Location Based Attendance Tracking with Facial Recognition on Android

Atharv Gudage[1], Vasudha Khandagale[2], Yash Kala[3], Pushkar Kasar[4], Omkar Katekar [5]

[1,3,4,5]*Student, Department of Computer Engineering, Sinhgad Academy of Engineering Kondhwa, Pune, 411048, Maharashtra, India*

[2]*Guide, Professor, Department of Computer Engineering, Sinhgad Academy of Engineering Kondhwa, Pune, 411048, Maharashtra, India*

Abstract— **The significance of an efficient attendance system cannot be overstated, particularly in the context of employee accountability and punctuality. Despite technological advancements, existing attendance solutions have encountered limitations in accurately capturing biometric data, barcodes, or QR codes. Consequently, many establishments still rely on manual paper-based methods, leading to time-consuming queues at attendance registers. This study presents a dynamic and adaptable attendance system that harnesses the power of mobile technology, specifically through a mobile application, to streamline and expedite the attendance tracking process. By leveraging geofencing and facial recognition technologies, the proposed system eliminates the need for costly dedicated hardware. The mobile application serves as a convenient attendance interface, enabling employees and staff members to mark their presence seamlessly. Each individual is assigned a unique geofenced area, serving as a personalized attendance marker, thereby enhancing accuracy and efficiency. Through the fusion of geofencing and facial recognition within a mobile application, this system revolutionizes attendance tracking, minimizing resource expenditure while optimizing operational effectiveness.**

Index Terms— **attendance, geofencing, accuracy, expedite.**

I. INTRODUCTION

Attendance tracking is a fundamental aspect of managing the workforce, educational institutions, and various events. Traditionally, attendance systems have relied on manual methods, such as paper-based registers or swipe cards, which are not only time-consuming but also prone to errors and fraudulent practices like buddy punching. In recent years, with the advent of advanced technologies, there has been a significant shift towards automated attendance tracking solutions, particularly using biometrics and facial recognition. This research presents an innovative Android-based attendance tracking system that combines the power of location-based services and facial recognition technology to offer a robust and efficient solution. The proposed system aims to address the limitations of traditional methods and revolutionize attendance management in diverse settings, including workplaces, schools, universities, and events The first component of the system utilizes GPS and geofencing capabilities available in modern Android devices. Geofencing allows the establishment of virtual boundaries around specific areas, such as classrooms, offices, or event venues. When a registered user enters or exits these predefined boundaries, the system automatically records their attendance, providing realtime tracking and eliminating the need for manual registration.

The second key feature of the system is the integration of facial recognition technology. Leveraging the front-facing camera of Android devices, the system captures and analyzes the facial features of users during the attendance process. These facial features are then compared with preregistered images stored in a secure database. By accurately verifying the identity of individuals, the system minimizes the risk of proxy attendance, ensuring a more reliable attendance management process. The Android platform was chosen for its widespread usage, user-friendliness, and availability across a diverse range of devices. The proposed system seeks to provide a seamless and intuitive experience for both administrators and users, promoting widespread adoption and acceptance.

II. LITERARY SURVEY

This paper focuses on the "Attendance Mobile Application With Face Recognition and Location Detection." Employee attendance tracking is a critical aspect of organizational management, and manual attendance systems can be prone to errors and time-consuming. To address these challenges, this paper introduces an innovative mobile application that combines facial recognition and location detection technology. The application aims to automate and streamline the attendance recording process for employees in various companies. It leverages the advancements in computer technology and internet connectivity to provide a convenient and efficient solution. The integration of facial recognition ensures the accuracy of attendance records, while location detection adds an extra layer of validation. This paper seeks to explore the benefits of such a system in improving attendance management, reducing errors, and enhancing overall workforce performance.[1]

This paper focuses on the "Mobile Based Student Attendance System Using GeoFencing With Timing and Face Recognition." Attendance management is a crucial concern for educational institutions, and this study addresses the challenges associated with it. The paper introduces an innovative solution that combines geofencing technology, Google Play services, Google location services, Firebase, Geofire dependencies, and face recognition functionality to automate attendance tracking for students. The proposed system records attendance based on the student's physical presence within a designated geofence (classroom) for over 90 percent of the time. It also requires students to have a unique ID, login password, and registered face photo for validation. By employing geofencing and face recognition, this system aims to minimize attendance fraud and enhance the accuracy of student attendance records, ultimately improving educational outcomes. The paper provides a comprehensive literature review, outlining the challenges of manual attendance systems and the limitations of various mobile-based alternatives, paving the way for this innovative approach.[2]

This paper focuses on the "Android-Based Course Attendance System Using Face Recognition." Student attendance tracking is crucial in educational institutions, and traditional methods are often inefficient and prone to errors. The paper presents an innovative system that leverages face recognition technology to streamline the attendance process. Students capture their face images and QR codes displayed in the classroom with their smartphones, which are then sent for attendance processing on a server. The results indicate an impressive face recognition accuracy of 97.29 percent with minimal processing time. This technology offers an efficient and accurate solution to attendance monitoring in educational settings. Future work may explore incorporating Bluetooth devices to ensure students' physical presence and prevent potential cheating in the attendance process.[3]

This paper focuses on the "Campus Attendance System Based on Face Recognition and Trajectory Tracking" tailored for morning jog attendance in colleges and universities. Traditional attendance methods, such as card swiping, suffer from issues like queues and the potential for proxy attendance. Location-based and facial recognition attendance systems alone fall short of ensuring accurate attendance records. To address this, the campus happy running system integrates face recognition and trajectory tracking within designated "geo-fenced" areas. Students must complete face recognition within this boundary to confirm their attendance. Real-time trajectory tracking and recording of motion data enhance supervision and management efficiency while providing valuable insights into student participation. Additionally, the system offers features like sports rankings, fun running activities, and personalized music recommendations to motivate students. This innovative approach combines technological solutions with individual student needs, improving attendance accuracy and enhancing the overall campus experience.[4]

This paper focuses on the "Privacy-Preserving Zero-effort Class Attendance Tracking System," addressing the crucial need for automating student attendance tracking. Traditional methods are often time-consuming and prone to inaccuracies, making modern solutions essential. Leveraging the widespread use of smartphones, this system utilizes radio frequency technologies like Wi-Fi, Bluetooth, and cellular signals to sense location and collect signal strength data. The proposed system, designed for educational environments, aims to generate "location proofs" based on the radio frequency fingerprints received by students' devices. Importantly, it ensures privacy by not revealing user identities or class locations. The

research underscores the significance of modern technology in streamlining attendance tracking, enhancing academic performance, and addressing privacy concerns. Previous efforts have explored biometric recognition, voiceprints, QR codes, RFID, and GPS-based systems, but they often require hardware integration, and user interaction, or suffer from privacy issues. The proposed approach offers a zero-effort, privacy-preserving solution, leveraging existing technology.[5]

III. PROPOSED SYSTEM

Introducing an innovative system set to redefine attendance tracking with the seamless integration of location-based services and facial recognition technology on the Android platform. This cutting-edge solution offers a comprehensive suite of features that aim to simplify and enhance the entire attendance management process.

At its core, this system enables employees to mark their attendance with precision through a combination of geofencing and facial recognition. This ensures an accurate record of their presence while eliminating the need for traditional and often cumbersome methods.

What makes this system truly exceptional is its ability to present attendance data in a user-friendly and intuitive application format. No longer will users need to decipher complex attendance logs or wrestle with paper-based registers. Instead, this system translates intricate attendance data into easily understandable language. It's as if attendance tracking becomes as simple as a conversation, demystifying the process for everyone involved.

Within the application, users gain access to a wealth of information about their own attendance patterns, all presented in straightforward terms. It's not just about marking attendance; it's about understanding the bigger picture. This system provides details about each employee's attendance history, including tardiness, absences, and attendance patterns. This empowers both employees and HR personnel to make informed decisions and streamline workforce management.

Furthermore, this system streamlines the entire attendance tracking process, reducing the burden of administrative tasks and the potential for errors. We recognize that not everyone has a technical background, and that's why we've made it our mission

to simplify attendance tracking without sacrificing accuracy and relevance.

This proposed system is a game-changer in the field of attendance tracking, combining the power of geofencing and facial recognition with intuitive user interfaces. In a world where efficiency, accuracy, and accountability are crucial, this system empowers employees and HR personnel to make informed decisions, bridging the gap between technology and everyday administrative tasks.

A. System Architecture

The system is a cutting-edge solution designed to revolutionize attendance management for employees and HR personnel. This system leverages mobile technology, specifically through an Android application, to enhance efficiency, accuracy, and convenience in the attendance tracking process.
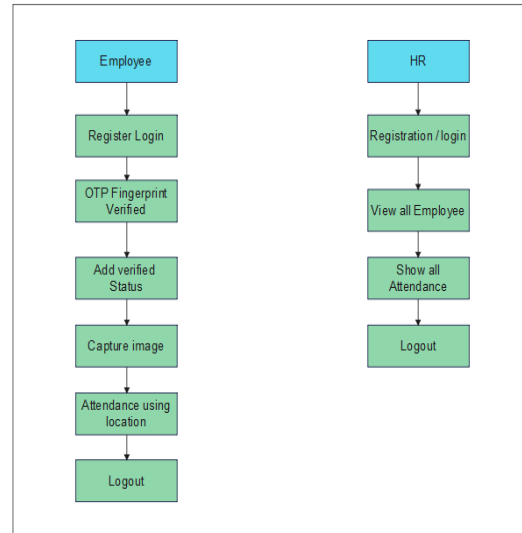

Figure 1: System Architecture

For employees, the system offers a user-friendly registration and login process, securing their access through OTP and fingerprint verification. Upon successful authentication, employees can add their verified status and capture a facial image to further confirm their identity. The system uses geofencing to pinpoint their precise location when marking attendance, ensuring accuracy and preventing unauthorized check-ins. A logout option is available to conclude their session.

For HR personnel, the system provides registration and login features, granting access to view all employees' profiles and their attendance records. This comprehensive overview simplifies workforce management and accountability tracking, reducing

administrative burdens. The combination of geofencing and facial recognition technology optimizes operational effectiveness and minimizes the need for dedicated hardware. Overall, this system streamlines attendance tracking, benefiting both employees and HR in various industries.

IV. CONCLUSION

The integration of location-based attendance tracking and facial recognition technology in Android applications offers a promising solution for efficient and accurate attendance management. This innovative approach enhances accountability, reduces resource overhead, and streamlines the attendance tracking process, marking a significant advancement in attendance management systems.

REFERENCE

[1] Yanto, A.B.H., Fauzi, A., Indriyani, N.: Attendance mobile application with face recognition and detect location. Jurnal Teknologi dan Open Source 5(1), 51–63 (2022)

[2] Babatunde, A., Oke, A., Babatunde, R., Ibitoye, O., Jimoh, E.: Mobile based student attendance system using geo-fencing with timing and face recognition. Journal, Advances in Mathematical & Computational Sciences 10(1) (2022)

[3] Sunaryono, D., Siswantoro, J., Anggoro, R.: An android based course attendance system using face recognition. Journal of King Saud University-Computer and Information Sciences 33(3), 304–312 (2021)

[4] Cao, F., Zhu, L.: Research on campus attendance system based on face recognition and trajectory tracking. In: IOP Conference Series: Earth and Environmental Science, vol. 769, p. 042065 (2021). IOP Publishing

[5] Shene, A., Aldridge, J., Alamleh, H.: Privacy-preserving zero-effort class attendance tracking system. In: 2021 IEEE International IOT, Electronics and Mechatronics Conference (IEMTRONICS), pp. 1–4 (2021). IEEE