Chapter 18
The Future of Artificial Intelligence in Blockchain Applications

Amit Kumar Tyagi
https://orcid.org/0000-0003-2657-8700
National Institute of Fashion Technology, New Delhi, India

Shrikant Tiwari
https://orcid.org/0000-0001-6947-2362
Galgotias University, Greater Noida, India

ABSTRACT

The integration of artificial intelligence (AI) and blockchain technologies represents a powerful synergy with the potential to revolutionize various industries. This chapter explores the promising future of AI in blockchain applications, shedding light on the significant impacts, challenges, and opportunities it offers. AI's capabilities in data analysis, pattern recognition, and automation find natural alignment with blockchain's immutable, transparent, and decentralized ledger technology. The chapter examines several key use cases where AI and blockchain intersect, including supply chain management, healthcare, finance, and smart contracts. It also discusses the challenges of scalability, data privacy, and regulatory compliance, and how AI can address or mitigate these issues. Furthermore, the chapter highlights the opportunities for innovation and disruption in emerging AI-powered blockchain applications, such as self-executing smart contracts, fraud detection, and identity verification.

1. INTRODUCTION TO BLOCKCHAIN TECHNOLOGY, FEATURES AND USE CASES

1.1 Evolution, Features, and Challenges of Blockchain Technology

Blockchain technology is a decentralized and distributed ledger system (Gomathi et al., 2023; Sk et al.,

DOI: 10.4018/978-1-6684-8531-6.ch018

2022) that underlies cryptocurrencies like Bitcoin, but its applications extend far beyond digital currencies. Here, we will discuss the evolution, features, and challenges of blockchain technology. Here, the evolution of Blockchain Technology can be discussed as:

- Pre-Bitcoin Era (2008): The concept of blockchain technology was first introduced in a white-paper published by an anonymous person or group known as Satoshi Nakamoto in 2008. It was designed to serve as the underlying technology for the digital currency Bitcoin.
- Bitcoin (2009): The first blockchain network was implemented with the launch of Bitcoin in 2009. Bitcoin's blockchain is a public ledger that records all Bitcoin transactions in a transparent and immutable way.
- Altcoins (2011-present): Following Bitcoin's success, alternative cryptocurrencies (altcoins) were created, each with its own blockchain. These introduced variations in consensus mechanisms, block generation times, and other features.
- Ethereum (2015): Ethereum introduced the concept of smart contracts, enabling programmable and self-executing contracts on the blockchain. This expanded the potential use cases of blockchain beyond simple transactions.
- Enterprise Adoption (2016-present): Blockchain technology gained the attention of businesses and governments for its potential in various industries, including finance, supply chain management, healthcare, and more.
- Features of Blockchain Technology:
- Decentralization: Blockchain operates on a decentralized network of nodes (computers). This decentralization enhances security, as there is no central point of control.
- Immutable Ledger: Once data is recorded on the blockchain, it is extremely difficult to alter or delete, ensuring data integrity.
- Transparency: Transactions on a public blockchain are visible to anyone, promoting transparency and trust.
- Security: Cryptographic techniques and consensus mechanisms, like proof of work (PoW) or proof of stake (PoS), ensure the security of the network.
- Smart Contracts: Ethereum popularized smart contracts, enabling automated, self-executing agreements without intermediaries.
- Permissioned Blockchains: Some blockchains are permissioned, meaning only authorized entities can participate, making them suitable for business applications.

Challenges of Blockchain Technology:

- Scalability: Blockchains can become slow and costly as more users join the network. Improving scalability is a major challenge.
- Energy Consumption: Proof of work blockchains, like Bitcoin, require significant computational power and energy, leading to environmental issues.
- Interoperability: Different blockchain networks often have limited interoperability, making it challenging to exchange data and assets between them.
- Regulatory and Legal Issues: The regulatory landscape for blockchain and cryptocurrencies is evolving and can be uncertain, creating challenges for adoption.