

# An Attendance Monitoring System Utilizing Wi-Fi

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**Abstract:** The attendance monitoring system significantly improves faculty presence tracking. Previously, department heads or higher-ranking administrators managed attendance using outdated methods, leading to disparities in records. A new system utilizing facial recognition and fingerprint scanning addresses these issues. Additionally, a smartphone app tracks staff attendance on campus using Wi-Fi and GPS, storing data securely in a database for administrators to edit if necessary. This integrated solution simplifies the process, ensures data integrity, and enables real-time monitoring.

**Keywords:** face recognition, smart attendance monitoring, image enhancement, segmentation

## I. INTRODUCTION

To measure attendance rates and differentiate between those present and those absent, an attendance tracking system is necessary in any organizational setting, including companies, universities, and schools. In the past, the procedure for recording attendance required registering or signing a signature form. But in large-workforce organizations, these systems are labor-intensive, needing human labor to compile records for every hour of every day, month, and year. There are other options for tracking attendance, such as fingerprint, iris, and biometric scanners. Still, keeping databases up to date for every employee and student utilizing all of these tools ends up being an expensive undertaking [1].

This approach uses Wi-Fi, an Android smartphone, and facial recognition software to track staff attendance. To grant access to the app, it also makes use of location services [2].

As an alternative to the conventional punching method, this methodology removes the necessity for physical touch, particularly during the epidemic. The approach that is being suggested is in line with a repertoire resource that is intended to help recruiters choose their skill set [3].

The suggested method helps harried employees who might find it challenging to maintain social distancing protocols while keeping track of their attendance. The automated attendance management system is examined in detail in this paper, with a focus on data accuracy and ease. Establishing a verification system tailored to smartphones that tracks student attendance via Wi-Fi signals is the main goal of this project. Teachers, administrators, and students must all install the system.

The distribution of notifications to cellphones and software development are the two primary concerns. Moreover, the execution comprises a pop-up message notice mechanism for teachers who neglect to record their attendance. The creation of attendance reports is made easier by the recording and storing of attendance data in a database. Students are able to interact with faculty members, ask questions regarding attendance, and leave comments via a module that the recommended technique offers.

## II. LITERATURE REVIEW

In 2021, Alburaiki et al. introduced a mobile-based attendance system called "Mobile Based Attendance System: Face Recognition and Placement Detection using Machine Learning" [4]. This proposal aims to create a mobile application that employs a smartphone's camera to report the location and recognize faces, allowing teachers to monitor student attendance. The system consists of three essential elements: first, the inclusion of handheld cameras for automatic facial identification and evaluation; second, the integration of a face recognition API driven by machine learning; and finally, the incorporation of functionalities from the Maps API. Upon identifying the professor, the system precisely captures student attendance and also provides the user with the option to download a report that summarizes the supplied attendance data.

In 2021, Alburaiqi et al. presented the concept of the "Mobile Based Attendance System: Face Recognition and Placement Detection using Machine Learning" [4]. This proposal advocates for the creation of a mobile application that incorporates location reporting and facial recognition features with a smartphone's camera. The aim is to offer teachers a tool for monitoring student attendance. The system comprises three main components: firstly, the integration of handheld cameras for automatic facial identification and evaluation; secondly, the inclusion of a face recognition API driven by machine learning; and lastly, the exploitation of features from the Maps API. Once the professor is recognized, the system precisely logs student attendance and provides users with the choice to obtain a report that summarizes the supplied attendance data.

The article explores the utilization of MAC addresses and Wi-Fi for attendance tracking systems. This technology utilizes a smartphone in the classroom to establish a link with the network or modem for the purpose of attendance control. Upon a student's arrival in the classroom, their smartphone automatically establishes a connection with a designated router, facilitating the monitoring of attendance. The staff and administrator receive and retain all data pertaining to the student's attendance in the classroom in a database.

The research, conducted by Sawhney et al., presents a remedy for the challenges encountered in the manual administration of attendance by teachers. The title of the paper is "Real-Time Smart Attendance System Using Face Recognition Techniques" [7]. The manual administration of attendance can be arduous, leading to a growing interest in automated and intelligent systems. However, authentication is a significant obstacle with these systems. Biometric approaches are commonly employed in intelligent attendance systems, with facial recognition being a prominent method. Facial recognition, a crucial element of biometric authentication, is employed in several domains such as indoor access control, human-computer interfaces, closed-circuit television (CCTV), network security, and video surveillance. The primary objective of the building's design is to tackle issues like as proxy attendance and inaccurate record-keeping of students' attendance by incorporating facial recognition technology.

The research described in [9] presents a design methodology for implementing a student attendance system that relies on fingerprints and is based on the Global System for Mobile Communications (GSM). This strategy obviates the need for humans and permanent resources to oversee attendance. The main goal of the project is to develop an embedded system that improves the functionality of security software. This technology utilizes a tracking module to precisely locate persons who cannot be accounted for. The study proposes the use of human odor to improve safety and authentication, consequently strengthening the security of the authentication process.

There is a scarcity of books that specifically focus on improving the quality of photos captured in low light circumstances [10]. In addition to its influence on consumer photography, limited visibility also presents difficulties for computer vision applications. Enhancing photos taken in low-light conditions is essential for improving human viewers' perception of information in images and overall image comprehension. Modifying the pixel values of digital photographs captured in low light conditions can boost the level of detail, with the main goal being to enhance visibility in images with poor levels of visual acuity. Nevertheless, the existence of noise is a substantial obstacle in the process of upgrading. Prior studies have suggested many approaches to tackle problems commonly found in low-light photographs, including inadequate brightness, insufficient contrast, excessive noise, and dark color tones.

In order to address these issues, a model is created that relies on absorption light scattering. This model utilizes a monochromatic atmospheric scattering model [11]. The objective of this model is to offer sufficient and consistent illumination, reproducing concealed intricacies and characteristics in photographs captured under low-light conditions.

The technique prioritizes attaining exceptional results in terms of the organization, intricacy, and resemblance of local characteristics. The monochromatic atmospheric scattering model and absorption light scattering model are utilized to produce the most luminous image using mathematical algorithms. The absorption light scattering approach exhibits improved outcomes in comparison to alternative methods, emphasizing the importance of crucial data acquired through this model. As a result, this technique provides improved processing of images in low-light conditions, resulting in enhancements in contrast, brightness, sharpness, and other important factors.

When encountering connectivity issues with the Wi-Fi network, our intelligent attendance system adapts by providing an alternative method for establishing connections. Staff workers can quickly record attendance by utilizing the GPS functionality and mobile data on their smartphones [12].

The primary goals of this research are to utilize the finger punching attendance mechanism in the current epidemic situation while avoiding direct physical contact.

- Wi-Fi and location access can be utilized to avoid unnecessary consumption of mobile data.
- Faculty members can conveniently employ it on their own smartphones through a single application.
- Receive notifications regarding the nonattendance of academic personnel.
- Effortlessly manages and accesses records and views
- Avoid time wastage.
- Highly portable for convenient usage.

### III. PROPOSED DESIGN

This study determines the specific area where employees can utilize face recognition software, as well as the campus Wi-Fi and smart phone attendance management system, for the purpose of checking in. The smartphone must be connected via the wireless network available on campus. Upon arrival on college premises, a professor is required to establish a connection to Wi-Fi in order to utilize the program. The database containing the staff's attendance is stored and shared with the administrator and college registrar. Prior to the deadline, the faculty member will be alerted with a pop-up notification in the event that they have failed to declare their attendance.

An inherent drawback of using a Wi-Fi system for input is the inability of staff members to log their attendance in the absence of Wi-Fi connectivity. This technique provides a solution by using a location-based attendance marker. To enable employees to log their presence at the area in case Wi-Fi is not accessible. In addition, the program incorporated a platform where students could access their attendance records and communicate with the teachers for any inquiries. The design consists of three modules: Staff, Students, and Admin (HOD). Figure 1 displays the three entities.

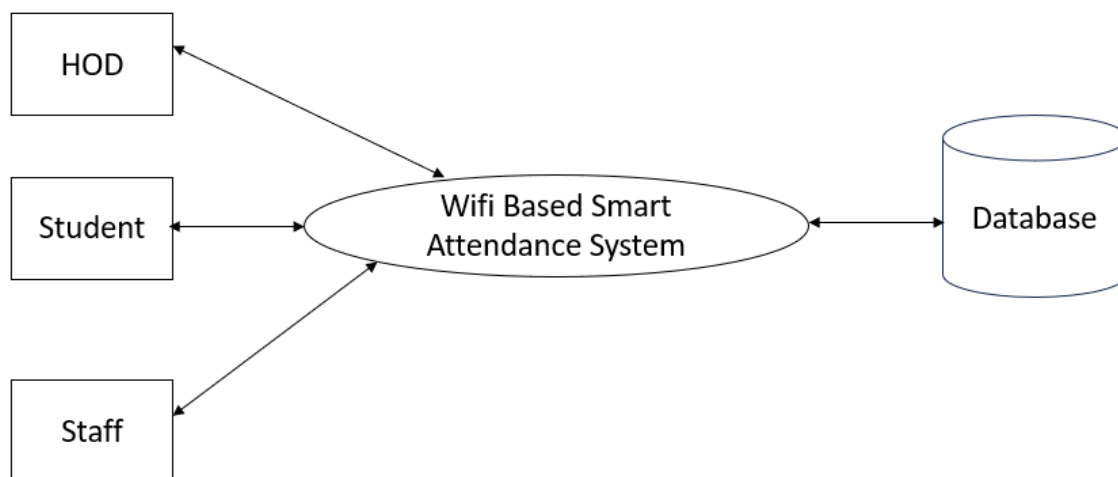


Fig.1. Level 0 Data Flow Diagram.

### IV. SYSTEM MODEL

This method facilitates supervision of both staff and students and is more time-efficient compared to conventional attendance monitoring. This research proposes an innovative artificial intelligence (AI) system that utilizes the Wi-Fi signal to autonomously detect the presence or absence of staff members in educational institutions.

Prior to recording their attendance, employees must select the Wi-Fi network of the department. Subsequently, the attendance is stored in the database. Both students and staff have multiple options available to them for carrying out various tasks, as depicted in Figures 2 and 3. Upon their arrival on campus, staff members can access and review the attendance records they have recorded.

Staff members oversee scholars, while administrators oversee staff members. Only the scholars have access to the documented attendance of the staff. Staff members may only access the application over the college Wi-Fi, while students and administrators have the option to use their mobile data to view and manage their functions. Even in the absence of Wi-Fi access, personnel can utilize location services to log their attendance. Figure 4 displays the block diagram of the proposed attendance monitoring system.

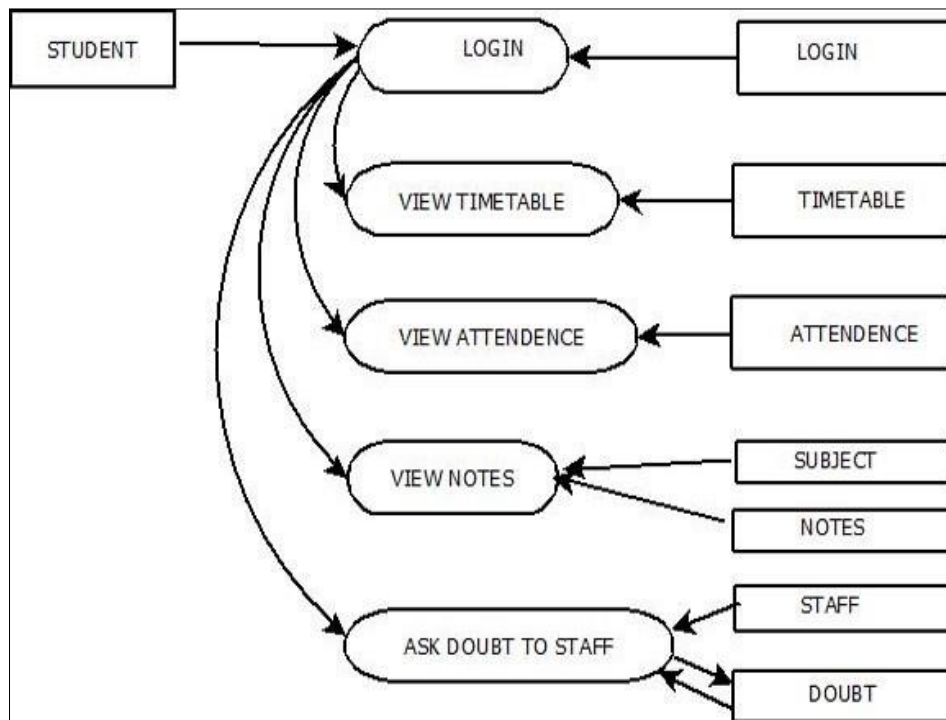


Fig.2. Level 1 Operations.

## V. RESULTS AND DISCUSSION

The Android app was developed as an ideal substitute for the manual process of recording staff or employee attendance in their workspace, which involves physically punching in with their fingers. Due to their hectic schedules, individuals may neglect to document their attendance and only realize this after it is no longer possible, resulting in the system registering their presence on campus as an instance of being absent. The system utilizes the finger punching method to offer a precise means of avoiding physical touch during a pandemic scenario. Due to its limited accessibility within the campus, the Wi-Fi based smart attendance system has the capability to reduce the consumption of mobile data [13].

These items are affordable, easily expandable, portable, and flexible. When a user utilizes a Wi-Fi network to access the internet on their phone, the data consumed is not included in the allocated data limit [14].

Upon launching the program on their cellphones, the staff is immediately presented with the page displaying the IP address of the Wi-Fi network they have connected to. Once the faculty members have correctly entered the IP, they reach the login screen. Personnel are restricted to opening and accessing the application exclusively through the department's Wi-Fi network, as the Wi-Fi's IP address is pre-configured in the database's Wi-Fi table [15].

Staff or faculty members can gain access to an application by entering their login and password. Upon filling out the required information on the login page, the system cross-references the provided data with the database for verification. If all verifications are successful, the user is immediately redirected to the home page of the program.

Upon accessing the home page, the staff will have the capability to view their assigned subject, add and manage students, access timetables, record student attendance, view student attendance, request information, add and manage comments, record staff attendance, view attendance records, and log out. By choosing a tab, employees have the ability to navigate to any page on our website.

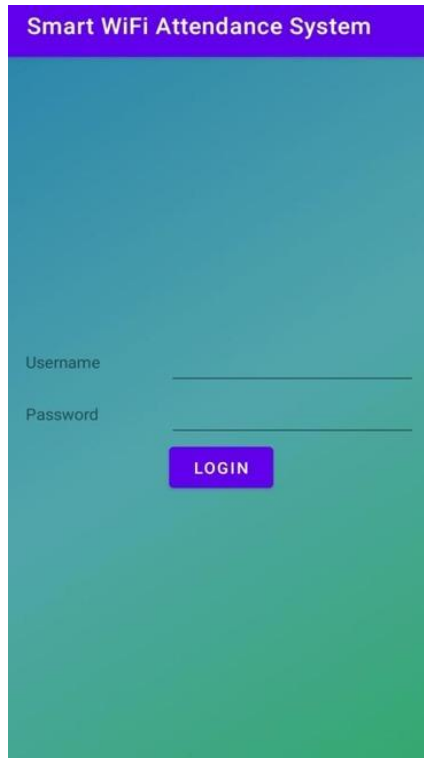


Fig.5. Application login page.

The subjects allocated by the administrator to the personnel are perceptible to the user. Furthermore, his role is limited to supervising pupils and the specific subject he has been assigned to. The administrator is responsible for allocating duties to different personnel. The webpage designated for faculty members to input and oversee student information consists of two sections. Initially, staff members can view the students who have been enrolled in the subject they are responsible for on the primary page. Subsequently, on the subsequent page, staff members have the ability to add a student by supplying essential details such as the student's first and last name, date of birth, phone number, and course particulars.

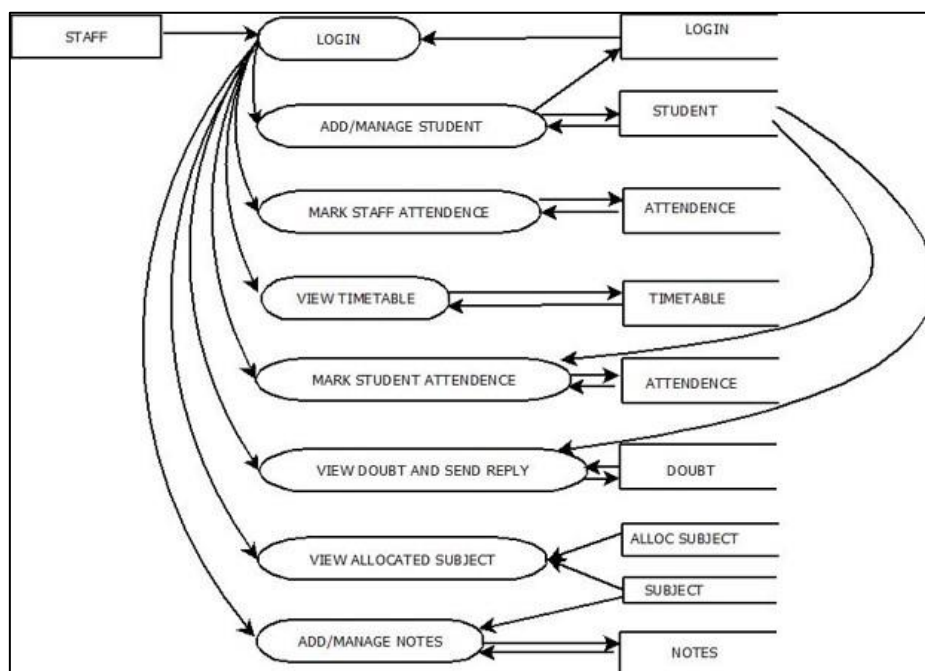


Fig.3. Level 2 Operations

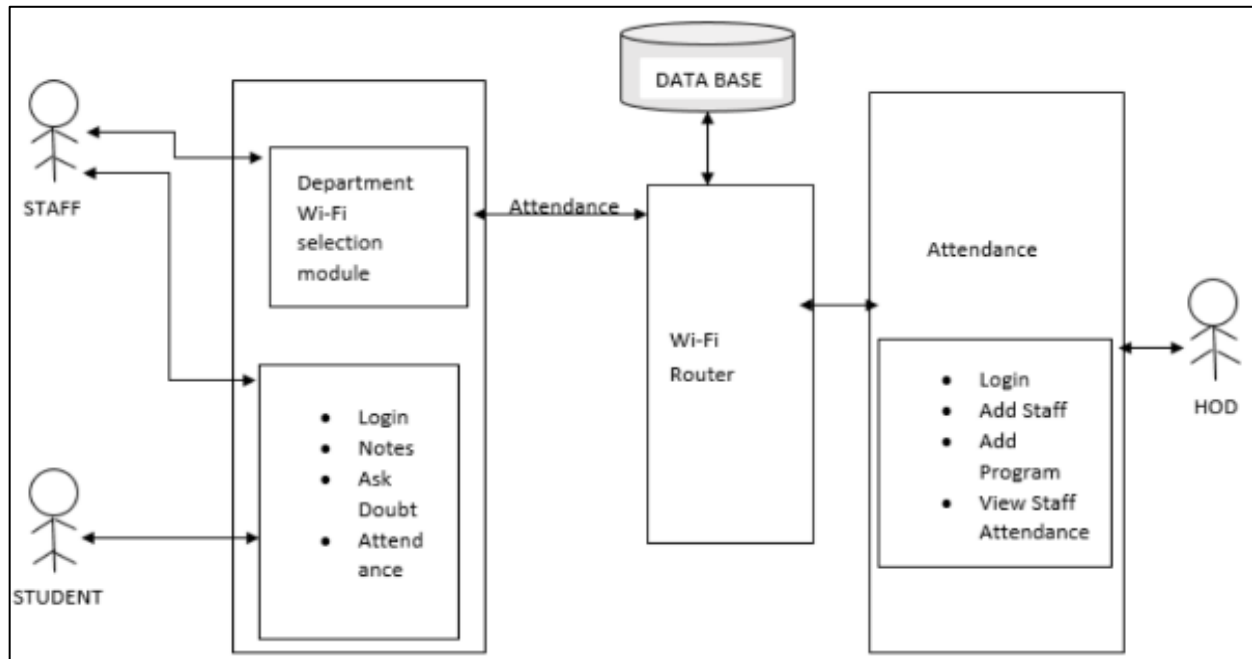


Fig.4. Block diagram of the proposed smart attendance monitoring system

It is possible to view the subjects assigned by the administrator to the personnel. Furthermore, his responsibilities are restricted to overseeing the student population and the designated academic field. The task of assigning topics to different staff is under the purview of the administrator. On the first page of the add and manage students page, the faculty can access a list of the students added for the subject they are assigned to. On the second screen, users have the option to include a student by inputting the necessary facts, such as the student's first and surname name, date of birth, phone number, and course information.

The personnel have access to the admin's designated timetable. Consequently, the staff person can effortlessly access the classroom by utilizing her phone to verify the class schedule she must attend. Staff personnel have the ability to document student attendance for each topic based on the specific time period on the student's record.

Page for recording attendance. To enable staff to view the percentage of attendance achieved by each student on the attendance report page. Students have the ability to inquire of the staff members for each course within the student module. Personnel have the ability to peruse the inquiries that pupils have designated for their consideration on the application inquiry information website. This enables the staff to access the student's name, the substance of the question, and the date when the question was evaluated. Personnel have the ability to contribute to and oversee student-assigned annotations for a certain subject on this website. The file can be in several formats, such as png, jpg, and pdf. Students can see the comments that faculty members have posted on their webpage.

When staff members visit the mark attendance page, they are redirected to the facial recognition website, where they can use their smartphone's camera to take a picture. Their countenance. Upon saving the image from the system, the system proceeds to compare each face in the database. The system plays a voice message stating "Your face has been detected and your attendance has been recorded" when the employee's face matches the photo provided by the administrator during the enrollment process for a certain login and password. Once the staff members record their attendance, they can access the attendance report page to view their monthly attendance percentage.

Face recognition software offers clear advantages compared to other methods of attendance systems, whether they are biometric or non-biometric. Proxy impersonators face challenges while attempting to accurately reproduce the unique facial characteristics possessed by each individual. Consequently, a facial recognition algorithm is a crucial component of such a system [16]. Experts categorize these algorithms into two main categories: statistical photometric techniques, which retrieve values from photographs, and geometric methods, which focus on identifying facial characteristics. The accurate identification and validation of individuals in face-based attendance systems heavily relies on these algorithms.



The device sends a notification to the personnel's smartphones in the form of a pop-up message, reminding them to confirm their attendance, ten minutes before the scheduled time if they have not done so. Consequently, it is exceedingly advantageous for colleagues who, due to their hectic schedules, neglect to declare their presence. When comparing this to the punching mechanism, the application may derive advantages from it.

Upon inputting the correct IP address, the personnel will be presented with a login screen. At this point, users will need to input the username and password given by the administrator. Upon successful authentication, the system will fetch the corresponding data from the database and present the user with the home page. In order to indicate their presence at the institution, staff members are required to select the "mark attendance" button on the home page and subsequently proceed with the required procedures. Our main objective with this implementation is to record staff attendance, while the home page also offers several additional services.

To document their presence, an employee is required to utilize the facial recognition technique. In order to accomplish this, individuals are required to capture a photograph of themselves, which the system utilizes to conduct a comparison with all the facial images stored in the database. Provided that the image corresponds to the confirmed employee's identity and password, the system will log the employee's attendance. Upon marking the attendance, the personnel can review their monthly attendance percentage.

The administrator can access the staff members' recorded attendance on the administrative webpage using the android application. This strategy offers administrator's additional advantages compared to a punching system, where they are required to maintain records in the key departments. The attendance report allows the administrator to access the staff's total number of days present, which is crucial for calculating their attendance and salary. The program sends a pop-up notification to the staff member's mobile phone ten minutes before the scheduled time if they fail to declare their attendance. Thus, it is exceedingly advantageous for faculty members who, due to their hectic schedules, inadvertently neglect to notify their presence. When comparing the program to the punching system, this feature provides an advantage. The communication sent after the attendance marking can be observed in Figure 6.

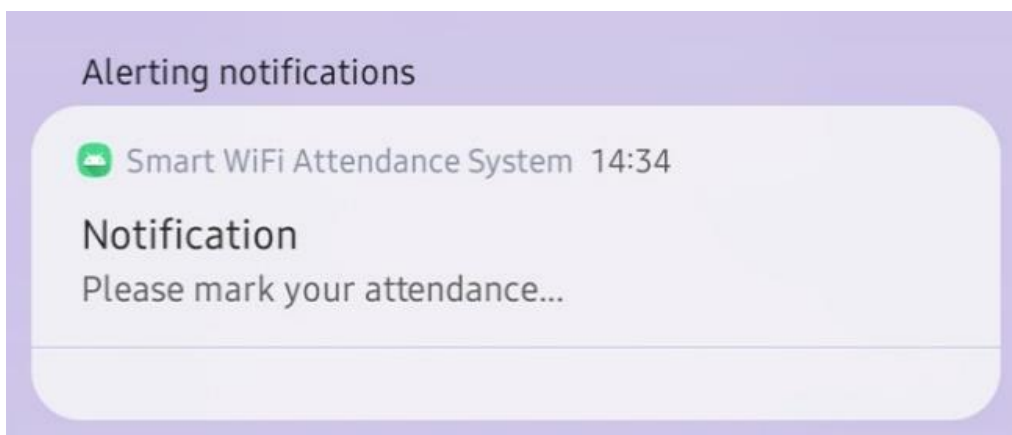


Fig.6. Notification to mark attendance

One of the drawbacks of the Wi-Fi based smart attendance system [17] is the occurrence of slow Wi-Fi network, which affects its functionality. Additionally, we have offered a solution: employees can use the mobile data on their phones to access the GPS and identify their presence. The longitude and latitude of the department's location are already included in the location table of the database. This enables employees to record their attendance when they are present in that particular area.

## VI. FUTURE WORK

Wi-Fi based smart attendance tracking systems employ facial recognition technology to enhance system security. Nevertheless, the inclusion of more staff members (users) in the database results in a prolonged duration for the facial recognition system to analyze each face in the system. Consequently, staff members are compelled to wait until all faces have been compared before they may record their attendance. Hence, further investigation into one of the limitations of the system is necessary. This mechanism is exclusively accessible to users of iOS and Android. Within this attendance tracking system, this can confer a significant advantage.

**VII. CONCLUSION**

In modern times, mobile phones have become an integral part of people's everyday lives and actions. The proposal suggests implementing an automated system to monitor staff attendance, utilizing technical components included in educational infrastructure and the user's smartphone, with the aim of managing class time, weariness, and labor effectively.

The demonstration showcases the utilization of facial recognition, campus Wi-Fi, and a smartphone for attendance verification. Implementing the recommended approach enables efficient time management by altering the procedure for monitoring employee presence. The outcome is a transformation, as novel technologies are created by deviating from the advancements of prior generations.

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