



SURVEY ON DECENTRALIZED AI MARKETPLACE USING BLOCKCHAIN

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Abstract : Both Blockchain and A.I. are cutting edge technologies. Blockchain is essentially a peer-to-peer distributed ledger that stores data in an encrypted, immutable format. Whereas A.I. is a term used to describe a machine capable of performing tasks that seemingly require human intelligence. For the most part, most A.I. systems in development today are actually specialized expert systems that use a database of knowledge to make decisions by building and using certain models. The centralized nature of AI models and data repositories have raised concerns regarding data privacy, security, and monopolistic control. In response, this project introduces a novel approach - a Decentralized AI Marketplace using Blockchain - that harnesses the power of Blockchain to enable easy, secure, and efficient access to AI Models.

Index Terms – Blockchain, Artificial Intelligence (AI), Decentralized.

I. INTRODUCTION

Decentralized AI and Blockchain are cutting-edge technologies with distinct capabilities, and their convergence holds the potential to revolutionize various industries [2]. Decentralized AI involves the distribution of AI models, algorithms, and computations across a network of nodes or devices, eliminating the need for a central server or authority. This approach allows for greater sustainability, scalability, and efficiency in AI and Blockchain systems [6]. On the other hand, blockchain is a distributed ledger technology that records transactions across a network of nodes, ensuring transparency, immutability, and security [3]. It is often associated with cryptocurrencies like Bitcoin, but its applications extend far beyond digital currencies. The motivation behind combining these technologies is multifaceted. Firstly, it addresses the critical issue of data privacy. Traditional AI models often require centralized data storage, leading to concerns about data security and privacy breaches. By decentralizing AI using blockchain, users can retain control of their data, granting permissions for AI model access while maintaining their ownership [7]. Additionally, the transparency and immutability of blockchain can enhance trust in AI systems [6]. Users can trace the history of AI model development and verify its integrity, reducing the risk of malicious or biased AI algorithms. Furthermore, combining decentralized AI and blockchain enables secure sharing and monetization of AI models [2]. Smart contracts, a feature of blockchain, can facilitate automated and transparent transactions between AI model creators and users [3]. This opens up new possibilities for collaborative AI ecosystems and fair compensation for model providers.

II. LITERATURE SURVEY

Decentralized AI Marketplaces:

Decentralized AI marketplaces are innovative platforms that leverage blockchain technology to facilitate the exchange of artificial intelligence services and models in a decentralized and trustless manner [7]. These marketplaces act as intermediaries connecting AI developers and consumers while removing the need for centralized control and intermediaries. One defining characteristic of decentralized AI marketplaces is their use of smart contracts, which automate and enforce the terms of transactions [2]. This ensures transparency, security, and trust, as all transactions are recorded on the blockchain. Additionally, these marketplaces often feature token-based economies, allowing developers to monetize their AI services and users to pay for them using cryptocurrency [1]. For developers, decentralized AI marketplaces offer several key benefits. Firstly, they provide a global platform for AI developers to showcase their models and services, expanding their reach and user base [6]. Developers can monetize their work without the need for traditional intermediaries, thus retaining a larger share of the revenue. Users, on the other hand, gain access to a diverse range of AI services and models, often at a more competitive price [7]. Several existing platforms exemplify these characteristics and benefits. SingularityNET, for instance, enables AI developers to publish their services as APIs and facilitates AI service discovery for users [6]. Ocean Protocol focuses on AI data services, allowing developers to share and monetize data sets. These platforms leverage blockchain's inherent security and transparency to create vibrant marketplaces that cater to the needs of both developers and users. As the field of decentralized AI marketplaces continues to grow, we can expect further innovation and adoption, benefiting the AI ecosystem as a whole [6].

Blockchain and Decentralized AI Integration:

Integrating blockchain technology into decentralized AI ecosystems is a compelling approach that offers a variety of advantages, ranging from enhanced data privacy and security to transparency, trust, and decentralized marketplaces [6]. This integration fundamentally reshapes the way AI operates and interacts with data and users. One of the primary roles of blockchain in decentralized AI is to address data privacy and ownership concerns. In traditional AI systems, user data is often collected, processed, and stored in a centralized manner, raising significant privacy and security issues [9]. By leveraging blockchain, data can remain on user devices, or in private storage, with access regulated through cryptographic keys and smart contracts. Users maintain control over their data, only granting permission when necessary, significantly enhancing data privacy [6]. This is particularly critical in fields like healthcare, where sensitive patient data must be protected. Blockchain also brings transparency and accountability to AI ecosystems. Its immutable ledger records the entire history of AI model development and usage, allowing users to trace the origins and verify the integrity of AI models [6]. This fosters trust in AI systems by reducing the risks associated with biased, unethical, or malicious models. Users can be assured that the AI models they interact with are transparently accountable. Furthermore, smart contracts on the blockchain automate and secure transactions between AI model providers and users, creating a fair and transparent compensation system for those contributing models and data [3]. This incentivizes data sharing and collaboration, promoting innovation within the AI community. Data monetization is another exciting prospect enabled by blockchain. Users can directly profit from sharing their data for AI model training without intermediaries [2]. This empowerment can lead to more comprehensive and diverse datasets for AI development, ultimately improving the quality and accuracy of AI models. The creation of decentralized AI marketplaces is an additional benefit of blockchain integration. These marketplaces facilitate the buying, selling, or renting of AI models and services, making AI tools more accessible and competitive, while maintaining security. To successfully integrate blockchain into decentralized AI ecosystems, organizations and developers must work on creating compatible protocols, standards, and infrastructure tailored to specific use cases and industries [7]. They should address challenges such as scalability, energy efficiency, and regulatory compliance. The collaboration between blockchain and AI presents an exciting future for AI ecosystems, one that is more secure, transparent, and user-centric, fostering innovation and trust.

III. USE CASES AND APPLICATIONS

Decentralized AI and blockchain are being investigated in a variety of practical applications, including:

- **Decentralized Medical Records:** Decentralized AI and Blockchain could be used to create decentralized medical records that are more secure and private than traditional medical records systems. This would allow patients to control their own data and share it with healthcare providers only when they want to [8].
- **Drug discovery:** Decentralized AI could be used to accelerate drug discovery by analyzing large datasets of medical data to identify new drug targets and predict the safety and efficacy of new drugs. Blockchain could be used to ensure the transparency and traceability of the drug supply chain [8].
- **Decentralized finance (DeFi):** DeFi is a financial system that is built on blockchain technology and uses Decentralized AI to automate financial processes. DeFi offers a variety of financial services, such as lending, borrowing, and trading, without the need for intermediaries such as banks [8].
- **Fraud detection:** Decentralized AI can be used to develop fraud detection systems that are more effective than traditional systems because they are not controlled by a single entity and can analyze data from a variety of sources [8].
- **Supply chain management:** Decentralized AI and blockchain can be used to create more transparent and efficient supply chain management systems. This could help to reduce fraud and waste and improve food safety and quality [8].

IV. CHALLENGES AND LIMITATIONS

Blockchain is a promising technology for decentralized AI ecosystems, but it faces several problems and constraints, including scalability issues, energy consumption, and regulatory concerns [6]. Because blockchain networks can only process a certain number of transactions per second, scaling is a significant challenge. Decentralized AI ecosystems that generate an enormous amount of data and need to update AI models frequently may find this to be an issue [6]. Because decentralized AI ecosystems frequently need huge datasets to train AI models, blockchains, for instance, are not well-suited for storing vast amounts of data [2]. Energy usage persists as another issue. Miners, who use computers to solve challenging mathematical puzzles in order to validate transactions and add them to the blockchain, fuel blockchain networks. Many companies and consumers are concerned about this methods potential energy usage because it might be rather high. Another point of concern is the prevalence of various attacks identified on both public and private blockchain platforms in context of Smart Contracts, some of which are Re-Entrancy Vulnerability, Underflow/Overflow Errors, Sybil Attacks, Bad Randomness, Double Spending Attacks, Majority Attacks, Destroy-able Contracts, Exception Disorder Call Stack Vulnerability, Unbounded Computational Power Intensive Operations. This emphasizes on the need to improve efficiency and transaction processing time of Smart Contracts [8]. Despite these challenges and limitations, there is a growing interest in using blockchain in decentralized AI ecosystems. A number of startups and research projects are working on developing new solutions to address these challenges. For example, some projects are developing new blockchain protocols that are more scalable and energy efficient. Others are developing new ways to store and process data on the blockchain.

V. CONCLUSION

Decentralized AI and blockchain hold tremendous promise in shaping the future of AI ecosystems. They address critical challenges in data privacy, security, and trust. Decentralized AI allows data to stay on user devices, preserving privacy, while blockchain ensures transparency and accountability by recording data usage and model history. This trust-enhancing feature is essential for the ethical deployment of AI, particularly in sensitive fields like healthcare and finance. Moreover, the combination of blockchain and decentralized AI opens doors to decentralized marketplaces for AI models and data. It facilitates secure sharing and equitable compensation, democratizing access to advanced AI. However, challenges such as scalability, energy

consumption, and regulatory issues must be addressed for widespread adoption. This integration of technologies promises a future where AI ecosystems are more responsible, secure, and collaborative. Users retain control of their data, trust is fostered, and innovation is encouraged. As these technologies evolve and mature, their synergy will play a pivotal role in shaping an AI landscape that is not only advanced but also equitable and accountable.

REFERENCES

- [1] Venkata Raghava Kurada and Pallav Kumar Baruah, "Blockchain Enabled, Collaborative Platform for AI as a service", ICTACT Journal on Soft Computing, April 2023, volume: 13, Issue: 03.
- [2] Justin D. Harris and Bo Waggoner, "Decentralized & Collaborative AI on Blockchain", 2019 IEEE International Conference on Blockchain.
- [3] Tharaka Mawanane Hewa, Yining Hu, "Survey on Blockchain-Based Smart Contracts: Technical Aspects and Future Research", IEEE 2021.
- [4] Saminur Islam, Mohammad Jaminur Islam and Mahmud Hossain, "A Survey on Consensus Algorithms in Blockchain-Based Applications: Architecture, Taxonomy, and Operational Issues", IEEE 2023.
- [5] Joana Tirana, Christodoulos Pappas, Dimitris Chatzopoulos, Spyros Lalis, Manolis Vavalis, "The role of compute nodes in privacy-aware decentralized AI", 6th International Workshop on Embedded and Mobile Deep Learning, Association for Computer Machinery, 2022.
- [6] Bhaskar Chavali, Sunil Kumar Khatri and Syed Akhter Hossain, "AI and Blockchain Integration" , 2020 8th International Conference on Reliability, Infocom Technologies and Optimization (Trends and Future Directions) (ICRITO).
- [7] Nishant Somy, Kalapriya Kannan, Vijay Arora, Sandeep Hans, Abhishek Singh, Pranay Lohia and Sameep Mehta, "Ownership preserving AI Market Places using Blockchain", IEEE International Conference on Blockchain 2019.
- [8] Hamed Taherdoost, "Blockchain Technology and Artificial Intelligence Together: A Critical Review on Applications", Applied Sciences, vol. 12, no. 24, p. 12948, Dec. 2022.
- [9] Abhishek Kumar, Benjamin Finley, Tristan Braud, Sasu Tarkoma and Pan Hui, "Marketplace for AI Models", arXiv:2003.01593v1 [cs.CY] 3 Mar 2020.

