A Mini Project Report on

Decentralized Finance - Savings and Lending

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CERTIFICATE

This to certify that the Mini Project report on **Decentralized Finance - Savings and Lending** has been submitted by **Harmi Mathukiya (21104044), Avantika More (21104033) and Atharva Mohape (21104121)** who are a Bonafede students of A. P. Shah Institute of Technology, Thane, Mumbai, as a partial fulfilment of the requirement for the subject of ITL801 Blockchain Lab in degree of **Information Technology**, during the academic year **2024-2025** in the satisfactory manner as per the curriculum laid down by University of Mumbai.

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ABSTRACT

The Decentralized Finance (DeFi) is revolutionizing traditional banking systems by removing intermediaries and enabling peer-to-peer financial services on blockchain networks. This project focuses on developing a DeFi Savings and Lending Platform that allows users to deposit crypto assets to earn interest (savings) or borrow assets against collateral (lending), using smart contracts for automation and trustless execution.By leveraging Ethereum and Solidity, this platform ensures transparency, security, and immutability. Users can interact with the platform using a decentralized application (DApp) with a user-friendly interface connected via web3.js or ethers.js.This abstraction layer simplifies the complexities of blockchain interactions and provides a clean API for integrating savings and lending functionalities, including interest rate models, over-collateralization, and liquidation mechanisms.

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Chapter 1

Introduction

This In recent years, Decentralized Finance (DeFi) has emerged as a transformative force in the financial ecosystem, offering an open, permissionless alternative to traditional banking systems. By leveraging blockchain technology and smart contracts, DeFi eliminates the need for centralized intermediaries such as banks or financial institutions, enabling peer-to-peer financial services that are transparent, secure, and globally accessible.One of the most impactful applications of DeFi is in the area of savings and lending. Traditional savings and loan systems often involve lengthy approval processes, low interest rates for savers, and high borrowing costs. DeFi platforms, on the other hand, provide automated, efficient, and fair mechanisms for users to earn interest by supplying crypto assets or take loans by locking up collateral—all governed by programmable smart contracts.This project focuses on designing and implementing a DeFi Savings and Lending platform abstraction, which demonstrates the core principles of decentralized borrowing and lending. The platform aims to provide users with functionalities to deposit tokens, earn interest, borrow assets, and manage collateral, all through a user-friendly decentralized application (DApp). The smart contract logic ensures transparency, immutability, and trustless execution, reducing the reliance on centralized authorities.By building this platform, the project aims to explore the inner workings of DeFi protocols such as Compound, Aave, and MakerDAO, while providing a simplified abstraction layer that can serve as the foundation for more advanced financial applications.

1.1 Purpose

The Supply Chain The purpose of this project is to design and develop a decentralized savings and lending platform that showcases the core functionalities of DeFi (Decentralized Finance) through a simplified abstraction. The goal is to allow users to save crypto assets and earn interest or borrow assets using collateral without relying on traditional financial intermediaries.This project aims to:Demonstrate the power of smart contracts in automating financial operations like interest generation, borrowing, and collateral management.Eliminate the need for centralized control, providing financial services that are transparent, trustless, and accessible to anyone with an internet connection.Provide a learning abstraction that simplifies complex DeFi concepts for educational and development purposes.Explore and apply real-

world DeFi mechanisms such as over-collateralization, interest rate modeling, and liquidation processes.By building this abstraction layer, the project contributes to the growing ecosystem of decentralized financial tools and serves as a stepping stone for developers and users to understand and interact with DeFi protocols more effectively.

1.2 Problem Statement

Traditional financial systems often rely heavily on centralized intermediaries such as banks and lending institutions to facilitate savings and loans. These systems are typically slow, require trust in third parties, involve complex approval processes, and may exclude individuals who lack access to formal banking. Additionally, interest rates are often not favorable to users, and transparency is limited. In contrast, Decentralized Finance (DeFi) offers an open and permissionless alternative that allows users to interact directly with financial services on blockchain networks. However, for many users and developers, understanding and implementing DeFi protocols remains complex due to the technical depth and variety of mechanisms involved, such as collateralization, interest rate models, and liquidation strategies. There is a need for a simplified, abstracted model that captures the essential functionalities of DeFi-based savings and lending systems, making it easier to understand, test, and extend. This project aims to address that gap by developing an abstracted DeFi savings and lending platform that demonstrates the core principles and functionalities in an accessible, transparent, and decentralized manner.

1.3 Objectives

- To create a blockchain-based platform for saving, lending, and borrowing cryptocurrencies.

- To ensure secure and transparent financial transactions using smart contracts.

- To remove intermediaries and reduce transaction costs.

- To provide users with better interest rates and financial flexibility.

- To make the lending and borrowing process faster and more accessible.

1.4 Scope

- Can be used by anyone looking to save, lend, or borrow cryptocurrencies.

- Can provide an alternative to traditional banking for financial transactions.

- Can be expanded to support multiple cryptocurrencies and blockchain networks.

- Can be improved with AI-based risk analysis for secure lending.

- Can integrate with decentralized exchanges (DEX) for additional financial services.

Chapter 2

Literature Review

[1] DeFi Protocols and Lending Models

Vitalik Buterin and other Ethereum developers have laid the foundation for decentralized financial services through the introduction of smart contracts. Protocols like Compound and Aave have built on this foundation to create lending and borrowing systems that use algorithmic interest rates based on asset supply and demand. Studies show that these platforms provide an efficient alternative to traditional lending by removing intermediaries, enabling real-time interest calculation, and offering transparency through publicly auditable smart contracts. Their success has validated the feasibility of DeFi lending models on a large scale.

[2] Smart Contracts and Trustless Transactions

A study published in *IEEE Access* highlights how smart contracts enable trustless transactions in financial systems by automating processes and enforcing agreements without manual intervention. Researchers emphasize that by encoding rules directly into smart contracts, DeFi platforms can ensure secure, immutable, and verifiable execution. This eliminates the risk of human error and fraud, which are prevalent in traditional systems. These capabilities are especially crucial in savings and lending platforms, where accurate interest calculation and timely liquidation of collateral are essential.

[3] Challenges in DeFi Adoption

According to a review in *Elsevier's Journal of Financial Innovation*, the rapid growth of DeFi also brings challenges such as scalability, user experience, and risk of smart contract vulnerabilities. It highlights that while DeFi platforms offer significant advantages, they remain technically complex for new users and developers. The lack of abstraction layers often leads to difficulty in adoption and experimentation. This supports the motivation for building simplified models or abstractions of DeFi systems to facilitate wider adoption and educational use.

[4] Collateralization and Liquidation Mechanisms

The *Springer Journal of Blockchain Research* discusses over-collateralization as a key feature in DeFi lending, where borrowers must deposit more value than they borrow to protect lenders from defaults. Liquidation mechanisms are triggered automatically when the value of collateral drops below a threshold. This mechanism, though effective, can be harsh on users during volatile market conditions. The study

suggests that abstracting and simulating these mechanisms in educational or prototype platforms can help developers understand risk management strategies and improve upon existing models.

Chapter 3

Proposed System

The proposed system uses blockchain technology to ensure secure, transparent, and tamper-proof tracking of pharmaceutical products. It automates operations, reduces fraud, and enhances traceability through smart contracts and role-based access.

3.1 Features and Functionality

Blockchain technology brings transformative capabilities to supply chain management, particularly in enhancing product traceability and operational transparency. The proposed system is built around three core features that address key supply chain challenges:

1. End-to-End Product Tracking

This feature allows comprehensive tracking of a product's journey through each stage of the supply chain, right from raw material sourcing to the final delivery to consumers. By leveraging the distributed nature of blockchain, every step—from manufacturing and warehousing to transportation and retail—is recorded in real-time and made visible to all authorized stakeholders. This not only improves operational oversight but also strengthens consumer trust by offering transparency into product origin, processing history, and handling practices.

2. Secure and Immutable Data Storage

The system uses a decentralized blockchain ledger to store all supply chain data. Unlike traditional databases, the blockchain ledger is immutable—meaning once data is entered, it cannot be altered or deleted. This ensures that all transactions and product movement records are tamper-proof, offering a single source of truth for all participants. Each block contains encrypted data, which enhances confidentiality and secures information against unauthorized access or manipulation.

3. Smart Contract Automation

The system integrates smart contracts to automate critical supply chain operations. These self-executing contracts are programmed with predefined rules that trigger automatic actions when conditions are met—such as validating a product's authenticity, approving a shipment, or initiating payment upon delivery confirmation. This reduces the need for manual intervention, speeds up transaction processes, and eliminates human errors or delays.

Chapter 4

Technical Specification

1. Frontend (User Interface)

- **Technology Stack**: HTML, CSS, JavaScript, React.js
- **Wallet Integration**: MetaMask (Web3-enabled wallet)

Functionality:

- Wallet connection and disconnection
- Dashboard to view balance, deposits, and borrowed assets
- Deposit and borrow interfaces
- Real-time transaction updates via Web3 events

2. Backend (Smart Contract Logic)

- Platform: Ethereum Virtual Machine (EVM)
- Language: Solidity
- Tools: Remix IDE / Hardhat / Truffle

Smart Contracts:

- Deposit contract to receive and track user funds
- Lending contract to allow borrowing against collateral
- Interest rate model for earnings and repayments
- Collateral management and liquidation logic
- Token Standard: ERC-20 for asset handling

3. Blockchain Interaction

- Library Used: Web3.js or Ethers.js
- Node Provider: Infura or Alchemy (for Ethereum mainnet/testnet access
- Network: Ethereum (Rinkeby, Sepolia, or local Ganache for testing)

Transaction Handling:

- MetaMask prompts for signing
- Gas estimation and fee calculation
- Transaction receipts and hash confirmations

4. Security Considerations

- Input validation to avoid reentrancy attacks
- Use of `require()` conditions in smart contracts
- Contract testing using Chai/Mocha
- Optional integration of OpenZeppelin library for secure token standards and access control

Chapter 5

Project Design

The design of the decentralized savings and lending platform is centered around three major components: User Interface (Frontend), Smart Contract Logic (Backend), and Blockchain Integration. Each component plays a vital role in ensuring a smooth, secure, and decentralized experience for the user.
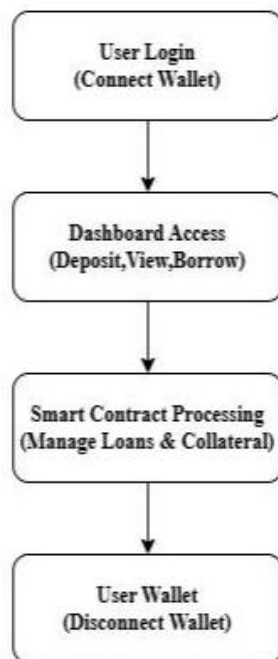
5.1 System Architecture

Fig 4.1:Workflow of the DeFi Savings and Lending Platform

The workflow of the DeFi Savings and Lending Platform begins with the user login process, where the user connects their crypto wallet to the decentralized application (DApp). Once the wallet is successfully connected, the user gains dashboard access, allowing them to perform essential functions such as depositing funds, viewing their account status, and borrowing assets. All user actions are handled through smart contract processing, which automatically manages loans, interest calculations, and collateral security based on predefined logic. These smart contracts ensure that all financial interactions are trustless and transparent. After completing their transactions or managing their finances, the user can disconnect their wallet, securely ending their session. This structured flow ensures seamless and secure interaction with the decentralized savings and lending system.
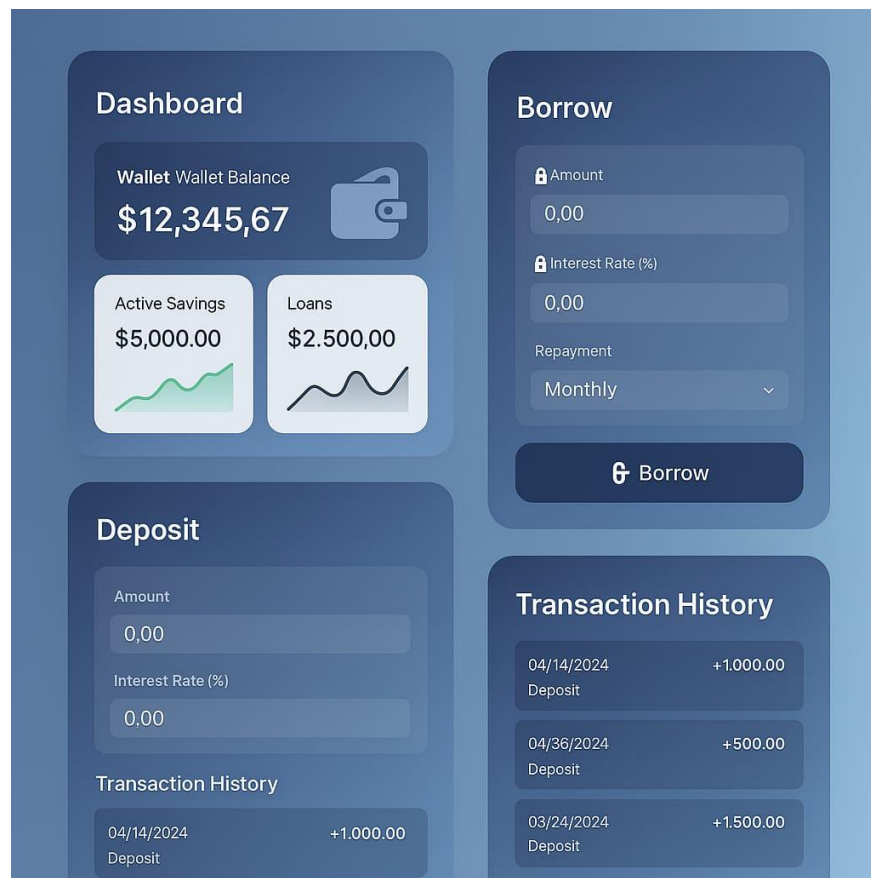
Chapter 6

Results

The implementation of the decentralized savings and lending platform was successfully completed using Ethereum smart contracts and a React-based frontend. Users were able to interact with the system through a web interface, connect their MetaMask wallets, and perform key financial operations such as depositing tokens, borrowing against collateral, and viewing real-time balances and interest accumulation.

Smart contracts deployed on the testnet effectively managed user funds, enforced borrowing limits based on collateral, and handled interest calculations automatically. Transactions were executed securely with proper validation, and the platform ensured transparency and decentralization by recording all actions on the blockchain. The system demonstrated how DeFi can offer a reliable alternative to traditional financial institutions while giving users full control of their assets without intermediaries.
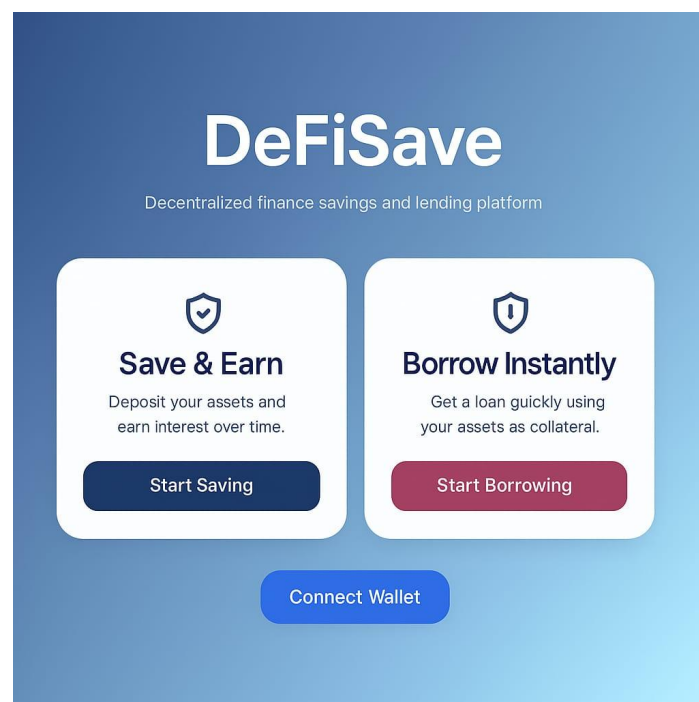
Fig 6.1: Home Page of DeFi Saving and Lending.

Fig 6.2: DeFiSave User Interface - Interactive Dashboard Decentralized Saving and Lending **.**

Chapter 7
Conclusion

In conclusion, this project demonstrates how decentralized finance (DeFi) can revolutionize traditional savings and lending systems by offering a transparent, trustless, and accessible financial ecosystem. By leveraging smart contracts and blockchain technology, the platform eliminates the need for intermediaries, reduces operational costs, and enhances security. Users can seamlessly deposit, borrow, and manage their assets directly from their wallets with full control over their funds.

The abstraction-based approach simplifies complex DeFi mechanisms, making it easier for learners, developers, and early adopters to understand the core concepts of decentralized lending. Through wallet integration, automated interest handling, and collateral management, the platform serves as a strong foundation for future enhancements and real-world adoption.

Overall, this decentralized savings and lending model not only addresses the inefficiencies of conventional systems but also opens doors to financial innovation, inclusion, and autonomy—paving the way for the next generation of open financial services.

Chapter 8

Future Scope

The future of decentralized finance (DeFi) in the savings and lending domain holds immense potential. As blockchain adoption grows, the platform can be scaled to support multiple blockchain networks such as Binance Smart Chain, Polygon, and Avalanche, allowing users to benefit from lower transaction fees and faster processing times. Additionally, cross-chain lending and borrowing can be enabled using interoperability protocols, allowing users to lend on one chain and borrow on another, thus increasing liquidity and utility across ecosystems.

Another major enhancement involves the integration of algorithmic interest rate models and risk assessment mechanisms. By implementing AI-based analytics and decentralized oracles, the platform can calculate dynamic interest rates, predict liquidation risks, and assess borrower credibility without relying on centralized credit scores. This will lead to more accurate loan evaluations and help mitigate default risks. Additionally, introducing stablecoin support will attract users looking for price-stable asset management and improve the overall accessibility of the platform.

Finally, the project can evolve into a full-fledged Decentralized Autonomous Organization (DAO), where token holders can vote on protocol changes, interest policies, and collateral types. This governance model would make the platform more community-driven and resilient. Features such as NFT-based collateral, identity verification using decentralized IDs (DIDs), and mobile app development for DeFi access on the go are promising directions that could significantly broaden the platform's reach and usability in the near future.

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