

# GEOFENCING-BASED ATTENDANCE TRACKING: A NOVEL BASED APPROACH FOR ACCURATE AND EFFICIENT TIME AND ATTENDANCE MANAGEMENT

Rachakolla Sai Viswanath<sup>1</sup>, Nareddy Shreya<sup>2</sup>, Shaik Sufiyan<sup>3</sup>, Suram Aarthi<sup>4</sup>, Dr. M. Ravikanth<sup>5</sup>

<sup>1</sup>Computer Science and Engineering, VNR VJTIET, Hyderabad, Telangana, India.

<sup>2</sup>Computer Science and Engineering, VNR VJTIET, Hyderabad, Telangana, India.

<sup>3</sup>Computer Science and Engineering, VNR VJTIET, Hyderabad, Telangana, India.

<sup>4</sup>Computer Science and Engineering, VNR VJTIET, Hyderabad, Telangana, India.

<sup>5</sup>Assistant Professor, Dept. of Computer Science and Engineering, VNR VJTIET, Telangana, India.

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**Abstract** - Educational technologies, such as learning management systems, can be coupled with smart attendance systems employing geofencing to provide more functionality and insights. The precision and dependability of smart attendance systems that use geofencing are among their main advantages. Since they are based on geographical data rather than self-reported information, they offer a more impartial record of attendance. In comparison to more conventional techniques for tracking attendance, such self-reporting or manual sign-in sheets, they also save time and minimize errors. This paper provides an overview of how we are tracking the employee's location and marking the attendance using geofencing. We aim to create a flexible attendance system that can streamline and accelerate the process using a mobile application based on geofencing and face recognition so that the business won't have to spend extra money on a specialised machine.

**Key Words:** geo fencing, biometric, RFID, GPS, IMEI, MAS, PCA, ZZ Status, GPRS

## 1. INTRODUCTION

Over time, it has been apparent that practically all educational institutions still use the manual attendance technique. The procedure takes a lot of time and is occasionally ineffective, which results in erroneous attendance records. These days, we don't need to keep attendance records on paper and pen. Employees now live their lives through their mobile devices. Small smart phones that fit in pockets are taking the place of computers as the preferred method of computing. For all of the staff, an effective method of tracking attendance is via a smart phone. Due to numerous problems, including authentication and authorization, keeping track of employee attendance is a difficult task.

As they automate the process of recording attendance and offer a practical and effective means to record and monitor employee presence in the office, smart attendance systems utilizing geofencing technology are a potential solution in this aspect. A geofence is an imaginary geographic boundary that can be entered or exited by a mobile device or RFID tag. Radio frequency identification, Wi-Fi, GPS, or cellular data are used by an app or other location-based service called geofencing to launch a specific marketing campaign (like a text, email, social media advertisement, or app notification).

Administrators can set up virtual fences around a physical area, such as an office or business premises, using geofencing, a GPS-based technique. After entering the Office Premises, employees can login to the application and give attendance through facial detection, which enables employee attendance. Traditional means of tracking attendance, including manual sign-in sheets or self-reporting, have not been demonstrated to be as precise and dependable as smart attendance systems that use geofencing technology.

## 2. RELATED WORKS

M. Makhtar, R. Rosly, S. A. Fadzli., [1] An Android smart phone, GPS, a Wi-Fi access point, and a server make up this system. By pressing a button on the phone, it uses the GPS receiver included into a smart phone to determine the location of each employee and automates clocking them in and out in real time. The smart phone's IMEI number and GPS data are uploaded to a database.

Ester Erni Sinaga , Eko Budi Setiawan., [2] This paper proposes and implements a system that employs geofencing technology in its application to give hotel guests access to check-in, check-out, and other services as well as navigation to these services based on where the visitors are.

Sudheer Nagothu., [3] Using GPS and GPRS technologies, the suggested system keeps an eye on the animals. Using this technology, the farmer can follow the animal continuously. When it departs from the predetermined location, whether intentionally or unintentionally, or if it misses the path to the house, an alert will be sent to the farmer.

Aakruti Buddhiwant , Mudita Bharkshe., [4] This method suggests an android-based attendance tracking software. The software offers dependability and straightforward control. By cutting down on the time and calculations necessary for manually updating the attendance, this will help the lecturers lighten their job. It can serve as a foundation for creating comparable software to track attendance in workplaces, offices, and other businesses. Parents and kids will be able to review information on attendance and curriculum on the website.

Najwa Suraya Binti Abdul Samat., [5] Provides an Android-based mobile application for tracking attendance. Reliability, time savings, and simple control are all features of the application. By cutting down on the time and calculations necessary for manually updating the attendance, the seminar will help the lecturers lighten their job. It can serve as a foundation for creating comparable software to track attendance in workplaces, offices, and other businesses. Using the website, parents and students can examine information about attendance and curriculum.

Lia Kamelia, Eki Ahmed Zaki Hamidi., [6] This system suggests hardware that comprises an "LCD TFT" and an MP3 player for output, a fingerprint sensor and a "GPS module" for input, and an "Arduino Mega microcontroller" for system processing. The "GPS" can calculate latitude and longitude with an average error of 0.007352% and 0.0003%, respectively, while the fingerprint sensor can identify a fingerprint stored in the database with an average reaction time of 1.39 seconds.

Zakiah Ayop,Hmaid Erman, Syarulnaziah Anawar., [7] This system uses a cloud-based Firebase database and an Android application to construct a location-aware event attendance system that manages attendance data using GPS and QR codes. According to the review, the suggested technology records student attendance by scanning a "QR code". To guarantee full attendance, the location, time login, and time logout were monitored. However, because this system can only handle Android apps, iOS users may find it inconvenient. Additionally, the suggested system is only able to track a user's location without figuring out how far they are from the event place. Additionally, a reliable Internet connection is required for the program.

Dankar, A.,& Kundapur, P., [8]The advancement of AMAS is the system's goal. The services offered include task emails, SMS notifications, and attendance tracking. A

website and database server are also connected by the program, which stores and accesses all records. Additionally, it was only available on Android operating systems; it cannot be used on iOS smart phones.

Dwi Sunaryono, Joko Siswanto, Radityo Anggoro., [9] This research suggests an Android-based face recognition-based course attendance system. Every student's picture is captured. After being captured, the image was uploaded to the server in order to be used for facial recognition and the attendance procedure. Only in a specific course was a classifier utilized to perform face recognition in order to have strong face recognition accuracy and quick processing time. The experimental finding gives an efficiency of 97% and required only 0.000096 seconds for the server to execute the face recognition procedure.

Aayushi Singh, Tanya Goel., [10] the system was able to fulfill the requirements. Both professors and students had to be present. It lessened the additional work needed to keep records and check if candidates met the requirements to sit for tests. In government-run schools, it would be incredibly successful. However, after taking attendance, this system was unable to monitor the actions of the students.

Sharvani Yedulapuram, Rajeshwarrao Arabelli.,[11] This system employs a "Raspberry Pi" based security. The technology is being put into place to keep an eye on any unauthorized door entry. Face detection is used to establish contact with electronic devices using the "Pi camera" and "Raspberry Pi" platform. "Python" and the "Open CV libraries" are used for creating software. Face detection uses the Haar classifier approach to provide a precise and clear image of an intruder.

W. Wirawan F. Cahyono and R. Fuad Rachmadi., [12] This study compares "FaceNet" and "Openface",to determine the best approach to use in a presence system that uses faces. The employee's face will first be added to an image dataset in this process. The face preprocessing from the dataset will be carried out by finding, and resizing the face. then using FaceNet and Open face to extract facial features To achieve precision, the classification of facial features will be carried out using the "Support Vector Machine". Five fold cross-validations are used to verify the model.

Bequin Zhao., [13] In this system, each network has a distinct identity, the software identifies change in 'Wi-Fi' when a user moves across geofences. The user's smart phone must have Wi-Fi turned on for the app to function. When users enter the area around their place of employment, the app automatically clocks them in, and the software automatically calculates the number of hours for convenient tracking and reporting of work hours.

S K Baharin., [14] this system ensures that students cannot attend class if they are outside the class session range created by lecturers; it helps to avoid fraudulent attendance registration. With the help of this automated method, it was no longer difficult to keep track of students' attendance and calculate their absenteeism rates. The technology can also alert teachers and students to their excessive absenteeism rate and to inform them of their ZZ status. In contrast to similar systems from other services now in use, the suggested system just needs users' devices for attendance. Some of the existing gadgets require additional hardware to take attendance, such as an "RFID" and "iris recognition module".

'Zhao B', 'Lam J', 'Lee AM', 'El-Kareh RE', 'Jacobsen GR', [15] A deep neural network-based approach for facial data recognition is suggested. Convolutional neural networks are used to extract facial characteristics, the "PCA algorithm" is used to reduce feature dimensions, and the joint "Bayesian method" is used to measure vector similarity. Finally, the goal of increasing facial data recognition accuracy is accomplished. Following a series of experimental comparisons, the findings demonstrate that using the "CAS-PEAL" data set, face picture recognition accuracy can reach high levels.

Edeh Michael Onyema., [16] In this study, Various Machine Learning algorithms are applied on facial expressions of patients to interpret their health conditions. To expand the number of samples in the FER2013 dataset, various data augmentations have been done. They created the "CNN" model by adding a residual block to the current ConvNet model. To boost the model's learning and optimization, they have selected various sets of parameters. They applied a "random flip data augmentation technique".

G B Iwasokun., [17] In this Research work, Design requirements placed a high priority such that the final application may be used to protect persons and family members from kidnapping. When people are forcibly removed from a virtually specified zone, 'geo-fencing' technology is used to enable quick and real-time reporting of suspected kidnapping instances. By integrating GPS-enabled smart phones with mobile Internet, it also made optimal use of the IoT idea to track and find people. Following then, the tracker's location on a Google map is broadcasted along with the locations of the people being followed.

M. Makhtar., [18] In this Literature Study, 'Mobile Attendance System' is identified through Wi-Fi access point and a server. "IMEI Number" and "GPS" data is transferred to Database. Every user authentication includes user id and password to mark their attendance. The system has undergone successful testing since its implementation outside the building. When the user is out of the office or at

a remote location, it facilitates the efficient and economical process of taking staff attendance. For employees that cherish every minute of their workday, 'Mobile Attendance System(MAS)' is mandatory.

### 3. CONCLUSION

The old attendance systems, such as those based on fingerprints, iris scans, and RFIDs, which have many shortcomings, have been replaced by a number of models that have been developed for the tracking of attendance in workplaces. With tight notifications and alerts, a geofencing-based attendance tracking system with geofencing api references will strictly monitor a person's attendance based on their device across the geofencing region. Face recognition technology using genetic algorithm which is a combination of SVM and CNN to authenticate users, Hence increasing the system's security.

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