**### Abstract**

With the development of blockchain technology, smart contracts have shown tremendous potential in the rental market. Traditional rental methods face numerous security issues, such as information asymmetry, data leakage, and contract tampering. Additionally, rental transactions typically rely on intermediary agencies, which can lead to trust issues. Smart rental contracts manage rental agreements automatically, ensuring transparency and security, and protecting the confidentiality of personal information and the immutability of contracts. This paper describes in detail the design and implementation of a smart rental contract system, focusing on protecting the rights of both parties, reducing trust costs, and mitigating operational risks. Through in-depth research on smart contracts, this study demonstrates their significant potential in enhancing rental market efficiency, reducing costs, increasing transparency, and ensuring information security.

**### 1. Introduction**

#### Background and Motivation

As the global rental market continues to grow, it has become a significant and vital economic sector worldwide. However, the traditional rental market faces numerous challenges, including information asymmetry, difficulties in contract enforcement, high transaction costs, and frequent disputes. Rental transactions typically depend on intermediary agencies, which not only increase costs but also can lead to trust issues. Additionally, the efficiency and transparency of contract enforcement need improvement, particularly in areas such as rent payments and contract amendments, where traditional methods are often cumbersome and inefficient. More importantly, the traditional rental market has significant risks in data security and privacy protection, making it vulnerable to fraud, data breaches, and unauthorized access.

The advent of blockchain technology offers new solutions to these problems. Blockchain's decentralized, immutable, and transparent nature provides inherent advantages for smart contracts in terms of automated execution and trust mechanisms. Smart rental contracts can automate the execution of rental agreements, handle rent payments automatically, and effectively protect the rights of both parties, thereby enhancing the efficiency and transparency of the rental market and reducing the operational risks associated with intermediaries. Furthermore, blockchain's encryption technology and distributed storage ensure the security and privacy of rental transaction data, effectively preventing data tampering and unauthorized access, and reducing the risk of information leakage. Through these security mechanisms, smart rental contracts not only increase transaction transparency and efficiency but also offer higher security guarantees for both parties involved.

#### Research Objectives

This study aims to comprehensively explore the application and potential advantages of smart rental contracts in the modern rental market. With the continuous advancement of blockchain technology, smart contracts, as a new automated management tool, can significantly enhance the efficiency and security of the rental market. This paper also explores how to use this tool more efficiently and maximize its security benefits.

We designed and implemented a smart rental contract system. Through in-depth research on smart rental contracts, we aim to demonstrate their specific application scenarios and technical implementation processes in the rental market. We will explore how smart contracts can improve overall market efficiency by automating rental agreement execution, ensuring transaction transparency, protecting user privacy, and reducing operational risks.

In summary, this research is not only an exploration and implementation of smart rental contract technology but also a comprehensive demonstration of its advantages in real-world applications, such as efficiency improvement, cost reduction, and increased transparency. Through this research, we hope to provide rental market participants with a more secure, efficient, and transparent transaction method, thereby supporting a safer digital transformation of the rental market.

#### Paper Structure

This paper is structured as follows:

\*\*Chapter 1: Introduction\*\* - An introduction to the topic area and the problem statement.

\*\*Chapter 2: Literature Review\*\* - A review of terminology and concepts related to the technologies used in this project, including insights gained from reading various papers. It also includes summaries of different projects that have adopted these technologies to address practical problems.

\*\*Chapter 3: System Module Description\*\* - A comprehensive description of each functional module.

\*\*Chapter 4: System Deployment and Testing\*\* - A description of the system deployment environment configuration and a brief overview of how each module's functionality is tested.

\*\*Chapter 5: Analysis\*\* - Challenges faced, future developments and directions, and a presentation of the achieved results with quantitative and qualitative analysis.

\*\*Chapter 6: Conclusions\*\* - A summary and critical analysis of the work realized, as well as potential future directions.