Carbon footprint analysis of minting an ERC-721 NFT

Ecological impact report of minting NFTs

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1 INTRODUCTION

Nowadays an artist faces the challenge of understanding several encrypted terms of the blockchain ecosystem : What is a Blockchain ? What is Bitcoin ? What is Ethereum ? What is a Cryptocurrency ? What is a carbon footprint ? What is a NFT? or even What is a ERC-721 Token?

The objective of this article is to describe the main definitions regarding these concepts and reference published papers that shows carbon footprint number analysis in the blockchain mining context.

Blockchain concepts emerged since Satoshi Nakamoto (anonymous person or persons) published the paper "Bitcoin A Peer-to-Peer Electronic Cash" Bitcoin [1] in 2008. What is Bitcoin ? Bitcoin is a proposed system for electronic transactions without relying a third part to trust. Bitcoin use a peer-to-peer network with a decentralised consensus mechanism named proof-of-work (PoW) to record all public history of transactions [1].

What is a Blockchain ? A blockchain is a public record of transactions in chronological order.

What is Cryptocurrency ? Cryptocurrency can be defined as "any form of currency that only exists digitally, that usually has no central issuing or regulating authority but instead uses a decentralised system to record transactions and manage the issuance of new units, and that relies on cryptography to prevent counterfeiting and fraudulent transactions" [2].

What is a carbon footprint? According to Wiedmann [3] the carbon footprint is a measure of the exclusive total amount of carbon dioxide emissions that is directly and indirectly caused by an activity or is accumulated over the life stages of a product.

What is a NFT NonFungile Token ? Non-fungible tokens (NFTs) are a new type of unique and indivisible blockchain-based tokens [4]. NFTs represents ownership over digital or physical assets like : physical property, virtual collectables, unique pictures proposed by EIPS Ethereum Improvement Proposals (ERC-721) [5].

What is a ERC? ERC stands for Ethereum Request for Comments and are technical standards for Ethereum-based tokens, available online as EIPs - Ethereum Improvement Proposals [6]. ERC-721 standard provides basic functionality for the tracking and transferring of NFTs [6].

What is Ethereum ? Ethereum is a major blockchain-based platform for smart contracts [7] (a detail proposal of Ethereum technical paper by Dr. Gavin Wood is available at [8]).

Creating and implementing an NFT through any Ethereum compatible blockchain automatically generates a unique and traceable identification reference, which is linked to the artwork created by the artist. Defining art most commonly consists in the attempt to find necessary conditions and sufficient conditions for the truth of the statement that an item is an artwork [9].

Is NFT ERC-721 art? Is cryptart art ? It goes beyond a rapid review of these concepts.

Energy consumption of blockchain technology differs significantly between different design choices so stands that blockchain technology with non-PoW consensus substantially mitigates sustainability issues [10]. De Loose [11] estimate that the cryptocurrency market consumes on average 80 TWh/year, with an average lower and uppper bound of respectively 35.7 and 150.6 TWh/year. By using geographic mining data and an per kWh of electricity consumed for mining, 473.64 g CO2-eq is emitted. Finally, De Loose [11] estimates that the entire cryptocurrency industry emitted 81.47 kilotons of CO2-eq over the final year. Indicators are available at WorldBank [12]. In synthesis, artists and collectors must be aware of the main concepts of the ecosystem and the associated ecological impact of mining NFTs.

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