

NFTForge: Empowering Decentralized Trades with Custom Tokens

A PROJECT REPORT

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CHAPTER 2

LITERATURE REVIEW

2.1. Timeline of the reported problem

The timeline of research on designing the NFTForge project spans over a decade.

Zhipeng Fan.(2019)[1]: This research paper explores blockchain consensus algorithms and presents a hybrid consensus algorithm designed to address the shortcomings of individual algorithms. Combining PBFT and PoW, enhances both decentralization and performance, resulting in improved throughput and latency compared to traditional consensus methods. This hybrid approach offers a promising solution to the challenges of achieving decentralization and efficiency in blockchain systems for the Internet of Things.

Yashika Nagpal. (2020)[2]: This research paper seems to explore the potential of NFTs, their growth, and the legal challenges they pose, with a particular focus on India's legal framework. It highlights the increasing interest in NFTs as digital collectibles and investments while also acknowledging the uncertainty and legal questions surrounding their use in India.

Deepak Puthal et al. (2020)[3]: This research paper introduces a novel consensus algorithm tailored for fast, scalable, and private blockchain within large-scale Internet of Things (IoT) frameworks, it likely explores innovative solutions for achieving efficient consensus in blockchain systems optimized for the unique demands of IoT applications.

Rahul Dattaram Belose et al.(2021)[4]: This research paper examines NFT-based startups listed on cryptocurrency exchanges, presenting a novel NFT classification. It demonstrates impressive NFT performance, including a 130% return on the first listing day and an average long-term investment multiple of 40 (equivalent to 4,000%), outperforming Bitcoin. NFTs exhibit positive alpha, and above-average beta, and played a pivotal role in the cryptocurrency market's recovery post the mid-2021 crash, yielding a return of nearly 350%.

Shreyansh Goushal(2021)[5]: This research paper explores Non-Fungible Tokens (NFTs), tracing their origins and development. It highlights their role in the art and digital asset

markets, while acknowledging the challenges they face. Additionally, the paper aims to investigate if there is a correlation between NFT sales and the prices of Bitcoin and Ethereum.

Subhita Menon et al.(2021)[6]: This research paper presents a comprehensive survey of blockchain smart networks based on consensus algorithms. It highlights the rapid growth of blockchain technology and its potential to impact various application fields. The paper primarily focuses on consensus mechanisms' sustainability, scalability, throughput, computation overhead, and latency. It offers insights into the diverse applications of blockchain networks across various domains, emphasizing the role of consensus mechanisms in these applications. Furthermore, the paper identifies and discusses open challenges in blockchain consensus algorithm design, offering future research directions. Key themes covered include blockchain technology, consensus mechanisms, and network applications.

Huanliang Xiong et al.(2022)[7]: This paper provides an overview of recent advancements in blockchain consensus algorithms. It delves into various consensus mechanisms, highlighting their strengths, weaknesses, and real-world applications. This review serves as a valuable resource for researchers, developers, and blockchain enthusiasts interested in staying updated on the latest developments in consensus technology.

Timo Hanke et al.(2022)[8]: This research paper explores the Dfinity blockchain, emphasizing its secure consensus mechanism. It highlights the unique decentralized randomness beacon and its role in leader selection and ranking within the Dfinity blockchain. The paper also discusses notarization for rapid finality and security. It showcases Dfinity's fast block times, quick transaction finality with minimal confirmations, and resilience to network disruptions, all with provable security under synchronization conditions.

Phil Gonserkewitz et al.(2022)[9]: This research paper describes a comprehensive overview of NFTs, including their current use cases and potential future directions. It also acknowledges the importance of addressing security issues and educating businesses about NFT opportunities.

Saeed Banaeian Fara et al.(2022)[10]: This research paper discusses the applications of Non-Fungible Tokens (NFTs) in the real world and the Metaverse. NFTs, have gained popularity and found applications in various industries. The Metaverse, a blockchain-based technology, is explored as a platform where NFTs can be used for identity management and

ownership rights of digital assets. The paper aims to identify new applications of NFTs and presents future directions for their use in industry and academic research.

Kebira Azbeg et al. (2022)[11]: This research paper offers an overview of blockchain consensus algorithms, discussing their significance in securing distributed systems. It explores various consensus algorithms within the blockchain ecosystem, providing a comparative analysis of their strengths and weaknesses and their suitability for different blockchain types. Additionally, the paper highlights challenges and future directions in this rapidly evolving field, aiming to assist in algorithm selection for specific scenarios and inspire the development of new algorithms. Key topics covered include blockchain, distributed systems, and consensus algorithms.

Ruihang Huang et al.(2022)[12]: This research delves into the consensus mechanism for software-defined blockchains in the Internet of Things (IoT). It assesses traditional consensus algorithms, introduces an improved DPOS-PBFT-based consensus scheme, and incorporates a dynamic credibility-based node ranking system. The results demonstrate the proposed mechanism's robustness, maintaining a high success rate and low latency under significant user loads. This study offers valuable insights for enhancing IoT blockchain consensus mechanisms and their practical applications.

In summary, the review of the analyzed research papers illustrates the significant advancements in blockchain technologies, Non-Fungible Tokens (NFTs), and consensus algorithms over the past decade. These studies have shed light on the potential of NFTs as digital collectibles and investments, the challenges and legal implications surrounding their adoption, and their correlation with the prices of prominent cryptocurrencies. Moreover, the exploration of innovative consensus algorithms tailored for IoT applications and the comprehensive survey of blockchain smart networks have paved the way for a deeper understanding of the scalability, sustainability, and applications of blockchain technology in various domains. The review also underscores the ongoing efforts in the development of secure and efficient consensus mechanisms, emphasizing the need for robust security protocols and dynamic credibility-based systems to enhance the performance of blockchain networks. These findings collectively lay the groundwork for the NFTForge project, indicating a promising trajectory for the integration of advanced blockchain solutions and NFT applications in the digital asset landscape.

2.2. Proposed solutions

There are various ways to develop such a system, but the most promising methods include the Implementation of a Hybrid Consensus Algorithm the utilization of NFTs, the Incorporation of Secure Consensus Mechanisms, the Development of Defi-Based Token, the Integration of Smart Contract Functionality, the Implementation of Decentralized Data Preprocessing:

Implementation of Hybrid Consensus Algorithm: The use of a hybrid consensus algorithm, combining aspects of Practical Byzantine Fault Tolerance (PBFT) and Proof of Work (PoW), can be considered for ensuring enhanced decentralization and improved throughput. This approach addressed the potential shortcomings of individual algorithms, fostering a robust and efficient blockchain system.

Utilization of Non-Fungible Tokens (NFTs): Leveraging the potential of Non-Fungible Tokens (NFTs) can facilitate seamless upload, ownership listing, and trading of digital assets. By adopting NFTs, the platform can enable users to securely and transparently trade digital collectibles, ensuring clear ownership records and simplified transaction processes.

Incorporation of Secure Consensus Mechanisms: Integrating secure consensus mechanisms within the project's architecture, such as those explored in the literature, can ensure robust and reliable transaction validation. This approach can enhance the security and credibility of the platform, establishing trust among users and facilitating seamless transactions with minimized risks of fraud or data manipulation.

Development of Defi-Based Token: The introduction of a decentralized finance (DeFi) based token, such as the ICP ,bitcoin Token, can serve as the primary medium of exchange within the platform. By utilizing this token, users can effectively engage in NFT purchases, sales, and subsequent transactions, fostering a secure and efficient ecosystem for digital asset trading.

Integration of Smart Contract Functionality: Leveraging the capabilities of smart contracts, particularly within the Motoko framework, can ensure the automation and execution of transparent, tamper-proof agreements between buyers and sellers. This feature

would enable streamlined and secure NFT transactions, guaranteeing fair and accurate ownership transfers while minimizing the need for intermediary interventions.

Implementation of Decentralized Data Preprocessing: Adapting decentralized data preprocessing techniques, as highlighted in the literature, can facilitate the transformation of raw data into a format suitable for machine learning analysis. By ensuring data accuracy, quality, and consistency, the platform can enhance the overall reliability and effectiveness of its machine-learning algorithms, supporting improved decision-making processes and user experiences.

In summary, by incorporating these proposed solutions, the project can establish itself as a cutting-edge platform for NFT trading, emphasizing secure transactions, decentralized data management, and efficient consensus mechanisms. The integration of these strategies can foster a transparent, user-centric, and reliable ecosystem, empowering users to participate in the seamless trading of digital assets while ensuring the security and integrity of their transactions.

2.3 Bibliometric Analysis

To further understand the research landscape in the area of NFTs buy and sell process, a bibliometric analysis was conducted. The analysis was performed using the Scopus database, which is a comprehensive database of peer-reviewed literature.

This study examines Non-Fungible Tokens (NFTs) by looking at NFT-based startups on cryptocurrency exchanges. It introduces a new way of classifying NFTs and highlights their impressive performance. For instance, they showed a 130% return on the first day they were listed and an average long-term investment that was 40 times the initial investment, outperforming even Bitcoin. NFTs also played a big role in helping the cryptocurrency market recover after the crash in mid-2021, resulting in a return of almost 350%.

The research paper emphasizes the growing importance of NFTs as a promising investment option. It points out that they have the potential to do better than traditional benchmarks, making them a lucrative opportunity for investors. By offering a detailed look into the

potential of NFTs, the study serves as a useful resource for professionals and investors, helping them make informed decisions in the changing world of cryptocurrency investments.

By emphasizing the impact of NFTs in the broader financial market, the research underlines their significant growth and impressive returns. It positions them as essential drivers of innovation and financial success within the thriving cryptocurrency landscape. This paper adds to our understanding of NFTs as transformative elements in modern investments, encouraging exploration and growth in the digital asset industry.

In a time when interest in digital assets is high, the research paper stresses the continued need to explore and understand the many aspects of NFTs. It highlights the importance of ongoing research to grasp the trends and dynamics shaping the NFT market, helping investors make informed decisions and create a strong investment environment in the ever-changing world of cryptocurrency.

Key feature of the proposed solution

Hybrid Consensus Algorithm Implementation: By integrating a hybrid consensus algorithm combining Practical Byzantine Fault Tolerance (PBFT) and Proof of Work (PoW), the system ensures enhanced decentralization and improved throughput, effectively addressing potential algorithm limitations while fostering a robust and efficient blockchain infrastructure.

Non-Fungible Tokens (NFTs) Integration: Leveraging the power of NFTs, the platform facilitates seamless upload, transparent ownership listing, and secure trading of digital assets. This integration guarantees clear ownership records and simplified transaction processes, enhancing user trust and participation.

Secure Consensus Mechanisms Incorporation: The integration of secure consensus mechanisms enhances the system's transaction validation, ensuring robust security and credibility. This feature establishes trust among users, minimizing risks of fraudulent activities and data manipulation, thereby fostering a secure and reliable trading environment.

DeFi-Based Token Development: The introduction of a decentralized finance-based token, facilitates efficient digital asset exchange within the platform. This token serves as the primary medium of exchange, enabling users to engage in seamless NFT purchases, sales, and subsequent transactions, thereby promoting a secure and efficient ecosystem for digital asset trading.

Smart Contract Functionality Integration: Leveraging smart contract capabilities, particularly within the Motoko framework, ensures automated execution of transparent, tamper-proof agreements. This integration streamlines NFT transactions, guaranteeing fair and accurate ownership transfers while reducing the need for intermediary interventions, thereby enhancing user convenience and transaction security.

Decentralized Data Preprocessing Implementation: By adopting decentralized data preprocessing techniques, the platform ensures accurate and reliable transformation of raw data for machine learning analysis. This approach enhances data quality and consistency, consequently improving decision-making processes and user experiences within the project, fostering a reliable and efficient ecosystem for users.

2.4 Review Summery

This literature review encompasses a comprehensive exploration of the evolving landscape of blockchain consensus algorithms, with a special focus on their application in the context of Non-Fungible Tokens (NFTs) and Internet of Things (IoT) frameworks. The reviewed papers analyze various consensus mechanisms, emphasizing their strengths and weaknesses in securing distributed systems. They also shed light on the potential applications of NFTs, examining their current use cases, market trends, legal implications, and future research directions.

The literature underscores the critical role of blockchain technology in addressing the challenges associated with NFT trading, including valuation ambiguity, ownership tracking, and fair revenue distribution. The surveyed works provide valuable insights into the mechanisms for creating secure, scalable, and private blockchains, particularly optimized for the requirements of IoT applications. Additionally, the studies delve into the correlation

between NFT sales and the prices of leading cryptocurrencies, elucidating the dynamics between NFT markets and the broader digital asset ecosystem.

Furthermore, the review identifies the emerging role of NFTs in diverse industries, both in the real world and the Metaverse, demonstrating their potential for identity management, digital asset ownership, and investment opportunities. The exploration of hybrid consensus algorithms tailored for IoT and the comprehensive survey of blockchain smart networks offer practical guidelines for addressing the challenges of scalability, throughput, and computation overhead in blockchain systems.

Overall, the review provides a comprehensive understanding of the current advancements and challenges in the NFT and blockchain consensus algorithm landscape, offering a robust foundation for the development of a user-friendly NFT marketplace that prioritizes transparency, security, and accessibility for all users.

2.5 Problem Definition

The process of buying, selling, and minting NFTs often involves intricate technical steps, including understanding blockchain protocols, setting up digital wallets, and navigating various platforms for transactions. This complexity poses a significant barrier to entry for newcomers, deterring them from participating in the NFT market. Lack of accessible resources and user-friendly guides further exacerbate the issue, limiting the inclusivity of the NFT ecosystem.

Many existing NFT marketplaces lack intuitive and user-friendly interfaces, making it challenging for artists, creators, and collectors to efficiently showcase and trade their digital assets. The absence of streamlined processes for uploading, tokenizing, and managing NFTs can lead to frustration and hinder the seamless interaction between buyers and sellers. This impedes the potential growth of the NFT market by alienating users who seek a hassle-free and engaging experience.

The surging popularity of NFTs has revealed the scalability limitations and speed constraints of various blockchain networks. Long transaction confirmation times and high gas fees pose

significant challenges, especially during periods of high network congestion. These issues not only contribute to user dissatisfaction but also hinder the broader adoption of NFTs as a viable medium for digital asset transactions, potentially limiting the scalability of the entire NFT ecosystem.

For artists and creators, the process of creating and managing smart contracts on blockchain networks demands a comprehensive understanding of coding languages and decentralized protocols. The technical complexities associated with developing secure and efficient smart contracts can deter individuals without specialized technical expertise from fully utilizing the potential of NFTs. This creates a significant barrier for content creators seeking to tokenize their work and engage with a broader audience.

Despite the inherent security features of blockchain technology, security vulnerabilities and fraudulent activities continue to pose risks in the NFT space. Issues such as unauthorized duplication of digital assets, counterfeiting, and lack of transparent ownership history can erode user trust and confidence in NFT transactions. Without robust measures to ensure the authenticity and traceability of NFTs, both creators and buyers remain exposed to potential risks and disputes, impeding the overall growth and credibility of the NFT market.

2.6 Objective and Goals

1. User-Friendly Platform: The primary objective is to create an intuitive and user-friendly NFT marketplace that streamlines the complex processes involved in buying, selling, and minting NFTs. By prioritizing a simplified and intuitive user interface, the platform aims to attract both newcomers and seasoned collectors, fostering a welcoming environment that encourages active participation and exploration of the NFT market.

2. Accessibility: Ensuring accessibility for a diverse user base is crucial. The project aims to eliminate technical barriers and provide a seamless onboarding process for artists, creators, and collectors, allowing them to effortlessly navigate the platform without the need for specialized technical knowledge. By fostering inclusivity, the platform endeavors to democratize participation in the NFT ecosystem, enabling a broader audience to engage with and benefit from digital asset trading and tokenization.

3. Security and Transparency: The project prioritizes the implementation of secure and transparent transactions through the use of smart contracts deployed on the Internet Computer (ICP) blockchain. By leveraging the inherent security features of blockchain technology, the platform aims to instill trust and confidence among users regarding the authenticity and ownership of their digital assets. Emphasizing a robust security infrastructure and transparent ownership tracking, the platform strives to mitigate potential risks and fraudulent activities, fostering a secure and credible environment for NFT transactions.

4. Feedback and Improvement: The project places significant emphasis on continuous user engagement and feedback collection. By actively soliciting and incorporating user feedback, the platform aims to iteratively enhance its features, user experience, and security measures. This iterative approach ensures that the platform remains adaptable and responsive to the evolving needs and preferences of its user base, thereby maintaining its competitive edge and relevance in the dynamic NFT industry.

5. Scalability and Speed: To facilitate a seamless and efficient user experience, the project targets the implementation of a robust and scalable infrastructure capable of handling high transaction volumes. By prioritizing speed and efficiency, the platform seeks to minimize waiting times and transaction costs, enabling swift and cost-effective NFT transactions. By ensuring optimal performance even during peak usage periods, the platform aims to provide users with a frictionless and reliable trading environment, fostering a positive and engaging user experience.