

SAAP – Smart Attendance Application Based On Blockchain Using Ethereum

Vineet Srivastava¹, Ravi Kumar Singh², Amiya Raman Tripathi³,
Teena Singh⁴, Ashish Kumar Madheshiya⁵

^{1,2,3,4} Computer Science and Engineering, Raj Kumar Goel Institute of Technology, Ghaziabad

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ABSTRACT— This project proposes a reliable attendance system to prevent proxy attendance and data tampering. The system uses face recognition technology and blockchain for secure data storage. The application is developed using Flutter and supported by Ganache for testing and Remix IDE and Android Studio for development. IPFS is used for decentralized file storage. The proposed system provides a secure and efficient way to manage attendance records.

Keywords:Flutter;Facial Recognition;Machine Learning; Blockchain; GPS;Gnache

I. INTRODUCTION

[1] The use of RFID technology in an IoT-based attendance system prototype can offer a more efficient and reliable method of tracking attendance. This can lead to improved productivity, better utilization of resources, and better monitoring of security in various settings. However, there could be concerns regarding privacy and data security, which would need to be addressed through proper measures and regulations. Overall, the technology has the potential to significantly improve attendance tracking and management in various settings.

[3] Blockchain technology is a promising innovation that has the potential to revolutionize various industries through its distributed, decentralized, and trustless nature. While it has primarily been used in finance and banking, its potential applications extend to insurance, supply chain management, energy, advertising and media, real estate, and healthcare. This research paper aims to provide a comprehensive overview of blockchain technology, its key features, characteristics, benefits, and popular consensus protocols, as well as its limitations and challenges such as scalability, security, and regulation. By doing so, this paper seeks to contribute to a better understanding of blockchain technology and its potential for wider adoption in various industries.

[5] Blockchain's decentralized and distributed nature makes it difficult for hackers to breach the system, and its use of advanced cryptographic techniques ensures the integrity of the data stored on the network. Additionally, blockchain can be used to create secure and private transactions, making it harder for hackers to steal sensitive financial data and for governments or other entities to track individuals' financial transactions. Finally, blockchain can be used to create secure digital identities, allowing individuals to control their own personal data and protect their privacy. Overall, blockchain technology has the potential to play an important role in enhancing cybersecurity and protecting privacy.

[6] The paper highlights MobileFaceNets, a class of highly efficient convolutional neural network (CNN) models designed specifically for real-time face verification on mobile and embedded devices. The paper outlines the limitations of common mobile networks for face verification and explains how MobileFaceNets overcome these weaknesses through their unique design.

The research paper then presents experimental results that show

MobileFaceNets achieve significantly improved accuracy and efficiency in face verification compared to previous state-of-the-art mobile CNNs. After being trained on the refined MS-Celeb-1M dataset using the ArcFace loss, MobileFaceNets achieve impressive accuracy results of 99.55% on the Labeled Faces in the Wild (LFW) dataset and 92.59% true accept rate (TAR) at a false accept rate (FAR) of $1e-6$ on the MegaFace dataset.

Furthermore, the paper highlights that MobileFaceNets are specifically designed to be

highly efficient, using less than 1 million parameters and achieving more than a 2 times actual speedup over MobileNetV2 under the same experimental conditions. The fastest MobileFaceNet model has an actual inference time of just 18 milliseconds on a mobile phone.

[8] This research paper proposes a face recognition system for maintaining attendance records subject-wise. The system uses deep learning techniques to detect and recognize faces, eliminating the need for conventional attendance methods. The proposed system has several advantages over conventional methods, including its ability to save time and eliminate the possibility of proxy attendance.

II. LITERATURE REVIEW

A literature review of several studies related to smart attendance application using blockchain, Ethereum wallet, and MobileFaceNet would reveal the following key findings:

Ethereum Blockchain: Ahram et al. [3] have emphasized on how ethereum blockchain is used to create decentralized applications (Dapps) and execute smart contracts. It enables developers to build and deploy Dapps using its programming language, Solidity. Ethereum's decentralized and trustless nature provides transparency and security for transactions, making it ideal for various industries, including finance, supply chain management, real estate, and healthcare. Its native cryptocurrency, Ether, serves as a medium of exchange for transactions and as a reward for miners who validate transactions on the network.

MobileFaceNet: Sheng et al. [6] describes how MobileFaceNet is used in application for face recognition and authentication. It is a lightweight deep learning model that can run efficiently on mobile devices. The app uses the face recognition feature of MobileFaceNet to identify students and mark their attendance automatically. The use of MobileFaceNet ensures accurate and efficient attendance tracking, improving the overall attendance management system.

Proxy Attendance Tackle: Karve et al. [12] states how proxy attendance can be tackled in a number of ways using technology. One approach is to use facial recognition technology to verify the identity of the person marking attendance, such as MobileFaceNet. Another approach is to use GPS location tracking to ensure that the person marking attendance is physically present at the designated location. Additionally, implementing strict

penalties and consequences for those caught engaging in proxy attendance can also serve as a deterrent.

Smart Attendance System: Abdalkarim et al.

[13] highlights the need to replace outdated paper-based methods with modern technologies. Specifically, the paper emphasizes the use of automatic recognition of individuals based on distinguishing characteristics such as QR code, ID and password, face recognition, and fingerprint recognition to tackle problems such as false signs, missing names, manual data input, and proxy attendance. The review critically assesses recent works on automated and smart attendance tracking systems based on technology, application domain, and key findings.

The literature review discusses the need for modern attendance management systems and the limitations of traditional paper-based methods, such as the possibility of proxy attendance and manual input errors. The review highlights the importance of adopting modern technologies, such as face recognition for attendance tracking. The paper provides a critical assessment of recent works on automated and smart attendance tracking systems, categorizing them by technology and application domain. The review highlights the key findings of the studies, emphasizing the need for accuracy, security, and user-friendliness in attendance tracking systems. Overall, the review emphasizes the importance of adopting modern attendance management systems to overcome the limitations of traditional methods.

III. TECHNOLOGIES USED

[14] Stated that building an attendance application using flutter which can involve several technologies. Here are some of the key technologies and components that you may need to consider:

1. **Ethereum Blockchain:** The Ethereum blockchain is a decentralized, distributed database that stores a continuously growing list of records, called blocks. Each block contains a cryptographic hash of the previous block, a timestamp, and transaction data. Ethereum is a popular blockchain platform that is widely used for building decentralized applications (dApps).

2. **MobileFaceNet:** The deep learning technique used in the face recognition process of the Smart Attendance App is called MobileFaceNet.

MobileFaceNet is a deep convolutional neural network that is specifically designed to achieve high accuracy face recognition with low

computation power and memory usage. The network is trained using a large dataset of faces to learn facial features and patterns that are important for recognition

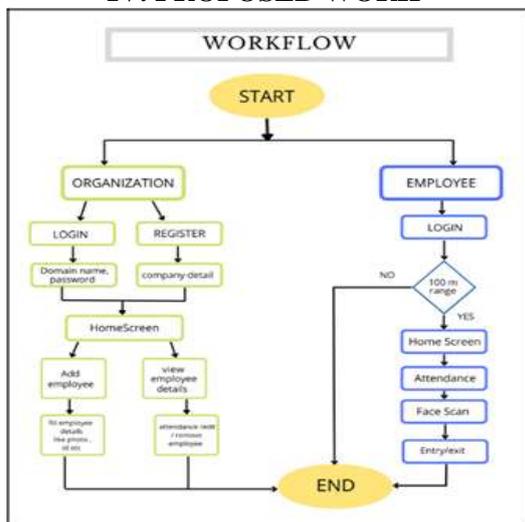
3. **Flutter:** Flutter is an open-source mobile application development framework developed by Google. It allows developers to create applications for both Android and iOS platforms using a single codebase. Flutter is designed to create high-performance and visually appealing mobile applications that work smoothly on various platforms. It is becoming increasingly popular among developers because of its ease of use, fast development, and customizability. This section will explain how Flutter was used as a base for the development of the Smart Attendance App project.

4. **Interplanetary File System (IPFS):** It is a peer-to-peer distributed file system that provides a high-performance and resilient way to store and access files. In the proposed Smart Attendance App, IPFS plays a critical role in ensuring that attendance data is securely and efficiently stored.

5. **Ganache:** In this project, Ganache is used to simulate the Ethereum network on the local machine, which allows developers to test and deploy smart contracts before deploying them to the main Ethereum network. Developers can use Ganache to deploy, test and debug smart contracts using the Remix IDE, which is also integrated with Ganache.

- 1) Initialize the blockchain network: Set up a private blockchain network using the Ganache tool and connect it to the Remix IDE.
- 2) Create a smart contract: Define a smart contract using the Solidity programming language in the Remix IDE. The smart contract defines the rules and conditions for marking attendance.
- 3) Deploy the smart contract: Deploy the smart contract to the blockchain network using Remix IDE.
- 4) Develop the mobile app: Develop a mobile app using the Flutter framework, which allows users to mark their attendance.
- 5) Integrate the mobile app with the blockchain network: Connect the mobile app to the blockchain network using Web3j library and IPFS.
- 6) Mark attendance: When a user logs into the app, they can mark their attendance by scanning their face using Mobile FaceNet. The attendance data is then sent to the smart contract, which verifies the user's identity and records the attendance on the blockchain.
- 7) Retrieve attendance records: Organizations can retrieve attendance records by accessing the blockchain. The records are stored in a tamper-proof and transparent manner, providing a secure and reliable method of storing attendance data.

IV. PROPOSED WORK



The implementation of the Smart Attendance Application:



This algorithm outlines the main steps involved in the implementation of the Smart Attendance App, which combines blockchain technology, mobile app development, and machine learning to provide a secure and efficient method of tracking attendance.

V. CONCLUSION & FUTURE WORK

The Smart Attendance App developed using blockchain technology and IPFS provides a secure and transparent method of storing attendance data. The use of blockchain technology ensures that attendance data is stored in a tamper-proof manner, while IPFS ensures that the data is stored in a redundant and decentralized manner. The app has the potential to revolutionize attendance tracking in organizations, providing a more efficient and secure way to store attendance data. The success of this project highlights the potential of blockchain technology and IPFS in creating decentralized, transparent, and secure systems for various applications. Further research and development in this area can lead to innovative solutions for various industries.

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