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EdTech-Based Learning Platform with Blockchain-Based Certificate Verification System

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Abstract:

The increasing prevalence of forged educational and professional certificates has created a critical need for secure and reliable verification systems. Traditional methods are often centralized, time-consuming, and vulnerable to manipulation. This project proposes a Blockchain-Based Certificate Verification System integrated with an EdTech learning platform to address these challenges. The system utilizes blockchain technology to store certificates as unique cryptographic hashes, ensuring immutability, transparency, and tamper-proof verification. In addition to verification, the platform includes a secure login-based learning environment where users can access educational video content, similar to modern e-learning platforms. Learners can enroll in courses and, upon successful completion, receive certificates that are directly recorded on the blockchain. This ensures that only authentic and earned credentials are issued. Authorized users, such as institutions and employers, can verify certificates in real time without intermediaries. The proposed system enhances trust, reduces verification delays, and minimizes fraud while integrating learning and certification into a unified, secure, and efficient digital ecosystem.

Keywords — **EdTech-Based Learning Platform With Blockchain-Based Certificate Verification System**

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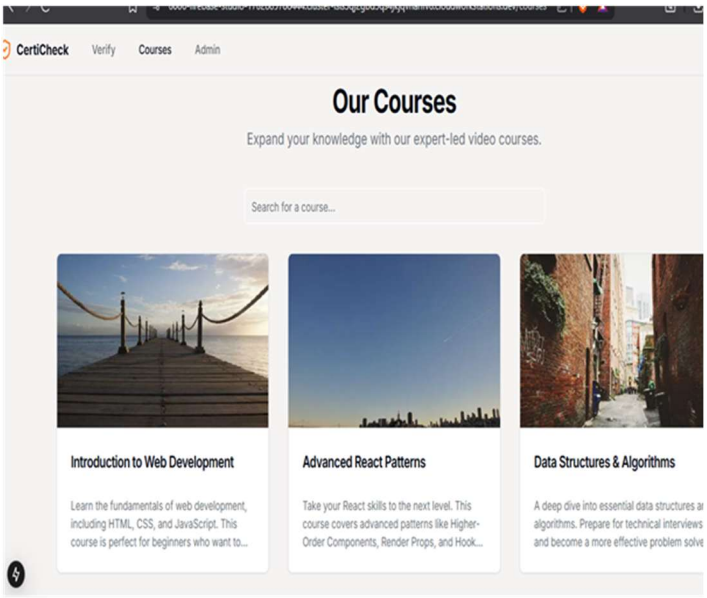
I. INTRODUCTION

In recent years, the verification of educational and professional certificates has become a significant challenge across academic institutions, corporate organizations, and government bodies. With the rapid growth of digital platforms and online education, the number of issued certificates has increased dramatically. Unfortunately, this growth has also led to a rise in forged and falsified documents. Fake degrees, manipulated credentials, and unauthorized certifications have created serious concerns for employers and institutions that rely on these documents to make important decisions. As a result, ensuring the authenticity and reliability of certificates has become more critical than ever.

Traditional certificate verification methods are largely dependent on manual processes and centralized databases. In most cases, verification involves contacting the issuing institution directly, checking records manually, or relying on third-party verification agencies. These approaches are not only time-consuming but also inefficient and costly. Additionally, centralized systems are vulnerable to data breaches, manipulation, and accidental data loss. A single point of failure in such systems can compromise the integrity of the entire database, leading to serious security risks. In a world that is increasingly moving toward digital

transformation, these traditional methods are no longer sufficient to meet modern demands.

To address these challenges, there is a growing need for a secure, transparent, and tamper-proof system that can verify certificates quickly and reliably. This is where blockchain technology emerges as a powerful solution. Blockchain is a decentralized digital ledger that records transactions in a secure and immutable manner. Once data is stored on the blockchain, it cannot be altered or deleted, ensuring a high level of integrity and trust. Each transaction is verified by a network of nodes, eliminating the need for a central authority. This decentralized nature makes blockchain highly resistant to fraud and manipulation, making it an ideal choice for certificate verification systems.

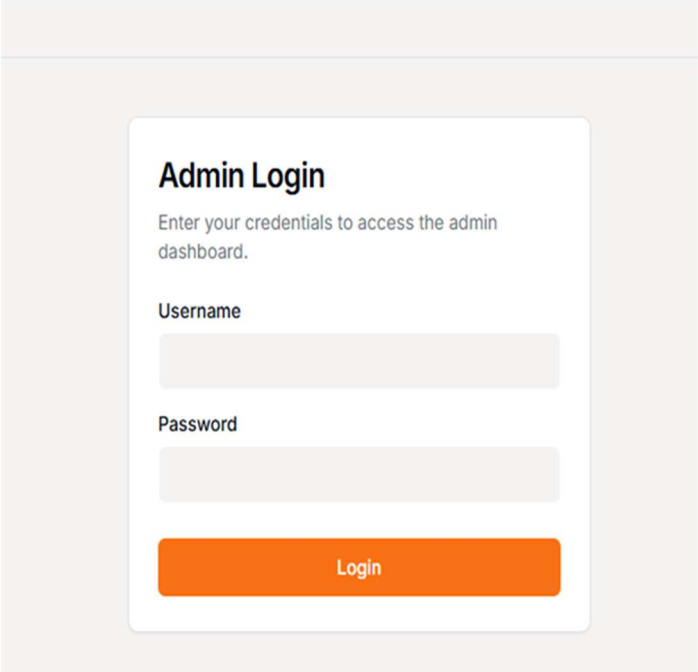


The **Blockchain-Based Certificate Verification System** proposed in this project leverages these unique features of blockchain technology to create a secure and efficient platform for issuing, storing, and verifying digital certificates. In this system, each certificate is converted into a unique cryptographic record and stored on the blockchain using smart contracts. These smart contracts define the rules for certificate issuance and verification, ensuring that the process is automated, transparent, and free from human error. Once a certificate is recorded on the blockchain, it becomes permanent and tamper-proof, providing a reliable proof of authenticity.

One of the key advantages of this system is its ability to enable instant verification. Authorized users, such as employers, universities, or organizations, can verify a certificate by simply entering its unique transaction ID or hash. The system retrieves the corresponding data directly from the blockchain and confirms its validity in real time. This eliminates the need for intermediaries and significantly reduces the time and effort required for verification. As a result, the process becomes faster, more efficient, and more trustworthy.

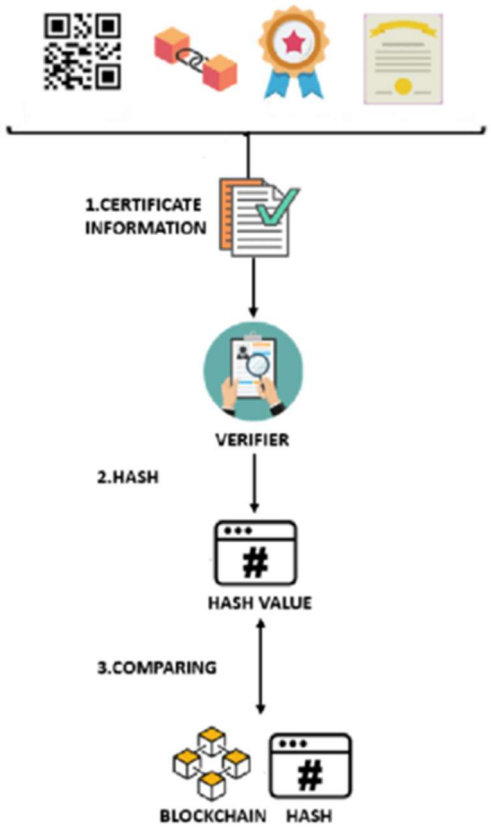
In addition to secure verification, this project goes a step further by integrating an **EdTech-based learning platform** into the system. With the increasing popularity of online learning, there is a growing need to ensure that certificates issued through digital platforms are credible and trustworthy. Many existing e-learning systems provide certificates upon course completion, but these certificates can often be easily manipulated or misrepresented. To overcome this limitation, the proposed system combines learning and certification within a secure blockchain environment.

The platform includes a **login-based authentication system**, allowing users to register and access the system securely. Learners can log in, explore educational video content, and enroll in various courses. This creates an interactive and engaging learning environment similar to modern e-learning platforms. Upon completing a course, users can receive certificates that are securely recorded on the blockchain. This ensures that the certificates are not only earned legitimately but are also permanently verifiable. By integrating learning, certification, and verification into a single platform, the system enhances the credibility of online education and builds trust among users.



The motivation behind developing this project stems from the increasing problem of certificate forgery and the limitations of existing verification systems. Employers and institutions often face difficulties in verifying the authenticity of credentials, which can lead to poor hiring decisions and loss of trust. Manual verification processes are slow and prone to errors, while centralized systems lack the security and transparency required in today's digital environment. By leveraging blockchain technology, this project aims to eliminate these issues and provide a more reliable and efficient solution.

Furthermore, the project demonstrates how modern technologies such as blockchain and smart contracts can be applied to real-world problems. It highlights the potential of decentralized systems in improving transparency, accountability, and efficiency. The integration of an EdTech platform also reflects the evolving nature of education, where digital learning is becoming increasingly important. By combining these technologies, the project creates a comprehensive ecosystem that supports both learning and secure credential management.



The primary objective of this system is to design and implement a decentralized platform that allows institutions to issue blockchain-secured certificates and enables users to verify them instantly. The system aims to eliminate certificate forgery, ensure data integrity, and provide a user-friendly interface for all stakeholders. It also focuses on integrating educational content to create a complete solution that goes beyond traditional verification systems.

II. METHODS AND CONCEPT

The concept of the Blockchain-Based Certificate Verification System is to utilize blockchain technology to ensure that issued certificates are authentic, tamper-proof, and permanently verifiable. Traditional certificate systems rely on centralized databases maintained by institutions, which are vulnerable to data loss, unauthorized access, and manipulation .

In contrast, blockchain provides a decentralized and immutable ledger, where all transactions are securely recorded and cannot be altered once validated, ensuring long-term integrity and trust. The proposed system combines blockchain-based

verification with an EdTech learning platform. It begins with a secure user authentication system, where users (students, institutions, and verifiers) register and log in to access the platform. Learners can enroll in courses and access educational video content.

Upon successful completion of a course, a digital certificate is generated automatically. This certificate is then processed through a smart contract deployed on the Ethereum blockchain, where key details such as the user's name, course information, certificate ID, and issue date are recorded.

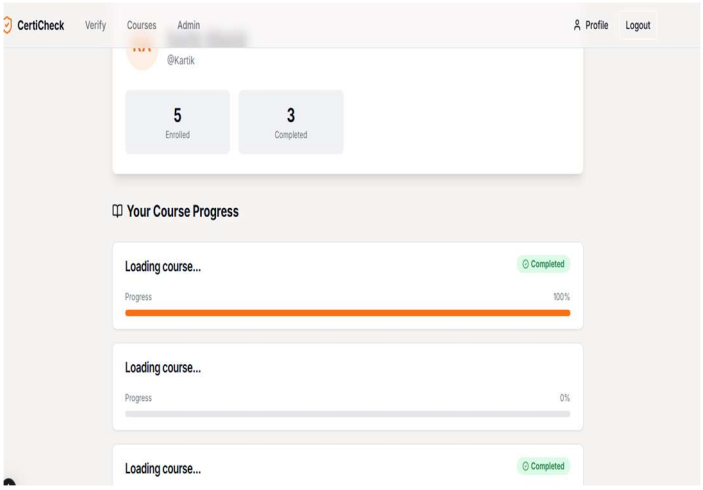
A unique transaction hash is generated for each certificate, acting as a permanent proof of authenticity. This methodology ensures a seamless integration of learning, certification, and secure verification, providing a transparent, efficient, and scalable solution for modern digital credential management.

III. RESULTS

The above image represents the User Interface (UI) of the Blockchain-Based Certificate Verification System integrated with a learning platform. The interface is developed using React.js and styled with HTML, CSS, and Bootstrap to provide a clean, responsive, and user-friendly experience. The UI consists of multiple modules, including User Authentication (Login/Register), Learning Module, Certificate Issuance, and Certificate Verification. The authentication module ensures secure access for different users such as institutions, learners, and verifiers.

The learning module allows users to access educational video content and interact with course materials. The Certificate Issuance Section enables authorized institutions to enter details such as user name, course, and certificate ID. These details are then securely recorded on the blockchain through a smart contract. The Certificate Verification Section allows users to input the certificate ID or transaction hash to instantly verify its authenticity using blockchain data.

The interface is designed with a focus on simplicity, clarity, and usability, making it accessible even to users with minimal technical knowledge. Functionalities are clearly separated, and real-time transaction feedback is provided through MetaMask integration, ensuring transparency during blockchain interactions. Overall, the UI effectively bridges the gap between complex blockchain operations and user accessibility, providing a seamless and intuitive experience for all stakeholders.



IV. CONCLUSION

The **Blockchain-Based Certificate Verification System** offers a secure, transparent, and reliable solution to one of the most pressing challenges in today's academic and professional landscape—certificate forgery and inefficient verification processes. As the number of digital credentials continues to grow, ensuring their authenticity has become increasingly important. Traditional verification systems, which rely heavily on manual checks and centralized databases, often fall short due to their limitations in speed, security, and reliability. This project addresses these issues by leveraging the core strengths of blockchain technology.

By utilizing the immutable nature of blockchain, the system ensures that once a certificate is issued and stored, it cannot be altered, duplicated, or tampered with. This creates a permanent and trustworthy record that significantly reduces the risk of fraud. Institutions can confidently issue digital certificates, knowing that their integrity will be preserved, while users can share their credentials without fear of manipulation. This not only enhances trust between stakeholders but also

simplifies the entire verification process.

An important aspect of this project is the integration of a **login-based learning platform**, which adds practical value beyond verification. Users can securely register, access educational content, and interact within a single unified environment. This combination of learning, certificate issuance, and verification creates a more holistic system that supports both education and credential management. It ensures that certificates are not just secure, but also meaningful, as they are tied to actual learning experiences.

Another significant advantage of the system is the speed and convenience it offers. Verification can be performed instantly using a unique certificate ID or transaction hash, eliminating the need for direct communication with the issuing authority. This greatly reduces administrative workload for institutions, employers, and organizations, while also saving time and effort for users. The system demonstrates how blockchain can streamline processes that were traditionally slow and resource-intensive.

Moreover, the project highlights the practical application of blockchain technology in solving real-world problems. It showcases how decentralization, transparency, and cryptographic security can be used to improve data integrity and system efficiency. The ability to operate without intermediaries further strengthens the system's reliability and scalability.

In conclusion, this project successfully achieves its objectives by preventing certificate fraud, enhancing data security, and establishing a decentralized framework for credential verification. It not only improves existing processes but also opens the door for future innovations in digital education and certification. As the world continues to embrace digital transformation, solutions like this will play a crucial role in building a more secure, efficient, and trustworthy ecosystem for managing credentials.

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References

[1] A. Rustemi, F. Dalipi, V. Atanasovski, and A. Risteski, "A Systematic Literature Review on Blockchain-Based Systems for Academic Certificate Verification," *IEEE Access*, 2023.

[2] N. Vikhankar et al., "E-Certificate Verification Using Blockchain," *International Journal of Engineering Research & Technology (IJERT)*, vol. 13, no. 5, 2024.

[3] K. Kumutha and S. Jayalakshmi, "The Impact of Blockchain on Academic Certificate Verification System," *EAI Endorsed Transactions*, 2021.

[4] A. Suresh Babu et al., "Certificate Validation Using Blockchain," *IRJAEM*, 2024.

[5] B. Liu et al., "Secure Digital Certificate-Based Data Access Control Scheme in Blockchain," *IEEE Access*, 2020.

[6] D. H. Nguyen et al., "CVSS: A Blockchain-Based Certificate Verification Support System," *International Symposium on Information and Communication Technology*, 2018.

[7] A. Curmi and F. Inguanez, "Blockchain-Based Certificate Verification Platform," *Springer BIS Workshops*, 2019.

[8] S. Rasool et al., "Docschain: Blockchain-Based IoT Solution for Degree Verification," *IEEE Transactions on Computational Social Systems*, 2020.

[9] A. Deebak and F. T. Al-Turjman, "Privacy-Preserving Smart Contracts Using Blockchain," *Journal of Information Security*, 2021.

[10] A. El-Dorry et al., "Blockchain-Based Digital Certificate Verification Model," *IC Software and Information Engineering*, 2020.

[11] R. Raimundo and A. Rosário, "Blockchain System in Higher Education," *European Journal of Investigation in Health*, 2021.

[12] A. Zainab et al., "Blockchain Applications in Credential Verification," *IEEE Engineering Management Review*, 2022.

[13] M. Y. Kubilay et al., "CertLedger: A New PKI Model with Certificate Transparency Based on Blockchain," *arXiv*, 2018.

[14] M. Baldi et al., "Security Analysis of Blockchain-Based Certification of Academic Credentials," *arXiv*, 2019.

[15] A. Tariq et al., "Cerberus: A Blockchain-Based Degree Verification System," *arXiv*, 2019.

[16] X. Zhao and Y. Si, "NFTCert: NFT-Based Certificates with Online Payment Gateway," *arXiv*, 2022.

[17] "Review: Verification Process of Academic Certificates Using Blockchain Technology," *ResearchGate*, 2022.

[18] "Verification and Validation of Certificate Using Blockchain," *Research Study*, 2024.

[19] C. Antony et al., "Counterfeit Detection of Documents Using Blockchain," *IJERT*, 2024.

[20] "Blockchain-Based Systems for Academic Certificate Verification: Review and Future Scope," *IEEE Access Survey*, 2023.

