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Blockchain Based Academic Certificate Verification System

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Abstract: *The rapid growth of digital education has increased the need for secure and tamper-proof academic certificate verification systems. Traditional certificate verification methods are manual, time-consuming, and vulnerable to forgery. This paper proposes a Blockchain Based Academic Certificate Verification System that ensures authenticity, integrity, and transparency of academic records. The system uses cryptographic hashing techniques to generate a unique hash value for each certificate and stores verification data securely in a blockchain-inspired structure. QR codes are generated for quick verification, allowing organizations and institutions to validate certificates instantly. The proposed system eliminates fake certificates, reduces verification time, and enhances trust between institutions and employers. The implementation demonstrates secure certificate issuance, tamper detection, verification logs, and real-time validation. The system provides a reliable and scalable solution for modern educational institutions*

Keywords: Blockchain, Certificate Verification, Cryptographic Hashing, QR Code, Academic Security, Digital Authentication

I. INTRODUCTION

The verification of academic certificates plays a crucial role in educational institutions and recruitment processes. Traditional verification systems rely on manual processes, physical documentation, and centralized databases. These methods are time-consuming, inefficient, and highly vulnerable to forgery and manipulation.

With the advancement of blockchain technology, secure and decentralized verification systems have become possible. Blockchain provides immutability, transparency, and cryptographic security. By applying blockchain principles to certificate management, institutions can prevent fake certificates and ensure data integrity.

This paper presents a Blockchain Based Academic Certificate Verification System that allows secure certificate issuance, hash-based verification, QR code validation, and tamper detection mechanisms.

II. LITERATURE SURVEY

Several researchers have proposed blockchain-based solutions for document verification systems. Studies show that blockchain ensures data integrity through cryptographic hashing and distributed ledger technology [1] , [4].

- Existing research highlights the following:
- Use of blockchain for educational record management
- Smart contracts for automated verification
- QR-based authentication systems
- Decentralized storage mechanisms

However, many systems require complex infrastructure and high implementation costs. Our proposed system focuses on a simplified and cost-effective blockchain-inspired verification model suitable for educational institutions.

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III. EXISTING SYSTEM

The current certificate verification process in most institutions includes:
• Manual verification through phone/email
• Physical certificate checking
• Centralized database validation Limitations of existing systems:
• High risk of certificate forgery
• Time-consuming verification process
• Lack of tamper detection
• No real-time validation
• No transparency in verification logs
These limitations demand a secure and automated solution.

IV. PROPOSED SYSTEM

The proposed system introduces a blockchain-inspired architecture for secure certificate management. Key Features:
• Certificate upload by admin
• Unique hash generation using cryptographic algorithm
• QR code generation containing verification link
• Hash-based certificate validation
• Tamper detection mechanism
• Verification activity logging
• Semester-based certificate management
Each certificate is assigned a unique hash value generated from certificate data. Any modification in data changes the hash value, making tampering easily detectable.

V. SYSTEM ARCHITECTURE

The system consists of three main modules:
1. Admin Module
2. Student Module
3. Verification Module Process Flow:
1. Admin registers student
2. Admin uploads certificate
3. System generates hash value
4. QR code generated automatically
5. Certificate stored in database
6. User verifies certificate using:
a. Hash code
b. QR upload
7. System checks integrity
8. Displays VALID or INVALID result This ensures secure and fast verification.
The overall working flow of the proposed system is illustrated in Fig. 1.

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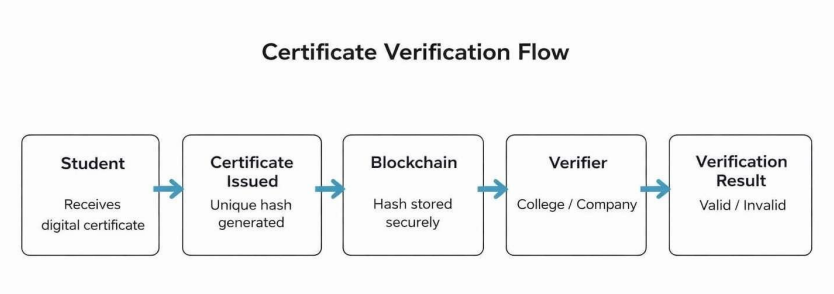

Fig. 1 Certificate Verification Flow

VI. METHODOLOGY

The system follows the below methodology:
1. Data Collection: -
Student information is collected during registration.
2. Hash Generation: -
SHA-256based cryptographic hashing algorithm generates unique certificate hash.
3. QR Code Integration: -
QR code contains verification link and certificate hash.
4. Tamper Detection: -
During verification, the system recalculates the hash and compares it with stored value.
5. Verification Logging: -
All verification attempts are recorded in verification logs.

VII. IMPLEMENTATION

The system is implemented using:
Frontend:
• HTML
• CSS
• JavaScript Backend:
• PHP
Database:
• MySQL
Key Functionalities Implemented:
• Secure admin login
• Student dashboard
• Certificate upload
• Blockchain-style hash linking
• QR upload auto-detection
• Animated verification result
• Insights dashboard
• Admin activity logs

VIII. RESULTS

The implemented system successfully:
• Prevented certificate tampering

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- Generated unique hash values
- Enabled instant QR verification
- Displayed verification status clearly
- Recorded verification logs
- Reduced manual verification effort

Testing showed that any change in certificate data resulted in hash mismatch and invalid certificate detection.

IX. CONCLUSION

The Blockchain Based Academic Certificate Verification System provides a secure and efficient solution for digital certificate authentication. By using cryptographic hashing and blockchain principles, the system ensures data integrity and prevents forgery. The integration of QR-based verification enables quick and reliable certificate validation.

The proposed system improves transparency, enhances trust, and reduces verification time significantly. It offers a scalable and cost-effective approach suitable for educational institutions and organizations.

Future improvements may include full decentralized blockchain integration and smart contract-based automation.

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