Despite Contradictions, Artificial Intelligence and Block Chain Technology are Composing the Future Together

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***Abstract*—** Now times, Block Chain technology and enhancements in Artificial Intelligence paradigm are facing more attention in the field of research with new advancements in many security techniques in all the sectors of IT and business. One cannot deny from the fact that the adoption of Artificial Intelligence paradigms and block-chain technology is shaping the new face of market. Beyond their contradictions both are proceeding at lightning speed. Both of them are aimed at providing something new to the world but the degree of complexity of each is quite different. With a secure, decentralized, and trustworthy system, block-chain technology did automate the bit-coin payments and provide the users an access to a shared ledger of records, transactions and data. With the use of smart contracts, a block-chain can also regulate the user interactions without the need for any central authority. In the contradiction, AI provides agents with the ability of reasoning, decision making and human-level intellect. At bottom one can say, block chain is concerned with keeping correct records, authentication and implementation while AI deals in conducting assessments, examining, and coming to a decision analyzing certain patterns and datasets, eventually giving rise to a self- directed interaction. Artificial Intelligence along with block chain allocates several descriptions which will make a seamless communication prospect certainly. AI and Block-Chain need sharing of data. The decentralized approach of database focuses on the significance of data sharing among various clients on a meticulous network. In the same way, AI depends very much on Big-Data, exclusively, for data distribution.

The first section in the proposed article offers the Introduction part. The second section focuses on the majorly emphasized topics and domains about block chain technology indulging Artificial Intelligence into it, presents a detailed literature-review of many of the contributions by eminent research analysts. The third section describes the challenges in the collaborating AI with block-chain. The last section expresses a brief conclusion of the research work.

Keywords- Block Chain Technology, Artificial Intelligence, AI, Machine Learning

1.Introduction

Artificial Intelligence (AI) and blockchain technology are two of the most innovative technologies that have emerged in the last decade. AI enables machines to assist humans and make decisions, while blockchain technology is a distributed ledger that allows for secure, transparent and tamper-proof applications. The intersection between AI and blockchain technology has the potential to transform various industries by enhancing their security, transparency, and overall efficiency.

It is not a secret that there are many new technologies being promoted right now, but among them, the blockchain has been gaining a lot of traction as a decentralized ledger sys- tem that can be used in a variety of settings [1,2]. Since its inception in the 1920s, blockchain has persisted as a potentially disruptive innovation that will affect the ways of work- ing together, automating payments, monitoring markets, and recording transactions [3]. Blockchain technology has the potential to be very useful in eliminating the need for a central authority figure to oversee and verify transactions and agreements between many parties [4]. Each transaction in the blockchain is cryptographically

hashed and verified by all mining nodes [5]. It creates immutable, secure, and accessible timestamped records that can be accessed by all parties involved [6]. Artificial intelligence (AI), which gives machines the ability to learn from data and make decisions based on what they haveve learned, is another very visible area that is gaining a lot of traction. Ongoing statistical polling predicts that by 2030, the AI sector will be worth as much as USD 13 trillion [7].

The use of Artificial intelligence to solve business-issues has achieved an excellent achievement in modern era 'coz of an exponential increment in clients' information and promptly accessible computational power. AI gives machines the ability to learn from the past and present data and make decisions based on what they have learned from surroundings, is another very much visible area that is gaining a lot more attraction.

In contrast, the block-chain technology makes functions much quicker, safer, and more apparent. The collision of the mentioned skill has been practiced in the financial segment originally with crypto currencies such as Bitcoin, Ethereum, & Litecoins, that made this a topic of discussion. The interest has also been diverted to other areas such as insurance, health care, advertisement & business administration security. Fig 1 illustrates advantages of using block chain technology.

Fig.1 Advantages of Block-Chain Technology

The objective of this study is to examine the state of the AI and blockchain combo literature in a manner that will help emerging researchers catch up on the evolution of the field and provide advice for improving the quality of future research. The structure of the current study is as follows. The research approach used to find, filter, and choose the literature is covered in depth in the second part. In the third section, the literature on AI and blockchain integration is covered. The most popular articles are presented, their applicability is discussed, and some of the key problems are highlighted. The last section of the study discusses the conclusion.

The convergence of AI and blockchain has the potential to revolutionize numerous industries by combining the capabilities of both technologies. Here are a few ways in which their intersection can bring about transformative changes:

Enhanced Security: Blockchain's decentralized and immutable nature can bolster the security of AI systems by providing a tamper-proof record of transactions and data. This ensures that data used by AI models remains secure and trustworthy, mitigating risks associated with data breaches and unauthorized access.

Transparent Data Sharing: Blockchain enables secure and transparent sharing of data among multiple parties while maintaining data privacy and integrity. This is particularly beneficial in industries such as healthcare, where sensitive patient data can be securely shared among healthcare providers and researchers for AI-driven insights without compromising patient privacy.

Smart Contracts: Smart contracts, which are self-executing contracts with the terms of the agreement directly written into code, can be integrated with AI algorithms to automate and enforce contractual agreements in various domains. This can streamline processes, reduce costs, and minimize the need for intermediaries in transactions.

Decentralized AI Marketplaces: Blockchain can facilitate the creation of decentralized marketplaces for AI algorithms and models, where developers can securely monetize their creations and users can access a wide range of AI services without relying on centralized platforms. This promotes innovation and competition while ensuring fairness and transparency in AI transactions.

Data Monetization and Ownership: Blockchain technology enables individuals to retain ownership and control over their data while allowing them to

monetize it by providing access to AI algorithms and services. This empowers individuals to leverage their data for financial gain while maintaining privacy and control over how their data is used.

Overall, the synergy between AI and blockchain technology holds immense potential to drive innovation, improve efficiency, and foster trust in various industries, ultimately leading to a more decentralized, secure, and equitable future.

The most significant innovation for which everyone in this world expects that it can do revolution in technology, as it can tackle issues from space exploration to countering psychological repression and notwithstanding making craftsmanship, the potential of artificial intelligence is ending up progressively obvious. This dynamic novelty of Artificial Intelligence still experiences huge obstacles however important confronts which should be managed before that credibility can be accomplished.

Recent years have seen progress toward the concept of decentralized AI. A combina- tion of these two technologies is the basis for decentralized AI (blockchains and AI) [11]. In a distributed and intermediary-free manner, it allows for the execution and storage of trustworthy, carefully tagged, and shared data on the blockchain [12]. The blockchain is now anticipated as a trusted platform to preserve such information, and simulated intelligence is described to work with massive amounts of data [13]. Blockchains may be programmed with smart contracts, allowing trusted third parties to monitor data access and sharing between users [14]. After being exposed to an autonomous system, a machine, and several scenarios, they may adapt and learn, yielding accurate and reliable decision-making outcomes that are unanimously sanctioned by all blockchain mining nodes [15,16].

As a result, everyone with a vested interest may trust and endorse such decisions. AI procedures using blockchains may provide decentralized deduction of how to promote security and trust in information sharing and choice outcomes across countless independent operators, which can contribute, arrange, and vote on future choices [17].

The convergence of AI and blockchain technology has produced several practical benefits [18]. Blockchain technology allows for the safe keeping of patient records in the healthcare industry. If they are permitted access, medical practitioners may learn valuable lessons from the patterns mined by AI in this data. Remarkably, their combined use has enabled the healthcare sector to deal with the COVID-19 pandemic [19]. One forward- thinking example is BurstIQ, a blockchain-based startup that offers data solutions for the healthcare sector and offers a health wallet using blockchain technology, AI, and big data to handle patient data. Medical providers may access patient health data via the wallet whenever needed [20]. Increased transaction speeds and mutual trust are two ways in which merging these two technologies is revolutionizing the financial services sector [21]. Integrating AI with a blockchain has been claimed to have far-reaching implications in fields as diverse as 6G networks, smart cities, banking, and driverless cars [22]. Estimates suggest several potential benefits of combining AI with a blockchain. Without relying on a centralized authority or intermediaries, this enables the safe and reliable distribution of large data sets for analysis, learning, and decision making among many parties [23]. Several new and useful large-scale applications may potentially emerge as a result [24]. As a consequence of a blockchain's capacity to ensure the veracity of data, it may be used to store both the inputs and outputs of AI systems [25]. This article discusses the advantages of merging blockchain technology with AI. This overview's most substantial portion focuses on the integration's practical use. The difficulties are also highlighted before the conclusion.

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2. COMPREHENSIVE LITERATURE STUDY

A comprehensive literature review of the integration of blockchain technology and artificial intelligence (AI) revealed a growing body of research exploring the synergies between these two innovative technologies. Here's an overview of the key findings and contributions from the research analysis:

Security and Privacy:
Researchers have emphasized the potential of blockchain technology to enhance the security and privacy of AI systems by providing a decentralized and immutable ledger for storing sensitive data. By leveraging cryptographic techniques and consensus mechanisms, blockchain ensures data integrity and prevents unauthorized access or tampering.
Studies have explored various approaches to secure data sharing and collaboration in AI applications, including multi-party computation (MPC) and homomorphic encryption, which enable computations on encrypted data without exposing the raw data to any party.

Decentralized AI Marketplaces:
The concept of decentralized AI marketplaces has gained traction in the literature, with researchers highlighting the potential of blockchain to facilitate peer-to-peer transactions and enable transparent and automated trading of AI algorithms and models. Smart contracts play a key role in governing transactions and ensuring trust between buyers and sellers.
Research has focused on designing incentive mechanisms and reputation systems to encourage participation and foster a vibrant ecosystem of AI developers and users within decentralized marketplaces.

Data Monetization and Ownership:
Scholars have explored the implications of blockchain technology for data monetization and ownership in AI applications. By enabling individuals to retain ownership and control over their data while monetizing access to it, blockchain empowers data owners to participate in the value creation process and share in the economic benefits generated by AI algorithms.
Studies have investigated the technical and economic challenges of implementing data monetization schemes on blockchain, including issues related to data pricing, privacy-preserving mechanisms, and regulatory compliance.

Governance and Regulation:
The literature has addressed the governance and regulatory challenges associated with the integration of blockchain and AI, including concerns about accountability, transparency, and fairness. Researchers have proposed governance frameworks and regulatory guidelines to ensure responsible and ethical deployment of blockchain-based AI systems.
Studies have examined the role of standards organizations, industry consortia, and government agencies in shaping the development and adoption of blockchain and AI technologies, with a focus on promoting interoperability, data portability, and consumer protection.

Case Studies and Applications:
Researchers have presented case studies and real-world applications of blockchain-enabled AI systems across various domains, including healthcare, finance, supply chain management, and decentralized autonomous organizations (DAOs). These case studies demonstrate the potential benefits of integrating blockchain and AI in improving efficiency, transparency, and trustworthiness in business processes.
Overall, the literature review highlights the multidisciplinary nature of research on blockchain technology and artificial intelligence, spanning computer science, economics, law, and ethics. Future research directions include addressing scalability and performance issues, exploring novel consensus mechanisms and cryptographic primitives, and evaluating the socio-economic impacts of blockchain-enabled AI systems on society.

Artificial Intelligence has progressed tremendously within last two decades by contributing to almost all sectors of society including business sectors. Due to scarcity of fundamentally sound professional people until in all respects in recent time business system is facing noteworthy confront. Simulated intelligence has been something discussed by scientific authors and took a shot at inclusion of Artificial Intelligence in data science and business applications. Now a days, e-commerce based business applications in retail shops, production units, banking sectors, health care units and home appliances everywhere safe and secured e-transactions are possible due to secured algorithms implemented by

very powerful artificial intelligent techniques. Expert systems uses machine learning based artificial neural networks and deep learning networks for pattern recognition and cyber security threats have been handle deficiently in maximum case studies. Further, there is a lot of contribution of AI into block chain technology which makes the business activities more secured, efficient and flexible. This section provides literature review of the current article.

3. INTEGRATION OF AI AND BLOCKCHAIN TECHNOLOGY

The integration of AI and blockchain technology offers a myriad of opportunities to enhance the security and transparency of AI systems. Let's delve deeper into how blockchain's decentralized and immutable nature can achieve this:

Enhanced Data Security: One of the primary concerns in AI is the security of data used to train models. Traditional centralized databases are susceptible to hacking and data breaches, putting sensitive information at risk. By leveraging blockchain technology, data can be stored in a decentralized manner across a network of nodes, making it more resistant to unauthorized access and tampering. Each block in the blockchain contains a cryptographic hash of the previous block, creating a chain of blocks that are linked together and secured through cryptographic principles. This ensures the integrity and security of the data used by AI algorithms, mitigating the risk of data breaches and ensuring that only authorized parties have access to the data.

Improved Data Transparency: Transparency is another crucial aspect of AI systems, especially in applications where decisions impact individuals' lives, such as healthcare and finance. Blockchain provides a transparent and auditable record of all transactions and data interactions, allowing stakeholders to trace the origin and usage of data throughout its lifecycle. This transparency enhances trust and accountability in AI systems by providing visibility into how data is collected, processed, and utilized by algorithms. Additionally, blockchain's immutable nature ensures that once data is recorded on the blockchain, it cannot be altered or deleted, providing a transparent and verifiable audit trail for regulatory compliance and accountability purposes.

Decentralized Intelligence: In centralized AI systems, decision-making authority is often concentrated in the hands of a few entities, leading to concerns about bias, lack of accountability, and potential misuse of power. Blockchain enables decentralized governance mechanisms, where decisions are made collectively by a network of stakeholders through consensus algorithms. This distributed decision-making process enhances the fairness and transparency of AI systems by reducing the influence of centralized authorities and ensuring that decisions are made in the best interest of the community. Smart contracts, which are self-executing contracts with predefined rules encoded on the blockchain, can further automate governance processes and ensure compliance with agreed-upon rules and regulations.

Secure AI Marketplaces: Blockchain facilitates the creation of decentralized AI marketplaces, where developers can securely monetize their AI algorithms and users can access a wide range of AI services without relying on centralized platforms. These marketplaces leverage blockchain's smart contract functionality to automate transactions and ensure fair and transparent interactions between buyers and sellers. By removing intermediaries and enabling direct peer-to-peer transactions, decentralized AI marketplaces empower developers to retain control over their intellectual property and enable users to access AI services in a secure and decentralized manner.

Overall, the integration of AI and blockchain technology holds immense potential to enhance the security, transparency, and accountability of AI systems, ultimately fostering trust and driving innovation in various industries. By leveraging blockchain's decentralized and immutable nature, we can build more robust and trustworthy AI systems that empower individuals and organizations to harness the full potential of artificial intelligence.

Blockchain	AI	Integration Benefits
- Decentralized	- Centralized	- Enhanced Data Security
- Deterministic	- Changing	- Improved Trust on Robotic Decisions
- Immutable	- Probabilistic	- Collective Decision Making
- Data Integrity	- Volatile	- Decentralized Intelligence
- Attacks Resilient	- Data-, Knowledge-, and Decision-centric	- High Efficiency

4. CHALLENGES IN COLLABORATING AI WITH BLOCKCHAIN

Collaborating AI with blockchain presents several challenges, despite the promising potential of integrating these two technologies. Here are some of the key challenges:

Scalability: Both AI and blockchain technologies require significant computational resources, which can pose scalability challenges when combined. AI algorithms often require large amounts of data and computational power for training and inference, while blockchain networks need to process and validate a growing number of transactions. Scaling both technologies simultaneously without compromising performance remains a significant challenge.

Performance: The decentralized nature of blockchain introduces latency and throughput limitations, which can impact the performance of AI applications that require real-time processing or low-latency interactions. Achieving high-performance AI on blockchain platforms requires optimizing algorithms, consensus mechanisms, and network protocols to minimize latency and maximize throughput.

Data Privacy: Maintaining data privacy and confidentiality is critical in AI applications, especially when sensitive or personal data is involved. While blockchain offers inherent security and transparency, ensuring data privacy on a public blockchain network is challenging due to the immutable nature of the ledger. Solutions such as zero-knowledge proofs and differential privacy techniques are being explored to preserve privacy while leveraging blockchain for AI.

Interoperability: Integrating AI with blockchain often involves interoperating with existing systems, protocols, and standards, which can be complex due to the fragmented nature of the technology landscape. Ensuring seamless interoperability between AI algorithms, blockchain platforms, and data sources requires standardization efforts and open protocols that enable cross-platform communication and data exchange.

Regulatory Compliance: Regulatory compliance is a significant concern in industries where AI and blockchain are deployed, such as finance, healthcare, and supply chain management. Compliance with data protection regulations, financial regulations, and industry standards requires careful consideration of legal and regulatory requirements when designing and deploying AI-powered blockchain solutions.

Energy Consumption: Blockchain networks, especially those using proof-of-work (PoW) consensus mechanisms, consume significant amounts of energy for transaction processing and validation. Integrating AI with blockchain exacerbates energy consumption concerns, particularly in resource-intensive AI training tasks. Developing energy-efficient consensus mechanisms and optimizing resource utilization is essential to mitigate environmental impacts.

Smart Contract Security: Smart contracts, which are self-executing contracts with predefined rules encoded on the blockchain, are susceptible to security vulnerabilities and exploits. Flaws in smart contract code can lead to financial losses, data breaches, and other malicious activities. Auditing smart contracts for security vulnerabilities and implementing best practices for secure smart contract development are crucial to ensure the integrity and reliability of blockchain-based AI applications.

Addressing these challenges requires interdisciplinary research and collaboration across fields such as computer science, cryptography, economics, law, and ethics. By overcoming these challenges, the integration of AI and blockchain

has the potential to unlock new opportunities for innovation, transparency, and trust in various industries.

5. CONCLUSION

There is rapid technological advancement due to inclusion of artificial intelligence strategies. Blockchain techniques performs the financial activities more secured and it is beneficial for Accounting Institutes as well as banks to handle issues such as how to improve customer administration, how to control budgetary dangers, and how to progress the bank's working execution, how to guarantee that the continued development in profits ,and so on. The current article detailed a review of important sectors, domains and applications of Artificial Intelligence in very advanced fields of blockchain technology. This presentation examined the current state of blockchain and AI combinations, their applications, and the possible revolutionary effects of their unique traits. The belief in the potential of AI and blockchains is gaining more and more acceptance. The benefits of combining AI with blockchain technology are covered in this essay. The bulk of this analysis is devoted to the use cases for integration, including supply chains, financial services, healthcare, life sciences, smart grids, agriculture, and the IoV. Before concluding, issues including privacy and security, credible oracles, the security of smart contracts, and the consequences of their deterministic execution, scalability, and collaboration between off-chain and on-chain data storage were covered.

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