Chapter 11
Smart Contracts in AI-Driven Decentralized Finance:
Navigating Emerging Technologies and Market Dynamics

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ABSTRACT

This study aims to explore the integration of smart contracts within decentralized finance (DeFi) platforms, focusing on their security, functionality, and potential applications across various industries. Utilizing a comprehensive survey methodology, the research analyzes existing literature and case studies to identify the advantages and challenges associated with smart contracts. Key findings reveal that while smart contracts enhance efficiency and transparency, they also present significant security vulnerabilities that necessitate advanced mitigation strategies, including the use of artificial intelligence. The study concludes that addressing these challenges is crucial for the broader adoption of smart contracts, emphasizing the need for standardized frameworks and rigorous testing protocols. The implications of this research highlight the transformative potential of smart contracts in reshaping

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traditional business models and regulatory landscapes.

1. INTRODUCTION

1.1 Background and Context

Nick Szabo introduced the idea of smart contracts for the first time. One of the most well-known platforms for smart contracts is Ethereum, which has a wide range of uses across various industries. At first, smart contracts were limited to use in financial applications, like ERC20 tokens. Because of different industrial requirements, smart contract platforms have been invented over time in a variety of ways. (Tharaka Hewa, et al. 2022)

Blockchain and Smart Contracts

With the help of distributed ledger technology, or Blockchain, transactions can be conducted safely and openly without the need for middlemen like governments or financial institutions. It is composed of a node network that collaborates to keep a shared transaction database up to date. A consensus process is used by the network to validate every transaction, and every node has a copy of the database (Suresh Babu, C. V. & Abhinaba Pal. 2023). This guarantees that all transactions are transparent and unchangeable, and that there is no way for the database to be tampered with. One important development in Blockchain technology is the idea of SCs. To automate complicated financial transactions without the need for middlemen, self-executing programs, or SCs, run on a Blockchain. When specific requirements are satisfied, they are automatically carried out and stored on the Blockchain. Applications for SCs include voting systems, financial derivatives, and supply chain management. Figure 1 depicts the general architecture of Blockchain.