Report On

YARCoin: Decentralized Bidding System for Academic Ecosystem

Semester VII

Artificial Intelligence & Data Science

by

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CERTIFICATE

This is to certify that the Mini Project entitled "Synapse Ledger: Decentralized Data Staking for the Future" is a Bonafide work of Ankit Bari (Roll No. 61), Yash Kerkar (Roll No. 63), submitted to the University of Mumbai in partial fulfillment of the requirement for the award of the degree of "**Bachelor of Engineering**" in Semester VII of Third Year **"Artificial Intelligence & Data Science"**.

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Abstract

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1. INTRODUCTION

1.1 Introduction

Academic achievements and contributions are an important part of a student's growth. However, in the traditional academic system, student efforts are mostly recognized only through grades or final submissions. In today's educational ecosystem, teachers find it difficult to find a talented student. Students also don't always get opportunities to showcase their skills and earn recognition based on their abilities.

YARCoin solves this problem by introducing a unique platform where teachers can discover the potentially talented students and they can bid these talented students using a Cryptocurrency known as YARCoin. It is like a marketplace for education where student's skills have real values and teachers can also build their dream teams to guide them for projects.

Students create their profiles by including their technical skills, achievements, personal information, set a base price, etc. Teacher also receives a YARCoin purse with certain YARCoin amount from the platform. Student's and Teacher's gets a wallet address using this Teacher can bid YARCoins on the students. The teacher who has bid the highest bid can acquire that student. The system automatically assigns that student under the guidance of that Teacher.

In the YARC ecosystem, teachers and students interact through a teacher–student auction mechanism. Teachers use YARC tokens to bid for students based on their profiles, skills, and prior achievements. This approach ensures that student allocation for project guidance is based on merit, interest, and reputation rather than random selection. Once a teacher wins a bid, both parties enter into a smart contract that governs the terms of collaboration, deliverables, and reward distribution.

This blockchain based system ensures secure transactions, transparent bidding history, and gives students a way to monetize their skills while still in college bridging the gap between academic learning and real project experience.

1.2 Problem Statement & Objective

In the current academic environment, recognizing and rewarding students for their performance, contributions, and participation in projects or events often lacks transparency and standardization. Most institutions still rely on manual evaluation methods, which can be biased, inconsistent, or inefficient. Similarly, there is no unified digital system that allows teachers to identify and mentor talented students based on merit or real-time achievements.

Additionally, existing reward and record systems are generally centralized, making them vulnerable to data tampering, delays, or manipulation. Students have limited ownership of their achievements, and teachers have no transparent way to evaluate or incentivize learners beyond traditional grading.

The absence of an automated, trust-based mechanism for reward distribution, bidding, and accountability creates a gap between student potential and teacher recognition. There is also no reliable token-based ecosystem that encourages active participation or fair competition among students.

Objectives

To implement a decentralized reward system using YARCoin tokens for students, who have a good potential and contributing in projects, events, and academic activities.

To develop a teacher student merit based bidding system where teachers can bid on the students using YARCoins to mentor talented students, ensuring fair and transparent bidding system.

To build a penalty and refund mechanism system via smart contracts, ensuring accountability in project performance.

To establish a controlled decentralized exchange (DEX) within the academic ecosystem for transparency and token circulation system.

To provide a user-friendly web interface for students and teachers using React.js, Web3.js/Ethers.js.

1.3 Scope

Decentralized Reward System:

YARCoin enables institutions to distribute rewards and recognition through blockchain-based tokens, ensuring transparency and eliminating manual intervention.

Reputation Management:

Each student's academic and extracurricular achievements contribute to their on-chain reputation score, which can be used for performance evaluation or placement purposes.

Secure Token Transactions:

All token transfers between teachers and students are securely handled through smart contracts, ensuring authenticity and preventing tampering.

User Roles and Automation:

The system supports multiple roles, including teachers and students. Teachers can assign tokens as rewards or recognition, while students can view and manage their earned tokens in real time.

Integration with Academic Ecosystem:

The platform can be expanded to integrate with institutional databases, enabling automated performance-based rewards and digital certification using NFTs.

Scalability and Extension:

The system can be scaled to multiple departments or institutions, with features such as multi-chain support, decentralized identity (DID), and analytics dashboards for performance insights.

Future Prospects:

In the long term, YARCoin can evolve into a universal academic reputation network, where students carry their verified achievements across institutions and platforms.

2. Literature Survey

2.1 Survey of Existing System

The current mentorship system in educational institutions happens in a centralized manner, where teacher student interactions based largely on personal familiarity or a specific teacher allocates the teacher to these students.

Limited Mentorship Opportunities: Process for teachers to identify and mentor talented students is currently based on person observation, or chances.

Lack of Rewards: While Students may receive certificates and praises from teachers, there is no unified system that provides the rewards.

No Competitive Marketplace for Talent: Currently there is no mechanism for teachers to actively compete for the opportunity to mentor potentially talented students, otherwise it could benefit both the student through rewards and the teachers by securing promising students.

Centralized and Non Gamified Process: Traditional system lacks features such as gamification, blockchain based transparency and decentralized system. There is no secure method to store these data securely.

Thus, the existing system lacks transparency, gamification, secure credential storage, and decentralized system, leaving a gap in recognizing and nurturing real academic talent.

2.2 Limitation in Existing system

Several studies and research works highlights the importance of blockchain in transforming educational systems through transparency, trust and decentralized system. By integrating blockchain it helps to create a secure environment in academic process.

- **Blockchain in Education**

  Researchers have explored how blockchain provides an immutable storage for academic records and certificates, ensuring verifiability and security. It reduces dependency on centralized system and provides students lifelong access to their credentials. Since the data stored on blockchain cannot be altered, so this provides lifelong access to the students to their credentials.

- **Token Based Reward Systems**

  Academic literature indicates that gamified reward systems improve student engagement and motivation. Tokenization has been applied in some learning platforms to encouraging the students to participate more, though its use in academic ecosystems remains limited.

- **Smart Contracts for Transparency**

  Studies shows that that smart contracts enable automatic enforcement of rules such as payments, penalties, and validations. Applying these in academics ensures fairness in task-based incentives and project allocations.

- **Decentralized Learning Management System**

Recent research suggests that using blockchain in decentralized Learning Management System (LMS) platforms allows peer to peer learning within the academic system without depending on centralized authority. Such systems helpful in tracking learning progress, assignment submissions, and competitions or events participations records. This allows students and teachers to give direct control over their data.

3 Proposed System

## 3.1 Introduction

The proposed system, YARCoin (YARC), introduces a blockchain-based decentralized reward and reputation framework designed to recognize, incentivize, and secure student achievements in academic ecosystems. The framework integrates tokenization, smart contracts, NFT-based credentials, and decentralized storage to ensure transparency and trust.

Key Components of the Proposed System:

1. **Teacher–Student Auction System**: Teachers bid with YARC tokens to guide students for projects. Ensures merit based and interest driven allocation instead of random assignments.

2. **Reward & Penalty Mechanism**: Students earn YARC tokens for timely submissions, competitions, and contributions. Penalties are enforced via smart contracts if tasks are incomplete, ensuring accountability.

3. **Controlled Decentralized Exchange (DEX)**: YARC tokens circulate within a restricted DEX environment in the academic ecosystem. Ensures fair trading, liquidity, and transparency without misuse outside the ecosystem.

4. **Web-Based Interface**: A React.js, CSS frontend integrated with Web3.js / Ethers.js to interact with blockchain. Backend uses Flask, MongoDB and Node.js, Express.js handles APIs, storage, and task processing.

5. **Analytics Dashboard**: Both students and teachers can view the online dashboard for performance, bidding activity, and reward trends through interactive dashboards. This feature helps in performance tracking and data driven decision making.

3.2 Block Diagram
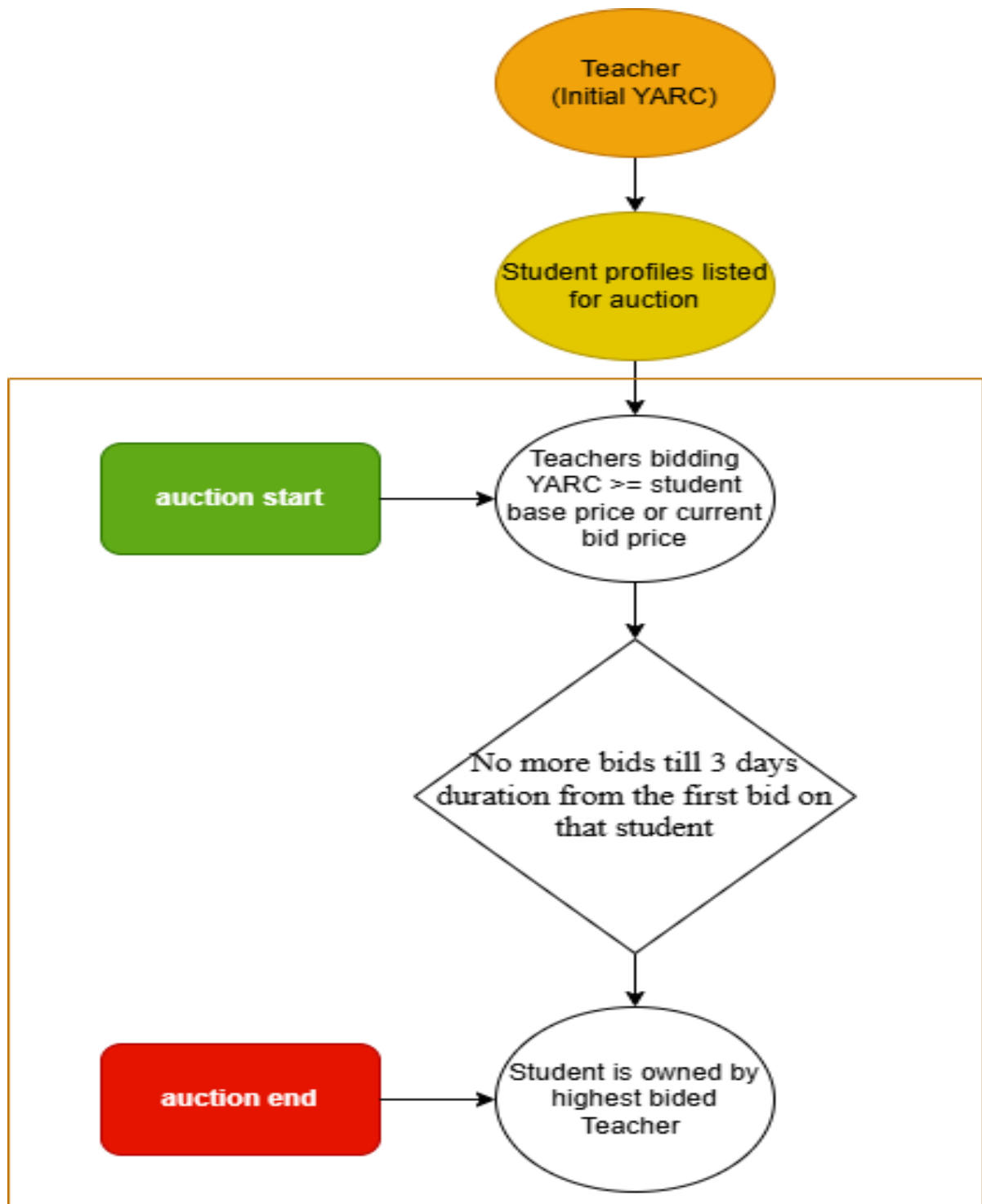
3.3 Details of Hardware & Software

Component	Specifications
Processor	Intel Core i5 or equivalent, 2.0 GHz or higher
RAM	8 GB minimum, 16 GB recommended
Storage	256 GB SSD or higher
Network	Stable internet connection with minimum 10 Mbps speed
Display	1366 × 768 resolution or higher

Component	Specifications
Frontend Framework	React.js 18.2.0 with JavaScript ES6+
Backend Framework	Node.js with Express.js
Database	MongoDB for storing datasets and user information
Blockchain Integration	Web3.js for wallet connectivity and transactions
Development Tools	Visual Studio Code, Postman for API testing
Version Control	Git and GitHub for source code management
Package Manager	npm (Node Package Manager)
Web Server	Express.js server running on Node.js runtime
Browser Compatibility	Chrome, Firefox, Safari, Edge (latest versions)
Additional Libraries	React Router for navigation, Axios for API calls

3.4 Experiment and Results for Validation and Verification

Results and Observations

The system performed successfully in all the tested operations. Registration, login, and bidding modules worked smoothly, and blockchain transactions were verified on the Hardhat console.

Token transfers executed correctly through smart contracts, confirming accurate deduction and credit of YARCoins between wallets. The data displayed on dashboards was consistent with blockchain records, showing correct updates after each transaction.

Validation

Validation ensured that each system component met its intended purpose. The registration and login modules validated user credentials correctly, while the bidding and token mechanisms worked as designed.

Multiple test runs produced consistent results, indicating reliability. The system maintained data integrity due to blockchain immutability and ensured transparency by making all transactions verifiable.

Verification

Verification confirmed that the implemented system followed the proposed architecture. Each module — from wallet generation to bidding — functioned according to the design.

Smart contracts executed without logical errors, ensuring correctness of the reward and penalty mechanisms. The frontend and backend communication through APIs was verified, and all data exchanges occurred securely and accurately.

3.5 Analysis

6.1 Functionality Testing: We tested all major features to make sure they worked as expected. The contributor dashboard successfully allowed users to upload datasets, view their earnings, and withdraw funds. The developer dashboard properly displayed available datasets and processed purchases. All buttons, forms, and navigation elements worked without errors.

6.2 Security Analysis

The system ensures secure operations through wallet-based login and smart contracts. All transactions are recorded on the blockchain, making them tamper-proof and transparent. MongoDB credentials and environment variables are securely stored, maintaining data privacy and integrity.

6.3 Functional Analysis

The platform successfully handled different user roles:

Students could register, log in, and view bids.

Teachers could register and bid on students.

All key features worked as expected during testing, confirming correct system functionality.

6.4 Comparative Analysis

Unlike traditional academic reward systems that are centralized and manual, YARCoin provides a decentralized, transparent, and automated solution using blockchain. It minimizes manipulation and increases fairness in academic recognition.

3.6 Conclusion & Future Work

The YARCoin project successfully demonstrates how blockchain technology can be integrated into the academic ecosystem to create a transparent and decentralized reward and reputation system. By enabling secure token-based transactions between teachers and students, the system promotes fairness, motivation, and accountability. It ensures that every achievement is immutably recorded and verifiable. Overall, YARCoin provides a modern approach to recognizing academic excellence while laying the groundwork for future advancements in decentralized education platforms.

Future Work

1. NFT-Based Reward and Recognition System:

Implement NFT minting for top-performing students such as hackathon winners, project achievers, and academic toppers. Each NFT will act as a digital certificate of excellence stored permanently on the blockchain. Integration with the existing bidding and reward mechanism to ensure automatic recognition.

2. Academic Certificate Storage System:

Develop a secure certificate storage module on decentralized storage (e.g., IPFS or Filecoin). Students verified certificates will be uploaded, hashed, and linked to their blockchain identity for lifelong access and verification.

3. Enhanced Teacher–Student Interaction Module:

Introduce a feedback and reputation scoring system for teachers and students after project completion. Maintain transparent academic reputation based on performance metrics stored on-chain.

4. Controlled Decentralized Exchange (DEX):

Implement a limited DEX environment for circulating YARCoins within the ecosystem. Enable token swapping, staking, and reward distribution under academic supervision.

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