# Chapter 7
# Blockchain and Artificial Intelligence for Cyber Security in the Era of Internet of Things and Industrial Internet of Things Applications

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## ABSTRACT

*As the internet of things (IoT) and industrial internet of things (IIoT) continue to expand, the need for robust cyber security solutions becomes increasingly critical. The convergence of blockchain technology and artificial intelligence (AI) offers promising opportunities to address the security challenges posed by IoT and IIoT applications. This chapter provides an overview of the potential synergies between blockchain and AI in the context of cyber security for IoT and IIoT. Blockchain technology, with its decentralized and immutable nature, can provide enhanced security and trust in IoT and IIoT networks. It offers features such as data integrity, transparency, and tamper resistance, making it well-suited for securing critical data and transactions. Additionally, blockchain can facilitate secure device identity management, access control, and secure communication among IoT and IIoT devices.*

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## 1. INTRODUCTION

The rapid proliferation of IoT and IIoT devices has introduced new challenges in ensuring the security and privacy of connected systems. The interconnected nature of these devices, along with the vast amounts of data they generate, has created a complex cyber security landscape. In response to these challenges, the integration of Blockchain technology and AI has emerged as a potential solution (Gupta & Sehgal, 2019). Note that Blockchain, originally developed for cryptocurrency applications, is a decentralized and distributed ledger technology that ensures the transparency, integrity, and immutability of data. It provides a secure and tamper-resistant platform for recording and verifying transactions. The decentralized nature of Blockchain eliminates the need for a central authority, making it suitable for securing IoT and IIoT networks. Artificial Intelligence, on the other hand, leverages advanced algorithms and machine learning techniques to enable systems to analyze, learn, and make intelligent decisions (Xu et al., 2018). AI has the potential to enhance cyber security by detecting anomalies, identifying patterns, and predicting and mitigating cyber threats. It can adapt and improve its defense mechanisms based on continuous learning from data patterns and user behavior. The integration of Blockchain and AI in the context of cyber security for IoT and IIoT applications offers several advantages. Blockchain provides a secure and transparent infrastructure for recording and sharing security-related information, such as device identities and access permissions. It enhances trust and accountability in IoT and IIoT networks. AI, on the other hand, can leverage the data stored on the Blockchain to analyze and detect potential threats in real-time. By combining the strengths of both technologies, organizations can achieve a higher level of security and resilience in their connected systems.

However, there are challenges and issues to be addressed in the implementation of Blockchain and AI for cyber security. Scalability and interoperability issues need to be overcome to handle the increasing volume of IoT and IIoT data. The computational overhead of Blockchain and the complexity of AI models pose additional challenges. Moreover, the explainability, privacy, and ethical aspects of AI algorithms need careful attention. In summary, the integration of Blockchain and AI presents a promising approach to address the cyber security challenges in the era of IoT and IIoT applications. By leveraging the strengths of Blockchain's decentralized and immutable nature and AI's advanced analytics and decision-making capabilities, organizations can enhance the security, trust, and resilience of their connected systems. In last, this work has been discussed in 11 sections.

## 2. INTERNET OF THINGS (IoT) AND INDUSTRIAL INTERNET OF THINGS (IIoT)

### 2.1 Overview of IoT and IIoT

IoT and IIoT are two interconnected concepts that involve the integration of smart devices, sensors, and networks to enable communication and data exchange between physical objects and digital systems (Aljawarneh et al., 2020). The IoT refers to a network of interconnected devices, objects, and systems that are embedded with sensors, software, and connectivity capabilities. These devices can collect and exchange data with each other and with cloud-based platforms, enabling various applications and services. IoT devices can range from everyday consumer products like smart thermostats and wearable devices to industrial equipment and infrastructure. The IIoT, on the other hand, focuses specifically on the application of IoT technologies in industrial sectors such as manufacturing, energy, transportation, and