A Statistical Perspective on Advancement in Blockchain Technology

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ABSTRACT

In computing, Blockchain is a decentralised, point-to-point program that provides a safe yet verifiable technique for secure distributed validation. Blockchain is a type of distributed transaction validation system. It is widely used in a variety of fields, including the finance sector, the Internet - Of - things, big data, virtualization, and edge computing, to name a few. Artificial intelligence technology, on the other hand, is having a substantial impact on the intellectual growth of a wide range of industries. Blockchain is a difficult technology that represents the important and influential vision and provide a comprehensive perspective to internet security. Blockchain is a hard technologies that represent an inventive and influential vision. When it comes to secure communication, Blockchain technology is always evolving and has the opportunity to deliver about substantial changes in how we work and live in the 21st century. Blockchain technology is continually evolving and become the next paradigms shifting technology. Our new problem is to figure out how we will keep up with the technological developments brought about by this revolutionary technology. A general overview of Blockchain technology, as well as its possibility to assist to future development, is presented in this article, which also proposes many study avenues for further investigation.

Keywords : Smart Technology, IoT, Blockchain, 4.0 Revolution, Artificial Intelligence

I. INTRODUCTION

Blockchain and artificial intelligence are two of the most cutting-edge technologies available today, and they are attracting increasing attention as a result of the crucial role that they play in technical innovation and industrial change [1, 2]. There would be no longer any debate about the existence of a digital world today. This will be an artificial intelligence (AI) world, in which robots will totally replace humans in the workforce. Imagine a world of smart homes, smart towns, and smart countries, because everything has this same capability of connecting to the internet (the Internet of Things), bridging the gap between the physical and digital worlds. This trend towards transformation is referred to it as the 4th Industrial Revolution (Industry 4.0), and it is built on the digital revolution that ushered in the information age. A number of leading experts have projected that this transformation will have a profound impact on each

and every member of a society including industry in some way or another. It will entail significant and comprehensive changes to the economy, community, security, and politics, and it may even alter the fundamental foundations of our way of life, as well as how we work and connect with one another.

The emergence of new technological breakthroughs, enhancing the interaction between humans and machines, and increasing the incorporation of technologies in the actual world can be described as the Fourth Industrial Revolution (or Fourth Industrial Revolution). This industrial revolution, in contrast to the previous industry revolution, such as the first, which also included modernization and the steam locomotive; the second, which also included electricity and relates to the availability; and the third, which also included knowledge technology and automation, includes information technology as well as equipment. The introduction of digital security solutions, which place a strong focus on speed and reliability, will symbolize the commencement of the 4th industrial revolution. With the Internet of Things (IoT) technology, every home object will be embedded with sensors as well as the capability to communicate and interact with one another. The streets will be overrun by self-driving automobiles, and the sky will be filled with self-flying planes, among other things. 3D printing will become more common, and robots equipped with artificial intelligence will quickly replace humans in the manufacturing process. All manual labour will be replaced by automation in the near future.

Artificial intelligence has entered an exponential phase in recent years, owing to major breakthroughs in machine learning particularly deep learning [4] and also an increase in the number of data available. Artificial intelligence[5] has the potential to alter industries as diverse as security, finance and retail, transportation, and education, thanks to its skills in analysis and prediction as well as judgment and decision-making [6]. Blockchain technology was only introduced relatively recently, with Satoshi Nakamoto's conception of Bitcoin in 2008 serving as the spark for its adoption. The Blockchain is a distributed database ledger in its most basic form. If there are multiple entities participating in an ecosystem where a distributed consensus method is used, it can do so without the involvement of a third trusted intermediary. Blockchain also enables the production and authentication of activities in an unsecured distributed system, hence reducing the cost of establishing confidence in an uncontrolled distributed system. It is exactly because of all this that too many researchers are focusing their efforts on Blockchain technology today.

The repercussions of the Industry 4.0 will be vast, but society's attitudes regarding it will be unsurpassed. In contrast to their initial wariness, in which they viewed technological change as a threat, businesses are now investing more resources in discovery and development of new smart factories, which include mechanization and robotic workforce. As a result, they believe that these improvements will shorten the manufacturing team while simultaneously increasing efficiency and decreasing costs:

- Big businesses and companies have benefited from Blockchain technology since it has given them the ability to ensure supply while simultaneously reducing the number of intermediates and operational expenses.

- Emerging technology implementations are slowly making their way into the life of the general public and society. People are increasingly seeing robots in their everyday routines, such as those in hospital, courts, or government buildings, in the hope that they may enhance the entire community as a result of their introduction.

- The new implications will create jobs, raise incomes, improve domestic product competitiveness, and strengthen the comparative advantages of labor forces in impoverished and

emerging countries. The value of labor will be raised, and it will be employed more effectively.

- For governments with an ageing population and a severe scarcity of highly educated young workers, the Fourth Industrial Revolution (Industry 4.0) will provide the solution that their businesses have been looking for to deal with the dangers and challenges posed by competitors.

- For emerging countries, the Fourth Industrial Revolution (Industry 4.0) is being focused on by their administrations through the development of a strategy relevant to their countries. The government is putting in place strong new policies and regulations, allocating funds for the construction of "smart factories," which will employ advanced technology such as robots, sensors, and artificial intelligence, and inventing new solutions to satisfy our demands.

Blockchain Technology is a list of records, referred to as blocks, that is constantly increasing and is linked and safeguarded using cryptographic techniques. In most cases, each block header contains a strong cryptographic code of the preceding block, as well as a Blockchain is resistant to modification data, which is aimed to ensure that these transactions remain unchangeable over time.
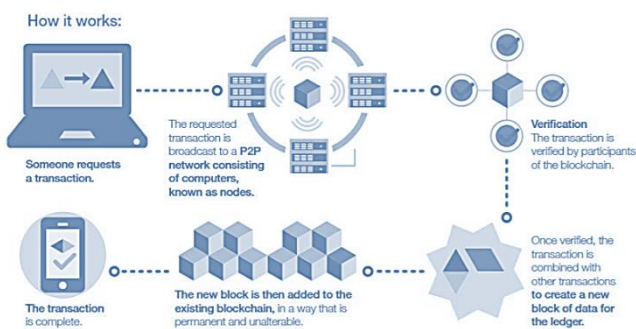

Figure 1. Conceptual Representation of Blockchain Technology

Blockchain A New Era of Technology

Operational Basics of Blockchian

Block-chain technology is a decentralised ledger technology that operates on a "peer-to-peer" mechanism of computer systems and allows for the monitoring and allocation of transaction information in a clear and open manner on a peer-to-peer framework of computer networks through the use of a cryptographic protocol. Blockchain is a decentralised ledger technology that is "peer-to-peer." Every copy of fresh data is not only kept on a personal server, and it is also sent to everyone individuals throughout the chain or system, which is how databases are distributed. Hackers should always modify 51 percent of both the editions of such entrance upon that framework in attempt to transform any component of the database, and every one of those copies must already have most of the prior interactions of this data in order to attempt to transform any bit of the database.
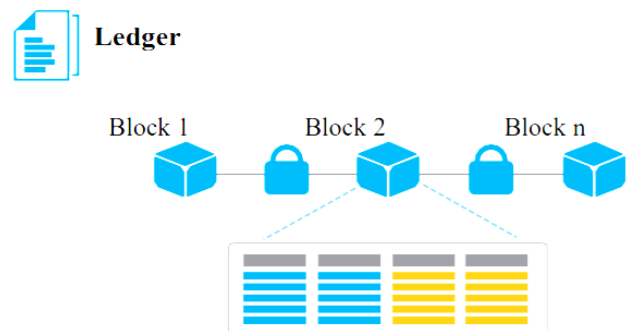

Figure 2. Basic Operational Concept of Blockchain

This methodology has virtually eliminated the need for third party companies, while Blockchain Technologies for the Development of the Future ensures safety, flexibility, and a high level of interaction. This contributes to the development of mutual trust and accountability between the parties. With Blockchain technology, organisations are able to become more transparent and democratic, while also becoming more efficient and safe, while also reducing costs, regulatory hurdles, and bureaucratic procedures.

There are many distinct types of Blockchain technologies, however the most important are indeed the Blockchain network, the private Blockchain, and the consortium Blockchain, which are all types of distributed ledger technology. Public Blockchains are the most often used, and private Blockchains are the least widely used. Each type has its own set of advantages and limitations, which allows them to be tailored to meet the requirements of a wide range of applications [6][7]. In Figure 3, the many varieties of Blockchains are illustrated.
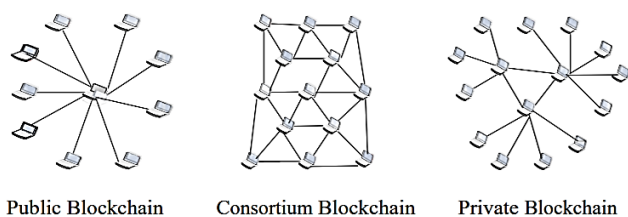
Figure 3. Representation of different types of Blockchain

- Anybody could interact upon that Blockchain networks that are both transparent and anonymous thanks to the public Blockchain, which is open to everyone. A decentralised block chain technology, including such Bitcoin, is totally decentralised in its operation. The system runs on the basis of user acceptance; there is no single point of failure in the system. The Public Blockchain, on the other hand, is sensitive to system attacks. Without really being recognized by the participants, an attacker may, for example, reconstruct and appropriately chain all of the block that had already been modified.

- The transactions on a private Blockchain are kept secret, and the data is not accessible to the general public, however the participants are known. Participants in a personalized Blockchain network are not permitted to read or write towards the Blockchain unless they have been given permission to do so or have been invited to participate in the network by its administrators or creator. Large organisations typically use private Blockchain, with permissions specified among the numerous stakeholders in a corporate Blockchain system, according to industry standards. Examples include banks creating their own Blockchain networks for internal usage only, with access to its many stakeholders such as clients, workers, and suppliers being restricted.

- Consortium Blockchain is a hybrid paradigm that combines the best features of both Blockchain networks in one place. With this architecture, businesses or institutions can create their individual Private Blockchain network, which can then be used to share data across consortium partners such as financial institutions, government agencies, and other businesses or associations.

The advantages of Blockchain technology, similar to those of the internet, are continually being discovered and refined. Blockchain ensures precise and error-free operation by keeping repeated information online and preventing it from being controlled by a single people or organisation. It's possible to think of Blockchain as a Google Docs document that is shared with everyone. No one is restricted from viewing or adding new information; but, editing or deleting entries is not permitted.

Benefits of Blockchain Technology

Blockchain is indeed the protocol that underpins cryptocurrency, including Bitcoin, which was the first virtual currency ever produced, and Ethereum, which was founded most recently. The use of Blockchain, thus according Ben Schiller [8] provides three different advantages:

- The Blockchain is organised logically, allowing customers to conduct short insurance requests that can be evaluated promptly through the application of artificial intelligence (AI).
- Because of the decentralization of the Blockchain, it's much less likely to be assaulted. This is the ideal

situation in which to conduct internet security checks.

- As others have already anticipated, Blockchain is the wave of the future, and its use in the banking world will continue to expand and become more widespread in the coming years.

Technology for the Transparency of the Future

Genesis Block (2017) [9] quotes Bill Gates who said, "With the creation and growth of the technology, our entire world will be processed, both globally and dramatically. Nothing you see as being right this time might not have been right tomorrow". Even though many people are still cautious of cryptocurrency, considering it to be a fraud and a creation of computer programmers, the introduction of private Blockchains is having a significant impact on how the world runs. A number of significant, irreplaceable industries have been demonstrated as having been threatened by the introduction of Blockchain technology. Almost all the sectors, including the huge corporates like, Walmart, Facebook, Amazon, Uber, or the medical care system, the social assistance and voting, in fact from financial services to insurance are confronted with the new revolution known as Blockchain.

Applications of Blockchain

Thus according research conducted by EuvieIvanova (2017), Blockchain technology will have a significant impact on a wide range of occupations during the next 5-10 years. Many professions have been impacted recently, including but not limited to:

A) Supply Chain Management

All transactions are processed in a distributed permanent ledger that is safely monitored and transparent, as according Adam Robinson (2016), who describes Blockchain technology as follows: This would assist in reducing latency caused by human mistake. Blockchain technology is also being used to track labor costs and even to track waste at every stage in the supply chain, according to the company. Blockchain technology could be used to validate legitimate transactions by tracing their origins back to their inception. Providence, Fluent, Skuchain, and BlockVerify are just a few of the firms operating in this field.

B) Banking and Imbursement

It will be easier enabling billions more individuals around the world, specifically those who are in emerging and third-world countries, to access and use wealth management if Blockchain technology is implemented. Currently, technologies such as Bitcoin and Onecoin are being utilised by a large number of people to transmit money across borders immediately and for a cheap price. ABRA is a firm that provides a transaction service using the Bitcoin cryptocurrency. Internet Security is also being accepted by a number of financial institutions, like Barclay's, as a technology that can help operations become faster, safer, and much more economical Internet Security Despite the fact that the Blockchain ledger is open to the public, data must be validated and authenticated through the use of cryptography, making it very difficult can access or change the data without authorization. By removing the need for third parties, Blockchain technology will allow for more efficient activities as compared to currently antiquated security mechanisms.

C) Healthcare

It is possible that Blockchain technology will assist hospitals in storing medical records and distributing them with authorized personnel. This will result in improved protection and reliability in health services, as well as a reduction in the likelihood that the system will be compromised due to the use of an older database protocol. GEN and Tierion are two startup companies that are now engaged in the provision of database services to the healthcare industry.

D) Insurance Industry

Blockchain technology has been used to extract relevant information in insurance contracts, such as distinguishing the characteristics of insurance users. Oracles can combine data from the virtual world into the actual world through smart contracts. This technique is extremely beneficial for any sorts of insurance that are dependent on real-world facts, such as purchasing decent insurance. Immortal is a cryptocurrency initiative that is active in this area.

E) Forecasting Industry

Blockchain will fundamentally alter the way people conduct research, consult, evaluate, and forecast. Augur, for example, is a distributed worldwide forecasting platform that is being developed. These technologies can be used to various industries, such as sports, stock markets, and decentralization voting, amongst many others.

F) Networking and IOT

Samsung and IBM are collaborating to develop breakthroughs connected to a network connect of Internet of Things gadgets. Blockchain acts as the primary ledger for a wide range of technologies, removing the need for a central database in the process. To update programming, manage problems, and monitor energy consumption, digital gadgets could interact with one another directly through the internet.

G) Charity Activities

By implementing Blockchain technology, charities can monitor donation transactions to confirm that funds are being transferred to the intended recipients, hence reducing inefficiency and fraud. Bitcoin charities, such as the BitGive Foundation, use the Blockchain ledger to transfer payments in a safe and professional manner, allowing donors to check directly that their funds are being transferred to the correct recipients.

H) Personal and Shared Transport

Blockchain technology can be used to develop decentralised peer-to-peer applications for ride-sharing, allowing both car owners and passengers to negotiate terms and times in a secure environment without the involvement of a third party. Automobile owners can save time and money by using a digital wallet to electronically pay parking fees, toll fees, and fuel costs for their vehicles. These concepts are being developed by startups such as UBS, ZF, and INNOGY.

I) Private Data Storage Systems

Data stored in typical centralised services is vulnerable to cyber-attacks, data loss, and human mistake, among other things. Because of Blockchain technology, cloud storage has now become safer and much more capable of defending itself against unwanted influences than it was previously. STORJ IO is an implementation of a cloud services system that will make use of such a Blockchain technology, and it is available for download here.

J) Election and Voting Mechanisms

Blockchain technology can be used to register for elections and to verify personal identification. Votes will be counted electronically, ensuring that only genuine votes are taken into consideration and that no voting can be modified or transferred. Elections will become more fair and democratic as a result of the use of public ledger blockchain recorded votes. Governments will be able to vote online through the platforms developed by Democracy Earth and Followmyvote, two startup companies.

K) Securing Government Records

The administrative systems are well-known for being slow, obscure, and susceptible to corruption. The application of Blockchain technology in government processes can aid in the elimination of bureaucracy, the enhancement of protection, efficiency, and transparency, and the reduction of costs. Dubai is an

example of a city that is looking to the future, having intentions to transfer all of its government records on a Blockchain network by 2020, according to the Dubai Internet Exchange.

Overall, any industry that deals with data or any form of transaction has the potential to be affected by the advent of Blockchain technology. On the basis of actual evidence, it is possible to conclude that the Blockchain field is vastly untapped and offers several potential.

Problems and Challenges

In this section, we discuss the issues and obstacles associated with the implementation of Blockchain technology and artificial intelligence (AI).

A) Scalability

Scalability is the key to successful smart Blockchain application deployment. A Blockchain App must run on the existing Blockchain underlying infrastructure. Insufficient performance and scalability prevent large-scale application implementation. In order to ensure data confidentiality and decentralization, Blockchain scalability concerns encompass three aspects: inconsistency issues, network delays, and performance restrictions. To secure the Blockchain, majority nodes must agree on the transaction information. The quest of scalability weakens the distributed network's consistency requirement, causing the Blockchain to split. Because the Blockchain is a decentralized ledger, the transmission delay between nodes limits the system's scalability. The third point is the durability of the Blockchain, which limits the installation of Blockchain applications. Blockchain transactions can indeed be processed in parallel to maintain security and ultimate consistency, limiting transaction throughput.

B) Security and Privacy.

Privacy protection and security, are major Blockchain application difficulties. It is the Internet of Value's infrastructure, and it could comprise personal identifying information that users do not wish to make public. Thus, securing user privacy is critical to the widespread adoption of Blockchain technologies. A prominent Blockchain privacy protection strategy is identity confusion. Identification obfuscation technology uses personal privacy signature methods like arranged and ring signatures to confuse both parties' identity information, making it hard to correspond to the real user. To maintain identity security, the supervisor can examine user information using their private key.

Information concealment makes use of technologies such as zero knowledge proof as well as secured multiparty computing in order to protect the privacy of the user during a transaction. Nevertheless, extending the computational effort decreases the efficiency of the system, resulting in more activity being required in actual applications. It is challenging to apply artificial intelligence algorithms to enhance low efficiency. Moreover, applying artificial intelligence algorithms to dispersed environments necessitates reworking existing algorithms.

C) Data Collaboration between On-Chain and Off-Chain Storage.

Either traditional data systems or digital economy have their own set of disadvantages. Blockchain technology is required by traditional information systems in order to protect data sharing and authenticity. This section between Blockchain technology and advanced information systems is required to assure the appropriateness and consistency of data on the chain and off the chain. Moreover, data is essential to the growth of AI. Poor data quality, data monopoly, and data abuse are still issues with artificial intelligence. Blockchain intervention opens new development avenues for these issues. Real-world applications of Blockchain and technological advancements can only be achieved by accurately mixing data from both sources.

II. CONCLUSION

Blockchain is the decentralised ledger technology that lies at the heart of popular cryptocurrency such as

Bitcoin, Ethereum, and other similar projects. Blockchain technology has the potential to assist institutions that use it in assuring openness, accountability, autonomy, efficiency, and safety for their people. This is due to its ability to capture and convey information in a safe, verified, and stable manner. The ramifications of Blockchain technology in data management are extremely wide, ranging from taxation to real estate to copyright to online shopping, among other things. However, because it is the underlying technology that powers cryptocurrency, its most significant application remains in the financial sector. Because of the Internet of Things (IoT) 4.0 revolution, it is expected that Blockchain technologies and information assets have huge potential and that they will disrupt various industries within the next 5 to 10 years. Specifically, in this paper, we provide an in-depth introduction to the background information of intelligent machines and Blockchain, conduct an in-depth investigation into the feasibility of integrating Blockchain with artificial intelligence, and provide a comprehensive summary of research work on the interconnection of Blockchain as well as autonomous systems in the domestic and international markets. Finally, we highlight some of the most potential application cases as well as possible future research. There are numerous innovations and tasks to be completed along the path to knowledge. Despite the fact that the benefits and cons of Blockchain are still up for dispute, we must acknowledge that Blockchain is the future but that it will revolutionize the way we do our jobs.

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