Advances in Consumer Research
https://acr-journal.com/
Volume-2 | Issue-6 | Dec: 2025
Original Researcher Article

Smart Attendance System Using Geo-Location System

Dr.M. Sangeetha[1], Dr. P. Anbumani[2], Pavitran N[3], Praveen kumar S[4], Nathin A N[5], Logesh A[6]
[1]Assistant professor Department of Computer Science and Engineering V.S.B Engineering College, Karur, Tamil Nadu.
Email ID:rsv2008pll@gmail.com
[2]Assistant professor Department of Computer Science and Engineering V.S.B Engineering College Karur, Tamil Nadu
Email ID: anbuanc@gmail.com
[3]Department of Computer Science and Engineering V.S.B Engineering College, Karur, Tamil Nadu.
Email ID:pavitranandand@gmail.com
[4]Department of Computer Science and Engineering V.S.B Engineering College, Karur, Tamil Nadu.
Email ID:spraveenk34@gmail.com
[5]Department of Computer Science and Engineering V.S.B Engineering College, Karur, Tamil Nadu.
Email ID:nathinan30115@gmail.com
[6]Department of Computer Science and Engineering V.S.B Engineering College, Karur, Tamil Nadu.
Email ID:alogesh122005@gmail.com

ABSTRACT
Businesses, schools, and places that operate outdoors must keep track of attendance. Conventional techniques, such as RFID-based systems, biometric scanners, and manual roll calls, may be burdensome for administrators, inefficient, and open to fraud, such proxy attendance. Geolocation-based attendance monitoring has become a realistic option for assuring accuracy, transparency, and automation owing to the swift development of mobile technology and the ubiquitous availability of Global Positioning System (GPS) services. This paper presents a geolocation-based methodology for attendance management that utilises cloud computing, geofencing, and mobile apps to verify user presence in specified locations before documenting attendance.
Keywords: *Attendance tracking, Geolocation, GPS, Geofencing, Workforce management, Website, IEEM*
.

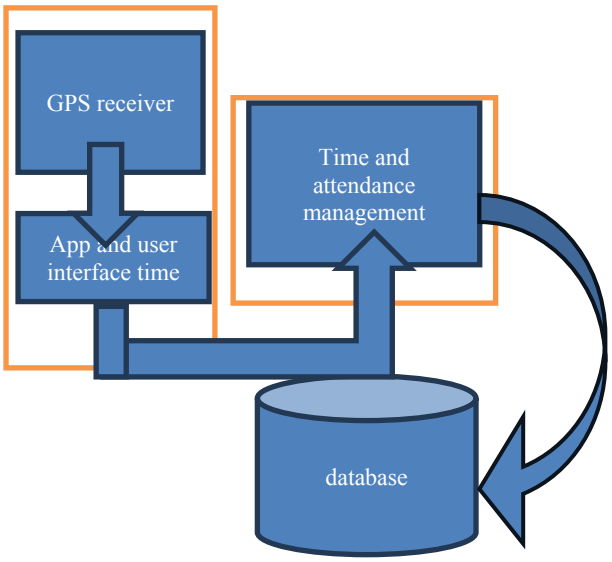
1. INTRODUCTION

Keeping track of attendance is an important job in schools, businesses, and government organisations. Traditional methods like manual registers, RFID cards, and biometric systems sometimes have difficulties with upkeep, take a long time, and allow people to attend on behalf of others. In order to get around these issues, our Geolocation-Based Attendance Tracking System offers An advanced, secure, and efficient attendance register system that automatically captures attendance based on the attendance holder's real-time geolocation via GPS. This web-based system would allow a staff member or student to check-in only at designated locations such as a classroom, office, or campus locations. This system would incorporate a combination of geofencing methods and the Google Maps API (or comparable services) as a means to capture an individual's accurate location, thereby limiting the potential for fraud by students checking in elsewhere. The process of automatically capturing attendance will improve on the accuracy of attendance, increase transparency in the process, and lessen the administrative burden of standards for the system. Additionally, real-time reporting with analytics will be provided for decision-making purposes

2. RELATED WORK

In prior occurrences, several strategies have been advanced and practiced, to improve attendance (tracking) management systems. In manual systems, attendance management was done using a paper-based register format, which was equally simple, but prone to errors, abuse, and time-consuming. To improve accuracy, Biometric systems were introduced (mostly) using face, iris, and fingerprint recognition. While effective, the biometric systems are also susceptible to hygienic deficiencies (as seen recently from the pandemic perspective) and often include considerable upfront costs for hardware and ongoing support and maintenance. Recent iterations have considered relying on situations to identify / track attendance using mobile phones. Typically, systems simply employ one of two methods of using NFC or QR codes for reading purposes, in that staff or students simply scan the code to confirm their presence. Although convenient, QR codes can be shared, and NFC systems require compatible devices and hardware installation. With the growing adoption of location-based services, researchers have explored GPS-based and geofencing approaches for attendance automation. For instance, some systems utilize Google Maps API to verify user coordinates within a predefined range, ensuring that attendance is marked only in the designated area. This approach significantly reduces the risk of proxy attendance compared to traditional or QR-based systems.

Additionally, related studies have examined the integration of cloud storage and real-time analytics to provide administrators with automated reports and insights. Some works also combine Wi-Fi triangulation and Bluetooth beacons to enhance indoor location accuracy, where GPS signals may be weak. In general, previous research shows a strong trend toward an attendance system that has mobile and geo-location capabilities based primarily on scalability, cost, and security. Several related works have explored Smart Attendance Systems use geo-location technologies, each proposing different ways to improve accuracy, security. Some studies focused on geofencing-based attendance systems. In these systems, a virtual boundary is set around an institution. Students or employees are automatically marked present once they enter the defined area.

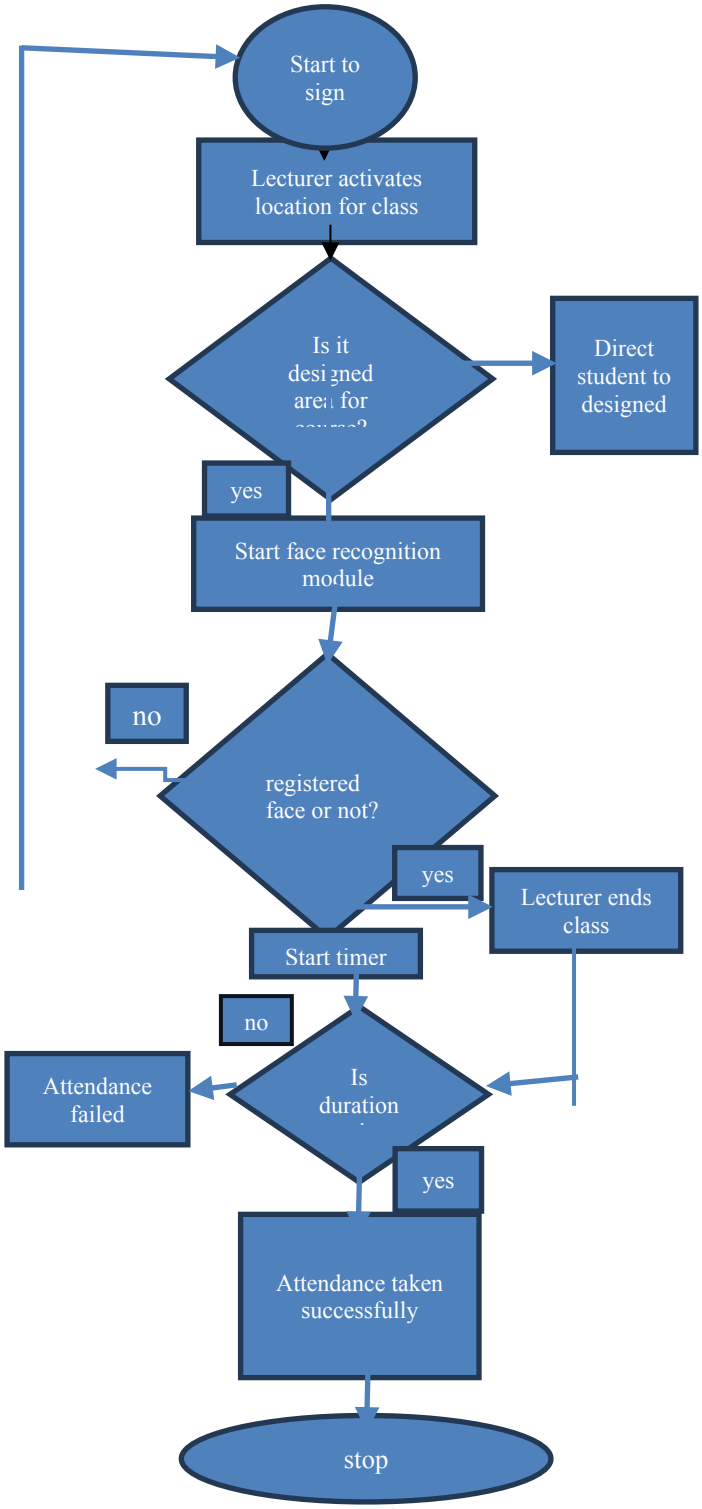


That said, there are still areas for improvement with respect to location accuracy, mobile device energy consumption, and also offline usage. Some research and implementation efforts have investigated geo-location based attendance tracking systems that have combined GPS, geo-fencing, QR codes, and facial recognition systems together to enhance precision while decreasing fraudulent behaviour. Traditional systems used for tracking attendance rely on mobile applications that track a user's GPS location and check it against an established geo-fence to record attendance. In these cases, attendance is only surmised if the user is present at the designated location prior to it being recorded; however, this attendance and check-in still has a time delay associated with it. Recent work, including Geo Work Track, follows this established attendance-tracking format and provides real-time GPS tracking, reporting, and alert systems that provide additional details about employee movement and time on-site. More educational systems are being developed that track students' locations during class time using a Node.js-based system that provides highly accurate attendance reporting when students are within a specific radius of the classroom. Hybrid models have also been proposed that utilize QR-code scanning combined with geo-location and verification by capturing a photo of the student. These models significantly decrease proxy attendance within educational institutions and provide more reliable attendance data by considering the embodiment of the student as a verification process. More advanced models have integrated facial recognition with geo-fencing that utilizes a biometric measure of location to provide verification that an identity and presence were both categorized; this is especially helpful if both verification measures must be accounted for in the same process. There are no studies looking into using RFID or IoT technology, which could be used as an add-on or alternative to geo-fencing and accuracy of reporting in environments where low GPS signal coverage exists, such as indoors.

3. PROPOSED SYSTEM

The suggested service is an attendance tracking platform that uses geolocation to address the issues of traditional attendance measures including: manual archival of attendance, RFID cards, QR codes, and biometric systems. The platform utilizes GPS and geofencing to only confirm attendance when a user is verified to be physically present in a pre-defined geofenced location in a classroom, on a campus, or in an office premise. Users can securely authenticate themselves in the platform with a web interface and the users location is checked against the geofenced boundary of the location, only after this confirmation will attendance be marked. In addition, upon validating the location, the attendance record will automatically be saved into the database and thereby preventing nominal attendance submissions including proxy or false entries. In addition the service also has the benefit of an administrator dashboard for which teachers, managers, or HR personnel can review, analyze, and generate attendance reports in real time reporting. Overall, the proposed system limits human error, deters fraud, saves time and accuracy while also having a transparent attendance management policy due to the system generating automatic reports to support attendance management. Furthermore, web-based attendance systems can limit cost as these systems can be adopted via more scalable options as districts, departments or institutions. educational institutions and corporate organizations. A Geo-Location-Based Attendance Tracking System is an innovative system established to automate and simplify the process of managing attendance by using GPS and other location-based technologies. The system is based on a mobile application used for users to check in and out of specific geographical areas known as geo-fences that define authorized areas with latitude, longitude and it captures their location at the time and checks whether it is recorded at any point inside the authorized zone. If the attendance is validated, it records the timestamp and location into a centralized database for reporting purposes. An admin dashboard enables supervisors or HR personnel to monitor attendance in real-time, conduct attendance reports that summarize attendance, to use to edit manage geo-fences and users. Additional verification, such as photo verification or QR code scanning, may further increase security and accuracy. WiFi/Bluetooth proximity detection can also be utilized to help establish the legitimacy of check-ins, particularly for indoor attendance, attendance spoofing, and other situations where dishonest attendance may occur. This method gets rid of human mistakes, stops proxy attendance, and works

with mobile or field-based workers. It's a good and scalable option for businesses, schools, or institutions with flexible or scattered setups.



4. METHODOLOGY AND TECHNOLOGIES USED

System Initialization

The purpose of the Geolocation-Based Attendance Tracking System is to keep track of attendance in a safe, accurate, and automated method. The first step is to make sure that each student or employee may access into the attendance tracking system with their own account. The device's location services obtain their GPS coordinates in real time when a user has been confirmed. An administrator set up a geofence border on site that displays the permissible area, such as a campus, workplace, or classroom. The coordinates are then compared to this boundary.

Data Processing and Storage

If the recorded location is within the geofence area, the system will immediately add the date and time of the attendance to a central database. The system runs a number of checks to make sure that the data is accurate and that there are no duplicates. It also only keeps track of attendance within a time period designated by the organisation. After that, an admin dashboard will reveal who has logged in. making it easy for administrators to keep a check on participation, look at patterns, and produce reports on attendance. This approach makes sure that everything is obvious, prevents phoney check-ins, reduces down on errors made by hand, and makes it easy to keep track of who is there.

User Authentication

The system begins with a secure login module that needs students and workers to provide their own unique credentials, such a username and password. This authentication makes sure that only registered users may use the attendance system. Also, there is role-based access, which means that administrators, staff, and users have varied degrees of authorisation. This step makes sure that no one can get into the system without permission.

Location Capture

The system asks for permission to utilise the device's GPS services to find out where the user is in real time once the user has been verified. In this stage, the browser or mobile device gets the latitude and longitude numbers. This is a critical step in the process of getting the raw data that will be used to make sure the user is permitted to enter the building. The system will prompt the user to switch on their GPS before it can continue if the GPS is off or not available.

Geofence Verification

Our system maintains track of the user's attendance information in our central data repository when the geofencing verification succeeds. The record will include the date, time, user ID, and the exact location. The system provides criteria for validation that stop duplicate records or extra check-ins on the same day. This makes sure that attendance monitoring is clean, dependable, and not falsified.

Report Generation and Monitoring

Finally, administrators will be able to monitor real-time information on attendance on a dashboard. The ability to generate reports every day, week, or month will provide you information on attendance and how on-time and involved users are. Additionally, the reports help institutions and organizations assess attendance trends, decrease human error associated with the process, and support evidence-based decisions. To add further value, the dashboard will support data export for official use

TECHNOLOGIES USED

Location Determination Technologies

GPS / GNSS: Provides accurate latitude and longitude, commonly used outdoors. Wi-Fi Positioning: Uses nearby Wi-Fi access points to estimate location indoors. Cell Tower Triangulation: Mobile networks help approximate location when GPS is weak. Bluetooth Low Energy (BLE) Beacons: Short-range signals used for fine-grained indoor positioning.

Front-End Technologies

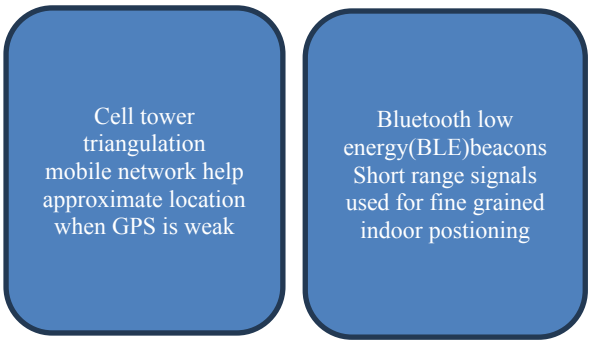
The Geolocation-Based Attendance Tracking System employs web technology, databases, and Location-Based Technology in order to achieve the most efficient, accurate, and scalable system. The front-end to developed using HTML, CSS, and JavaScript to provide students, employees, and administrators interactive access to the application that is user-friendly. The back-end to developed in PHP or Node.js to facilitate user authentication, geolocation authentication, and attendance protocols. Location Determination Technologies: GPS / GNSS: Provides accurate latitude and longitude coordinates for the most part for outdoor use.

Geofencing Techniques

Virtual Boundaries are pre-established radius around a place of work/class. The Entry/Exit triggers Attendance is indicated automatically when the device comes into the geofence. The algorithms Distance computation methods like the Haversine formula checks for containment in the allowable distance. MySQL, a relational database, will facilitate the secure storage of user credentials, geofence boundaries, and attendance data, and retrieval. The core element of the system is location tracking via GPS technology using Google Maps API (or OpenStreetMap API) is used to collect and confirm coordinates real-time.

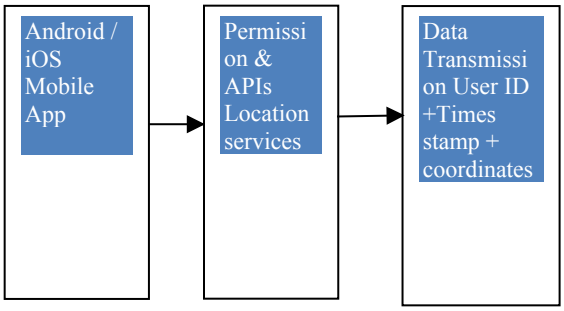
Mobile Application Layer

Android/iOS Apps are used as Front-end interface for students/employees. Permissions & APIs are Uses mobile OS location services and Google Maps/Apple Maps APIs. Data Transmission are used as a Securely sends user ID, timestamp, and coordinates to the server.



Backend & Database Technologies

Web Services: RESTful APIs or cloud platforms (AWS, Firebase, Azure) facilitate data exchange. Options for database storage are either SQL (MySQL, PostgreSQL) or NoSQL (MongoDB, Firebase Realtime DB) databases within which attendance is logged. Processing is involved with the validation of user location, time window, and modifying the attendance log. The application is hosted on a web server or cloud service to ensure access for multiple users at the same time, in adequate quantities and with a good level of service. The system uses HTTPS, access control, and a secure authentication mechanism to protect data privacy and security. When combined, these technologies create an equitable, dependable, and affordable entity to automate attendance management in educational and corporate settings. The backend and database are the foundational technologies behind the geo-location-based tracking of attendance, providing means for secure storage of data, and effectively processing of data between web services and mobile devices. Web services, particularly RESTful APIs, serve as middleware between the mobile application and server, while cloud services such as AWS, Firebase, or Microsoft Azure provide scalability, hosting, and real-time data exchange capacity. Appropriate to the requirements of a given system, both SQL and NoSQL databases, are utilized for data maintenance and storage. Data transmission is protected through encryption, and authenticated users only are able to access the system, which promotes security and integrity. When combined, these backend and database, technologies.



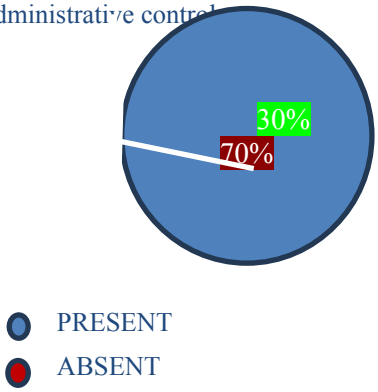
5. RESULT AND DESCUSSION

The Geolocation-Based Attendance Tracking System represents a major advancement beyond traditional attendance approaches in regards to accuracy, reliability and security. The system successfully checks whether a user is present in a geolocation using GPS coordinates and records users' attendance only when they are located inside the defined geofence. As a result, proxy attendance and false check-ins are no longer a limitation that is frequently faced in manual and RFID attendance systems. The automated attendance process also greatly decreases the amount of time and effort by both users and administrators, since attendance is marked automatically and reporting is displayed virtually in real-time using the admin dashboard. Systems testing showed that the system was able to accurately and consistently capture user locations with little to no error. Attendance records were collected securely in the database without duplication or data loss. Administrators experienced the dashboard as an effective return on investment and for monitoring daily, weekly, and monthly reporting on user attendance, which enhanced future decision-making and monitoring of timeliness. Database performance testing found that SQL and NoSQL databases were able to manage large-scale attendance logs, as N0SQL databases were able to provide faster real-time updates and SQL provides a stable structure to design reports and analytics. User feedback improvements included ease of logging attendance and less dependence on manual logging and less time spent waiting in a line. However, there were still limitations in the system's functioning. The discussion shows that the system works well outdoors, but GPS accuracy may be less reliable indoors, away from the GPS satellites where signals are weaker. In the future, Wi-Fi location or Bluetooth beacons may be used to increase accuracy inside. In conclusion, the findings demonstrated that the suggested method is a cost-effective, scalable, and efficient way to keep track of attendance in schools and businesses. The discussion demonstrates that the suggested system mitigates the shortcomings of conventional approaches by providing a contemporary, transparent, and user-friendly approach to attendance monitoring using geolocation and web-based technology.

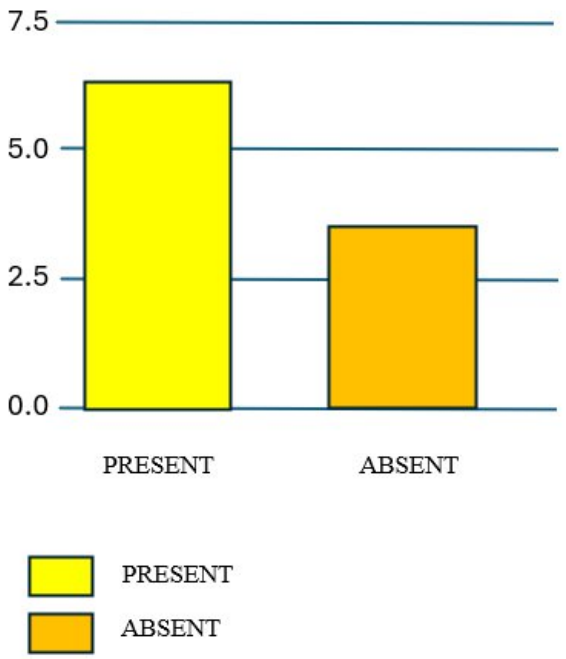
6. RESULT ANALYSIS

RESULT ANALYSIS

Both systems want to replace the existing attendance system with GPS-based verification, but they do so in various ways, have different security features, and are developed in different ways. The initial system only works on phones and tablets. Each user has an app that is linked to their own user ID and GPS data. It uses time and attendance software on a computer to read and analyse the encrypted data packets that arrive from the user's device. The mobile app operates in a straight line: it discovers the GPS position, compares it to office coordinates stored on the device, encrypts the user's ID and location, and sends the data to the system. The second system offers a platform that can grow and includes both mobile and web interfaces. It also supports geofencing to check that you are within specified virtual limits. The first system just checks to see whether the location is correct. The second system, on the other hand, automatically saves timestamps to a database and doesn't let anyone attend as proxies since it keeps verified information up to date.The biggest difference is in the features and how they are run. The first system is easy to use for taking attendance and sharing information, but it can't produce reports, analyse data, or keep an eye on things in real time. The second option, on the other hand, has a full administrator panel that lets instructors, HR staff, or managers view attendance, make analytical reports, and dynamically control geo-fences and users. The security elements are also quite different. Before transferring information, the first system encrypts just the location and user ID. The second approach, on the other hand, employs many ways to check that someone is who they say they are, such as QR scanning, picture verification, and proximity verification using Bluetooth or Wi-Fi. This makes it harder to fake your position and makes it more accurate, especially inside.Lastly, the first system is only meant for one workstation with fixed stored coordinates, which means it can only be used in small office settings. On the other hand, the second system is meant for schools, companies, and campuses. It is adaptable and can be accessed from the cloud, reports in real time, and supports field operations. The first system is usually basic and specialized for specific functions, while the second is a more advanced enterprise-level system that offers improved fraud prevention, automation, transparency, and administrative control.



EMPLOYEES ATTANDANECE



7. CONCLUSIONAND FUTURE SCOPE

CONCLUSION

The implementation of a geo-location-based attendance tracking solution is certainly a change from the traditional manual attendance approach to an efficient, automated, and location aware solution. Using GPS and mobile devices, attendance records can be efficient, accurate, and reliable and an increase of accountability and transparency is created within organizations. This type of attendance service is especially advantageous for locations where employees or students are in transit, including field based, or multi location institutions. The system is capable of addressing issues such as buddy punching, time theft, and human error with manual attendance entry and it would likely reduce some administrative overhead. With real time data collection, centralized reporting, and integration with the existing HR/academic management systems, using geo-location based attendance tracking is a robust method of monitoring workforce attendance or academic tracking. The added component of geo-fencing delineates and defines the boundaries where attendance could be taken, in specific locations, adding accuracy and reliability to the attendance data. Nevertheless, like any technology there are a few hurdles to work through. The geo-location solution is dependent on user device location services, connectivity to the internet, and user compliance. GPS technology can be affected by environmental, ambient interference, battery life, and privacy issues - all of which may undermine accuracy, and the owner of the geo-location based attendance system is not necessarily guaranteed total accuracy.

FUTURE SCOPE

The website necessary features and is beneficial, there are a number of improvements which would help improve usability, performance, scalability and the overall experience of the end user:

Facial recognition integration

Adding a GPS tracking feature in combination with facial recognition can provide added confidence with identification verification and to impede a user from proxy checking in.

Geo-fencing and notification alerts

Active geo-fencing with notification alerts of users who are arriving and departing attendance zones.

Offline mode option

An offline mode to log attendance, which would then sync back once the user was back online.

Admin dashboard and analytics

An admin dashboard that could be web based would provide visibility into attendance data, reporting and trends.

Integration with payroll systems

Automatic pay calculations based on attendance records would reduce HR and payroll workload.

Multi-location and multi-shift support

Attendance logging functionality for employees across shifts and multi-locations.

REFERENCES

1. Geolocation-Based Employee Attendance and Monitoring System" — IRJMETS (project paper, Nov 3, 2024).
2. "GPS using Attendance Tracking System" — (C. Nallusamy et al.), ResearchGate / ISJEM (2024).
3. "GPS Based Attendance System Using Geofencing" — IJSDr (article / PDF describing geofence approach, 2024)
4. "GPS using Attendance Tracking System" — ISJEM (alternate host PDF; implementation & evaluation, 2024).
5. "QR-Attendance System with Geo-Location" — IJARIIT (QR + geo-verification, Nov 2024).
6. "Design and Implementation of a University Attendance Management System using Geofencing" — AJCST (2025; includes geofencing design notes).
7. "Mobile-Based Student Attendance System Using Geo-Fencing With Timing and Face Recognition" — ResearchGate (implementation combining geofence + face recognition 2024).
8. "Geofencing and Location-based Attendance" — IJARSCT (geofencing attendance system overview, 2024).
9. "Integrating Facial Recognition and GPS Technology for Attendance Management" — ICEEI proceedings (2025).
10. Patent: "Attendance management system using GPS information" — Korean patent listing (KR102249057B1 2025).
11. "An Embedded Intelligent System for Attendance Monitoring" — arXiv (embedded device + camera for attendance, 2024).
12. Patent: "Attendance tracking system" — US patent (US8353705B2 2024).

13. “AI-Enabled Automatic Attendance Monitoring Systems” — Evergreen / Kyushu Univ. tech report (2024).
14. “How Workers Understand and Resist Surveillance” — research on worker surveillance and implications (relevant ethics/privacy, Dec 2024).
15. “GPS Clocking with Geofencing in Time & Attendance” — TimeTec blog / product guidance (practical vendor view, 2025).
16. “5 Ways GPS-based Attendance is Revolutionizing Field Productivity” — LystLoc (industry blog / 2025 overview of benefits).
17. “The Future of Attendance Tracking in 2025: Facial Recognition, Geofencing, GPS” — Medium article (industry trends; 2025).
18. “Implementing Secure Mobile Attendance Systems with Geo-Fencing Capabilities” — conference proceedings (Mar 2024) — (E. Johnson & L. Smith).
19. “QR-Attendance System with Geo-Location” — IJARIIT (full PDF, Nov 2024).
20. “Implementation of an Android-Based Attendance Application Using Geofence” — IJEEPSE (2024 implementation note).
21. “Robustness Analysis of QR-Code Based and Geolocation-Based Attendance Systems” — Jurnal Media Infotama (robustness comparison, Oct 2024).
22. “GPS-based employee monitoring and attendance system” — IJIRSET (project report / PDF, 2024).
23. “Smart Attendance System using Geolocation” — GIJET / Grenze (2024 paper describing QR + geolocation hybrid approaches).
24. “Implementing QR code and Geolocation Technologies for the Student Attendance System” — Cogito (Universitas Klabat; 2024 PDF).
25. Anbumani P, Vasantharaja R, Gokul MP, Roopesh VS, Hareesh SD. Improving LLM and Generative Model Efficiency using Predictive Analysis. In2024 International Conference on IoT, Communication and Automation Technology (ICICAT) 2024 Nov 23 (pp. 69-73). IEEE.
26. S Prabakaran, V Shangamithra, G Sowmiya, R Suruthi, Advanced smart inventory management system using IoT, International Journal of Creative Research Thoughts (IJCRT), vol 11, Issue 4, page 37-45
27. Improved K-Means with Fuzzy-Genetic Algorithm for Outlier Detection in Multi-Dimensional Databases Authors
28. M.Senthil Kumar Dr.C.Sumithirdevi , M.Parthiban , K. Manivannan , P.Anbumani
29. Data Security in Communication using Blockchain and Key Based Protocols Authors
30. S Prabakaran, K Harinivaash, R Prasad, J Kaviyan, D Rabin