

A Technical Seminar Report
on
“ Introduction to Non Fungible Tokens ”



**Submitted to the faculty of Computer Science and Engineering
JAYAPRAKASH NARAYAN COLLEGE OF ENGINEERING**
(Affiliated to J.N.T.U.H., Approved by A.I.C.T.E.)

By
K. Mohan Durga Sathish
(18361A0544)
Bachelor of Technology
(Fourth Year First Semester)

Under the Esteemed Guidance of
Mrs. D. Jamuna
Assoc. Professor

Department of Computer Science and Engineering
JAYAPRAKASH NARAYAN COLLEGE OF ENGINEERING

DHARMAPUR, MAHABUBNAGAR – 509001

Web: www.jpnce.ac.in, Phone: 888668002

2021-2022

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

JAYAPRAKASH NARAYAN COLLEGE OF ENGINEERING

DHARMAPUR, MAHABUBNAGAR – 509001

(Affiliated to J.N.T.U.H., Approved by A.I.C.T.E)



CERTIFICATE

This is to Certify that the Technical Seminar report on “ Non Fungible Tokens” is a bonafide work done by K. Mohan Durga Sathish (18361A0544) in partial fulfillment of the requirement of the award for the degree of Bachelor of Technology in “**Computer Science and Engineering**” J.N.T.U., Hyderabad during the year 2021-2022.

Supervisor

H.O.D

Mrs. D. Jamuna
Assoc. Professor,
Dept. Of C.S.E.

Dr. Sandeep V.M
Professor & Head,
Dept. Of C.S.E.

ACKNOWLEDGEMENT

We wish to thank the management, our chairman **Sri K. S. RAVI KUMAR**, Jayaprakash Narayan college of Engineering, for his enthusiastic support without which this research would not have been completed with any degree of success.

At the very outset ,we wish to place on record our sincere thanks and gratitude to our beloved head of the institution **Dr. SUJEEVAN KUMAR AGIR**, principal Jayaprakash Narayan College of Engineering for his encouragement and support.

We would like to express our sincere deep sense of gratitude and indebtedness to **Dr. SANDEEP V.M**, HOD, Computer Science and Engineering department, for his significant suggestions and help in every aspect to accomplish the research work. His persisting encouragement, everlasting patience and keen interest in discussions have benefited me to the extent that cannot be spanned by words. He has been the continuous source of inspiration for us throughout the work.

We owe a debt of gratitude to our supervisor **Mrs D. JAMUNA**, Assoc. Professor, CSE, JPNCE for her admirable guidance and inspiration both theoretically and practically and most importantly for the drive to complete the research successfully. Working under such an eminent guide was our privilege.

We would like to express our deep gratitude towards our teaching and non- teaching staff for giving their valuable suggestions and co-operations for doing our project.

K Mohan Durga Sathish (18361A0544)

ABSTRACT

Non Fungible Tokens(NFTs) seem to have exploded this year in the last two years, with the net transactions of NFTs in 2021, being valued at 25 Billion Dollars in 2021 alone. NFTs are non-interchangeable units of data stored on a blockchain, that can be sold and traded. Types of NFT data units may be associated with digital files such as photos, videos, and audio. Because each token is uniquely identifiable, NFTs differ from blockchain cryptocurrencies, such as Bitcoin.

Although NFTs are around since 2014, The term "NFT" only gained currency with the ERC-721 standard, first proposed in 2017 via the Ethereum GitHub, following the launch of various NFT projects that year. The standard coincided with the launch of several NFT projects. NFTs are gaining notoriety now because they are becoming an increasingly popular way to buy and sell digital artwork. These NFTs also make use of blockchain technology, which is a centralized ledger to record and store transactions chronologically and irreversibly.

Even though these NFTs don't hold any copyrights or Intellectual property rights to the data/object they represent, and doesn't prevent others from copying or sharing the underlying digital files, these still represent the physical object in a virtual world. These NFTs are already being used in many use cases and these are increasing everyday. These NFTs are now being used to represent virtual objects in virtual worlds and games, these NFTs that are earned in the virtual worlds can be traded in the real world for real money, making it possible for gamers and other artists to earn.

Various platforms came into existence that support creating, buying and selling of these NFTs. These platforms are always in the news headlines for the all time price high records they make. One such platform is opensea.io which is now worth over \$25 Billion. NFTs have been used as a speculative asset, and they have drawn increasing criticism for the energy cost and carbon footprint associated with validating blockchain transactions as well as their frequent use in art scams and the NFT market has been seen by some as being similar to a pyramid or Ponzi scheme, where early adopters profit at the expense of those buying in later.

TABLE OF CONTENTS

S.No	Contents	Pg.no
	Certificate	I-II
	ACKNOWLEDGEMENT	III
	ABSTRACT	IV
1	INTRODUCTION	1
	1.1 NFT Origin	1
	1.2 What is an NFT ?	1
	1.3 Characteristics of NFT	2
2	OVERVIEW	3
	2.1 BLOCKCHAIN	3
	2.2 Cryptocurrency	4
	2.3 NFTs vs Cryptocurrency	5
	2.4 Properties	5
3	WORKING	6
	3.1 How are NFTs created ?	6
	3.2 Steps for Minting NFTs	8
4	APPLICATIONS	10
	4.1 Digital Art	10
	4.2 Games	11
	4.3 Music	13
	4.4 Virtual Worlds	14
	4.5 Films	16
5	ENVIRONMENTAL IMPACT	17
	5.1 Greenhouse Emissions	17
	5.2 Probable Solution	17
6	CONCLUSION	18
7	BIBLIOGRAPHY	19

1. INTRODUCTION

1.1 NFT Origin

The first known "NFT", Quantum was created by Kevin McCoy and Anil Dash in May 2014, consisting of a video clip made by McCoy's wife, Jennifer. McCoy registered the video on the Namecoin blockchain and sold it to Dash for \$4, during a live presentation for the Seven on Seven conference at the New Museum in New York City. McCoy and Dash referred to the technology as "monetized graphics", which are now called as NFTs.

The term "NFT" only gained currency with the ERC-721 standard, first proposed in 2017 via the Ethereum GitHub, following the launch of various NFT projects that year. The standard coincided with the launch of several NFT projects, including Curio Cards, CryptoPunks (a project to trade unique cartoon characters, released by the American studio Larva Labs on the Ethereum blockchain) and rare Pepe trading cards.

The 2017 online game CryptoKitties was monetized by selling tradable cat NFTs, and its success brought some public attention to NFTs. The NFT market experienced rapid growth during 2020, with its value tripling to \$250 million. In the first three months of 2021, more than \$200 million were spent on NFTs. In the early months of 2021, interest in NFTs increased after a number of high-profile sales and art auctions.

1.2 What is an NFT ?

An NFT is a digital asset that represents real-world objects like art, music, in-game items and videos. These digital files such as photos, videos, and audio are the data units that are stored on blockchain. They are bought and sold online, frequently with cryptocurrency, and they are generally encoded with the same underlying software as many crypto tokens.

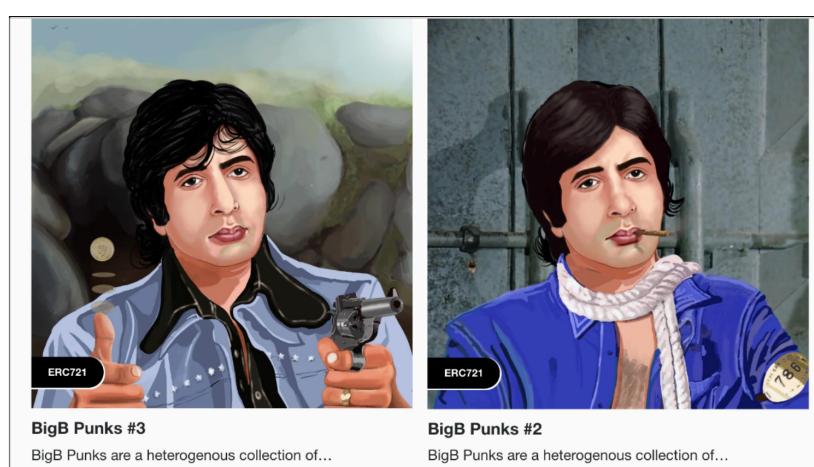


Fig 1.1 Autographed vintage posters of Amitabh Bachchan (NFTs)

1.3 Characteristics of NFT

An NFT is a unit of data stored on a digital ledger, called a blockchain, which can be sold and traded. The NFT can be associated with a particular digital or physical asset (such as a file or a physical object) and a license to use the asset for a specified purpose. An NFT can be traded and sold on digital markets.

NFTs are created when blockchains string records of cryptographic hash, a set of characters identifying a set of data, onto previous records therefore creating a chain of identifiable data blocks. This cryptographic transaction process ensures the authentication of each digital file by providing a digital signature that is used to track NFT ownership.

Ownership of an NFT does not inherently grant copyright or intellectual property rights to the digital asset a token represents. While someone may sell an NFT representing their work, the buyer will not necessarily receive copyright privileges when ownership of the NFT is changed and so the original owner is allowed to create more NFTs of the same work. In that sense, an NFT is merely a proof of ownership that is separate from a copyright.

NFTs have been used as a means of exchanging digital tokens that link to a digital file. Ownership of an NFT is often associated with a license to use the underlying digital asset, but generally does not confer copyright to the buyer. Some agreements only grant a license for personal, non-commercial use, while other licenses also allow commercial use of the underlying digital asset.

2. OVERVIEW

2.1 Blockchain

A blockchain is a distributed database that is shared among the nodes of a computer network. As a database, a blockchain stores information electronically in digital format. A blockchain collects information together as blocks. Blocks have certain storage capacities and, when filled, are closed and linked to the previously filled block, forming a chain of data known as the blockchain.

One key difference between a typical database and a blockchain is how the data is structured. A blockchain collects information together in groups, known as blocks, that hold sets of information. Blocks have certain storage capacities and, when filled, are closed and linked to the previously filled block, forming a chain of data known as the blockchain. All new information that follows that freshly added block is compiled into a newly formed block that will then also be added to the chain once filled.

A database usually structures its data into tables, whereas a blockchain, like its name implies, structures its data into chunks (blocks) that are strung together. This data structure inherently makes an irreversible timeline of data when implemented in a decentralized nature. When a block is filled, it is set in stone and becomes a part of this timeline. Each block in the chain is given an exact time stamp when it is added to the chain. The goal of blockchain is to allow digital information to be recorded and distributed, but not edited. In this way, a blockchain is the foundation for immutable ledgers, or records of transactions that cannot be altered, deleted, or destroyed. This is the reason for blockchains being known as a distributed ledger technology (DLT).

What a blockchain does is to allow the data held in that database to be spread out among several network nodes at various locations. This not only creates redundancy but also maintains the fidelity of the data stored therein—if somebody tries to alter a record at one instance of the database, the other nodes would not be altered and thus would prevent a bad actor from doing so. This system helps to establish an exact and transparent order of events. This way, no single node within the network can alter information held within it.

Because of this, the information and history are irreversible. Such a record could be a list of transactions, but it also is possible for a blockchain to hold a variety of other information like legal contracts, state identifications, or a company's product inventory. Blockchain technology achieves decentralized security and trust, and allows all transactions to be viewed by anyone as they're happening.

2.2 Cryptocurrency

Cryptocurrency, sometimes called crypto-currency or crypto, is any form of currency that exists digitally or virtually and uses cryptography to secure transactions. Cryptocurrencies don't have a central issuing or regulating authority, instead using a decentralized system to record transactions and issue new units.

Cryptocurrency is a digital payment system that doesn't rely on banks to verify transactions. It's a peer-to-peer system that can enable anyone anywhere to send and receive payments. Instead of being physical money carried around and exchanged in the real world, cryptocurrency payments exist purely as digital entries to an online database describing specific transactions. When you transfer cryptocurrency funds, the transactions are recorded in a public ledger. Cryptocurrency is stored in digital wallets.

Cryptocurrency received its name because it uses encryption to verify transactions. This means advanced coding is involved in storing and transmitting cryptocurrency data between wallets and to public ledgers. The aim of encryption is to provide security and safety. The first cryptocurrency was Bitcoin, which was founded in 2009 and remains the best known today.

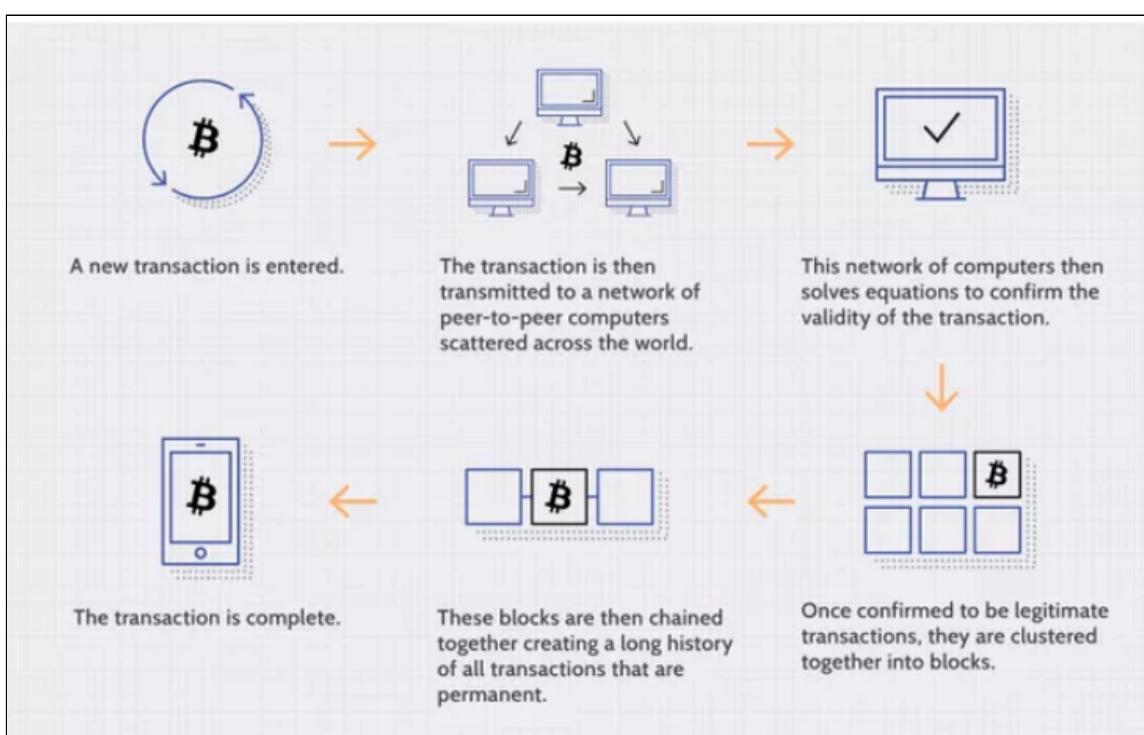


Fig 2.1 A Bitcoin transaction happening on a block chain

2.3 NFTs vs Cryptocurrency

NFT stands for non-fungible token. It's generally built using the same kind of programming as cryptocurrency, like Bitcoin or Ethereum, but that's where the similarity ends. Physical money and cryptocurrencies are "fungible," meaning they can be traded or exchanged for one another. They're also equal in value—one dollar is always worth another dollar; one Bitcoin is always equal to another Bitcoin. Crypto's fungibility makes it a trusted means of conducting transactions on the blockchain.

NFTs are different. Each has a digital signature that makes it impossible for NFTs to be exchanged for or equal to one another (hence, non-fungible). One NBA Top Shot clip, for example, is not equal to EVERYDAYS simply because they're both NFTs. (One NBA Top Shot clip isn't even necessarily equal to another NBA Top Shot clip, for that matter.)

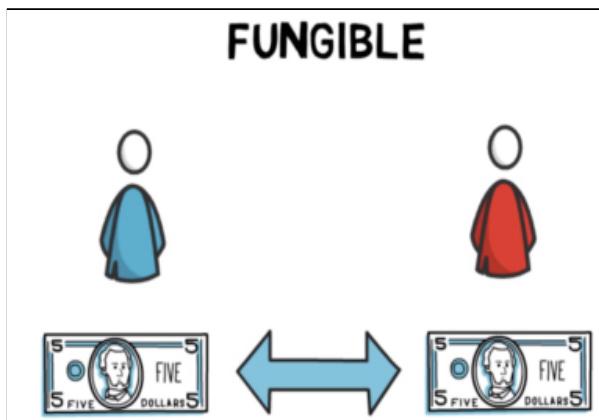


Fig 2.2 One Dollar always Equals another Dollar



Fig 2.3 An NFT is not Equal to another NFT

2.4 Properties

- ❖ NFTs are inherently indivisible, like an item of furniture that can't be divided into smaller parts and retain its initial qualities.
- ❖ An NFT is minted by an entity, after which it can be sold to a new entity who then becomes the owner of that token.
- ❖ Smart contract rules can be used to prevent or limit subsequent transfers of the token.

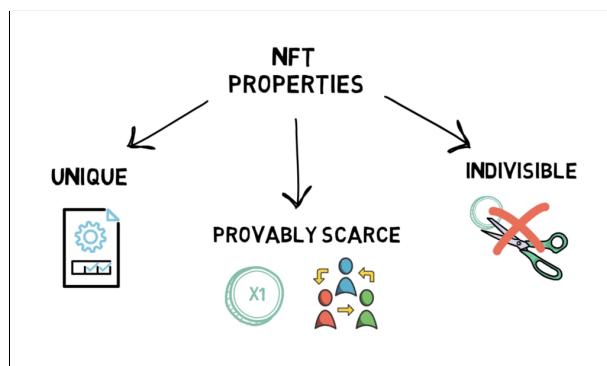


Fig 2.4 NFT Properties

3. WORKING

3.1 How are NFTs created ?

Non-fungible tokens or NFTs are executed by smart contract blockchains and specialized protocols. The most widely used smart contract blockchain for NFTs is Ethereum. Ethereum has become the most widely used blockchain when it comes to minting NFTs. This is because the Ethereum blockchain supports a wide range of NFT token standard, including ERC-721, ERC-1155, ERC-809, ERC-994, ERC- 1201, and ERC-998. The ERC-1155 standard for example allows the creation of fungible tokens and non-fungible tokens (NFTs). Other platforms, blockchains and smart contract protocols that also support the creation of NFTs are: Flow, WAX, Tezos and Binance Smart Chain.

When an NFT token is created it stores metadata about a digital file or a valuable item, the most common form is digital art. The components or details of this NFT token metadata can include the artist or creator of the item, the description of the item, the price, the NFT creation date, the ownership of the item, specifications such as royalties, the transaction history of the asset, the new owner, and the location links of the file representing the NFT usually on the decentralized IPFS (Interplanetary File System) server.

NFTs serve as verifiable proof of unique digital items, but the main purpose is to create verifiable digital scarcity of digital items. But their main use is in digital art. They help to prove authenticity and ownership of digital artworks.

3.1.1 Minting

In simple terms, Minting NFT refers to the process of turning a digital file into a crypto collectible or digital asset on the Ethereum blockchain. The digital item or file is stored in this decentralized database or distributed ledger forever, and it is impossible to edit, modify, or delete it. As is the process of creating fiat coins, when a manufacturer mints a physical coin, the process of uploading a specific item onto the blockchain is known as “minting”.

Or we can define “NFT Minting” as the process by which your digital art or digital content becomes a part of the Ethereum blockchain. The NFT minting process is Similar to the way metal coins are minted and put into circulation, non-fungible tokens are also “minted” after they are created. This process turns a simple file into a crypto asset easily traded or bought with cryptocurrencies on a digital marketplace without an intermediary.

During the minting process, the creator of the NFT can schedule royalties from every subsequent sale, which will be a commission he can receive whenever his work is sold to another person, or is traded on the secondary market.

3.1.2 Gas Fee

We cannot mint an NFT for free. Currently, the largest NFT marketplaces are hosted on the Ethereum blockchain and the Binance Smart Chain protocol. Using the Ethereum blockchain (creating NFTs, buying, selling, or transferring an asset at an Ethereum address) has a cost, and that cost is called the “gas fee” or “Gwei”. This fee typically costs between \$50 and \$200, depending on the NFT platform.

3.1.3 Platforms

The most popular and most economical NFT marketplaces on the Ethereum blockchain are: the OpenSea NFT, Rarible, and Mintable. The most popular marketplaces on the Binance Smart Chain network are BakerySwap, Juggerworld and Treasureland.

OpenSea.io

A peer-to-peer marketplace for NFTs, rare digital items and crypto collectibles. Allows Buying, selling, auctioning, and discovery of NFTs. The OpenSea platform is worth \$13.3 Billion.(₹10,08,25,83,70,000)

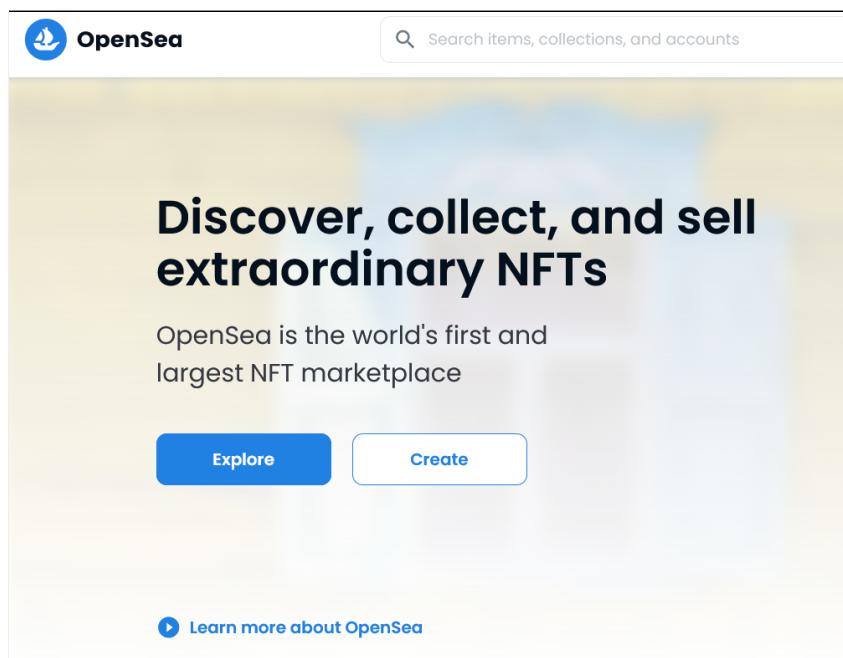


Fig 3.1 Web Page of Opensea.io

3.1.4 Digital Wallets

After selecting the platform and before starting minting NFTs, we will need a digital wallet or Ethereum wallet. The most popular digital wallets are Metamask, Trust Wallet, Coinbase Wallet, and Rainbow. When you create a wallet it generates a “seed phrase,” which is a string of 12 random words that allows you to access your funds in case you lose access or forget your wallet password. A cryptocurrency wallet or digital wallet is composed of a ‘public wallet address’ and a ‘private key’. The ‘public wallet address’ is usually used to transfer any cryptocurrency or NFTs from one wallet to another, while the private keys or secret keys allow you to have control over your funds.

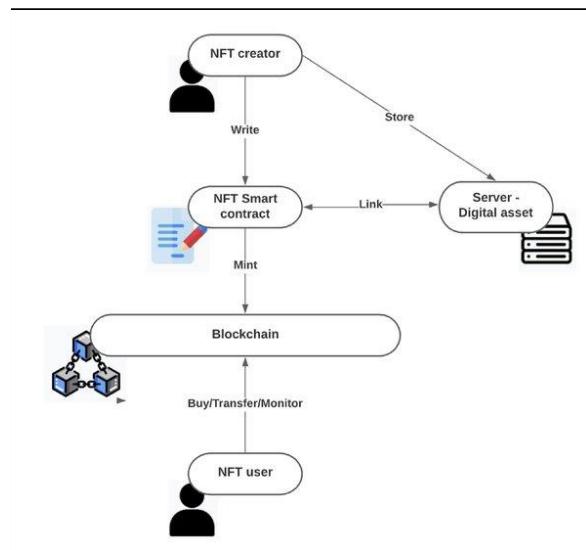


Fig 3.2 Working of NFT

3.2 Steps for Minting NFTs

3.2.1 Connect your wallet to the NFT marketplace.

Your profile on any Ethereum-based NFT marketplace (OpenSea NFT, Rarible, Nifty Gateway, Foundation or SuperRare) will be activated as soon as you connect your Metamask wallet, and from there you can create a username or display name, add a profile photo or cover photo of your collection, and add links to your social networks, personal blog, e-shop, or portfolio page.

3.2.2 Upload your file

The process of uploading your file or creating your own NFTs is quite simple, just look for the “Create an NFT” page in your chosen marketplace, from there you can upload images in PNG, JPG or GIF formats, a music file in MP3 or .Wav formats, a video file in MP4 format or a 3D file in GLB format.

Remember that an NFT is not the digital file or any digital content itself, but rather a representation of the file or content.

Given that the Ethereum blockchain will be able to store your NFT tokens for quite some time, you need to make sure that the file being represented by an NFT is being well stored. It makes more sense to store the digital file in a decentralized database, such as in IPFS (InterPlanetary File System).

3.2.3 Mint your NFT

After uploading your file or your digital artwork, here you can add or assign a title and a description of the item, and then click the “Mint NFT” or “Is for sale” button, depending on the platform.

Approve Gas Fee or Transaction Fee

All transactions made on the Ethereum network have a cost, and this cost is paid with the Ether (ETH) cryptocurrency. Hence, at this stage, a gas fee or transaction fee will need to be approved in your digital wallet to complete the minting of the NFT.

3.2.4 Wait until your NFT is minted

After uploading the file and paying the gas fee, the NFT minting process is automatically started. During this process the Ethereum smart contract executes a code that will be implemented in your artwork on the Ethereum blockchain.

After your NFT is minted, you can store the NFT in your wallet or sell it using any NFT Marketplace.

4. APPLICATIONS

4.1 Digital Art

A Digital Art or an NFT Art is a digital asset that exists completely in the digital universe. We can't touch it, but can own it. An NFT can be any type of digital file: an artwork, an article, music or even a meme.

Before NFTs, videos and motion graphics were repurposed and reposted, but there wasn't a opportunity to automatically assume complete, concrete ownership over a digital file or artwork. The rise of NFT's changes this, allowing creators the authority to rent digital artworks out, to sell them or display them how they wish. In order to sell them, designers need to get some kind of 'legal' ownership of their work. So, after NFT art is created, it's 'minted' or tokenized on the cryptocurrency service, Blockchain.

NFT art is a totally new way of categorizing digital artworks that enables designers to monetize their work. It's supposed to be a quicker process and a more accessible way for designers to produce work and reap the rewards for their creativity. There's no chasing clients for payment, there's no preparing files for print and there's no waiting to hear feedback or changing and editing your work to suit a client's needs. Some NFT art comes with royalties to the artist, meaning every time the artwork is sold on, the artist can receive 8-10% of all future sales.

The rise of NFT trading means that art collecting has been able to move online, opening it up to many artists, on a global scale, who may not have previously had the chance to sell their work to buyers.

4.1.1 Most Popular Digital Arts

- "Merge" by artist Pak being the most expensive NFT with a price of \$91.8 million
- Everydays: the First 5000 Days, by artist Mike Winkelmann at US\$69.3 million in 2021.

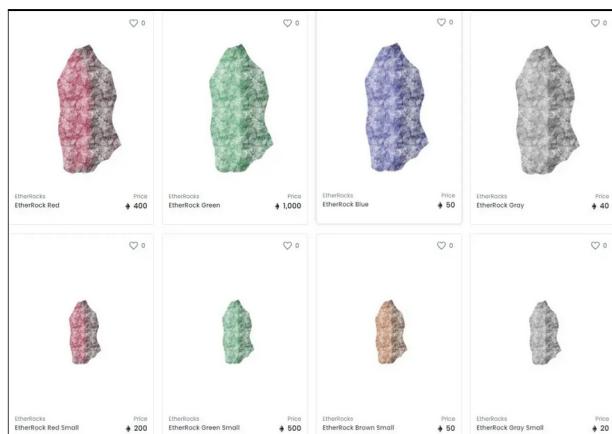


Fig 4.1 ETHER Rocks worth 400ETH



Fig 4.2 Cyberpunks 10,000 Limited edition art

4.2 Games

NFT games are different to mainstream experiences, as items bought or earned can be sold or traded within and perhaps across games for real money. The NFTs themselves can be used as part-ownership in a game.

4.2.1 CryptoKitties

CryptoKitties was an early successful blockchain online game on Ethereum developed by Canadian studio Dapper Labs in 2017, that allows players to purchase, collect, breed, adopt and trade virtual cats. The virtual cats are breedable and carry a unique number and 256 bit distinct genome with DNA and different attributes (cattributes) that can be passed to offspring. Several traits can be passed down from the parents to the offspring. There are a total of 12 'cattributes' for any cat, including pattern, mouth shape, fur, eye shape, base color, accent color, highlight color, eye color, and optional wild, environment, 'purrstige' and 'secret'. Other features like cool down times are not passed down but are instead a function of the 'generation' of the offspring, which is one more than the 'generation' of the highest 'generation' attribute.

A CryptoKitty does not have a permanently assigned gender. While they can only engage in one breeding session at one time, each cat is able to act as either matron or sire. There is a 'cooldown' time that indicates how soon the cat can breed again, which goes up with the number of breeds, capped at one week. The virtual cats are static images that can only be purchased, bred and sold. The game has no goal. The monetization of NFTs within the game raised a \$12.5 million investment, with some kitties selling for over \$100,000 each.

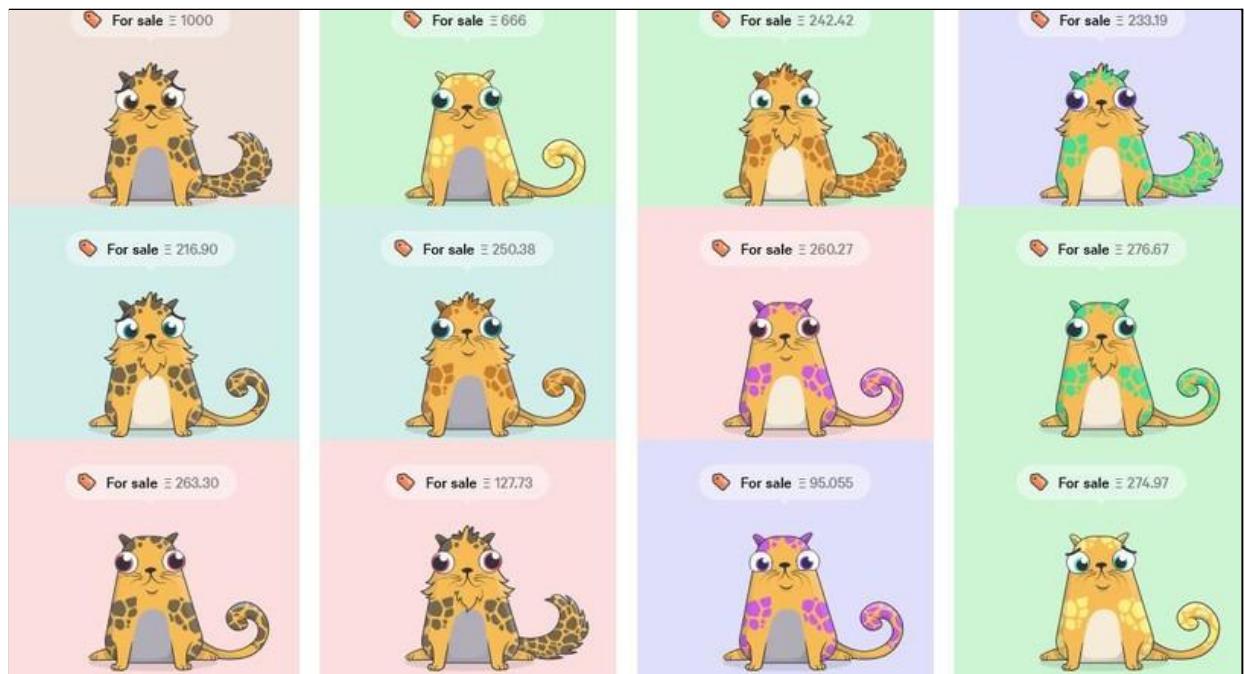


Fig 4.3 CryptoKitties listed on a platform for sale

4.2.2 Axie Infinity

A monster raising game where the monsters you breed and battle are NFTs. All the axies are some variation of a little blob. There is an actual combat system here, and you can play against other players, but the cards and axies cost currencies that are, of course, their own forms of crypto.

4.2.3 Gods Unchained

Gods Unchained is a free-to-play game designed to infuse elements of NFT into a familiar card trading gaming genre. Players accumulate cards by purchasing them from other players or winning PVP matchups where the quality of cards and the gaming skill of players often determine the winner.

4.2.4 The Sandbox 3D

The Sandbox is a voxel-based gaming metaverse and one of the most active NFT gaming platforms where players can build and trade virtual assets. In this game, players can manipulate and monetize voxel assets.

4.2.5 Alien Worlds

Alien Worlds is an NFT Defi metaverse that simulates economic competition and collaboration between players in a bid to explore other planets. This is achieved by incentivizing players to compete for Trilium (TLM), which is required to control competing decentralized autonomous organizations and to gain access to additional gameplay.

4.2.6 Battle Racers

As its name implies, Battle Racers is inspired by popular titles like Super Mario Kart and F-Zero. The whole idea is to combine different weapons and parts in order to create the most powerful cars. Players get to mix different parts and weapons that will give them some sort of advantage on the arcade-sized tracks.

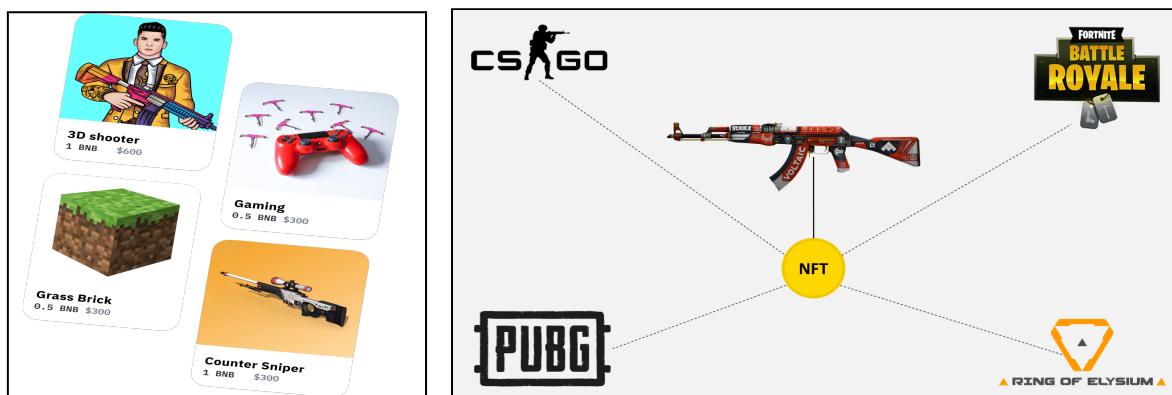


Fig 4.4 In game items and Skins as NFT Collectibles

4.3 Music

Many experts expect NFTs to prove especially transformative in shaping the future of music. Songs, albums, music, lyrics, and soundbites can all be NFTs. Last year, Kings of Leon became the first band to release an album as an NFT. Music can even be combined with digital art in jpeg or gif formats to create unique pieces of artwork with music incorporated. For example, Lostboy NFT is a popular music collective that combines music and art, along with a focus on mental health. Thanks to smart NFTs that can support multiple formats, music-related NFTs can be displayed differently depending on how they are accessed. NFTs have the potential to ensure that musicians are more fairly compensated for their work. Consider a personal anecdote by Linkin Park's Mike Shinoda, who raised about \$11,000 for his first NFT.

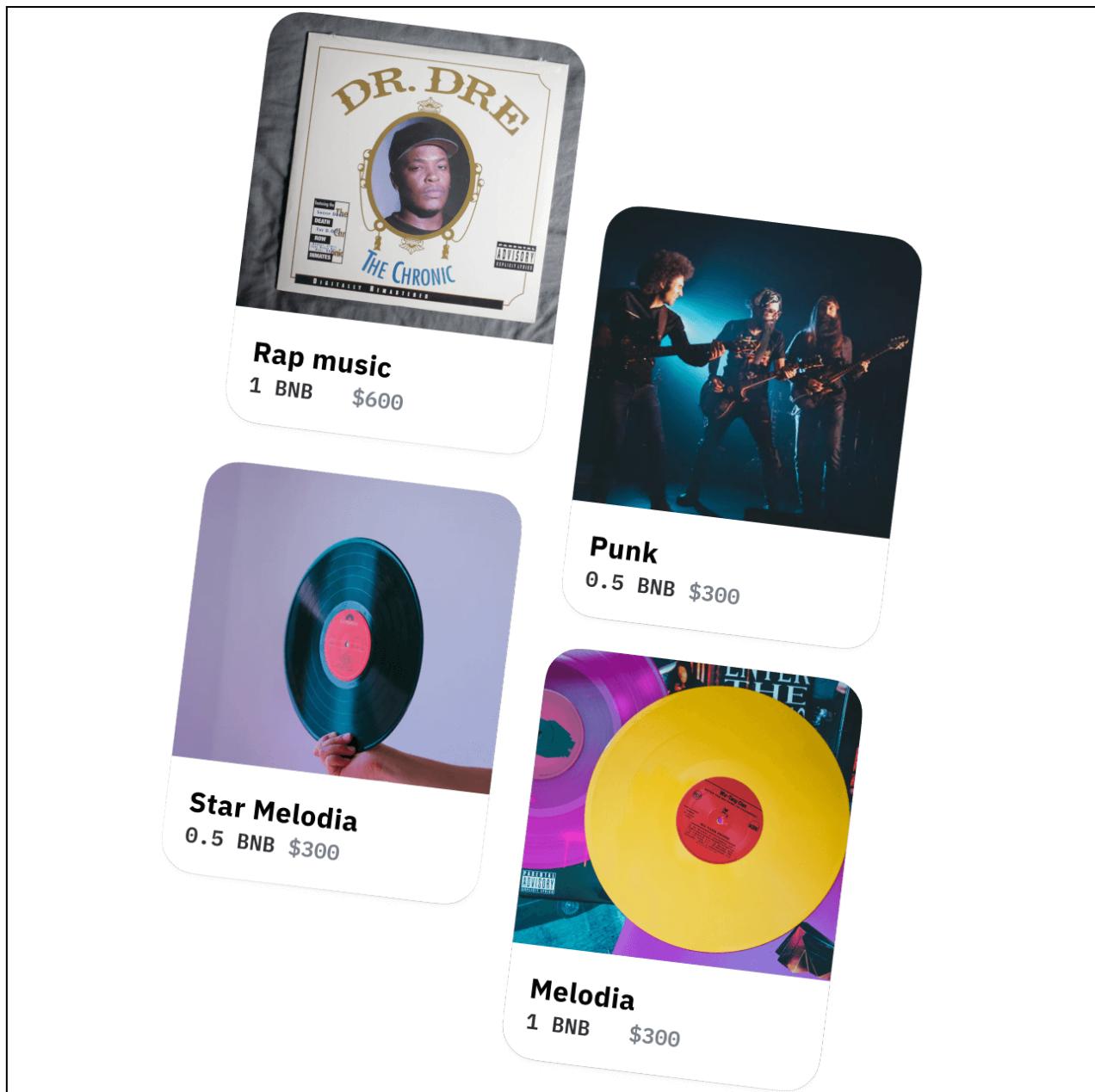


Fig 4.5 Music NFTs (Images/gifs/pdfs of the song along with music)

4.4 Virtual Worlds

Virtual worlds are blockchain-fueled alternative realities where users can create and trade digital goods, play games, and display NFTs in galleries, among other intriguing use cases. Non-fungible token categories like art, collectibles, and domain names are all put to use in the metaverse, with ecosystems built and maintained by the crypto community.

4.4.1 Decentraland

One of the buzziest metaverses today is Decentraland. Visitors enter the virtual space through a web browser, choose an avatar, and are transported to a vibrant digital hub where they can tour a replica of Sotheby's London art gallery, attend a virtual Paris Hilton concert, or visit a JPMorgan Chase & Co. lounge featuring a portrait of Jamie Dimon.

Decentraland is a fusion of the two most sought-after themes for technology investors: the metaverse and Web3. People buy and sell the app's custom currency, MANA, which has a market value of \$4.7 billion. Some 600,000 people use the app each month, according to its creative director. Decentraland has captured headlines for hosting a DJ performance by Deadmau5 and for persuading Barbados officials to construct a virtual embassy.

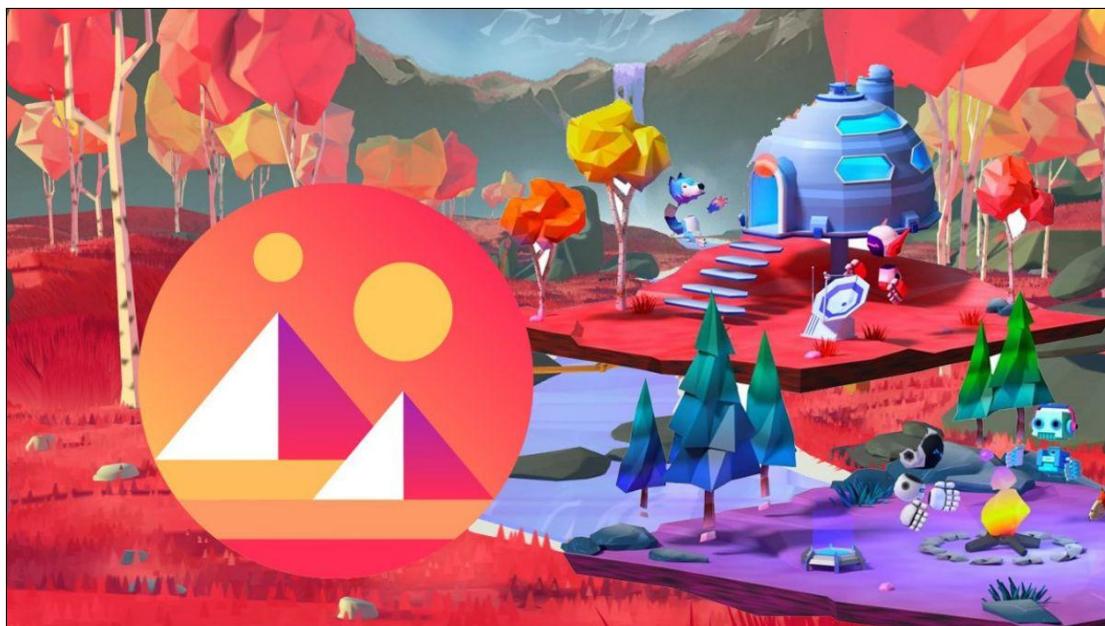


Fig 4.6 A virtual place in Decentraland with NFTs

4.4.2 Somnium Space

Somnium Space is an open and social virtual reality world built on the Ethereum blockchain. Buy land, build or import objects, and instantly enjoy or monetize assets. Somnium space is a universe shaped entirely by its community of users.

4.4.3 Metaverse by Facebook

The metaverse is an immersive internet experience that lets you replace or augment reality with computerized simulations that strive to be as realistic as possible. "Essentially, it's a world of endless, interconnected virtual communities where people can meet, work, and play, using virtual reality headsets, augmented reality glasses, smartphone apps, or other devices. Meta describes the metaverse as "the next evolution of social connection," 3D spaces where you can "socialize, learn, collaborate and play in ways that go beyond what we can imagine."

Meta is focusing on creating virtual office spaces where people working from home can gather as if in person, plus virtual homes people can design and host real friends for metaverse games. You will also be able to attend concerts, travel to distant cities and natural wonders, and, of course, shop for virtual clothes and goods that will exist in our virtual worlds. Theoretically, once the technology is good enough, the possibilities are as broad as our imaginations.

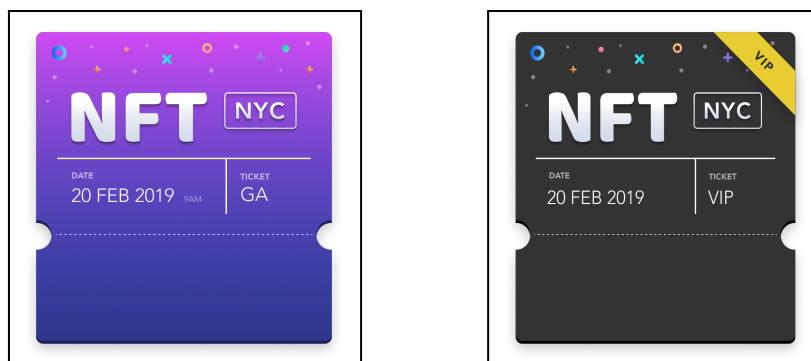


Fig 4.7 Land, Buildings, Tickets, Apparel etc are NFTs in these Virtual Worlds

4.5 Films

In May 2018, 20th Century Fox partnered with Atom Tickets and released limited-edition Deadpool 2 digital posters to promote the film. They were available from OpenSea and the GFT exchange. In March 2021 Adam Benzine's 2015 documentary Claude Lanzmann: Spectres of the Shoah became the first motion picture and documentary film to be auctioned as an NFT.

Other projects in the film industry using NFTs include the announcement that an exclusive NFT artwork collection will be released for Godzilla vs. Kong and director Kevin Smith announcing in April 2021 that his forthcoming horror movie Killroy Was Here would be released as an NFT. The 2021 film Zero Contact, directed by Rick Dugdale and starring Anthony Hopkins, was also released as an NFT.



Fig 4.8 The film lotawana was sold as NFT for \$100,000

5. ENVIRONMENTAL IMPACT

5.1 Greenhouse Emissions

NFTs are at least partially responsible for the millions of tons of planet-heating carbon dioxide emissions generated by the cryptocurrencies used to buy and sell them. ArtStation, an online marketplace for digital artists, canceled its plans to launch a platform for NFTs within hours after getting a lot of backlash from people who think dealing in crypto art is environmentally unethical.

There have been some initial estimates of how much power an NFT uses up and, consequently, how much planet-heating pollution that generates. Take “Space Cat,” an NFT that’s basically a GIF of a cat in a rocket heading to the Moon. Space Cat’s carbon footprint is equivalent to an EU resident’s electricity usage for two months.

NFTs are largely bought and sold in marketplaces like Nifty Gateway and SuperRare that use the cryptocurrency Ethereum. Ethereum, like most major cryptocurrencies, is built on a system called “proof of work” that is incredibly energy hungry. There’s a fee associated with making a transaction on Ethereum — and, ironically, that fee is called “gas.”

Proof of work acts as a sort of security system for cryptocurrencies like Ethereum and bitcoin since there’s no third party, like a bank, that oversees transactions. To keep financial records secure, the system forces people to solve complex puzzles using energy-guzzling machines. Solving the puzzles lets users, or “miners,” add a new “block” of verified transactions to a decentralized ledger called the blockchain. The miner then gets new tokens or transaction fees as a reward. The process is incredibly energy inefficient on purpose.

5.2 Probable Solution

The most popular alternative to proof of work is a system called “proof of stake”. Instead of having to pay for huge amounts of electricity to enter the game, miners have to lock up some of their own cryptocurrency tokens in the network to “prove” they’ve got a “stake” in keeping the ledger accurate. If they get caught doing anything fishy, they’ll be penalized by losing those tokens. That gets rid of the need for computers to solve complex puzzles, which, in turn, gets rid of emissions.

There are other ways to bring down emissions from NFTs and keep a more decentralized proof-of-work network. One potential solution is to build out another “layer” on top of the existing blockchain. Working on this second layer can save energy because transactions happen “off-chain” — away from the energy-intensive proof-of-work process.

6. CONCLUSION

The most obvious benefit of NFTs is their potential to make markets more efficient. The conversion of a physical asset into a digital one can streamline processes, eliminate intermediaries, enhance supply chains and bolster security. This is so beneficial to painters, collectors, musicians and other people who now has access to a global market of buyers and sellers. Through digitization, the market for certain assets can be greatly expanded, leading to greater liquidity and higher prices.

Even though Cryptocurrency existed since 2009 it is still not legal in most of the countries throughout the world. Given the immature state of NFTs, the market for NFTs is not very liquid. NFTs are not widely understood and the number of potential buyers and sellers is small. NFTs are comparatively newer technology, and are risky because their future is uncertain, and we don't yet have a lot of history to judge their performance.

All of the potential fixes to the climate pollution problem of NFTs are in the works to varying degrees, but they haven't been widely adopted yet. Still, a lot of artists and even some environmentalists are optimistic about crypto art. Many believe by next year or year and a half, the emissions will be a non-issue.

NFTs are an exciting creation, and they're garnering more and more attention as their use cases multiply.

7. BIBLIOGRAPHY

- ❖ Virtual world <https://decentraland.org/>
- ❖ Cryptokitties <https://en.wikipedia.org/wiki/CryptoKitties>
- ❖ NFTs https://en.wikipedia.org/wiki/Non-fungible_token
- ❖ Block chain Introduction <https://www.investopedia.com/terms/b/blockchain.asp>
- ❖ Cryptocurrency <https://www.investopedia.com/terms/c/cryptocurrency.asp>
- ❖ NFTs working <https://www.forbes.com/advisor/investing/nft-non-fungible-token/>