid artists and developers in creating new and innovative works.

²An advanced language model from OpenAI, facilitating versatile communication and comprehension through natural language processing and generation capabilities.

creativity can be found in early computer-generated art experiments in the latter half of the 20th century, the contemporary intersection of AI and art gained prominence in the last decade. The evolution of AI art is a story of technological breakthroughs, artistic exploration, and the dynamic interplay between human creativity and machine intelligence.

The early seeds of AI art can be found commencing at a gathering of scientists and mathematicians at Dartmouth College, New Hampshire in 1956, intending to explore the feasibility of simulating the human mind. Psychologists from the field of cognitive science originated the inquiry if the intricacies of the human brain could be replicated by a computer, notably championed by figures such as Allen Newell, while Newell and Simon introduced the Logic Theorist, the inaugural program aimed at emulating human-like problem-solving (Miller, 2020, p. 38). Another pioneer of AI art was A. Michael Noll, who, in the 1960s, experimented with using computers to generate visual art. The initial images I crafted featured straight lines, merging aspects of order with the unpredictability of randomness. In a particular set of explorations, lines were randomly positioned and plotted at 90 degrees, forming a distinct series of visual compositions (Noll, 1994, pp. 39-44). Noll's computer-generated patterns and images laid the groundwork for the idea that machines could play a role in the creative process. However, these early endeavours were constrained by the limited computational power of the time, and the artistic outputs were relatively simple compared to the intricate creations we see today.

The real leap forward occurred with the advent of machine learning techniques, particularly generative models like Generative Adversarial Networks (GANs). Introduced by Ian Goodfellow and his colleagues in 2014, GANs are a class of deep learning models. Recent GAN research concentrates on enhancing image generation, enabling the creation of high-resolution images from lower-resolution versions. The trained model extrapolates realistic details during up-sampling, improving overall image quality.

GANs consist of two simultaneously trained neural networks, a generator and a discriminator. They are "Generative models acquire the ability to grasp the statistical distribution inherent in the training data, enabling the synthesis of samples that align with the acquired distribution" (Creswell, 2018, pp. 53-65). The generator creates new content, such as images, and the discriminator evaluates whether these creations are indistinguishable from real examples in the training dataset. Through this adversarial process, GANs can generate highly realistic and often visually stunning images, leading to a new realm of possibilities for artistic expression.

One of the landmark moments in AI art came with the creation of "DeepDream" by Google in 2015. DeepDream, based on convolutional neural networks, showcased the potential for neural networks to interpret and generate images in unique, surreal ways. "An image could never "be" just a word" (Chatonsky, 2016, p. 9). By amplifying and modifying patterns in existing images, DeepDream gave rise to dreamlike and hallucinogenic visuals, capturing the imagination of both the artistic and tech communities. DeepDream operates by restricting the activity of nodes at a layer specified by the user within the Deep Convolutional Neural Network (DCNN), which I will elaborate on in the chapter on technologies. Subsequently, the flow of information is inverted, leading to alterations in an input image until the network reaches a stable state. (Suzuki, 2017, p. 2). This project demonstrated the creative possibilities that

emerge when algorithms are given the freedom to reinterpret and augment visual content.

In subsequent years, artists and researchers began harnessing the power of GANs and other generative models to push the boundaries of traditional artistic expression. The collaborative nature of AI and human artists became a defining characteristic of this era. Artists like Mario Klingemann³, Memo Akten⁴, and Robbie Barrat⁵ (Hertzmann, 2019) embraced the role of co-creators, actively engaging with algorithms to guide and shape the generative process.

The democratization of AI tools also played a crucial role in the widespread adoption of AI in the arts. "The concept of democratizing artificial intelligence involves making machine-learning development accessible to a broader group of developers. In Microsoft's perspective, it is about bringing AI out of the exclusive domain and making it available to everyone" (Masood, 2019, p. 4). Open-source frameworks and user-friendly interfaces enabled a broader community of artists to experiment with and integrate AI into their creative workflows. Platforms like Runway ML and Google's Magenta provided accessible interfaces for artists to explore AI-driven creativity, lowering the barriers to entry and fostering a diverse ecosystem of AI art practitioners (Yang, 2017).

However, the rise of AI art has not been without challenges and ethical considerations. Questions of intellectual property, the potential for bias in algorithms, and the role of the artist in the creative process have become focal points of discussion (Hassine, 2019). The collaborative and iterative nature of AI art also prompts reflection on the evolving relationship between human artists and their machine counterparts.

The emergence of AI art is a testament to the dynamic interplay between technological innovation and artistic exploration. From the early experiments of pioneers to the contemporary collaborations between human artists and machine learning algorithms, AI art has evolved into a multifaceted and boundary-pushing field. The integration of AI tools into the creative process has not only expanded the possibilities of artistic expression but has also sparked conversations about the nature of creativity, authorship, and the ethical implications of algorithmic art.

What purposes does AI Art serve and who could it serve in the future?

AI art serves a myriad of purposes, ranging from expanding the boundaries of creative expression to influencing industries such as marketing and entertainment. As this field

³Artist and skeptic fascinated by neural networks, code, and algorithms. Exploring diverse interests like AI, deep learning, generative art, and more, their work questions and subverts various systems. They're intrigued by human perception and aesthetics, residing in Munich and co-running Dog & Pony gallery. Notable achievements include awards, residencies, and contributions to digital archives. They envision future machine artists surpassing human creativity, emphasizing the importance of a solid knowledge foundation

⁴Artist, musician, and researcher that delves into the intersections of science, spirituality, and technology. Nature serves as their primary inspiration, focusing on the underlying processes shaping the universe, life, and the mind. They write software, creating interactive systems for artistic expression, blending real-time computational elements. Holding a PhD in Artificial Intelligence, their interest spans technical and cultural aspects of AI and human-machine interaction

⁵artist and graphic designer who employs artificial intelligence as both a tool and medium he contributed to neural network applications for self-driving cars at NVIDIA, engaged in machine learning research for drug discovery at Stanford University

continues to evolve, it has the potential to serve diverse stakeholders, including artists, businesses, educators, and the broader public.

One primary purpose of AI art is the exploration of new creative frontiers. One of the earliest methods to attract notable attention in the field was DeepDreams, a technique introduced by Mordvintsev and colleagues (Cetinic, 2022, p.8). By leveraging machine learning algorithms, artists can break free from traditional constraints and push the boundaries of what is visually and conceptually possible. AI tools, such as GANs, enable artists to co-create with algorithms, producing artworks that blend human intuition with machine-generated innovation. This collaborative process introduces an element of unpredictability and experimentation, fostering a dynamic interplay between the artist's vision and the capabilities of the AI system.

Furthermore, AI art can democratize creativity by making artistic tools and processes more accessible.

An illustrative instance is Elaine Sturtevant, who reproduced the Flowers of Andy Warhol's Flowers series by acquiring the screen printing matrices from him and went on to curate an entire exhibition featuring Warhol's Flowers in 1991 (Schröter, 2019, p.308). This democratization empowers a more diverse range of creators, breaking down traditional barriers in the art world and fostering inclusivity.

During the economic boom that followed World War II, contemporary expressions of art's social mission surfaced, although artists had already embraced these ideas in the early to mid-1900s. (Booth, 2014, p.209).

In the realm of business and marketing, AI art serves the purpose of generating visually compelling and attention-grabbing content. Brands and advertisers are increasingly turning to AI-generated imagery to create eye-catching visuals for campaigns. "Smart advertisements can predict and understand the user's needs and desires across different contexts and specific time frames. They can provide tailored recommendations for specific offers to the user based on this understanding" (Li, 2019, p.335). AI tools can analyze trends and preferences in visual aesthetics, helping businesses tailor their creative content to resonate with target audiences. This application of AI in marketing aligns with the broader trend of utilizing technology to enhance the efficiency and impact of advertising strategies.

Additionally, AI art has found a place in the entertainment industry, contributing to the creation of immersive and visually stunning experiences. Video games, augmented reality applications and virtual reality, leverage AI to generate realistic and dynamic environments and Immersive Experiences (Hallur, 2021, P.29-34) even though AI itself has been part of the video game world since 1955 (Schaeffer, 1996, p. 1). The employment of generative models in game design allows for the development of procedurally generated landscapes and characters. This enhances the depth and intricacy of virtual worlds within games (Fairclough, 2001p.6).

In the future, AI art is positioned to have a crucial impact on education. offering innovative tools for learning and creative expression. AI-driven platforms can assist students in developing their artistic skills, providing personalized feedback and guidance. This aligns with the broader trend of integrating technology into education to enhance the learning experience and prepare students for the digital age. AI art tools could become valuable resources for educators seeking to inspire creativity and foster a deeper understanding of the intersection between technology and the arts. It can aid educators and students in cultivating an understanding of the ethical

considerations associated with AI. Art educators and AI artists operate at the crossroads of the societal viewpoint and technological progress (Dufva, 2023, p.205). Moreover, AI-generated content has the potential to serve as a source of inspiration for traditional artists. Machine learning algorithms have the capacity to analyze extensive datasets encompassing various artistic styles and movements. This capability equips artists with valuable insights into both historical trends and contemporary expressions in the realm of art (Sanakoyeu, 2018, p.3). This synthesis of human creativity and AI-driven analysis could and has resulted already to the emergence of new art movements and approaches, enriching the global artistic landscape.

In the realm of healthcare, the therapeutic potential of AI art is being explored. Art has long been recognized for its healing properties, and AI art introduces a new dimension to this therapeutic process. Creating art collaboratively with AI systems can be a form of self-expression and stress relief. Researchers are investigating how engaging with AI-generated art can positively impact mental well-being, providing individuals with a novel and interactive outlet for creative expression. The integration of AI art into medical education can contribute to the cultivation of humanistic physicians possessing essential soft skills like analytical reasoning, empathy, and receptive mindset (Park, 2023, p.1-3).

The potential societal impact of AI art extends to its role in challenging preconceived notions and biases (Srinivasa, 2021). Some artists and researchers are using AI as a tool to question and deconstruct societal norms, bringing attention to issues such as bias in algorithms and the ethical implications of technology. By using AI to create thought-provoking art, creators contribute to conversations around technology, ethics, and the societal implications of AI.

AI Art and Copyrights

AI art's unique challenges in copyright stem from blurred authorship lines. Questions persist on whether algorithms, data, or human-AI collaborations deserve legal protection, prompting a reevaluation of intellectual property frameworks.

Text and data mining

Artificial Intelligence has become a transformative force in the realm of art, reshaping creative processes and challenging conventional notions of authorship. As AI plays a growing role in generating artworks through methods like Generative Adversarial Networks (GANs) and text and data mining, questions surrounding copyrights and intellectual property rights have gained prominence.

AI raises intriguing questions about the definition of authorship ever since its involvement in the art creation process. Traditional copyright laws primarily attribute ownership to human creators (Rosati, 2019). However, with AI-generated art, the lines between human and machine contribution blur. For instance, in the case of GANs, where a generator produces art and a discriminator evaluates its authenticity, determining the primary creator becomes complex.

AI-generated art is a product of algorithms learning patterns from vast datasets, often including copyrighted material. While AI is a tool, it introduces a layer of autonomy in the creative process. Artists, using AI as a collaborator, guide and curate the output, but the algorithm also contributes creatively. This dual role complicates the assignment of authorship and challenges existing copyright frameworks.

Text and data mining (TDM) involves extracting valuable insights and enabling the discovery of new patterns and relations (Zammit, 2022, p.7) from large datasets, often through machine learning algorithms. In the context of AI art, TDM plays a crucial role in training models on extensive datasets of existing artworks, influencing the generative process. This mining of artistic data contributes to the creative capabilities of AI, impacting the resulting artworks' style, composition, and thematic elements. However, TDM raises questions about fair use and the extent to which copyrighted materials can be used for training AI models. When algorithms learn from copyrighted artworks, the generated content may carry traces of the original, potentially leading to legal challenges regarding the reproduction or transformation of copyrighted material. Some ambivalent and inconsistent attempts have been made by the EU e.g. in Articles 3 and 4 of the DSM Directive that provide: Member States shall provide for an exception to the rights provided for in Article 5(a) and Article 7(1) of Directive 96/9/EC, Article 2 of Directive 2001/29/EC, and Article 15(1) of this Directive for reproductions and extractions made by research organizations and cultural heritage institutions to carry out, for scientific research, text and data mining of works or other subject matter to which they have lawful access⁶. Meaning that E.U. Countries must permit cultural heritage institutions and research organizations to, for the reason of scientific research, conduct text and data mining excluding specific rights outlined in directives. The emergence of AI-generated art challenges copyright laws designed for human creators. In many jurisdictions, copyright protection is contingent upon human

⁶ELI: <http://data.europa.eu/eli/dir/2019/790/oj>

authorship, posing a hurdle when attributing rights to AI-generated works. Copyright laws typically don't recognize AI as a legal entity capable of ownership, leading to uncertainties in establishing copyright claims.

The issue becomes even more complex when considering collaborative efforts between humans and AI (Rosati, 2019). While artists guide and shape the AI's creative process, the algorithm's autonomous generation introduces a layer of uncertainty about authorship. This raises questions about joint authorship and whether AI should be granted some form of legal recognition in the creative process.

Exceptions in copyright laws, such as fair use, enable the utilization of copyrighted material for purposes like criticism, commentary, or transformative use. In the context of AI art, the transformative nature of the creative process is a key consideration. When AI algorithms transform and reinterpret existing works into something new, they challenge the traditional understanding of copyright infringement.

Yet, establishing what qualifies as fair use in AI art remains a matter of subjectivity. The fair use analysis takes into account the extent of transformation, the purpose behind the use, and the impact on the market for the original work. Courts are expected to play a pivotal role in setting precedents and defining the limits of fair use concerning AI-generated art.

As AI art and TDM gain prominence, legal systems worldwide are grappling with these challenges. While some jurisdictions are adapting existing copyright frameworks to accommodate AI-generated works, others are considering the creation of new legal categories to address the unique characteristics of AI creativity.

International collaboration is essential, given the borderless nature of digital art. Harmonizing copyright laws and establishing clear guidelines for AI-generated art on a global scale can provide a more consistent and predictable legal landscape for artists, developers, and the broader creative community.

Digital artworks

The creation of digital artworks has undergone a revolution with the advent of artificial intelligence. By enabling machines to generate visually stunning and conceptually rich pieces. Techniques such as GANs and deep learning algorithms empower AI to produce intricate digital compositions, ranging from images and animations to interactive installations. This shift in the creative process introduces a collaborative dynamic between human artists and algorithms.

But why would artists use AI in the first place to make art? The best answer would be, curiosity and experimentation. Artists embrace AI as a tool for its capacity to spark curiosity and facilitate exploration beyond conventional boundaries. The allure lies in AI's potential to generate novel, unpredictable outcomes, challenging traditional artistic processes. Even when Technology was created for any purpose other than art, artists still somehow managed to find ways to use it as such, Maybe the best example of this approach is the camera. As Ruth Catlow says, Artists understand that exploring the potential of the non-existent involves collaborating with its limitless potential, taking action, experimenting, and creating. Through these endeavors, they bring forth and shape its eventual existence” (Catlow, 2017, p.22). AI is no different in this case, as such we can classify it as a tool for art, albeit a different one. Until now we have distinguished between Traditional and Digital art, now we have come to the point of

distinguishing between Digital and AI art. Traditional art, rooted in centuries of manual craftsmanship, encompasses mediums like painting, sculpture, and drawing. In contrast, the advent of Digital art marked a revolutionary shift, with artists leveraging digital tools to create visually compelling works. However, the emergence of AI has blurred these boundaries, leading to the evolution of a new category: AI art. This intersection introduces Generative Art (Boden, 2009, p.23), a term coined in 1965, indicating computer-generated artistic expressions.

Digital art marks a revolutionary departure from traditional artistic practices, embracing the vast possibilities offered by technology (Brey, 2018). Unlike conventional mediums like painting or sculpture, digital art leverages electronic devices and software for creation. Artists employ tools like graphic tablets, digital brushes, and 3D modeling software to craft visually stunning pieces. The digital canvas allows for unparalleled flexibility, enabling artists to experiment with colors, textures, and forms in ways previously unimaginable. Moreover, the medium facilitates seamless collaboration between different artistic disciplines, merging visual art with technology. Digital art has become a dynamic and inclusive platform, democratizing artistic expression and transcending geographical boundaries (Drucker, 2013). From digital painting to interactive installations, this genre continually evolves, pushing the boundaries of creativity. It not only transforms the artistic process but also challenges traditional notions of art, opening new avenues for innovation and expression in the contemporary art landscape.

Digital artworks generated by AI possess unique characteristics that distinguish them from traditional forms of art. The algorithmic nature of the creative process introduces an element of unpredictability and novelty, often leading to outputs that human artists might not conceive through conventional means. Unlike human artists who draw upon learned techniques, experiences, and cultural influences, AI algorithms operate within the expansive realm of data, traversing vast landscapes of information to identify patterns and generate outputs that often surprise even seasoned creators (Zhang, B., 2023). This process of algorithmic exploration enables AI to produce art that is not constrained by pre-existing notions, cultural biases, or learned techniques. Challenging our preconceived notions about the creative process and forces us to reconsider the role of intent and control in artistic expression. Moreover, AI art serves as a mirror reflecting the vastness of the digital landscape from which it draws inspiration. In a world inundated with information, AI algorithms sift through data points, cultural references, and diverse perspectives, creating a rich tapestry of influences that converge in the final artistic output. This process reflects the complexity of the digital age, where information flows seamlessly across boundaries, transcending cultural, geographical, and temporal constraints. AI art, in essence, becomes a reflection of the interconnected nature of our globalized world, embodying the diversity and richness of the data it processes.

The algorithms are designed to explore vast possibilities rendering it impossible for the user to have full control over the AI tool's functioning (Hauhio, 2023, p.3). Artists harness AI's non-deterministic nature to introduce an element of unpredictability, emphasizing the allure of working with a material that defies easy control. The explicit desire for unpredictability, the inherent complexity of AI as a material contributing to its expressiveness, and the role of errors and accidents in the creative process.

(Caramiaux, 2022)Balancing desired unpredictability with unwanted uncontrollability

becomes a challenge in the artistic use of AI, as artists seek a harmonious interplay with the technology's non-deterministic nature. This unpredictability and originality challenges existing copyright frameworks, as that of authorship becomes intertwined with the autonomy of the AI system. However, It is crucial to emphasize that entirely random behavior may be unpredictable but that would not make it autonomously creative (Hauho, 2023, p.4).

The challenges surrounding copyrights in the digital realm extend beyond the mere creation of art. Digital artworks often rely on vast datasets for training AI models, potentially including copyrighted material. This prompts inquiries into the utilization the use of copyrighted material in the training process and the legal implications of AI-generated art that may bear traces of copyrighted works. As the digital art landscape evolves, legal frameworks must adapt to address these nuanced challenges. According to Jessica L. Gillotte, "using copyrighted works to train AI is Fair Use" (Gillotte, 2019, p.2679) because no single factor among the criteria used to determine fair use is individually decisive or conclusive. In evaluating fair use, a court or legal decision-maker should assess all relevant factors together. No single factor inherently decides the fairness of use, and the doctrine application of fair use should be evaluated on a case-by-case basis., adapting to specific circumstances (Campbell v. Acuff-Rose Music, Inc., 510 U.S. 569 (1994), <https://supreme.justia.com/cases/federal/us/510/569/> accessed by 27.09.2023).

The notion of fair use, a legal principle allowing the utilization of copyrighted material under particular circumstances, has become significant in the domain of AI-generated digital art.

The rapid evolution of technology demands a dynamic approach to copyright law. As AI continues to redefine creative boundaries, legal frameworks must adapt to accommodate the collaborative and transformative nature of digital art creation (Xiao, 2023). The intersection of technology, creativity, and copyright law requires an agile response to emerging challenges, striking a balance between safeguarding intellectual property and fostering innovation.

Transactions

In the digital age, transactions involving AI-generated art often occur in digital marketplaces and virtual spaces. Blockchain⁷ technology, recognized for its decentralized and transparent characteristics, is increasingly employed to verify the provenance, authenticity, and ownership of digital artworks like Non-fungible tokens (NFTs) are distinct digital assets that signify ownership or authenticate digital or physical items., often using blockchain technology (Akritidou, 2022, p.17). Smart contracts, coded agreements that self-execute terms, are crucial in automating and securing these transactions, extending to some degree to AI art. This digital infrastructure addresses some of the challenges in verifying the authenticity and ownership of AI-generated artworks.

Determining ownership in the context of AI-generated artworks introduces a host of challenges. Traditional copyright laws, designed with human authors in mind, struggle

⁷ A decentralized , distributed ledger technology , that is tamper-resistant. It securely records transactions across a computer network. Each block in the chain includes a timestamp and a link to the previous block, ensuring transparency and verifiability.. It's widely used in cryptocurrencies and various industries for transparent and secure record-keeping

to adapt to the collaborative nature of AI art creation (Rosati, 2019). The autonomy of AI algorithms and the dynamic interplay between human artists and machines complicate the attribution of rights. Consequently, clear delineation of ownership becomes a crucial aspect of copyright transactions involving AI-generated art. Smart contracts present a compelling solution for establishing and automating ownership in AI art transactions. Implemented on blockchain platforms, these contracts can encode ownership rights, licensing terms, and royalty mechanisms directly into the code (Ouyang, 2022 p14284). As AI-generated artworks change hands, the transparent and tamper-proof nature of the blockchain ensures a verifiable and immutable record of ownership, addressing concerns related to provenance and authenticity.

AI art transactions often involve licensing agreements that dictate the terms under which the digital artwork can be used, and reproduced, Thus licensing becomes a nuanced negotiation between the creators, owners, and potential users of the AI-generated art. These agreements can outline the extent of usage, duration, and any constraints on modifications, establishing a legal framework for the permissible utilization of the digital creation.

Furthermore, the use of AI in the creative process allows for the creation of unique licensing models. For instance, artists and creators may employ AI algorithms to generate personalized versions of their artworks for individual buyers, introducing a new dimension to limited edition and customized art transactions.

Given the global nature of digital transactions and AI-generated art, international perspectives on copyright and ownership must be considered (Xiao, 2023). Legal frameworks vary across jurisdictions, and harmonizing these laws presents a significant challenge. International collaboration is crucial to establish unified standards, fostering a more predictable and consistent environment for AI art transactions on a global scale.

As transactions involve AI-generated art, questions about the proprietary nature of algorithms and their impact on the final output become paramount. Algorithms are often considered trade secrets, raising concerns about transparency and accountability in the transaction process. Balancing the need to protect proprietary information with the desire for transparency is an ongoing challenge in algorithmic art transactions.

The future of AI art transactions holds both challenges and opportunities. Developing standardized frameworks for licensing agreements, leveraging blockchain and smart contracts for transparent ownership, and addressing the complexities of copyright in the digital age will shape the evolution of AI art transactions. As the field continues to advance (Rosati, 2019), the collaboration between legal experts, technologists, and artists will play a pivotal role in establishing ethical, transparent, and equitable practices in the world of AI-generated art transactions.

Some of these questions I will try to further analyze below.

Technology

Generative algorithms in AI art meld technology with the creative process. These algorithms, fueled by extensive datasets, collaboratively transform human intentions, sparking a dynamic interplay that redefines artistic creation. Some of the most prominent technologies utilized in AI Art are the following:

Generative algorithms and the creative process

At the core of AI art lies the utilization of generative algorithms, which form the technological backbone of the creative process. These algorithms, particularly Generative Adversarial Networks (GANs) and recurrent neural networks are trained on vast datasets of existing artworks. Through this training, the algorithms learn patterns, styles, and structures inherent in various artistic genres. Once trained, they can autonomously generate new, original pieces of art by combining and reinterpreting these learned elements.

Generative algorithms enable artists to break free from conventional constraints, fostering a symbiotic relationship between human intuition and machine-driven exploration. This cooperative method challenges the conventional role of the artist as the solitary creator, introducing a dynamic interplay between the artist's vision and the capabilities of the algorithm. Creativity must be with intention and control is the important part of an intentional creative process. Artists actively engage with these algorithms, guiding the generative process and influencing the final output to align with their artistic vision.

Deep learning and neural networks

Deep learning, a subdivision of machine learning, is a key technology driving advancements in AI art. Deep learning algorithms rely significantly on neural networks, drawing inspiration from the complex structure of the human brain. These networks consist of layers of interconnected nodes, each layer contributing to the learning and abstraction of different features.

In the context of AI art, deep learning models analyze and understand intricate patterns in artistic styles. Convolutional Neural Networks (CNNs), for example, excel at image recognition tasks and are often employed to discern visual elements in artworks. Recurrent Neural Networks (RNNs) capture sequential dependencies, making them adept at generating coherent and contextually relevant pieces, such as text or sequential art.

Generative Adversarial Networks

Introduced by Ian Goodfellow and colleagues in 2014 (Goodfellow, 2020), Generative Adversarial Networks (GANs) have become a fundamental aspect of AI art. GANs function on the intriguing concept of competition between two neural networks – a generator and a discriminator. The generator produces new content, like images, while

the discriminator assesses whether these creations are indistinguishable from real examples in the training dataset.

This adversarial training process leads to the generation of highly realistic and visually compelling images. GANs have unlocked a new frontier in artistic possibilities, allowing for the creation of artworks that blur the line between algorithmically and human generated content. The dynamic interplay between the generator and discriminator in GANs results in the production of visually stunning and often surreal artworks, expanding the limits of what is deemed attainable in the domain of AI-generated art.

Deep Convolutional Neural Network (DCNN)

A Deep Convolutional Neural Network is a neural network specially designed for tasks related to visual data, such as recognizing images and videos.. The "convolutional" aspect refers to the use of convolutional layers, which are specialized layers for processing spatial hierarchies in data. These layers are effective in capturing patterns and features in images. The "deep" part signifies that these networks typically consist of multiple layers, allowing them to learn hierarchical representations of features, from simple to complex. DCNNs have showcased remarkable efficacy in tasks related to computer vision. , including image generation, object detection image classification, among others. They leverage convolutional operations to efficiently extract and learn Features arranged in a hierarchical structure are from input data; making them powerful tools in various AI applications related to visual information. (Suzuki, 2017,p. 2).

Techniques

While most AI Art algorithms use a combination of the aforementioned technologies some are specialized in a specific style or technique.

Style Transfer and transformative techniques

Style transfer is another innovative technique in AI art that leverages deep neural networks. This method entails transferring the content of one image to the visual style of another. creating a hybrid artwork that merges different artistic characteristics. Thus style transfer showed the effective utilization of CNNs⁶ ito generate stylized images by isolating and blending the content and style of the image (Cetinic, 2022, p.8). Artists can experiment with diverse styles, seamlessly blending elements from various genres and periods.

Neural style transfer, popularized by the work of Gatys et al (Cetinic, 2022, p.8), enables the transfer of stylistic features from one image to another. This approach enables artists to explore new realms of creativity, producing artworks that amalgamate the aesthetics of different artists or art movements. Style transfer⁸

⁸Convolutional Neural Networks (CNNs) are specialized deep learning models designed for visual data processing. They use convolutional layers to automatically and adaptively learn spatial hierarchies of features from input images. CNNs excel in tasks like image recognition, object detection, and image classification due to their ability to capture intricate visual patterns.

exemplifies how AI technologies can be harnessed to foster experimentation and redefine the boundaries of artistic expression.

Algorithmic serendipity and unpredictability

One of the captivating aspects of AI art is its embrace of algorithmic serendipity. By relinquishing some control to the algorithm, artists open themselves up to unexpected and novel outcomes. The inherent unpredictability of generative models often leads to discoveries that may not have been conceivable through traditional artistic methods. Unpredictability in AI art has 3 categories, Stochastic unpredictability, refers to indeterministic unpredictability that cannot be predicted by the observer. Chaotic unpredictability refers to deterministic but chaotic processes. And Mixed-cause unpredictability which is a combination of both stochastic and chaotic unpredictability. Most AI generative Programs use the last (Hauhio, 2023).

This element of chance adds a layer of excitement and exploration to the creative process, challenging artists to embrace uncertainty and view it as a source of inspiration. Algorithmic serendipity introduces an element of playfulness and experimentation, encouraging artists to push the boundaries of their creative imaginations.

Interactive AI Art and human-machine collaboration

Beyond mere automation or replication of existing artistic styles, AI art is evolving into a realm of interactive and collaborative experiences. Artists are increasingly viewing AI algorithms not as substitutes for human creativity but as collaborators in a creative dialogue. This interactive approach is exemplified by artists like Mario Klingemann, who actively engages with algorithms, and fine-tuning parameters, guiding the generative process to achieve the desired aesthetic outcome (Hertzmann, 2019). Human-machine collaboration in AI art challenges the creative process. It highlights the potential for AI to serve as a tool for artists, amplifying their creative capabilities and enabling them to explore new frontiers of artistic expression. This collaborative paradigm underscores the dynamic relationship between human intuition and machine-driven exploration, emphasizing the potential for synergy in the realm of AI-generated art.

Databases

At the core of AI art lies the concept of training databases, and vast repositories of diverse artistic styles, genres, and compositions. These databases serve as the raw material from which machine learning algorithms, glean insights and learn intricate patterns. The algorithms analyze the nuances of existing artworks, discerning elements such as brushstrokes, colour palettes, and composition (Zhou, 2022, p.1110). The depth and diversity of these training databases influence the richness and complexity of the generated artworks. A well-curated database allows algorithms to capture a broad spectrum of artistic styles, enabling them to produce outputs that range from traditional to avant-garde. The dynamic interplay between the training

data and the algorithm's capacity to extrapolate from it forms the foundation of the creative process in AI art.

The composition of training databases significantly impacts the diversity and innovation achievable in AI-generated art. Databases encompassing a wide array of artistic movements, cultural influences, and historical periods empower algorithms to traverse a vast artistic landscape (Zhang, B., 2023). The inclusion of diverse styles – from classical to contemporary, abstract to realism – enriches the algorithm's understanding and allows it to produce artworks that transcend singular aesthetic boundaries.

However, the concept of diversity extends beyond artistic styles. Databases that encapsulate cultural, geographical, and individual variations contribute to fostering a more inclusive and globally diverse AI art environment. The democratization of artistic expression through AI hinges on the inclusivity of training databases, ensuring that the technology reflects and appreciates the myriad perspectives within the human artistic experience (Brey, 2018).

While databases fuel the creative engines of AI art, they also present challenges, particularly in the realm of bias (Hassine, 2019). Training databases, if not carefully curated, can unintentionally propagate and magnify biases inherent in the data. This raises ethical considerations as the AI algorithms may inadvertently replicate and accentuate societal and historical biases ingrained in the training data.

Addressing bias in databases requires a conscientious effort to curate diverse and representative datasets (Hassine, 2019). Additionally, advancements in AI research are focusing on developing algorithms that are more resilient to biases and capable of recognizing and mitigating them during the generative process. Striking a balance between harnessing the creative potential of databases and mitigating ethical concerns is crucial for the responsible evolution of AI art.

The size of training databases and the computational power required to process them are critical factors influencing the scale and complexity of AI art generation. Larger databases, encompassing a broader range of artistic expressions, empower algorithms to capture intricate details and nuances. However, the sheer volume of data poses challenges in terms of processing efficiency and computational resources.

Advancements in hardware and algorithms are continually pushing the boundaries of database size that can be effectively utilized in AI art. The quest for larger and more diverse datasets is intricately linked to the pursuit of creating AI-generated art that transcends the boundaries of what has been traditionally conceivable.

The curation of training databases involves a dynamic interplay between human expertise and machine-driven exploration. While algorithms autonomously analyze and learn from data, human curators play a pivotal role in shaping the content and diversity of training databases. Human expertise is crucial in selecting representative artworks, identifying gaps in cultural or stylistic diversity, and ensuring ethical considerations are prioritized (Zhou, 2019, p1107).

Collaborative curation reflects the symbiotic relationship between human intuition and machine learning algorithms in the realm of AI art. It underscores the potential for a harmonious partnership where human expertise guides algorithmic exploration, resulting in training databases that encapsulate the collective wisdom and creativity of both human and machine contributors.

The landscape of AI-generated art is not static; it evolves in tandem with shifts in artistic trends and preferences. Training databases, as living entities, must adapt to reflect contemporary artistic expressions. This dynamic evolution involves regularly updating databases to incorporate emerging styles, new movements, and the evolving narratives of the art world.

The adaptability of databases ensures that AI-generated art remains relevant and resonates with contemporary audiences. It also reflects the iterative nature of the generative process, where algorithms continuously learn and refine their outputs based on the evolving artistic landscape.

As AI art continues to advance, the role of databases is poised to evolve further. Future trajectories include the development of more sophisticated algorithms that can leverage smaller, more specialized databases efficiently. Additionally, advancements in federated learning, a decentralized approach to machine learning, may enable AI models to learn from a distributed network of databases without centralizing data. The integration of AI-generated art into virtual and augmented reality experiences adds another dimension to the role of databases (Latoschik, 2023). These immersive platforms require databases that not only capture visual styles but also incorporate spatial and interactive elements, opening new frontiers for creative exploration.

Ethical and philosophical considerations

Mitigating the threats in the AI art landscape requires a multi-faceted approach encompassing education, ethical frameworks, and collaborative initiatives. Artists, developers, and stakeholders must be equipped with a comprehensive understanding of the ethical implications of AI art, from the potential biases in algorithms (Hassine, 2019) to the risks associated with data privacy and cybersecurity.

Establishing ethical frameworks for AI art creation involves ongoing dialogues within the community, adherence to best practices, and a commitment to responsible innovation. Educational programs that raise awareness about the ethical considerations in AI art can empower creators to navigate the digital canvas responsibly, fostering a sustainable and ethically conscious environment.

The exploration of whether AI-generated art qualifies as original and determining ownership rights remains a complex question. To such creations remains a topic of debate. The convergence of artificial intelligence and the realm of art also brings to the forefront broader societal discussions about the implications of artificial intelligence on various aspects of human life, from creativity and culture to intellectual property and the future of work. Some argue that AIs can't participate in these conversations due to their lack of sentience and awareness (Galanter, 2020), but I will not delve further into the subject of Machine-ethics. But the same can't be said about how humans use the results of their functions. The ethical aspects of art contribute to the formation of a virtuous society, as argued by (Brey, 2018). Consequently, art can play a constructive role in influencing the exploration, advancement, and assessment of technologies related to the ethics of artificial intelligence.

As AI art continues to evolve, it brings forth a host of considerations. The use of algorithms in the artistic journey prompts inquiries into the concepts of authorship, originality, and the role of the artist in the digital era. The collaborative nature of AI art challenges traditional narratives of the solitary artist, prompting a reevaluation of the

creative process as a dynamic interplay between human and machine (Cetinic, 2022). One of the primary threats in the AI art landscape revolves around ethical concerns embedded in the algorithms driving creative processes. AI models, including generative systems used in AI art, learn from vast datasets, and if these datasets carry inherent biases, they may manifest in the generated artworks. Unethical decisions may arise from biases present in the training data, compounded by algorithmic biases, (Srinivasan, 2021, p.43). Bias in AI art not only perpetuates existing stereotypes but also raises questions about the societal impact of algorithmically-driven creativity. Addressing this threat requires meticulous curation of training datasets to ensure diversity and representation. Ethical guidelines for AI artists, developers, and organizations involved in AI art creation are crucial to fostering a responsible approach to algorithmic creativity. The ongoing dialogue around ethics in AI art is integral to shaping a future where these technologies contribute positively to cultural and artistic landscapes (Zhang, B., 2023).

The advent of AI-generated art blurs the lines of authorship, leading to potential threats to intellectual property and an uptick in plagiarism concerns. As algorithms learn from extensive datasets, there is a risk that AI-generated artworks may unintentionally replicate existing pieces or styles too closely, raising questions about the originality and authenticity of the creations.

Navigating these threats requires a reevaluation of intellectual property frameworks to accommodate the collaborative nature of AI art. Clear guidelines for attributing authorship and ownership in collaborative AI-human creations can mitigate risks related to plagiarism and ensure a fair and transparent environment for artists and stakeholders.

The rise of AI art brings forth concerns about the misuse of AI-generated content, particularly in the context of deepfakes. Deepfake technology, which leverages AI to create hyper-realistic videos or images, poses risks to individuals' reputations and can be exploited for malicious purposes (Masood, 2023). While AI art may not inherently produce deepfakes, the broader landscape of AI-generated content underscores the need for vigilance against potential misuse.

Mitigating this threat involves developing robust authentication mechanisms to verify the authenticity of AI-generated artworks. Additionally, public awareness and education (Williams, 2023) regarding the potential for misuse of AI-generated content are essential to fostering responsible consumption and interpretation of digital creations.

Securing the AI art ecosystem necessitates robust cyber security measures, including encryption, secure development practices, and ongoing monitoring for potential vulnerabilities. Collaborative efforts between the AI art community, cyber security experts, and platform developers are crucial to fortifying defenses against cyber threats (Gupta, 2023).

The collaborative nature of AI art, where algorithms interact with vast datasets, raises significant concerns about data privacy (Zhang, 2023). Artists and organizations involved in AI art creation must grapple with the responsibility of handling sensitive data, especially when training algorithms on diverse datasets that may include personal or proprietary information.

Safeguarding data privacy in the AI art landscape involves adopting privacy-preserving techniques, adherence to established data protection regulations and data

anonymization. Transparency about data usage practices and informed consent from individuals contributing to training datasets are essential components of a privacy-conscious approach in AI art creation.

AI algorithms, particularly those used in generative models, frequently function as complex black boxes (Castelvecchi, 2016), rendering the comprehension of the decision-making processes behind AI-generated art a challenging endeavor. The lack of explainability raises concerns about accountability, especially when biased or controversial artworks emerge (Srinivasa, 2021).

Addressing this threat involves advancing research in explainable AI, ensuring that artists and developers can understand and articulate how algorithms make creative decisions. Transparent documentation of AI art creation processes and open communication about the limitations of algorithms contribute to algorithmic accountability, fostering trust within the AI art community and beyond.

While AI art presents innovative possibilities, there is a threat of over-reliance on algorithms, potentially leading to the dehumanization of creativity (Rhee, 2018). If artists become overly dependent on AI tools, there is a risk of diminishing the human touch and intuition that defines traditional artistic expression. This threat prompts a reflection on the balance between leveraging AI as a tool and preserving the essence of human creativity in the artistic process.

Navigating this challenge involves promoting a collaborative approach where AI is viewed as a complement to human creativity rather than a replacement. Encouraging artists to actively engage with and guide AI algorithms ensures that the human element remains central to the creative process, preventing the erosion of the unique qualities that define human artistry.

The environmental sustainability of AI art also presents an ethical challenge. On one hand, the computational demands for training sophisticated algorithms contribute to a notable carbon footprint, raising concerns about energy consumption. Large-scale AI art projects, requiring extensive computational resources, can have environmental implications. On the other hand, there's a growing awareness within the AI community about the need for sustainable practices (Jääskeläinen, 2022).

The environmental impact of AI art primarily stems from the energy-intensive process of training deep learning models. The computational power required for training these models, especially for large-scale projects, contributes significantly to carbon emissions. Data centers, where much of this computation takes place, demand substantial electricity, often sourced from non-renewable energy. The environmental toll raises concerns about sustainability. Efforts to mitigate this impact include optimizing algorithms for efficiency, adopting energy-efficient hardware, and promoting the use of renewable energy sources in data centers. Balancing the creative potential of AI art with environmentally responsible practices is crucial for minimizing its overall carbon footprint. (Jääskeläinen, 2022). Efforts include optimizing algorithms, adopting energy-efficient hardware, and promoting renewable energy sources. Balancing the innovative potential of AI art with environmental responsibility is imperative. Collaborative initiatives among artists, researchers, and tech companies are essential to develop and promote eco-friendly practices, ensuring that the creative process aligns with global sustainability goals.

AI in other creative domains

While visual art has been a primary focus of AI applications, the influence of AI extends into other creative domains. e.g. music. Autotune, an AI technology with a history spanning over two decades, serves as one of the earliest tools designed to automatically correct vocal intonation errors. (Cetinic, 2022). AI-generated compositions have gained attention. Platforms like Jukedeck employ machine learning algorithms to create royalty-free music, allowing users to customize parameters such as tempo, mood, and instrumentation to generate unique musical compositions. In literature, GPT-3 and similar AI models have showcased the capability to produce cohesive and contextually fitting text, giving rise to the concept of "machine-authored" or "augmented" writing (Alarie, 2021). Writers and artists have utilized AI to create poetry, stories, and even entire articles, blurring the lines between human and machine-generated content. The collaborative interplay between human writers and artificial intelligence (AI) systems. In this symbiotic relationship, AI algorithms analyze vast datasets to offer suggestions, generate ideas, or even co-author content. Writers leverage these insights to enhance creativity, streamline processes, and explore novel perspectives. This synergy between human intuition and machine capabilities marks a transformative shift in various creative domains, from literature to journalism. In the field of design, AI has become a valuable ally in the creation of visual content. Graphic designers and artists leverage AI tools to automate repetitive tasks, enhance image processing, and even generate new design elements. by examining user preferences, historical data, and analyzing design trends, AI algorithms can inspire and inform the creative process. This collaboration between human designers and AI-driven tools accelerates the design workflow, allowing for more experimentation and innovation in various visual mediums(Shafran, 2023). Culinary arts, traditionally an arena dominated by human intuition and creativity, are also experiencing the transformative impact of AI. AI systems analyze flavor profiles, ingredient combinations, and cultural culinary traditions to suggest innovative recipes (Cromwell, 2015). AI-powered cooking assistants can guide chefs and home cooks alike, providing insights into optimal cooking techniques and flavor pairings. The application of AI in diverse creative fields underscores the versatility of these technologies. As AI continues to advance, we will likely witness further integration and exploration in various artistic disciplines.

Copyright

Unlike traditional artworks where a human artist is the sole creator, AI art involves a collaborative interplay between human creators and algorithms. The algorithm, typically a generative model trained on vast datasets, contributes significantly to the creative process, making it difficult to attribute authorship solely to a human artist. This blurring of lines raises fundamental questions about who can be considered the "author" of AI-generated art and how copyright, a legal framework designed for human creators, applies in this context. Current copyright laws are built on the premise of human authorship, introducing complexities when applied to AI-generated creations. In many jurisdictions, copyright protection is contingent upon the work being the result of human intellectual effort. As

a result, AI-generated art, which involves a machine-driven creative process, challenges the traditional criteria for copyright eligibility (Stokes, 2021). Legal scholars and practitioners grapple with the need for a reevaluation of copyright laws to accommodate the nuances of AI-generated art. Some argue for an expansion of the definition of authorship to include collaborative efforts between humans and machines, while others advocate for a new category of protection specifically designed for AI-generated creations or Algorithmic Authors (Xiao, 2023).

The issue of ownership further complicates the copyright landscape in AI art. In traditional artistic collaborations, the contributors typically negotiate and agree upon ownership rights. However, the autonomous nature of AI algorithms introduces a layer of unpredictability. Determining who owns the rights to an AI-generated artwork becomes a multifaceted challenge that involves considering the contributions of the human artist, the entity that owns the AI model, and the training data that shaped the algorithm.

And all that without the IP rights of Databases and algorithms, or rather the code itself, as they too are protected as computer programs and by if secret, whether in code or not, by the law of confidence (Blumberg, 1966). Patents may also apply

Without clear guidelines, disputes may arise over ownership and control, leading to legal ambiguities and potential conflicts between artists, AI developers, and other stakeholders. Establishing frameworks that address ownership in the context of AI art is crucial to fostering fair and transparent relationships among collaborators.

Distinguishing between AI as a tool and AI as a creator is a pivotal aspect of addressing copyright concerns in AI art (Xiao, 2023). While AI algorithms contribute significantly to the generation of artworks, they are ultimately tools employed by human artists. This perspective emphasizes the role of the human artist as the primary creative force, with AI serving as a sophisticated tool or medium through which the artist realizes their vision.

This distinction aligns with existing copyright principles that grant protection to the expressive choices and creative input of human authors (Stokes, 2021). It suggests that copyright ownership should be attributed to the human artist who directs and shapes the AI's creative output rather than to the AI algorithm itself.

Many proponents of traditional copyright frameworks argue that true creativity involves uniquely human qualities such as intention, emotion, and consciousness. While AI can analyze patterns, mimic styles, and generate new content, it lacks the subjective, emotional depth that human creators infuse into their works. This perspective asserts that copyright protection should be reserved for creations that bear the unmistakable imprint of human creativity (Stokes, 2021).

However, this perspective raises questions about the criteria for determining the threshold of human creativity. As AI technologies advance, they may develop capabilities that more closely emulate human creativity, challenging the notion that emotional depth is an exclusive domain of human artists.

For purposes such as criticism, commentary, and education, the concept of fair use is a doctrine within copyright law that allows the limited use of copyrighted material without permission. (Stokes, 2021), also comes into play in the context of AI-generated art. The transformative nature of AI-generated artworks, which often remix and reinterpret existing styles, may align with the principles of fair use.

However, the application of fair use in AI art introduces complexities. Determining the transformative nature of an AI-generated artwork, the amount of original content it incorporates, and the impact on the market for the original work are subjective evaluations that can vary widely. To ensure a fair balance between the rights of the original creators and the potential transformative uses of AI-generated works, clear guidelines and precedents specific to AI art are necessary.

In the absence of clear legal frameworks, artists, AI developers, and other stakeholders often turn to licensing and contractual agreements to define the terms of collaboration, ownership, and usage rights. These agreements can be tailored to address the unique challenges posed by AI art, allowing collaborators to establish clear guidelines for the distribution of royalties, attribution, and any limitations on the use of the generated artworks.

However, the effectiveness of contractual agreements depends on the parties involved and their understanding of the complexities inherent in AI art. Standardizing contractual templates or developing industry-wide best practices could provide a more streamlined and consistent approach to addressing copyright concerns in AI-generated art (Xiao, 2023).

The global nature of the art world and the borderless digital landscape underscore the importance of international cooperation and harmonization of copyright laws concerning AI art. Achieving consistency in legal frameworks can facilitate a more cohesive and equitable approach to addressing copyright concerns across jurisdictions. When grappling with the challenges presented by AI-generated works, even the World Intellectual Property Organization (WIPO), essential in shaping global intellectual property (IP) standards, faces limitations. The existing legal framework under WIPO primarily focuses on human-centric aspects of intellectual property, and there's a noticeable gap when it comes to addressing the unique issues presented by AI-created content⁹.

International organizations and legal bodies play a crucial role in establishing guidelines and standards that reflect the collaborative and cross-border nature of AI art. Harmonization efforts could contribute to a more predictable and accessible legal environment for artists, AI developers, and stakeholders engaged in the production and distribution of artworks Generated by AI.

As AI art continues to evolve, the legal framework surrounding copyright will likely need to adapt to accommodate the unique challenges posed by machine-generated creativity. Legal scholars, policymakers, and stakeholders in the art and technology sectors must engage in ongoing dialogue to develop robust and flexible legal frameworks that balance the rights of human creators, foster innovation, and address the intricacies of AI-generated art.

Ultimately, the intersection of AI and copyright in the realm of art necessitates a nuanced and forward-thinking approach. By considering the distinctive features of AI-generated creativity, respecting the contributions of human artists, and fostering collaborative solutions, the legal landscape can evolve to provide clarity and fairness in navigating the digital canvas of intellectual property in the age of AI art.

⁹<https://bit.ly/36bkoYh>.

Originality and Authenticity

The intersection of artificial intelligence (AI) and art sparks a complex discourse on the concept of authenticity and Originality (Morris, 2010). In traditional art, authenticity often revolves around the originality and uniqueness of an artwork, rooted in the artist's hand and creative intent.

AI art introduces a unique dynamic where algorithms act as co-creators. The human artist sets the stage, defining parameters, curating datasets, and guiding the algorithmic exploration, thus prompting a reevaluation of what it means for an artwork to be authentic in the context of machine-generated creativity.

AI art transcends mere automation; it introduces a collaborative paradigm where human artists and machines engage in a dynamic creative dialogue. Artists like Mario Klingemann actively collaborate with algorithms, shaping the generative process to align with their vision (Hertzmann, 2019). This collaborative approach challenges the traditional markers of authorship, emphasizing a symbiotic relationship between human intuition and machine-driven exploration. The artist becomes a conductor, orchestrating the symphony of algorithms to produce something that goes beyond the purely human or the purely artificial (Cetinic, 2022). The result is a polymerization, giving rise to artworks that bear the imprint of both worlds, as we can see with the case of the "Portrait of Edmond Belamy".¹⁰

In the realm of AI art, the concept of originality transforms. Unlike traditional artworks valued for their unique physical manifestations, AI-generated pieces challenge this norm by producing an infinite number of variations (Cetinic, 2022). The emphasis shifts from the singularity of a physical object to the uniqueness embedded in the algorithms and the potential for endless iterations.

This emergent creativity introduces an element of unpredictability, challenging artists to embrace the unexpected and find inspiration in the "chaotic" outcomes of algorithmic processes. It has the potential to empower artists but poses a risk of "unlearning" creativity. Automatic systems offer convenience but may hinder genuine artistic development, lacking symbolic depth.

The role of the artist is redefined in the context of AI art. Rather than being the sole creator, artists become orchestrators of algorithms, curating the creative process. This dynamic challenges the myth of the solitary artist, introducing a collaborative element where human creativity intersects with machine intelligence.

As I previously stated, the innovation inherent in AI art lies in the algorithms themselves, particularly models that learn patterns from datasets and generate new, and unpredictable, content. Artists relinquish some control to the algorithm, opening themselves up to surprising and novel outcomes. The unexpected nature of generative models can lead to discoveries that may not have been conceivable through traditional artistic methods, adding a layer of excitement to the creative journey. This emergent creativity challenges artists to embrace the unexpected and find inspiration in the serendipitous outcomes of algorithmic processes. GANs epitomize this innovation driving originality (Cetinic, 2022). In the dynamic interplay of GANs, a generator and a discriminator engage in an adversarial dance. Authenticity is assessed as the discriminator evaluates content created by the generator. This iterative process propels GANs to produce visually stunning and groundbreaking artworks. Each

¹⁰<https://obvious-art.com/portfolio/edmond-de-belamy/>

iteration contributes to the evolution of original forms, showcasing the transformative power of this artistic technology.

Originality in AI art is not confined to the creation of entirely new forms but extends to the reinterpretation and evolution of existing artistic styles. Algorithms, trained on diverse datasets encompassing art history and contemporary works, can mimic and remix established styles (Mazzone, 2019). This ability to traverse artistic epochs and genres opens new avenues for original expression, allowing artists to explore, deconstruct, and reconstruct visual languages in ways that were previously unimaginable.

Artists leveraging AI tools often find themselves in a dialogue with historical styles, pushing the boundaries of what is considered original. The machine becomes a repository of artistic knowledge, a collaborator that introduces echoes of the past into the present, creating a tapestry where tradition and innovation intertwine (Zammit, 2022).

Amidst the celebration of originality in AI art, ethical considerations loom large. The use of algorithms raises questions about the source of inspiration, ownership, and the fine line between influence and replication. Ethical landscapes become even more complex when considering issues of bias in algorithms (Srinivasa, 2021). If training datasets contain biases, they may be perpetuated in the generated artworks, challenging the boundaries of truly original creation.

In the realm of AI art, originality is not a static concept but a dynamic and evolving process (Morris, 2010). The iterative nature of algorithmic exploration, the constant interplay between human intention and machine-driven creativity, ensures that the notion of originality remains in flux. Each artwork becomes a snapshot of a moment in this ongoing journey, a testament to the evolving relationship between artists and AI. As a result, the authenticity of the creative process itself becomes a crucial aspect of AI art.

Art is a symbolic language influencing, and being influenced by, human evolution. As such art and technology act as interfaces between humans and their surroundings, both revealing epistemic knowledge. Distinguishing between art made by AI or humans concerning subjective experience is a subject that is being explored (Colton, 2008).

In navigating the landscape of authenticity in AI art, it is essential to recognize the evolving nature of creative expression. It is a journey into uncharted territories, a dynamic dance between the familiar and the unknown, where each creation becomes a brushstroke on the canvas of a new artistic era. As AI technologies continue to advance, the understanding of authenticity in art will likely undergo further transformations, requiring a thoughtful and adaptive approach, the exploration of originality in AI art becomes not just a destination but a continual and ever-evolving voyage into the possibilities of human-machine collaboration.

Transactions

Transactions in AI art represent a complex interplay between technology, creativity, and commerce, shaping the landscape of the art market in unprecedented ways. The term "transactions" encompasses various aspects, including the creation, sale, and ownership of AI-generated artworks, as well as the broader economic and ethical considerations within the evolving intersection of artificial intelligence and the art world.

First, let's start with the question: Is art made by machines even acceptable in the world of art?

With the example of Paul the Robot's "Human Study #2, with crow and fox". The installation includes a robotic arm with a pen, a camera that shifts its focus between subjects, and the canvas. The robotic arm draws what the camera observes (Ch'ng, 2019). And according to the sales of the pieces made by "Paul" there is at least a fascination, not necessarily with the art itself but certainly with the illusion of consciousness it is able to deliver. As human reactions to art are conditioned by biology and personal beliefs, the ever-evolving computational agents have been able to simulate empathy and challenge moral opinions, suggesting AI-generated art can evoke significant experiential knowledge comparable to human-made art (Daniele, 2016). During a charity auction organized by Google in 2016 in San Francisco, AI-created artworks by Memo Akten, a Turkish artist based in London were first marketed and sold for \$8,000.

A watershed moment in the recognition of AI art's market value occurred in 2018 with the auction of "Portrait of Edmond de Belamy"¹¹ a distorted portrait, that was auctioned and sold at Christie's auction house for 45 times its highest estimate at \$432,500 in a bid that lasted only 7 minutes (Ch'ng, 2019). Created by the Paris-based collective Obvious using GANs, this AI-generated portrait marked a significant milestone. The sale not only drew attention to the market viability of AI-generated creations but also sparked debates about authenticity, authorship, and the future role of AI in the art market. The transactional aspect of this sale highlighted the economic potential of AI art and set the stage for further exploration of the market dynamics. The market valuation of AI-generated artworks has been a subject of intrigue and debate (Harry, 2023). Determining the value of such creations involves considerations of the technology used, the artist's reputation, and the uniqueness of the piece. The economic landscape is still evolving as the art market grapples with establishing benchmarks for AI art transactions.

Non-fungible tokens (NFTs) have emerged as a transformative force in the transactional landscape of AI art. NFTs, built on blockchain technology, provide a way to establish digital ownership and provenance (Akritidou, 2021). Artists can tokenize their AI-generated works, allowing collectors to purchase and own a unique digital asset. This decentralized approach to ownership has redefined traditional notions of art transactions. Unique digital tokens representing ownership of digital or physical assets, have empowered artists to directly monetize their work without relying on

¹¹<https://www.christies.com/en/stories/a-collaboration-between-two-artists-one-human-one-a-machine-0cd01f4e232f4279a525a446d60d4cd1>

galleries or agents. Smart contracts, embedded in blockchain, automate royalty payments to artists every time their work is resold. This not only ensures fair compensation but also dismantles the exclusivity often associated with traditional art markets. The decentralized nature of blockchain technology reduces the risk of forgery and establishes a verifiable chain of ownership, enhancing trust in the art market. Collectors, too, benefit from increased liquidity as they can easily trade NFTs on various platforms (Akritidou, 2021). This decentralized ownership model challenges the established structures of the art world, redistributing power and democratizing access to the market. It fosters a more direct and transparent relationship between artists and their audience, marking a revolutionary departure from the traditional, centralized dynamics of the art industry.

Valuing AI art poses unique challenges. Unlike traditional artworks, AI-generated pieces may not have a physical form, leading to questions about their intrinsic value (Harry, 2023). The intangible nature of digital creations challenges established valuation methods, requiring a reevaluation of how the market assesses and values AI art.

The collaborative nature of AI art, where algorithms play a significant role in the creative process, raises profound questions (Cetinic, 2022). As artists collaborate with machine learning algorithms, the traditional notion of the solitary artist toiling away in a studio is challenged. The transactional aspect of authorship becomes a central theme, prompting legal and ethical discussions.

AI art transactions bring forth intricate intellectual property challenges. Determining the rights and ownership of AI-generated creations involves navigating legal frameworks that were not originally designed to accommodate algorithmic creativity (Ballardini, 2019). The lack of clarity regarding the copyright status of AI-generated works adds complexity to the transactional landscape.

The future of AI art transactions is characterized by continued innovation. Artists and technologists are likely to push the boundaries of what is possible, exploring new algorithms, technologies, and forms of creative expression. As technology advances, so too will the methods and dynamics of transactions in the AI art market (Brey, 2018). The advent of NFTs has already transformed ownership models in the digital art space. As the technology matures and the art market adapts, new ownership models may emerge, offering collectors unique ways to engage with and possess AI-generated artworks. The legal and regulatory frameworks governing AI art transactions are expected to evolve. Clarifications on issues of copyright, intellectual property, and authorship will play a crucial role in shaping the future of the AI art market. Legal precedents will likely be established to address the unique challenges posed by algorithmic creativity.

The intersection of AI and art will continue to foster critical dialogue. Conversations about the ethical implications, societal impact, and cultural significance of AI art transactions will shape the direction of the field. Stakeholders, including artists, collectors, scholars, and policymakers, will contribute to a nuanced understanding of the evolving landscape.

Artificial Intelligence has emerged as a powerful tool in the global fight against the illicit trafficking of cultural property, addressing longstanding challenges faced by law enforcement agencies, cultural institutions, and governments. The illicit trade in

cultural artifacts has been a persistent issue, fueled by organized crime, armed conflict, and a lucrative black market (Abate, 2023).

AI's significant contribution lies in its capacity to scrutinize extensive datasets and discern patterns that might escape human observation. Machine learning algorithms, a subset of AI, can process and interpret diverse data sources, including historical records, auction catalogues, and online marketplaces. This analytical capability enables authorities to track the movement of cultural artifacts, identify potential illicit transactions, and build comprehensive databases of stolen or trafficked items, such as LEONARDO of the Command for the Protection of Cultural Heritage of the Italian Carabinieri, INTERPOL Stolen Works of Art database, The FBI's National Stolen Art File (NSAF) and The Lost Art Database of the German Lost Art Foundation (Abate, 2023). International collaboration is essential in addressing the transnational nature of cultural property trafficking. AI facilitates information sharing and coordination among different countries and agencies.

AI's image recognition capabilities play a crucial role in identifying and authenticating cultural artifacts. These algorithms can analyze images of artworks, sculptures, and archaeological items, comparing them against databases of known cultural property. Specifically through the use of CNN's and Deep Learning algorithms like VGG16 that was developed in 2014. This not only aids in the recovery of stolen items but also acts as a deterrent, as potential traffickers are aware of the increased risk of detection.

Additionally, natural language processing¹² (NLP) algorithms help sift through vast amounts of textual data (Altaweel 2021), including documents, emails, and online communications. This technology assists investigators in uncovering information related to illegal transactions, provenance forgery, and networks involved in the illicit trade.

AI's predictive analytics further enhance the ability to anticipate and prevent trafficking activities (Abate, 2023). By analyzing historical data and identifying trends, authorities can allocate resources more effectively, target high-risk areas, and proactively intervene in potential trafficking schemes.

Despite these advancements, challenges persist. The adaptability of traffickers to new technologies, the need for standardized databases, and ethical considerations regarding data privacy and ownership require continuous attention. Striking a balance between the advantages of AI in combating illicit trafficking and safeguarding cultural heritage and addressing these challenges is crucial for the effective integration of AI into the fight against the illicit trade in cultural property.

¹²Computational models designed to interpret and generate human language. They analyze linguistic patterns, semantics, and context, enabling machines to understand, respond, and generate human-like text. NLP plays a crucial role in tasks like language translation, sentiment analysis, and chatbot interactions.

Conclusions

The profound impact of AI art on transactions within the art world is a compelling narrative that unfolds at the intersection of technology, creativity, and commerce. As we traverse this multifaceted landscape, exploring the evolution of AI art, its diverse purposes, ethical considerations, and implications on the traditional art market, we gain insights into a transformative paradigm shift that redefines transactions and transactions' dynamics.

The journey begins with the origins of AI art, tracing back to the visionary experiments of pioneers like A. Michael Noll in the mid-20th century. However, it is the advent of generative models, epitomized by the introduction of Generative Adversarial Networks (GANs) in 2014, that marks a revolutionary leap. Artists, such as Mario Klingemann, embrace a collaborative paradigm where human and machine engage in a dynamic creative dialogue, challenging established notions of authorship and the solitary artist. AI art transcends traditional boundaries, permeating diverse domains such as music, literature, education, healthcare, and beyond. From AI-generated music that challenges the norms of melody to language models like GPT-3 blurring the lines between human and machine-authored content, the ripple effects of AI creativity are far-reaching. In education, AI art becomes a powerful tool for innovative learning experiences, preparing students for the digital age. The therapeutic potential of collaborative creation with AI systems offers a unique outlet for self-expression and stress relief in healthcare.

The purposes of AI art extend to its role in challenging societal norms and biases. AI-generated content becomes a medium for thought-provoking art, contributing to conversations on bias in algorithms and the ethical implications of technology. As AI infiltrates traditional art markets, blockchain-based non-fungible tokens (NFTs) emerge as a transformative force, authenticating digital ownership and reshaping transactional dynamics.

Authenticity in AI art undergoes a paradigm shift, redefining originality and the artist's role. AI's ability to produce potentially infinite variations challenges conventional notions of singularity, emphasizing the uniqueness embedded in algorithms. The artist transforms into an orchestrator of algorithms, guiding the generative process in a collaborative dance between human intuition and machine-driven exploration. The unpredictable and serendipitous nature of AI-generated art introduces an additional layer to authenticity, emphasizing the uniqueness of the creative process itself. The implications of AI art on copyright underscore the need for evolving legal and ethical standards. Determining authorship and ownership becomes a complex task, prompting ongoing dialogues among artists, legal experts, and policymakers. The collaborative nature of AI art necessitates nuanced considerations within intellectual property frameworks to navigate the intricate landscape of ownership and originality. In the traditional art market, AI's influence is palpable, diversifying artistic practices, sparking innovation, and challenging established norms. High-profile sales at prestigious auction houses highlight the growing hype of AI-generated art, while online platforms dedicated to AI art democratize access, fostering a global community of creators and collectors.

As we navigate the evolving landscape of AI art's influence on transactions in the art world, the narratives of collaboration, redefined authenticity, and evolving legal frameworks converge. The transformative potential of AI art extends beyond the confines of traditional artistic practices, reshaping the very fabric of how transactions unfold. In this context, understanding the influence of AI art on transactions becomes an exploration of the delicate balance between technological innovation, artistic expression, and the intricate dynamics of the art market. As technology continues to advance, the narratives of AI art and transactions intertwine, inviting us to engage in a thoughtful and adaptive dialogue that paves the way for a new era in the intersection of creativity and commerce.

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