



ARTICLE

Between Crypto Art and Copyright: NFT Tokens as Tools for Confirming the Authenticity of Art Objects

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ABSTRACT

The symbiosis of blockchain technology with human creativity has given rise to what we now call crypto art, marking a new frontier in digital artistic expression. This development has profoundly altered our understanding of digital artifacts and ownership in this domain. Once easily accessible to all, digital art poses a unique challenge in the realm of collecting: how does one collect something that can be effortlessly replicated and shared? This paper explores the role of non-fungible tokens (NFTs) as authentication mechanisms and proof of authorship for digital artworks. Initially designed for decentralized financial transactions, blockchain technology has become instrumental in validating authorship and enabling the monetization of digital artworks through NFTs. Although digital artists now benefit from the validation of their work as legitimate investment assets through NFT technology, challenges persist due to the absence of copyright verification during token creation. For example, many artists have discovered their creations being used by third parties to mint tokens without their consent. The study demonstrates the transformative impact of NFTs on the digital art landscape while addressing the ongoing challenges and the imperative for enhanced copyright protection mechanisms.

KEYWORDS

crypto art, copyright, NFT, nonfungible token, digital art, authenticity problem, blockchain

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Introduction

The evolution of art has always entailed the exploration of new forms of artistic expression, and crypto art has become a pioneering direction in digital art, particularly in the realm of exclusive ownership of digital objects. Enabled by blockchain technology, non-fungible tokens (NFTs) serve as unique cryptographic records linked to specific digital files, functioning as tools for verifying the authenticity of artwork. Through an examination of the components of crypto art and the challenges inherent in verifying the authenticity and authorship of digital artworks, NFTs have emerged as pivotal tools for confirming authorship.

However, non-fungible token technology does not involve copyright verification when creating tokens. “The technology can also complicate these same issues—most notably copyright issues—especially with existing artworks not created with NFTs” (von Schlenhenried, 2022). This means that cases have occurred where authors have discovered their work being used by third parties to issue tokens without their knowledge or permission. In our article, we are going to explore how traditional art paradigm shifts into digital with NFTs.

To understand how ownership is established in crypto art through NFTs, we need to delve into the realm of decentralized exchange protocols. In order to distinguish a unique work amidst the vastness of the Internet, we should assign it a distinctive characteristic, for example, a serial number. Subsequently, a technology is required to facilitate the input, storage, and validation of this identifier. The inception of blockchain technology in 2008 marked a pivotal moment for digital art, as it laid the groundwork for the emergence of NFTs within its ecosystem (Trubina, 2022).

Blockchain, which is essentially a chain of interconnected blocks, operates on a strict chronological order akin to the pages of an endless book. Each block contains records of preceding transactions, resulting in an incremental accumulation of data with each subsequent block. These blocks are linked together via cryptographic signatures, ensuring the system’s security through data encryption. Any alteration to the system triggers a cascade effect, with the cryptographic signature propagating the information across all connected blocks.

In an open blockchain, tokens can typically be interchanged with identical counterparts, rendering them fungible and equivalent. In contrast, non-fungible tokens have a unique identifier that is immutably recorded in the blockchain database. This distinctive feature prohibits the token from being replaced or exchanged, as implied

by their name. NFTs can be associated with tangible or digital assets, spanning audio files, photographs, images, or even in-game items. Developers often liken them to digital collectible cards, emphasizing that their value lies not in the token itself but in what it attests to. Basically, any dataset, such as an image, can be linked to a token through a cryptographic signature on the blockchain. NFT serves as a cryptographic seal affirming ownership and integrity in the database.

In analyzing the market for NFTs, Calvo (2024) delineates three primary perspectives: “those who believe it is a new bubble, those who think it is a revolution, and those who think the idea has failed”. The debate hinges on whether the NFT market represents an economic bubble or a transformative opportunity. According to Calvo, voices in the cryptoart community, such as cryptoartist Beeple and cryptoinvestor Sundaresan, lean towards the former viewpoint, arguing that “it is an economic bubble with a clear negative prognosis in the short and medium term” (Calvo, 2024).

This study investigates the pivotal role of NFTs in resolving authentication challenges in the realm of crypto art and addressing broader trust issues in the digital sphere. Throughout the article, we delve into specific instances in the crypto art business to shed light on NFTs’ impact on both crypto art and gaming. To provide a comprehensive understanding, we explore various dimensions: the origins and evolution of crypto art; the challenges associated with collecting and investing in crypto art, in particular how NFTs help alleviate these concerns; and, finally, the legal and copyright-related aspects of crypto art.

The Origins and Development of Crypto Art

The research problem related to NFTs revolves around the essential need to authenticate artworks in the digital domain. In an era of boundless Internet access, discerning between a copy and an original proves challenging. When we duplicate an electronic artwork, we obtain a replica. In the digital realm, the distinction between the copy and the original blurs since they are indistinguishably identical. However, the scenario shifts if we turn to fine art, where the copy is inherently distinct from the original. This challenge finds resolution in the tool of digital art authorship verification, notably through asset tokenization via NFTs.

NFTs can look completely different (NFT uses will be described below), but most often a token is a metadata file with information encoded in a digital version of a tokenized work. Marketplaces are online platforms where an NFT may be stored and displayed (von Schlenhenried, 2022).

We will refer to works of fine art to which NFTs have been assigned as crypto art. The term “crypto art” is most often used exclusively in relation to digital art since the fact of confirmation through a unique token puts the digital object of intellectual activity on the same value level as the physical object of intellectual activity. However, digitized renditions of physical artworks, tokenized and offered for sale, can also fall under the category of crypto art. Calvo emphasized the significance of this phenomenon, stating that

the emergence of what is known as cryptoart or cryptographic digital art is particularly important. This is a trend based on the idea of non-fungible tokens

(NFTs), smart contracts, and cryptocurrencies, which, according to its advocates, guarantees the ownership, authenticity, scarcity, exclusiveness, immutability, verifiability, and traceability of digital works. (Calvo, 2024).

It should be noted that while crypto art falls under the umbrella of digital art, not all digital art qualifies as crypto art. The application of blockchain technology in art transactions predates the advent of ERC-721 smart contracts. In 2013, the sale of Kuno Goda's artwork *200 Bitcoins* marked one of the earliest instances of blockchain-based transactions (Hern, 2014). Although the transaction was conducted in bitcoins, it lacked a token confirming ownership, thus not fully qualifying as crypto art. Notably, the painting *200 Bitcoins* was a tangible object, not a digital one. Therefore, only digital objects paired with non-fungible tokens are considered crypto art (Trubina, 2022).

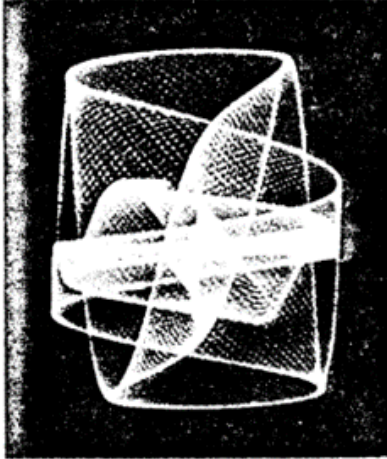
In this paper, digital art is understood as an art direction based on the use of computer programs and technologies, resulting in digital representations of art. This includes not only internet-based objects but also multimedia exhibitions, sculptures crafted using computer technology, and immersive technologies such as VR/AR (Virtual Reality/Augmented Reality), all of which complement traditional art forms.

The origins of computer-generated graphics go back to the pioneering work of mathematician and artist Ben Laposky in 1953. Laposky used an oscilloscope as his canvas, crafting abstract art through the manipulation of electronic waves displayed on a fluorescent screen (Figure 1). His creations were immortalized through photography (Laposky, 1969).

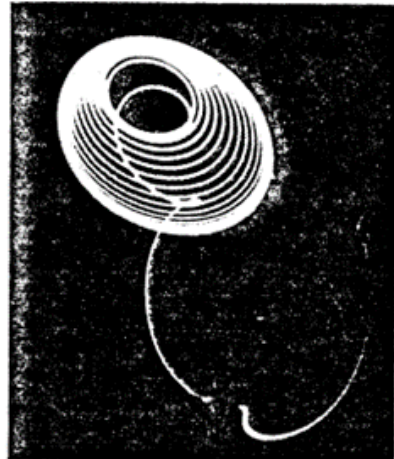
Another significant sphere of digital art is software art, also known as generative art. Michael Noll, a researcher at Bell Laboratories, stands as an early proponent, showcasing his algorithmically generated artwork, including *Gauss Quadrature*, at the 1965 *Computer Images* exhibition in New York (Noll, 1967). Noll envisioned computers not merely as tools but as active creative partners, offering new avenues for artistic expression. Artists in this realm often assume the role of programmers, leveraging software capabilities to explore novel forms of expression, from generative fractal art to interactive geometries responsive to sound and movement.

With the advent of the Internet, the net.art direction developed, with many different projects, one of which is *Starrynight*. This initiative served as an artistic interface for the curated online archive of the Rhizome email discussion list, a pivotal platform for artists exploring new media forms in the late 1990s. Every week selected messages from the list, including critical messages, exchange of resources and information, as well as illustrations in the form of e-mail, were archived, which was called Textbase. *Starrynight* transformed archived emails into luminous points on a dark backdrop, creating "constellations" that users could navigate, illuminating connections between related messages (Galloway et al., 1999).

Today, artificial intelligence opens new horizons for artistic creation, enabling the generation of unique images, music, and more. Artists harness neural networks to produce works evocative of styles pioneered by renowned artists like Salvador Dali or Claude Monet. This realm, referred to as algorithmic art, empowers users to become "co-authors" of algorithms, shaping artistic outputs with a simple click (Trubina, 2022).

Figure 1*Oscillons: Electronic Abstractions*

19



36



3



46

Note. Source: Laposky (1969).

Confirming the Authenticity of Digital Art

In order to authenticate digital art, it is necessary to verify the unique digital signatures associated with the original works, rather than the outward appearance of the artworks themselves. These signatures, represented NFTs, serve as programmable digital units of value recorded in a digital registry. They are integral to confirming authorship and ensuring the authenticity of digital art objects.

Paul (2015) highlights the challenges of collecting, storing, and verifying digital art objects, which encompass various styles and trends: unlike traditional object-oriented works that museums are equipped to handle, interactive digital artifacts

pose distinct challenges due to their temporal nature. While displaying digital objects is feasible through screens, projections, and virtual reality, issues of collecting and establishing authorship remain complex, especially considering the widespread accessibility of the internet.

In 2021, the introduction of NFTs revolutionized the world of digital art by enabling artists to secure authorship rights and receive financial support for their works. This marked a significant shift, as previously, digital art had been auctioned in the absence of such mechanisms. For instance, Tauba Auerbach's *Untitled (Fold)* was sold for £386,500 at a Phillips auction in 2013. However, it was the sale of Beeple's collage *500 Days* at Christie's auction in March 2021 for \$69.5 million that sparked widespread interest and propelled the rapid growth of the NFT market (Brown, 2021). With the introduction of smart contracts, NFTs can now verify ownership of digital objects, legitimizing digital art as a viable investment option and facilitating the sale and collection of virtual artworks.

The Use of NFTs in the Gaming Industry

Initially, NFTs were conceptualized as a means to confirm ownership of in-game assets, particularly attributes of characters in computer games. These non-fungible tokens adhere to various standards. For instance, games often utilize the ERC-988 token, enabling the creation of a "package" containing character attributes that can be traded in the game. Essentially, this token serves as a validation for other tokens.

The ERC-721 token standard was first used in the *Cryptokitties* game in 2017¹. The developers have offered the possibility of generating a unique character, that is a crypto bot. The speculative mechanics of a smart contract offers the user to sell a cat, generate a new one, or engage in "breeding cats." This process involves selecting two NFTs, which then undergo a "crossing" to produce offspring of varying degrees of rarity.

Later, there appeared games based on the "hot potato" principle. In the traditional children's game of the same name, participants form a circle and swiftly pass a ball while music plays, when the music stops, the holder of the ball is declared the loser. In January 2018, a game titled *Crypto Celebrities* was launched, where users sequentially purchased NFTs, i.e., digital cards featuring images of famous personalities. The premise was simple: if demand existed for a specific celebrity card, both the initial buyer and subsequent purchasers made a profit. However, if a user happened to be the final purchaser of a card, they would incur a loss².

Popular games incorporating non-interchangeable tokens are currently categorized into two main types based on their mechanics: "play to earn" and "move to earn." "Play to earn" encompasses traditional computer games where success is primarily dependent on the time spent in the game. On the other hand, "move to earn" introduces an element of beneficial physical activity, which has gained significant popularity among users. STEPn is one such popular "move to earn" game³. To

¹ <https://www.cryptokitties.co/>

² <https://cryptocelebrities.org/>

³ <https://stepn.com/>

participate in the game, you need to buy NFT sneakers, and take a certain number of steps every day, thereby earning cryptocurrency. The amount of energy depends on the category of sneakers (the more expensive the sneakers, the more energy), which allows you to receive tokens during physical exertion, but when the energy runs out, you need to wait for its recovery.

NFT games have surged in popularity, attracting increased investment in this sector. Furthermore, non-fungible tokens have attracted much attention and have been adopted by fashion brands—the process facilitated by the concept of the metaverse. The *metaverse*, a virtual space that relies on digital technologies like VR/AR, offers immersive experiences with user-driven values, economies, goods, and services. NFTs serve as connectors across various domains, enabling collaborations between clothing brands and game developers to introduce virtual representations of their products. For instance, Louis Vuitton company launched *Louis the Game*, a puzzle game commemorating the fashion house's 200th anniversary. Players explore different locations, delve into the fashion house's history, and have the chance to discover one of the 30 collectible NFTs by digital artist Beeple. These NFTs can be traded on various platforms, providing users with verified ownership and the autonomy to buy and sell digital goods as they see fit (Northman, 2021). This aspect stands as a primary catalyst for the metaverse and the user-owned meta-economy.

The Use of NFTs for Collecting

In the subsequent phase, NFT tokens saw significant integration into the art realm. From 2015 to 2018, developers primarily emphasized the culture of collecting rather than the artistic integrity of works. Crypto art bore resemblance to the popular basketball cards of the 1990s. It should be noted that much of crypto art is collectible, akin to amassing either comic cards or pieces by renowned digital artists.

Rare Pepes⁴ cards with a frog became one of the brightest representatives of collectible crypto art. Each artist could create their unique rendition of the frog, but only once, thus ensuring the exclusivity of the cards. Another notable collectible token series is CryptoPunks. While Rare Pepes were issued on the Bitcoin blockchain, CryptoPunks were tokenized on Ethereum. It is important to note that determining the exact value of any mentioned tokens is extremely difficult due to the volatility of cryptocurrency exchange rates.

Full-fledged tokenized digital art platforms, such as MakersPlace⁵ and R.A.R.E. Art Lab⁶, appeared in 2018–2019. Then, for the first time, artists had the opportunity to publish their works and get acquainted with the new world of digital art. During that period, there was active interaction between the community of artists and the blockchain. The Digital Art Chain social network emerged, simplifying the process of obtaining a non-fungible token: users could create a token from any digital image they

⁴ <https://rarepepes.com/>

⁵ <https://makersplace.com/>

⁶ <https://www.lagelnd.com/rare>

uploaded. Later, the OpenSea platform⁷ created a simple program for creating a smart contract and NFT.

As of today, there are numerous platforms specializing in NFT production, such as Rare or SuperRare.

The first person to embark on the “tokenization” trend in Russia was the calligrapher Pokras Lampas. He created an NFT that represents a hybrid of traditional and digital art. Initially, the artist painted the original work on canvas, which was later digitized. Subsequently, the image was projected onto the concrete structures of the Chirkey hydroelectric power station, which is the largest in the North Caucasus (Figure 2). The photograph of the projection was tokenized and made available for sale. It is important to note that the token purchased for \$29 thousand does not represent the art object itself, but rather its photograph.

Figure 2
Transition



Note. Source: Pokras Lampas prodal foto (2021).

⁷ <https://opensea.io/>

It is also possible to tokenize a photo or video of a physical art object and subsequently destroy the original. This was demonstrated by the blockchain company Injective Protocol, which purchased one of 650 copies of Banksy's work titled *Morons (White)* for \$95 thousand. During a live broadcast, the physical artwork was burned, and the video recording of the event was transformed into an NFT and put up for sale (Boucher, 2021).

Almost anything can be linked to a token. In 2021, the source code of the Internet was auctioned at Sotheby's (This changed everything, 2021). The lot contained a collection of four different objects represented as a single NFT. It included "source files with timestamps" of the Internet source code, an animated visualization of this code, notes from the creator of the World Wide Web, Sir Tim Berners-Lee, detailing the process of writing the code, and a digital poster created by the author. Overall, the files amounted to nearly 100 thousand lines of code.

Not only artists but also musicians issue non-fungible tokens. One of the most notable cases is the digital works of the Canadian singer Grimes (Kastrenakes, 2021). To purchase the video titled *Death of the Old*, potential buyers had to register on the Nifty Gateway platform and submit a request for the lot within a limited time, offering their price for the work. There are several interesting points in this story that require special attention. Two videos were sold not as single copies, but in an edition of 700 copies each, which raises the question: why pay substantial sums for something that several hundred more people also acquire? The explanation lies in the fact that by purchasing a token, one becomes part of a community of individuals who also own the same token, some sort of an exclusive club accessible only by invitation.

NFTs are revolutionizing the landscape of digital art, breaking down traditional boundaries. For instance, artists now have the ability to sell animated pictures with audio accompaniment. In his debut NFT project titled *On the Nature of Sound*, artist Jesse Woolston showcased an audiovisual digital creation, using artificial intelligence, computing, environmental design, and musical composition to craft a collection of "biomes" (Moret, 2021). The drawings and animation techniques employed for each biome incorporate physical simulations. The sculptures accentuate specific colors to elucidate how our perception of the environment is influenced by color. Textured wave patterns within each sculpture move seamlessly in a 30-second endless loop, accompanied by a soundtrack. This amalgamation of mathematical algorithms, animation, and audio forms a captivating artistic experience.

The artistic value inherent in digital works matches that of physical ones. These creations transcend mere images on the Internet, evolving into immersive performances crafted by authors leveraging modern computer technology. Thus, the significance and scale of digital art expand through crypto art and NFTs, marking a new era that intertwines art and technology.

Crypto art further blurs the boundaries between realities, enabling the connection of NFT tokens with tangible objects. In March 2022, American artist Jeff Koons announced the launch of his inaugural NFT project titled *Jeff Koons: Phases of the Moon* (Grush, 2022). Inspired by humanity's technological advancements and enduring fascination with the moon, the series comprises unique NFTs, each corresponding to

a physical sculpture. These sculptures will eventually be sent to the Moon, becoming the first authorized works of art on the lunar surface.

There is an abundance of such examples as artists continue to explore this novel direction. The shift from displaying works on the Internet to creating digital art, establishing official ownership, and profiting from sales marks a significant change in the art world.

Consequently, museums and galleries worldwide have taken an interest in NFTs. The Uffizi Gallery in Florence, Italy, became one of the first major institutions to utilize non-fungible tokens (Solomon, 2021). Seeking to recoup revenue losses incurred during the COVID-19 pandemic, the gallery digitized and sold NFT images of some of its iconic works. In May 2021, the gallery sold its first tokenized painting by Michelangelo, *Doni Tondo*. Later that year, the Hermitage hosted Russia's inaugural NFT exhibition, *Invisible Ether*⁸. The main idea was the lack of physical counterparts to the museum's exhibits. As a solution, a dedicated website featuring a catalog and a virtual gallery was established for the project. The exhibition comprised 38 exhibits, each representing various phenomena.

NFT works can be exhibited both in physical spaces through screens and projectors, as demonstrated by Russia's first NFT gallery ZAVTRA in Moscow. Digital artist Ruslan Vyaltsev commented on the significance of the gallery:

For a while in Russia, the NFT community was fragmented, but now we're witnessing the rapid expansion of NFT into the international market. Today, artists have the chance to gather here at ZAVTRA. This is valuable not only because, unlike traditional art, in digital art, an artist can track the resale and movement of their creations, but also because this space is where a unified NFT community is emerging, offering every artist the opportunity to gain visibility. (Studiia novykh media, 2022)

NFT works are predominantly exhibited in virtual galleries. In 2018, the Cryptovoxels project introduced a straightforward WebVR interface (Peaster, 2020). In this virtual world, users can design interiors and exteriors and showcase their NFT paintings. While VR functionality is currently limited, obtaining land in the virtual realm is straightforward: users can purchase land, construct galleries, and display tokenized collections. Cryptovoxels was among the pioneering virtual galleries to offer a platform for exhibiting NFTs in a virtual environment. Currently, there are many such galleries, including Terra Virtua. However, the latter primarily caters to collectors rather than artists, offering a few customizable virtual spaces for showcasing NFT digital collections.

Investing and Crypto Art

Crypto art offers undeniable investment opportunities. Like traditional art, the value of crypto art depends on authentication. While traditional art's authenticity can be confirmed through examination, digital art relies on the presence of an NFT token. NFTs

⁸ <https://celestialhermitage.ru> (currently unavailable).

have revolutionized perceptions of digital art and ownership rights by guaranteeing security and transparency in transactions.

In the traditional art market, purchasing a painting grants ownership of the physical object. To sell an original work, it must be transferred directly to the buyer, safeguarding it from third-party access unless authorized by the copyright holder. In contrast, digital art operates differently: following a sale, digital copies remain in circulation, accessible to anyone. Essentially, NFTs have elevated the digital art market to an enhanced iteration of the traditional model. Upon purchasing a digital painting, ownership of the original is obtained, with all transaction details recorded on the blockchain while copies of the painting can still be freely accessible.

The capitalization of the crypto art market since its inception amounts to \$2.5 billion, according to Cryptoart.io (rchen8, 2020). Franceschet (2021) highlights increased interest in digital art and NFTs, noting that “crypto art market went parabolic in late 2020—also because of the COVID pandemic and the consequent digitalization of our lives—attracting the attention of major mass media and major auction houses” (p. 311).

Until recently, the value of digital art was debatable due to the potential for endless copying of online works. As Francesco De Carlo (2020) observes,

it was generally believed that digital works of art have really limited economic value due to their easy reproducibility ... if no technological protection measures are applied to prevent reproduction, users, instead of buying works of art from their authors, simply create a copy, committing copyright infringement, being confident that this will go unpunished. (p. 155)

The potential for profit directly correlates with the copyright of the works. With an NFT, ownership rights can be transferred, thereby establishing the investment value of crypto art. For creators, NFTs offer an avenue to monetize their work. Through smart contracts, artists receive a percentage from each resale of their work, with platforms typically offering deductions ranging from 5% to 25% for each transaction.

However, while NFTs offer incentives to creators of art, they do not protect their works from free downloads or resolve copyright issues. Visiting any NFT platform⁹ reveals that images for sale can be easily downloaded. Platforms are increasingly seeking to safeguard auctioned paintings, yet the most significant advantage of NFTs and smart contracts lies in the hidden content received by the buyer immediately after purchase. For instance, when purchasing an image or video, buyers receive the original in the highest quality along with additional materials and a letter from the author.

⁹ The leading platforms include OpenSea, Rarible, and SuperRare, each catering to different levels of works and user demographics. OpenSea (<https://opensea.io/>), being the largest platform, is considered the most accessible but faces challenges with pricing and work authenticity. Rarible (<https://rarible.com/>), a primary competitor to OpenSea, allows free NFT creation but charges a commission for removal. SuperRare (<https://superrare.com/>) stands out as a more exclusive platform, showcasing renowned artists and media figures and selling rare works at higher prices. To become an author on SuperRare requires an invitation and selection process. While new platforms continually emerge in the expansive NFT market, OpenSea, Rarible, and SuperRare remain at the forefront.

The difference between owning the original digital artwork and simply acquiring a copy lies in the fact that the former is backed by an NFT. No matter how digital art distances itself from physical art, the rules of ownership are the same. A replica of a Renoir painting will not hold the same value as the original. In the digital realm, purchasing an NFT enables legal selling, gifting of art objects, and earning interest from resales. While copying images from platforms is possible, it can be compared to museum visitors photographing masterpieces, as digital copies lack authentic characteristics and thus have no economic value. Therefore, the value lies in the certificate of authenticity rather than the work itself.

The certificate of ownership is not the sole motivator for collectors to invest in digital art. The investment aspect makes NFTs a valuable tool for resale and speculation, as the value of an artist's works depends on their reputation and presence in the digital sphere. Purchasing works from artists frequently mentioned online can yield profits from subsequent resales. Pricing digital paintings is a complex matter closely tied to various fluctuating factors, including cryptocurrency exchange rates.

The disruptive nature of NFTs raises questions about their role in intellectual property and the potential for shifting copyright law paradigms. As stated by Okonkwo (2021), "NFTs are channels for intellectual property commercialization," underscoring their significance in the digital landscape. This article explores the intersection between NFTs and copyright law.

At this point it should be noted that as of December 2022, the frenzy surrounding NFT art has subsided, but investor and user interest in the market persists.

Insights From a Crypto Art Experiment: Exploring the Fusion of Art and Tech

To gain insight into the crypto art market, Marya Trubina, one of the authors, embarked on her own NFT project. The objective was to examine the opportunities available to digital artists and to assess the challenges faced by newcomers in creating NFTs. For experimentation we chose platform Rarible, which helped us assess pricing dynamics and platform functionalities. A notable observation resulting from the experiment was the significant difficulty encountered by lesser-known artists in generating sales, with established artists and popular collectible tokens commanding the highest values.

The project centered on a niche known as binary art, which incorporates various artistic styles such as GIFs. An innovative approach was adopted whereby the binary code of a literary work was overlaid onto a photograph, transforming zeros and ones into a recognizable image. This technique not only enhances visual appeal but can also imbue the artwork with hidden meanings. To achieve this, the photograph underwent pixelation, each square accommodating a pair of binary digits. Subsequently, these pairs were color-coded to correspond with individual pixels. The resulting synthesis of computer technology (binary code), visual art (photography), and literature (Shakespeare's sonnets) culminated in a GIF-image, thus giving rise to the project's title, *Ciphered Art* (the resulting work is shown in Figure 3).

schemes via NFTs. However, unauthorized creation of NFTs based on original works without the author's consent remains a challenge. Authors often face the burden of proving both their authorship and the link between the token and the work.

Recognition of NFTs in international jurisdictions poses another challenge as they fall under various legal frameworks. While digital rights were incorporated into civil law in Russia in 2019 (O vnesenii izmenenii, 2019), there is currently no specific legal framework governing NFTs. Consequently, the responsibility for safeguarding authors' intellectual property often falls on platforms where NFT art is exhibited.

In most NFT sales, buyers acquire ownership of the digital artwork, while the artist retains exclusive rights to the work. Platforms like SuperRare emphasize the separation between ownership of the copyright and ownership of the tangible or digital asset. Artists typically maintain copyright protection unless explicitly transferred in writing. Collectors hold proprietary interests solely in legally obtained NFTs, without acquiring authorial rights to the underlying artworks.

The owner of the exclusive copyright to the work can grant the other party a license, providing the right to use the work for specified purposes and a specified period. Currently, only art platforms protect the market from the so-called license gaps and fraudulent schemes. License gaps occur when the line of use of exclusive rights to a work becomes blurred. A notable example is the NFT comic *Wonder Woman* by Jose Delbo, exhibited on an NFT platform during the pandemic. In spring 2021, amidst the rise of NFTs, fans paid nearly \$2 million for a set of NFTs by Delbo and a team of Hackatao artists (Pearce, 2021). This case raises questions about who has the right to sell NFTs: the comic's author or the company that owns it. If the works sold as NFTs were created as part of official duties for a publisher, they are considered official works. However, if the author creates a comic independently, and the company wants to publish it for commercial gain, their relationship is determined by the license agreement. After the Delbo precedent, DC Comics issued a notice prohibiting the creation of NFTs with DC characters. This incident underscores the copyright conflicts between creative workers and corporations in the entertainment industry, brought to light by new technologies.

Algorithms as Intermediaries and Trust Issues

Algorithms act as intermediaries between creators and their audience, as well as between developers and corporations. The popularity of crypto art among Internet users stems from its portrayal as an experimental showcase of blockchain technology's potential in the digital realm, with NFTs serving as a means to solidify property rights in virtual spaces.

Moreover, NFTs represent an endeavor to establish virtual art as both elite and accessible, bridging the digital and physical worlds to reshape our artistic perceptions. This fusion highlights how technology not only alters artists' methods of expression but also reshapes our artistic sensibilities. Despite its online accessibility, the storage of virtual assets can hold as much value as traditional physical artworks.

Blockchain technology addresses trust issues in transactions through algorithmic solutions. The emergence of crypto art aligns closely with the principles demonstrated by blockchain technology. If we approach algorithms as neutral arbiters, however, we may overlook the biases that developers, consciously or not, may introduce, as well as the social dynamics among all parties involved.

In the context of fraudulent transactions with NFTs, complexities arise due to multiple factors at play. Fraud in the NFT markets, often referred to as scams, encompasses a range of activities, from hacking crypto wallets to selling unauthorized copies of original works. These instances, such as the unauthorized sale of copied works, directly violate copyright laws, complicating the verification of authenticity within the digital art market. For example, in March 2021, digital artist Weird Undead lodged a complaint with the OpenSea platform after dozens of her works were sold without her consent (Roberts, 2021).

A more intricate form of fraud involves the imitation of renowned artists, posing greater challenges in detecting such scammers, which can be illustrated by the case of digital artist Derek Laufman (Stephen, 2021). Despite platforms implementing profile verification processes, fraudsters can still deceive the system. This case underscores the verification challenges on NFT platforms, where anyone can falsely claim to be a famous artist.

The matter of trust is also influenced by technological factors. The case of the above-mentioned game *Cryptokitties* is quite illustrative in this respect. Through its speculative mechanics, this game provided a unique opportunity for its creators to profit. Players were encouraged to breed virtual cats, earning ethers as a reward. The repetitive nature of this process, coupled with its unconventional appeal, captured widespread attention. Despite the whimsical allure of these digital cats, the idea of spending \$1,000 on one was so outlandish that it became a sensation, driving a surge in user engagement. However, as the novelty wore off, so did the demand, resulting in a decline in both average prices and sales volumes by the beginning of December 2020. While *CryptoKitties* could not sustain its initial broad appeal, it still processes approximately 50 Ethereum per week. Subsequently, other developers improved upon the game, introducing features like Kitty Race and Kitty Hats. This evolution was facilitated by the original *CryptoKitties* game allowing developers to build upon its foundation without explicit permission, enabling the game to thrive beyond its initial scope.

Discussion and Conclusion

This study intended to provide an overview of the problem of non-fungible tokens (NFTs) as a tool for authentication. On the one hand, NFTs offer solutions to issues such as tracing a picture's origin, market transparency, liquidity, and regulation of new media and technologies. On the other hand, anyone can claim authorship and tokenize someone else's artwork, raising questions about the authenticity of such pieces.

Crypto art holds potential comparable to physical paintings and sculptures, with artists benefiting most from NFTs as they gain a means to profit from their digital

works. NFTs are meant to revolutionize ownership rules, extending beyond the art market to sectors like real estate, where tokens can address land ownership issues. Transactions recorded in blockchains are reliable due to immutable information and smart contracts ensuring agreement compliance.

However, blockchain technology faces a number of challenges, including environmental concerns such as increased carbon dioxide emissions. The energy-intensive nature of blockchain operations, particularly under the “proof of work” algorithm, contributes to this issue. Nonetheless, efforts are underway to mitigate these environmental impacts.

The rise of crypto art also raises copyright issues, with attempts to leverage NFTs for copyright management. Nevertheless, NFTs still hold promise for authenticating digital objects and art, marking a shift from the era of free content to one of metaverses and secure digital ownership.

While NFTs offer new opportunities for digital art, concerns about their speculative nature, where they are often seen as investment assets rather than authenticators of art, have prompted skepticism. However, when used appropriately, NFTs can enhance the value of digital art, especially for artists who can openly register property rights. To ensure the successful integration of NFTs into the digital artist community, it is imperative to establish effective regulatory frameworks.

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