Chapter 13
Integrating AI and Blockchain in EV Charging:
Innovations and Challenges

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ABSTRACT

This chapter investigates the creative uses and underlying difficulties of integrating blockchain and artificial intelligence (AI) technology in electric vehicle (EV) charging systems. It thoroughly examines the industry's state today, highlighting AI-driven advancements like dynamic pricing, predictive maintenance, and user behaviour monitoring for better charging station operations. The chapter also examines how smart contracts and decentralised processes in blockchain provide safe and effective transactions in the EV charging infrastructure. Real-life case studies demonstrate effective deployments worldwide and provide insights into the advantages and practical problems. The conversation ends with a critical analysis of the issues, such as legislative barriers and data privacy concerns, and a look ahead, highlighting the revolutionary potential of blockchain and artificial intelligence in reshaping the landscape of sustainable mobility.

1. OVERVIEW

The merging of Blockchain and Artificial Intelligence (AI) technologies is about to revolutionise the current state of electric vehicle (EV) charging infrastructure. This chapter thoroughly examines the complementary capabilities of these state-of-the-art inventions, emphasising their significant impact on the scalability, security, efficiency, and user experience of the EV charging ecosystem.

The need for sophisticated, dependable, and secure EV charging systems grows as the world moves more and more towards sustainable transportation (Tariq, 2024a). This perspective emphasises the strategic importance of using blockchain technology and artificial intelligence to meet these changing demands.

AI-Powered Changes: Revolutionising Productivity

This chapter presents a detailed examination of the functions of artificial intelligence. AI presents dynamic pricing models (Ahl et al., 2022), intelligent charging algorithms, and predictive maintenance strategies (Andoni et al., 2019; Tariq, 2024). Through individualised services and real-time decision-making, EV charging infrastructure may optimise operations, cut costs, and improve user experience by utilising these advances (Assiri, 2022; Tariq, 2024).

Blockchain Technology for Increased Transparency and Security

This chapter presents a smooth transition to blockchain technology and analyzes it in detail for EV charging transaction security. Blockchains facilitate safe and transparent transactions and build stakeholder confidence using decentralised processes and smart contracts (Raimi et al., 2022; Atlam et al., 2020). By departing from conventional centralised approaches, this novel strategy promotes an EV-charging infrastructure that is more robust and dependable.

Applications in the Real World: Case Studies

This chapter includes real-world case stories to support the theoretical topics. These instances provide actual data, demonstrating how Blockchain and AI technology can be successfully integrated into various international EV-charging infrastructures (Baashar et al., 2021). These studies not only show the benefits, but also offer insightful information on the real-world problems faced and the solutions that came up with.

Overcoming Obstacles: A Comprehensive Analysis

This chapter critically analyzes topics such as data privacy concerns, legislative barriers, technical interoperability, and scalability issues, acknowledging the complexity of this integration (Baidi 2022, Tariq, 2024). This thorough research provides a more nuanced view of the challenges that must be overcome before mainstream adoption.

Prospects for the Future: Handling the Technological Horizon

In conclusion, the review takes a forward-looking stance and makes predictions about new developments in blockchain, artificial intelligence, and future trends. This covers their possible influence on the worldwide shift toward environmentally friendly transportation. The significance of AI and Blockchain in influencing the future of EV charging is highlighted along with the necessity of ongoing innovation, industry stakeholder engagement, and supporting legislative frameworks (Badidi, 2022).

This chapter functions as a thorough manual, providing insights into the revolutionary potential of AI and Blockchain technology to revolutionise EV charging stations. This technological integration presents both challenges and opportunities, and it does so by guiding the reader via a combination of theoretical discourse, empirical data, and critical analysis.

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