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# Comparative Study of Block Chain and Artificial Intelligence Metrics to Provide Security and Privacy for the Growth of Organizations

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***Abstract: Artificial intelligence and block chain are the two major technologies that lead the innovation and change almost every industry from automotive to healthcare. Both are among the key drivers behind innovation today and introducing radical shifts in every aspect of our life and predicted to contribute trillions of US dollars to the global economy. AI, as defined by Marvin Minsky and John McCarthy—the fathers of the field—is any task performed by a program or a machine that seems to require intelligence. AI systems often exhibit the following behaviors associated with human intelligence: reasoning, planning, learning and problem solving, as well as social intelligence and creativity. The recent resurgence in AI is fueled by breakthroughs in machine learning, especially within the field of deep learning. It has also been driven by the explosion in available data, making the training of machine learning algorithms more effective. A blockchain is a open ledger, mutual and agreed on by all users in a distributed network .to do business it presents a new model and describes how big data analytics, blockchain, and artificial intelligence strength us to rethink present business models and develop organization's that will be ready for human–machine interactions[2]. Blockchain will help AI's decisions be more transparent, explainable, and trustworthy. As all data on blockchain is publicly available, AI is the key to providing users with confidentiality and privacy.***

***Keywords: Artificial Intelligence, Machine learning, Block chain Technology, Smart contracts, ledger.***

## 1. INTRODUCTION

A blockchain is an open ledger, shared and approved on by all users in a distributed network. Data records, for example, transactions, are stored in blocks together with hash values and timestamps. Like a chain every block is connected to the previous one. One important feature of block chain is immutability; that is, it is almost impossible to modify any information without having network consensus.[1] It also asks us to consider the impacts of these emerging information technologies on people and society. It permits

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peer-to-peer collaboration and trustless interactions governed by cryptography and smart contracts. Meanwhile, artificial intelligence allows for new and different levels of intensity and involvement among human and artificial actors. With that, new modes of organizing and emerging where technology facilitates collaboration between stakeholders and where human-to-human interactions are increasingly replaced with human-even machine-to-machine interactions.

We live in exponential times. We are experiencing a paradigm shift, where businesses and technology change and grow at an exponential rate, causing profound social and economic change. The fast-changing, uncertain and ambiguous environments that organisations operate in today require them to rethink their internal business processes and customer touchpoints. The last time such rapid changed happened was the advent of the internet. The internet caused organisations to completely rethink their business and enabled the success of organisations that embraced the new paradigm, including Amazon, Google, Facebook and WeChat, to become monopolists within record time. There are also concerns about the monopolization of AI power by a few big performers, such as Google, Microsoft, and Amazon, because of high barriers to acquiring data, talent, and computing resources.

Now, we are experiencing another change due to emerging information technologies such as big data analytics, blockchain, and artificial intelligence(AI).These technologies make it easier for startups to compete with existing organisations. As a result, and because of the lack of legacy systems, these startups are more flexible and agile than Fortune 1000 companies. Within a short timeframe, startups can become a significant threat if not paid due regard. Therefore, only paying attention to the day-to-day operation is simply no longer enough. Organisations have to become innovative and adaptive to change if they wish to remain relevant and competitive. New technologies can help achieve this shift[3]. When big data analytics, blockchain and AI are combined, it will change collaboration among individuals, organisations and things. When implemented correctly, these technologies can significantly improves the growth of business.

## 2. BLOCKCHAIN TECHNOLOGY

Depending on the consensus protocol, blockchain technologies are classified into two groups. The first method *proof-of-work* (POW) blockchains such as Ehereum and Bitcoin, users will participate in a mining process called as miners to solve a computationally hard problem and to create a new block. A block reward is won by the miner who has the right to create a block and collects the transaction fee. POW protocols are, in general, energy-consuming. Also, they are subjected to majority hash rate attacks when the block reward reduces, as seen in recent events with Bitcoin-Gold, Verge, ZenCash, and other POW-based cryptocurrencies. The new generation of protocols use *proof-of-stake* (POS) blockchains, in which there is no energy-consuming mining process. Instead, User's chances of creating a block increase with the amount of coins—the stake—that they have. blockchain technologies indeed are powering a new serverless Internet and decentralized web future in which users are in control of their own data, identity, and destiny. They will also revolutionize the healthcare system such that we will be able to track how our data records are used and have our own data copyrights. With the promising future, we will be given alternative, if not better, choices for every platform we know today, whether it is Facebook, EBay, Uber, Airbnb, or even the energy market.

## 3. BLOCKCHAIN FOR AI

Blockchain can power decentralized marketplaces and coordination platforms for various components of AI, including data, algorithms, and computing power. These will foster the innovation and adoption of AI to an unprecedented level. Artificial Intelligence's decisions becomes transparent, explainable, and trustworthy with the help of block chain. As all data on blockchain is publicly available, AI is the key to providing users with confidentiality and privacy.

### *Secure Data Sharing*

One of the driving factors behind the current AI revolution is the massive amount of data available for research, development, and commerce. Data is the new gold in today's data-driven economy. Yet, there are high barriers to getting access to this gold. First, it might be difficult to obtain sufficient data for your

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training models unless you are with one of the big players, such as Facebook or Google. This ultimately deters the competition among AI researchers and companies that is needed to boost AI. Second, privacy is a critical and growing concern after a series of leaks and misuse of personal data. Notably, the recent Facebook scandal, in which 50 million users were profiled and targeted without consent by Cambridge Analytical, a political third-party firm. This targeting behavior is disturbing, and was compared to a customized whisper campaign: Groups both ethical and malicious can divide Americans, whispering into the ear of each and every user, nudging them based on their fears and encouraging them to whisper to others who share those fears, by University of Maryland cybersecurity professor Timothy Summers.

Blockchain can encourage data sharing because it provides transparency and accountability regarding which users' data is accessed, when, and by whom. As blockchain puts the control of data back into users' hands, they will have more confidence in sharing data and knowing that their data will be used properly to provide better personalization or for other good causes. The potential impact of this is tremendous. For instance, doctors and researchers could access huge medical records and cases, substantially expediting the discovery of cures for diseases and the development of better treatment paradigms and medical procedures. Patients with rare diseases, especially, would find new hope, as doctors could access similar cases from all around the world. Some part of that vision has become reality with development efforts from the Centers for Disease Control and Prevention and many other blockchain-based health companies.

***Smart contracts and Data***

Beyond sharing and controlling your own data, blockchain technologies could let you sell your data via smart contracts. This enables data marketplaces without middlemen, making them more secure and private. Such marketplaces will lower the barrier for smaller players, leveling the playing fields and thus fostering innovations. Through technology such as zero-knowledge proofs, businesses and researchers might search for relevant information without knowing the details of the data, or the identity of the data owners. We cannot stress enough the huge impact of being able to filter out and locate the data you want while keeping user' privacy intact. For example, Nebula Genomics, a start-up cofounded by Harvard University's George Church, provides a marketplace that connects people who want their genomes sequenced with companies who want this data .In a similar effort, Lon genesis provides a platform to share and monetize life data such as medical record and health data.

***Computing Power***

Blockchain can leverage more distributed computing power for AI through a decentralized market for computing power, that is, blockchain-based cloud computing. AI developers can now make use of millions of GPUs from gamers to prepare, model, train, and deploy their machine learning algorithms. Gamers, whose GPUs are often utilized for a small fraction of time, can list their computing time for bids in the form of AI smart contracts, and get paid. Today's market for AI-supported cloud computing enjoys numerous applications, as many as AI can power. Further, in centralization cryptography token payment attracts more users to sell their computing resources.

***Coordination of Untrusting Devices***

There is also a bright future for AI on devices, in which untrusting devices, for example, swarm robotics, Internet of Thing devices, or cell phones, will coordinate and make joint decisions. In those scenarios, blockchain will serve as a coordination platform in which adversaries can compromise the security only if they hold the majority. Applications of this paradigm can range from updating software for your refrigerators to coordinating swarm robotics in tactical missions. The gloomy side of this, however, is that it can be used to sustain commands and controls for botnets and malware programs. Currently, security experts can shut down those harmful programs at once by locating their centralized control center.

Despite the wide success of machine learning in building autonomous systems that are capable of perceiving, learning, and acting on their own, there is reluctance to adopt these systems in practice. One reason is that with machine learning techniques, for example, deep learning, it is difficult to understand

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what exactly goes inside the black boxes. Thus, decisions made by those systems are unexplainable to human users and thus cannot be verified or trusted. Hesitation is even higher in the fields of medical research and financial planning, where explain ability becomes crucial as wrong decisions could imply loss of life or economic disaster. It is essential that we have an immutable trail to track the development of the data flow and complex behaviors of AI-based systems. Without the Opposition Owns the Majority Mining Power, Blockchain is Almost Impossible to Hack.

## 4. ARTIFICIAL INTELLIGENCE FOR BLOCKCHAIN

The design and operation of a blockchain involves thousands of parameters and tradeoffs between security, performance, decentralization, and many others. AI can ease those decisions, and automate and optimize blockchain for higher performance and better governance. Moreover, as all data on blockchain is publicly available, AI plays a key role in providing users confidentiality and privacy.

### *Security and Scalability*

The applications and functionalities built on top of the blockchain platform are, unfortunately, not as secure. For example, the decentralized autonomous organization (DAO), one of the largest crowd-funding groups with 150 million of a crypto currency called Ether, was the victim of a 50 million theft. The hacker exploited several mistakes made in the writing of the smart contracts that allowed repeated transactions to be run that withdrew more money than the fund put in. With the unlikely movement made by machine learning, a blockchain directed by an intelligent machine learning algorithm might be able to detect the presence of attacks and automatically invoke the appropriate defense mechanisms. When the damage is unavoidable, the AI might at least isolate the attacked component from the blockchain platform, keeping the rest safe from the attack. A similar AI can be used to govern the blockchain, making it more scalable and robust. For example, when there is a spike in the number of transactions, the AI might be smart enough to increase the block creation rate, which would increase the throughput at the cost of longer confirmation times.

## 5. MOVING TOWARDS SECURE ENVIRONMENT

The increase of security is one of the most important advantages that blockchain brings. If developers create AI solution in a centralized platform, they need to ensure the integrity and security of the data, accuracy of machine learning algorithms. They should also make sure that the interface provides a reliable representation of an AI output. In such a model the developers have to trust the platform blindly. Meanwhile blockchain's transparency and accessibility to all participants of a peer-to-peer network significantly pumps up the security. All the information (such as AI app/data ownership and/or platform earned tokens) cannot disappear from blockchain, while immutable and audited smart contracts guarantee safe and fair execution of transactions without the need for a trusted intermediary. Machine learning Progress in the last few years makes AI a great friend for the blockchain to guarantee a secure applications' deployment.

## 6. AI AND BLOCKCHAIN: INTEGRATED APPROACH

The focus of this paper is to show how AI can help us implement blockchain technology. Accordingly, the follow aspects, illustrated in Fig. a, serve as the starting point of synthesizing AI and blockchain. These aspects are:

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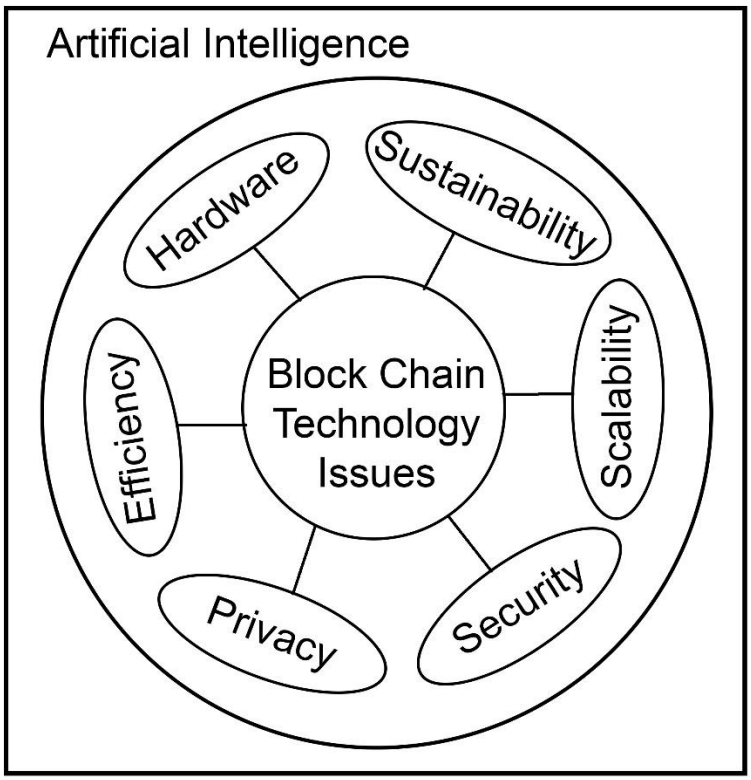


**Fig(a):Collaboration of Artificial Intelligence and Block chain**

**6.1 Sustainability**

The methodologies of AI have long been applied to optimize large-scale system (e.g., power system planning and operation). On the other hand, intelligent optimization algorithms are also the basic tools for analysing microeconomic environment. Essentially, blockchain (or distributed ledger system) and microeconomics both are large-scale distributed systems, and there are inherent connections found between them. In principle, a blockchain system (including various nodes such as full node, mining node, and lightweight node) and a microeconomic system (including a social system, which consists of producers, consumers, and markets) have many similarities: different interconnected subsystems, decentralized computations, and so on. The broad concern of microeconomics is to allocate scarce resources among various uses with the goal of maximizing users' utility and producers' profit. Then a unified view of AI-backed blockchain system energy consumption optimization can be established from the large-scale complex systems perspective.

**6.2 Scalability**

Scalability in the context of blockchain generally refers to its scale capability with the increase of the number of users. In practice, we can view scalability issues via various angles such as latency (the time required for confirming a transaction), bootstrap time (the time consumed for validating a transaction), and cost generated per confirmed transactions. Overall, the efficiency of a blockchain system is limited by one or more of these scalability issues. Since each block contains a certain amount of transaction data, conventional centralized data mining techniques are struggling to cope with this situation. Nevertheless, novel AI algorithms (say, federated learning) can learn from distributed data sources, which in turn offer us a global optimal solution for the target blockchain system.

**6.3 Security**

The security concerns of a blockchain system cover the applications layer vulnerability (say, smart contract), data encryption mechanism, etc. In terms of the vulnerability applications layer, the intrusion detection system (IDS) and intrusion protection system (IPS) are critical components for monitoring various threats. In order to increase the efficacy of an IDS, swarm intelligence [15] (a sub-branch of AI which seeks inspiration from swarms of different biological system) approaches have been widely applied in this direction. Regarding blockchain data encryption mechanism, computational intelligence (another key branch area of AI) also plays an important role in both classical and modern cryptographic systems. Their

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applications in this regard range from cryptography (e.g., cellular automata and DNA computing), cryptanalysis (e.g., evolutionary computation), and hash function (artificial neural network). In general, the advantages of using computational intelligence include creating more robust ciphers and improving blockchain system's resilience via computational intelligence improved system attack-defense process.

**6.4 Privacy**

With more and more personal data embedded in blockchain system, the data encryption becomes a prominent issue for guaranteeing users' privacy. This aspect is more or less related to previous security issue in which we have showed the important role of AI. Take Bitcoin blockchain system, it is currently utilizing elliptic curves based private and public key generation. However, for now, no one has managed to develop a public-key algorithm that is free from weaknesses. To better address this problem, different intelligent search algorithms can be used collectively for searching the bits of a secret key (an in-depth exploration and exploitation of the search space).

**6.5 Efficiency**

In blockchain network, simply getting the total throughput maximized is not always sufficient for maintaining a desired transaction validation performance. Take a sensor network, when we use it to track certain objects' mobility in a large observation space, the total throughput maximization only strategy might cause fairness issue among different mining nodes (i.e., majority nodes could be excluded due to data transportation cost). Network utility maximization(NUM) model can assist us in seeking distributed solution for controlling congestion, routing, and scheduling in computer networks (including Internet and emerging blockchain network). Since NUM is essentially a twice differentiable utility function that is characterized by its concavity and non-decreasing features, and most importantly in many practical scenarios, the amount of available resources is unknown a priori. AI can, therefore, perform active and dynamic learning so as to accelerate resources estimation and improve overall system's performance.

**6.6 Hardware**

Focused computer components plays a crucial role in keeping a blockchain system running. The current computer architecture is mainly built on von Neumann architecture which classified a computer into different components such as central processing unit (CPU), internal memory, external storage, input/output (I/O) devices, and buses (wires used to connect these components together). Other computer architectures also include Harvard architecture, RISC (reduced instruction set computer), and parallel processing architecture. In this regard, neural-inspired neuromorphic hardware [19, 20] shed light on a new direction. One example of such hardware design could consist of a couple of hundred neurons along with numerous synaptic phase change memory cells that are built on leaky integrate-and-fire and spike-timing-dependent plasticity spiking neuron models.

## 7. CONCLUSION

In this paper, I surveyed and reviewed the current state of-the-art related to the use and applicability of blockchain features for AI. I gave an overview of blockchain and decentralized storage on how blockchain technology can enhance and solve key issues related to AI. Moreover, we presented a detailed taxonomic discussion and comparisons of common blockchain applications in terms of decentralized AI operations, blockchain types and infrastructure, and consensus protocols. Different features of Artificial Intelligence for blockchain applications are also summarized. Our literature review shows that adopting AI for blockchain applications is still in its early stages, and there exists many research challenges to be addressed and tackled in areas related to privacy, smart contract security, trusted oracles, scalability, standardization, interoperability, consensus protocols and governance.

# REFERENCES

**[1].** A. Maxmen, "Ai researchers embrace bitcoin technology to share medical data," Nature, vol. 555, pp. 293–294, 2018.

**[2].** Z. Baynham-Herd, "Technology: Enlist blockchain to boost conservation," Nature, vol. 548, no. 7669, p. 523, 2017.

**[3].** S. Ahmed and N. ten Broek, "Food supply: Blockchain could boost food security," Nature, vol. 550, no. 7674, p. 43, 2017.

*© 2019, IJCSMC All Rights Reserved* 

**[4].** S. Nakamoto, "Bitcoin: A peer-to-peer electronic cash system," 2008.
**[5].** M. Swan, Blockchain: Blueprint for a new economy. " O'Reilly Media, Inc.", 2015.
**[6].** M. Koch, "Artificial intelligence is becoming natural," Cell, vol. 173, no. 3, pp. 531–533, 2018.
**[7].** J. Schmidhuber, "Deep learning in neural networks: An overview," Neural networks, vol. 61, pp. 85–117, 2015.
**[8].** N. A. Team, "Nebula ai (nbai)â˜A ˇ Tdecentralizedaiblockchain whitepaper," 2018.
**[9].** T. N. Dinh and M. T. Thai, "Ai and blockchain: A disruptive integration," Computer, vol. 51, no. 9, pp. 48–53, 2018.
**[10].** Y. Qi and J. Xiao, "Fintech: Ai powers financial services to improve people's lives," Communications of the ACM, vol. 61, no. 11, pp. 65–69, 2018.
**[11].** G. Wood, "Ethereum: A secure decentralisedgeneralised transaction ledger," Ethereum project yellow paper, vol. 151, pp.1–32, 2014.
**[12].** H. B. McMahan, E. Moore, D. Ramage, S. Hampson et al. "Communication-efficient learning of deep networks from Decentralized data," arXiv preprint arXiv:1602.05629, 2016.
**[13].** S. Wang, Y. Yuan, X. Wang, J. Li, R. Qin, and F.-Y. Wang, "An overview of smart contract: architecture, applications, and future trends," in 2018 IEEE Intelligent Vehicles Symposium (IV). IEEE, 2018, pp. 108–113.
**[14].** X. Zheng, M. Zhu, Q. Li, C. Chen, and Y. Tan, "Finbrain: When finance meetsai 2.0," arXiv preprint arXiv:1808.08497, 2018.
**[15].** T. Baltrušaitis, C. Ahuja, and L.-P. Morency, "Multimodal machine learning: A survey and taxonomy," IEEE Transactions on Pattern Analysis and Machine Intelligence, 2018.
**[16].** F. Fioretto, E. Pontelli, andW. Yeoh, "Distributed constraint optimization problems and applications: A survey," arXiv preprint arXiv:1602.06347, 2016.
**[17].** K. Yeow, A. Gani, R. W. Ahmad, J. J. Rodrigues, and K. Ko, "Decentralized consensus for edge-centric internet of things: A review, taxonomy, and research issues," IEEE Access, vol. 6, pp. 1513–1524, 2018.
**[18].** T. M. Fernández-Caramés and P. Fraga-Lamas, "A review on the use of blockchain for the internet of things," IEEE Access, 2018.
**[19].** A. Panarello, N. Tapas, G. Merlino, F. Longo, and A. Puliafito, "Blockchain and iot integration: A systematic survey," Sensors, vol. 18, no. 8, p. 2575, 2018.
**[20].** K. Christidis and M. Devetsikiotis, "Blockchains and smart contracts for the internet of things," Ieee Access, vol. 4, pp. 2292–2303, 2016.
**[21].** T. Neudecker and H. Hartenstein, "Network layer aspects of permissionless blockchains," IEEE Communications Surveys & Tutorials, 2018.
**[22].** W. Cai, Z. Wang, J. B. Ernst, Z. Hong, C. Feng, and V. C. Leung, "Decentralized applications: The blockchain-empowered software system," IEEE Access, 2018.

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