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Digital Forensic Evidence Management System Using Improved Blockchain

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Abstract - *Handling forensic evidence with precision, storing it safely, and maintaining correct chain of custody records are all essential components of contemporary criminal investigations. Data manipulation, unauthorised access, and a lack of transparency are problems that traditional evidence management systems have. This study discusses a novel use of blockchain technology in the forensic evidence management system to overcome these problems. To guarantee the integrity, security, and transparency of forensic evidence throughout its existence, the suggested method makes use of blockchain's decentralised and immutable properties. To increase productivity and lower the possibility of human mistake, smart contracts are used to automate the chain of custody procedure. The proposed system leverages the suggested method makes use of blockchain's decentralised and unchangeable structure to guarantee the authenticity, safety, and transparency of forensic evidence for the course of its existence. By automating the chain of custody procedure, smart contracts increase productivity and lower the possibility of human mistake. Furthermore, the legitimacy of the evidence may be confirmed with the use of cryptographic hashing techniques without disclosing private information. A blockchain-based forensic evidence management system prototype was created and put through testing in a controlled setting. The evaluation's findings show that the system safeguards private data from unauthorised parties and offers better accessibility, accountability, and data integrity. A blockchain-based forensic evidence management system prototype was created and put through testing in a controlled setting. The evaluation's findings show that the system safeguards private data from unauthorised parties and offers better accessibility, accountability, and data integrity.*

Key Words: **Forensic, Blockchain , Chain of Custody**

1. INTRODUCTION

An imprecise approximation compiled from several academic and journalistic sources indicates that over 20,000 Americans are wrongfully charged, found guilty, and imprisoned year. Since no single organisation gathers verified information about exonerations resulting from mistaken convictions—and even if it did, it would not be able to know about the situations in which someone was never exonerated—it is necessary to use a variety of sources to approximate the number. Exconerations are rare among the estimated 20,000 people wrongfully charged, convicted, and imprisoned in the US alone. Contributing factors have resulted in 28% of convictions due to erroneous identification, 12% of false confessions, 23% of forensic science-related exonerations, 54% of official wrongdoing, and 58% of false accusations and perjury-related exonerations. (Source: The Innocence Project. More than 100% due to some cases having multiple contributing factors.) In fact, according to the National Institutes of Justice, "The most significant number of wrongful convictions in which forensic science is considered a contributing factor is attributable to eyewitness misidentification and official misconduct." Many people effectively lose their entire lives to false imprisonment as the average term served by those falsely convicted was 10 years. That's a decade in the life of a broth er, sister, father, mother, colleague, or student who will not be allowed to contribute fully to society once falsely convicted of a crime. Even after release, convicts struggle throughout their lives to gain and keep opportunities those without a criminal history are provided. Blockchain technology, which offers a decentralised and unchangeable ledger system, has completely transformed.

a Evidence management is one area where blockchain technology shows great promise. Conventional evidence management systems frequently encounter issues with transparency, security, and data integrity. The purpose of blockchain-based evidence management systems is to leverage the inherent characteristics of blockchain technology, like immutability, transparency, and decentralised consensus, to overcome these difficulties. Electronic proof can be managed and stored in a safe, unchangeable

repository with the help of a blockchain-based evidence management system. Time stamps, chain of custody, and metadata can all be securely recorded together with the guarantee that the data is unaltered and auditable at all times during its lifecycle. Blockchain-based solutions improve trust, transparency, and efficiency in evidence management procedures by leveraging distributed ledger technology and cryptography approaches.

1.1 Literature Survey

Title: "Blockchain for the Protection of Digital Evidence: A Systematic Literature Review" Authors: A. Collotta, L. Grassi, L.Ronga Published: 2020

This literature review provides an overview of current research on blockchain and technology and the use of digital evidence storage based on methods. It investigates many aspects such as data integrity, confidentiality, access control and scalability. The review also highlights challenges and future directions in this field.

Title: "Blockchain-based anti-tampering of digital forensic logs" Author: H. Yang, System.

Its purpose is to ensure the integrity and non-duplication of logs, which are important evidence in criminal investigations. This study uses real data to demonstrate efficiency and measure efficiency and sustainability.

Title: "Blockchain-based approach to ensuring data integrity in digital research" Author: S. R. Rad, M. Z. Alhaddad,M. Dehghantanha, K.-K. R. Choo published: 2020

This research demonstrates a way to provide information in digital research through blockchain. Describe the details of combining blockchain with other cryptographic technologies to provide proof and security. This article also discusses the pros and cons of the plan.

Title: "Blockchain Technology to Increase Trust and Consent in Products" Author: D. Khan, R. Khan, R. Z. Khan, M. Ahmed Publication Date: 2021

Indirect for evidence management, But this study explores the use of Evidence management The use of blockchain in supply chain management, which has similarities with the process. It discusses the advantages of using blockchain technology to increase trust, transparency and security in the supply chain, with benefits extending to evidence-basedmanagement.

Title: "Blockchain-Based Digital Evidence Management in Criminal Justice" Author: P. Elsden, R. Grasso, A.V. Moere Publication date: 2019

This study explores the use of blockchain technology in criminal justice. It can be used in evidence management. It discusses the benefits and challenges of using blockchain to store digital evidence, ensure authenticity, and facilitate secure sharing among stakeholders. This article also explores the legal and ethical implications of blockchain evidence management.

These papers provides information on the current state of research and application of blockchain-based evidence management systems. They demonstrated the benefits, challenges, and potential applications of blockchain technology in improving the integrity, security, and transparency of evidence management processes.

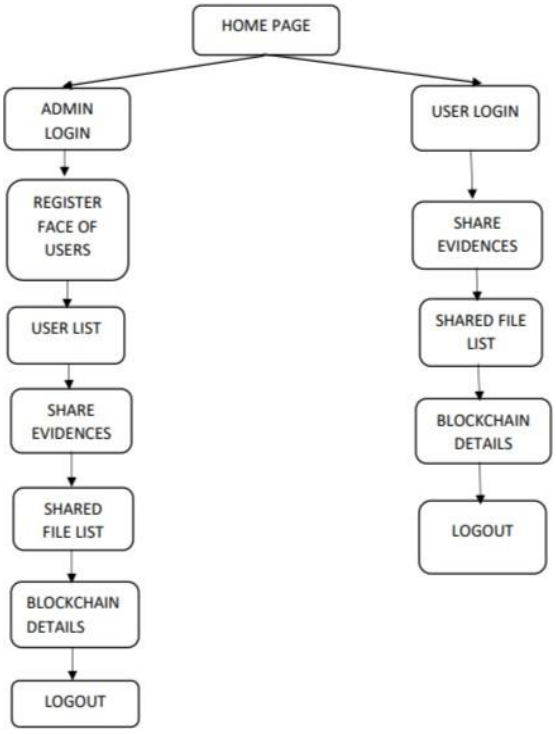
1.2 Objective

The objective of integrating blockchain technology into a forensic evidence management system, combined with chain of custody protocols and face recognition technology, is to create a highly secure and transparent environment for handling digital evidence. Blockchain's immutability ensures that every transaction and access to evidence is securely recorded, enhancing the integrity of the chain of custody and making it tamper-proof. By incorporating face recognition, the system adds an extra layer of authentication, allowing only authorized personnel to access specific evidence or perform actions within the system. This integration not only enhances security but also streamlines processes through automation, reducing manual errors and improving overall efficiency. Furthermore, blockchain's decentralized nature ensures transparency and trust in the data, making it invaluable for maintaining the evidentiary value of digital information in forensic investigations.

1.3 Proposed System Configuration

The project focuses on effectively using blockchain technology within the Law Enforcement chain of evidence, which can be considered a type of supply chain for evidence collection. The authors and researchers of this project are using the terms "chain of custody" interchangeably. Alister Inc. is introducing a blockchain-based evidence management system to alleviate the problems the traditional chain of custody has, including loss of evidence, theft, tampering, and worse, manipulation of evidence within the evidence management system. Blockchain technology can shield defendants and police officers who have been unfairly targeted from chain of custody problems that could result in false imprisonment for defendants and, worse, wrongful firing for cops. This project will outline the specific difficulties associated with keeping evidence on a blockchain and offer a workable fix. The project utilising Blockchain technology in financial applications will not be able to provide services if a single centralised server experiences a hack or crash as a result of an excessive number of requests. To recover from Decentralised Blockchain technology, which maintains data at several nodes or servers and allows users to access services from other operational nodes in the event of a node failure, can be applied to this situation. An estimated approximation compiled from several academic and journalistic sources suggests that over 20,000 Americans are wrongfully charged, found guilty, and imprisoned year. Since no single organisation gathers verified information about exonerations resulting from mistaken convictions—and even if it did, it would not be able to know about the cases in which there was no exoneration—it is necessary to use a variety of sources to approximate the number. Exonerations from the estimated 20,000 people wrongfully charged, convicted,and imprisoned in the US alone are rare and far between.

1.4 Project Flow



2. Implementation

In the execution of this project, we have harnessed a PYTHON-based Blockchain tool known as FLASK. The endeavor is structured around the following pivotal modules:

I. Admin Login: This model provides security personnel access to the application. Authentication is done using the username "admin" and password "admin".The admin can add the 'User' and see the User list. Admin can also add theevidences.
II. User Login: This model can add evidences to the Blockchain.

III. Add credentials to the blockchain: In this mode, Admin and Users have the opportunity to add new credentials to the blockchain. This process ensures the security and immutability of important evidence.

IV. Recovering evidence from blockchain: This model allows law enforcement to extract evidence previously stored in blockchain files. It is important to note that access to this feature is only allowed to authorized and authorized personnel, thus preserving the integrity and security of the transcript originally stored on the blockchain.

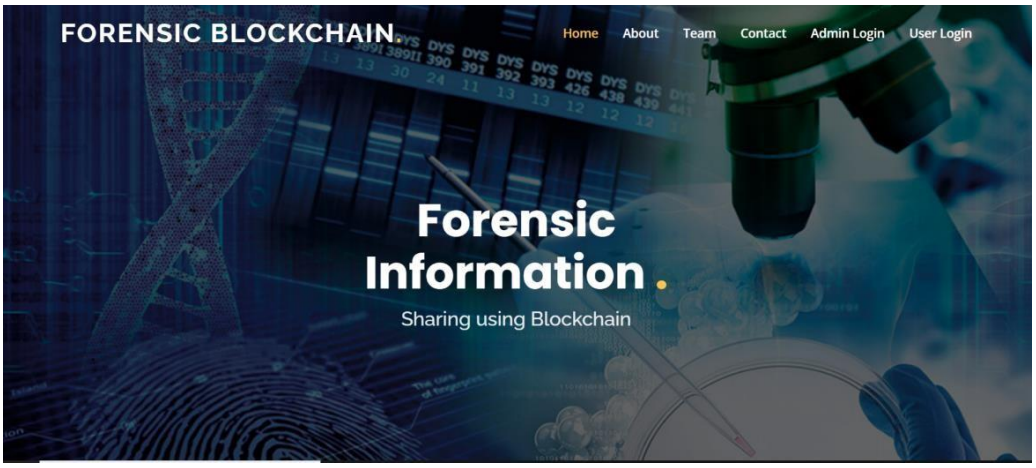


Fig -1: Home Page

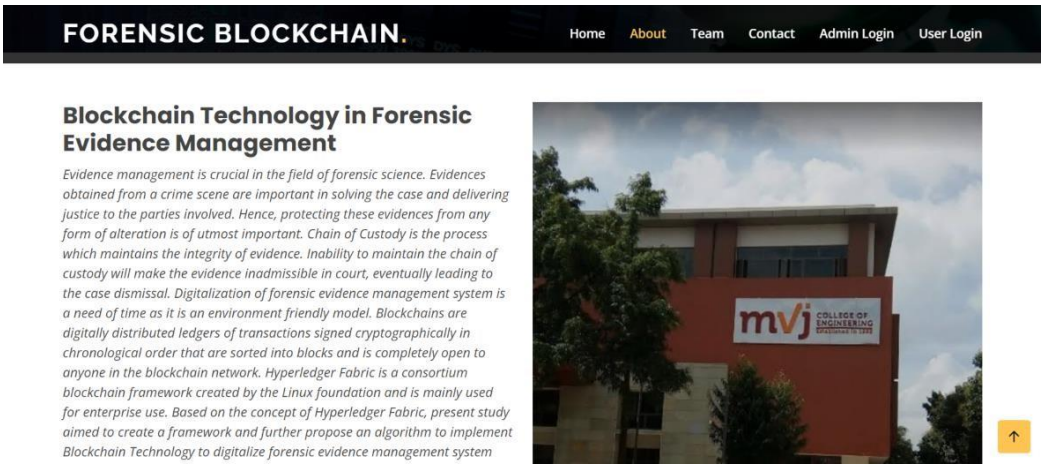


Fig -2: About Page

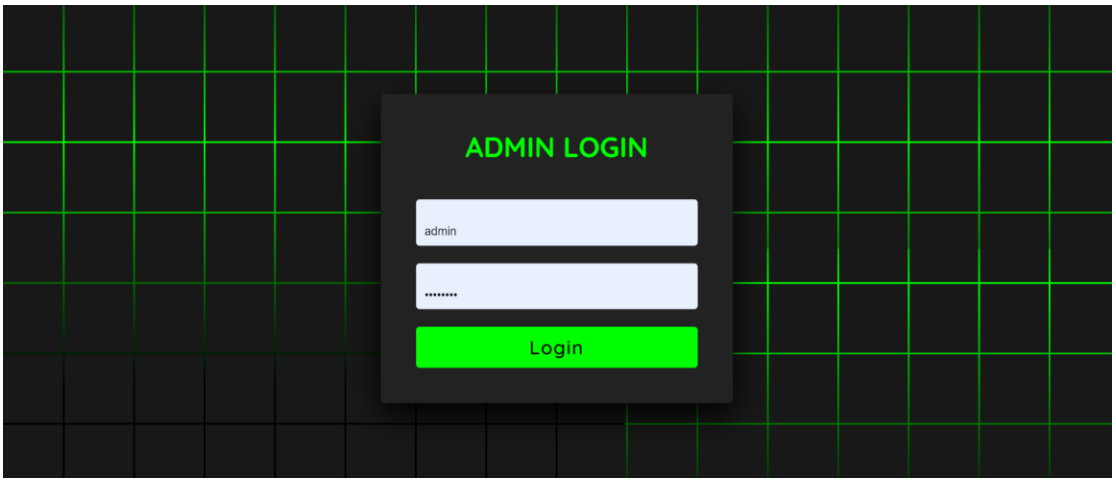


Fig -3: Admin Login

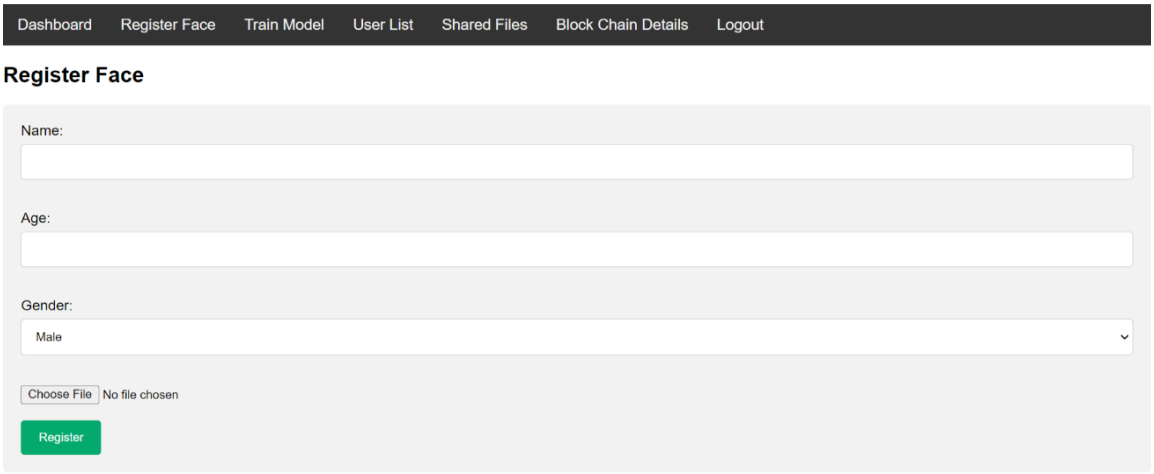


Fig -4: Admin Dashboard

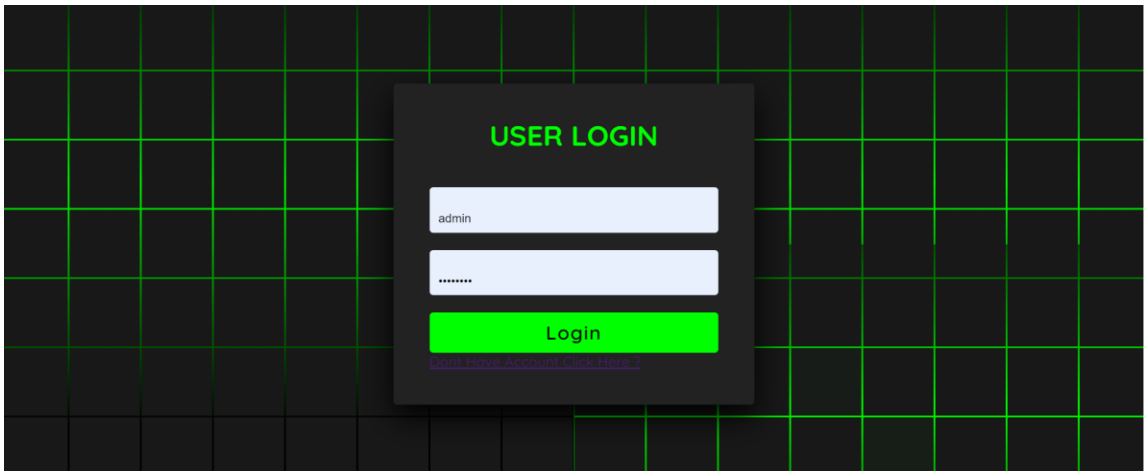


Fig -5: User Login

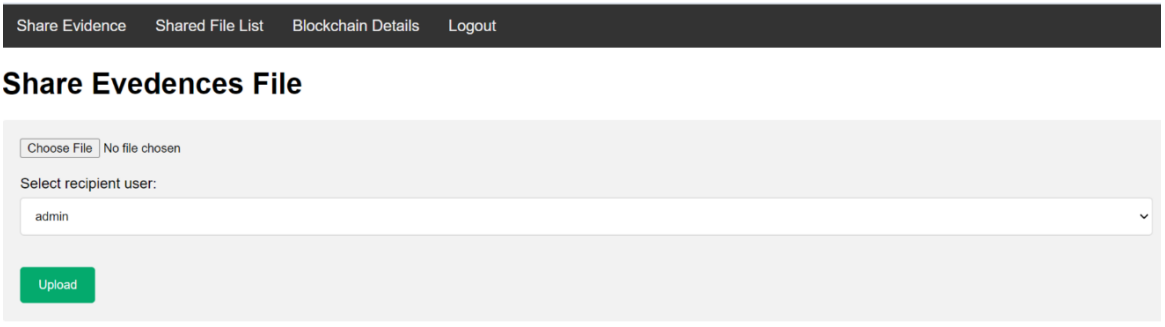


Fig -6: User Dashboard

3. Conclusion

It makes sense and is very vital to employ blockchain technology to improve the integrity of evidence in the criminal justice system. It can be a reasonably priced and all-inclusive solution that keeps agencies utilising all of their current products while eliminating the majority of the risks associated with human error and criminal intent. LOCARD and Alister Inc.In an effort to rebuild public confidence in the criminal justice system, the EU plans to integrate blockchain technology into the chain of evidence.

Verified evidence tracking across many law enforcement agencies will be feasible with blockchain. The system will only register hashes that validate the "state" of the physical evidence, enabling better and quicker processing as well as increased digital storage capacity. Immutable tracking of evidence from the scene to court will be possible with the attribution of hashes to tangible pieces of evidence, and this approach will make it simple and quick to reject inadmissible evidence. The authors and researchers from Alister Inc. hope to provide their readers with a clear understanding of the significance of blockchain technology in the justice system and the various ways it will aid in the pursuit of a more equitable and precise criminal evidence tracking system through the tragic cases that have been detailed above. Maintaining due process in the global legal system depends on accurate evidence with a track record of integrity. Tracking this evidence using blockchain technology might reduce the number of political unrest caused by erroneous arrests and convictions. We will all lose a large deal of hardworking, honest, and unfairly accused Americans who may have become the next great doctor, lawyer, inventor, researcher, or police officer if we don't address this systematic issue with our criminal justice system. You really cannot afford to stay the same, and implementing blockchain in the evidence supply chain is the necessary change.

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