

Network Based Smart Attendance System for Students

Akshar Vadwala

Computer Engineering Department, Madhuben and Bhanubhai Patel Institute of Technology, CVM University, Vallabh Vidyanagar, Gujarat, India
E-mail: aksharvadwala@gmail.com

Abstract - In the era of rapidly advancing technology, an effective and reliable attendance monitoring system is quite vital within the learning environment. The conventional attendance monitoring strategies are not only laborious and time-consuming; they also result in mistakes made by humans and proxy attendance. With the mobile phone, which is easily accessible, a better way for attendance management can be achieved. This paper proposes a Network-Based Smart Attendance System, wherein students' mobile devices and the institutional Wi-Fi or local network can be used to facilitate the attendance process. In this digital solution, cases of attendance by proxy and errors in recording will fall drastically. More importantly, the record-keeping is burdensome to the faculty, which can be reduced, making the attendance system manageable and efficient to handle. Additionally, this solution could be integrated with machine learning, IoT devices, and NFC technology to further enhance its functionality and effectiveness. In this paper, a design of the system along with its implementation will be presented that details how it can improve the entire attendance management procedure in an educational institution.

Keywords: Technology, Smart Attendance System, Network, Wi-Fi, Machine Learning, IoT, NFC.

I. INTRODUCTION

Modern higher education institutions face the problem of effective control and management of student attendance. Traditional methods of attendance tracking often prove to be unreliable, time-consuming, and prone to errors; this causes significant problems in administration. Innovative approaches have been designed to reduce these difficulties, including those based on biometric identification, Internet of Things solutions, and Radio Frequency Identification technology [1][2][3]. The further increased access to the internet and Wi-Fi automatically facilitates the widespread use of mobile devices among the students, with nearly every college student owning a smartphone that can facilitate attendance tracking.

This paper proposes a software-based attendance system comprising two user-friendly dashboards—one for faculty and one for students. At the start of every lecture, the lecturer generates a random alphanumeric code which is valid for a

specified duration. Students enter this code into their dashboard, automatically marking their attendance for that subject and instructor. Such a digital component can be easily integrated into a college's private intranet, therefore safeguarding privacy while creating an active learning environment with better accuracy in attendance.

II. LITERATURE SURVEY

The developments of the different technologies led to the invention of the different effective digital attendance systems. For example, some technologies like the biometric give a high accuracy by using the fingerprint identification as said by Patil et al. [4] and Mekala V et al. [5]; these solutions can be very expensive because it requires several IoT devices like scanners and cameras. In contrast, Bhalla V et al. [6] focused on systems based on Bluetooth that relied upon the interfacing with developed RFID technology; therefore, they needed supplementary complementary elements in the form of BLE range extension modules and RFID readers [13-15].

A more straightforward and accessible solution for attendance tracking is the use of Wi-Fi, which is typically available throughout educational campuses. There is a work done by Choi et al. [7] showing the token-based approach to detecting users near the person who was recording the attendance. This had shown Wi-Fi as a proper medium for efficient attendance tracking. Ramakrishnan et al. [8] also utilized wi-fi with the location. This research presents an attendance management system that utilizes face recognition technology and campus Wi-Fi, allowing staff to check in via a smartphone. While attendance marking requires Wi-Fi connectivity, the system incorporates a location-based feature for marking attendance when Wi-Fi is unavailable.

Additionally, an AI-based attendance system has been developed by Narzullaev et al. [9] and is fully automated to discern the presence of a student using Wi-Fi signal information from the student's smartphone. For installed extra devices, the elimination needs have hence achieved an excellent accuracy up to 95% through the Logistic Regression algorithm. Based on the matching AP ratio, RSSI difference, and beacon RSSI difference, an extracted feature set will depend on the dataset of the wireless signals. Similarly, Anand

et al. [10] used the k-NN algorithm for student positioning, achieving an accuracy of up to 94%.

Hasan et al. [12] developed a BSSID-based Monitoring Class Attendance System using Wi-Fi, which involved creating three applications for administrators, faculty, and students, like our approach.

III. METHODOLOGY

The proposed system in this paper is easily accessible, as the web application is hosted on the college's local Wi-Fi, making it operating system independent. Furthermore, it provides convenient management for faculty members, as it includes functions for making alterations and updates.

A. System Workflow

The design and development of the attendance management application involve several critical features that help in achieving real-time monitoring of attendance effectively and securely. Initially, faculty members initiate an attendance session through a user-friendly interface, selecting a time frame of 30, 45, or 60 seconds for students to submit their attendance codes. When a session is opened, the system will generate a unique alpha-numeric attendance code that will appear on the faculty dashboard. After that, students log into their dashboards and enter the code provided within the time available, hence encouraging timely participation. The application verifies the submitted codes against the generated one, marking attendance instantly for those who match.

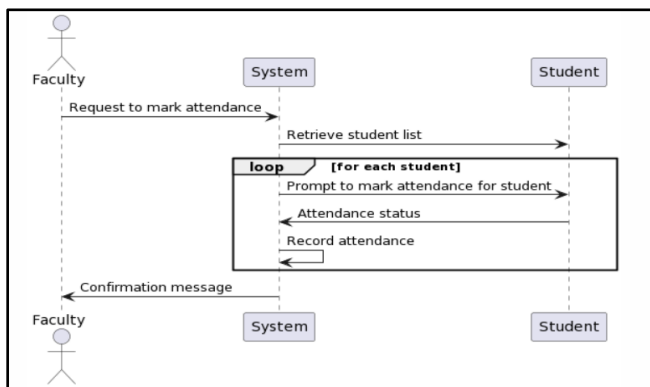


Figure 1: Sequence diagram showing the system behaviour

All attendance records, including student IDs and timestamps, are securely stored in a centralized database for easy retrieval and reporting. Security measures, such as user authentication and session management, are implemented to prevent unauthorized access, ensuring that only registered students can submit codes. Besides, after the session, participants can leave feedback which includes issuing information on attendance and participation to assist in designing better upcoming sessions.

B. System Architecture

The system has three distinct interfaces meant for the administrator, faculty, and students. The academic interface provides for timetables, class management, subject management, or even user registries. Through the dashboard, the faculty will be able to create attendance sessions or update the records of the student. In the student interface, one shall pick the subject then the enrolment number and the submission of the respective attendance code.

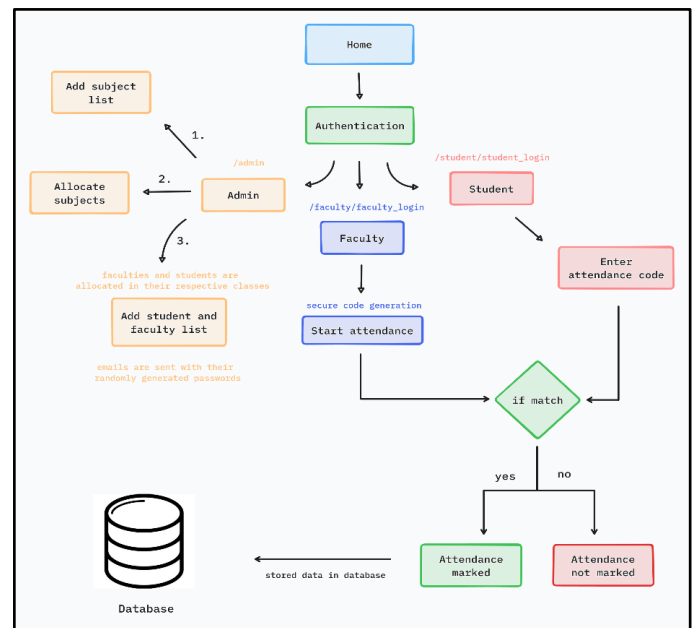


Figure 2: Proposed Model

The flowchart depicts the architecture and sequence of operations of the Attendance Management System for an educational institution. Starting from the top is a "Home" page, which serves as the entry point for every user. Next, an "Authentication" stage branches into three levels of users: Admin, Faculty, and Student. Each has its way of entering the system through their respective login pages. Then faculty and student can complete the attendance process. Every detail is logged on to the server and records are stored in the respective databases. The chart delineates the interactions among various user roles within the system and provides an outline of the attendance verification process, thereby presenting a comprehensive overview of the complete attendance management workflow.

C. Implementation

In this phase, the design is transformed into a fully functional system. The web application is developed using Python and Flask for the backend, while the frontend utilizes HTML, CSS, Bootstrap, and JavaScript for a responsive user interface which is optimized for computer and mobile phones.

MySQL is employed as the database management system to efficiently store and retrieve data. The system utilizes two distinct databases: "wifiattendance" for user account management and "attendance_details" for storing attendance records, which will be dynamically created when the admin adds the data from the dashboard.

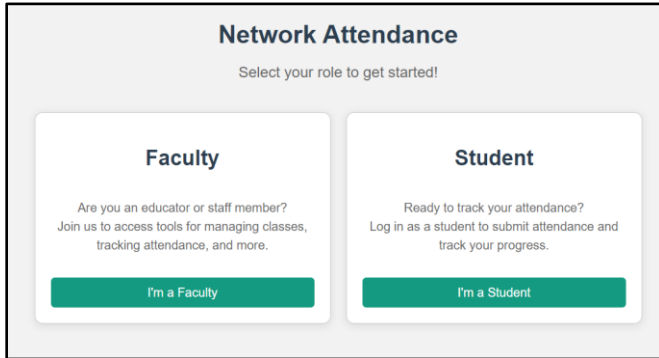


Figure 3: Home page (Choose role)

The admin dashboard features three main sections for managing timetables, faculty, and students. Additionally, when a subject is assigned to a faculty member or a student is added to a class, their accounts are automatically created and are notified by an email.

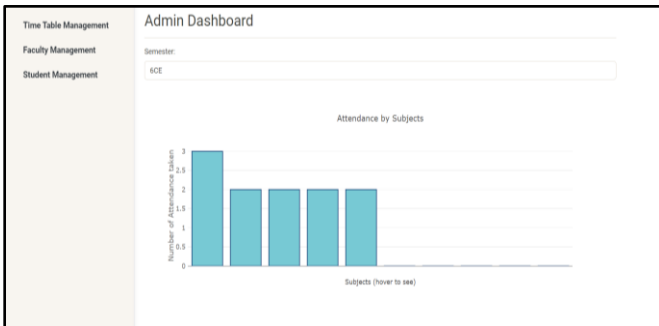


Figure 4: Admin Dashboard

The admin is required to input subject details using the provided form. After submission, sections and classes are automatically created, generating attendance record tables in the database for each entered class.

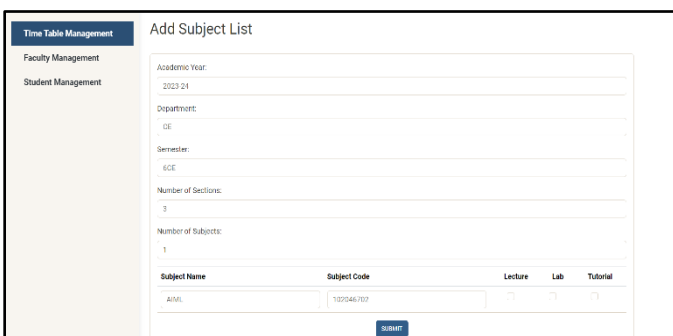


Figure 5: Admin Feature (Add subjects)

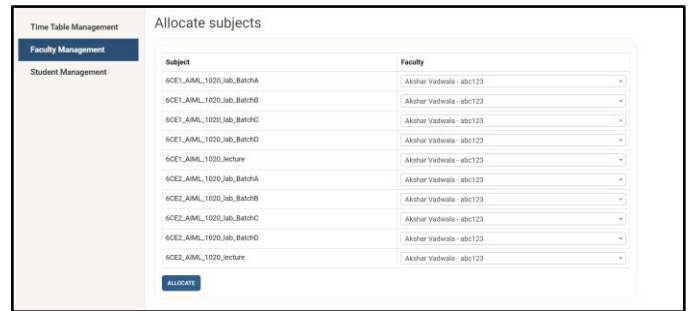


Figure 6: Admin Feature (Allocate subject to faculties)

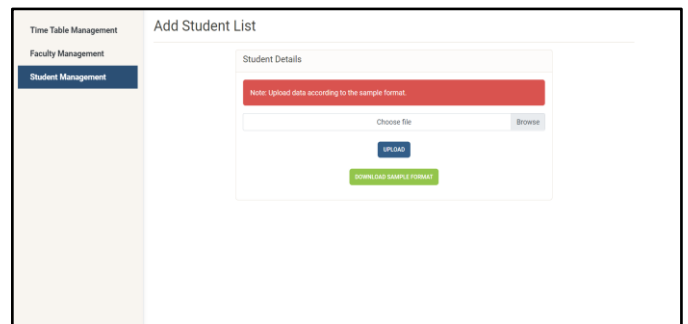


Figure 7: Admin Feature (Add Student list)

The faculty panel includes features for setting attendance information and initiating attendance sessions. There is also a settings menu that involves updating the records of attendance and downloading filtered spreadsheets. Faculty members are required to enter the date, specify the session time (not compulsory), and select the relevant subject. When the attendance session is started, it will generate an alphanumeric code that may serve as an attendance identifier of the lecture.

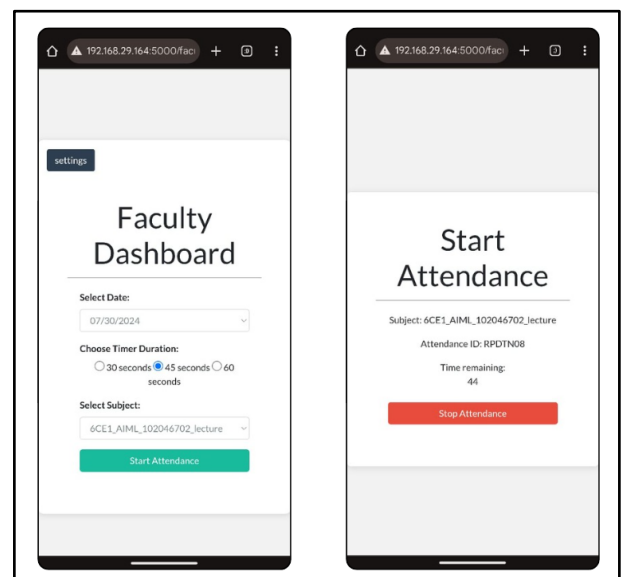


Figure 8: Faculty's Panel

On the student panel, students must enter the subject name, their enrolment number (authenticated by the session), and the attendance ID provided by the faculty.

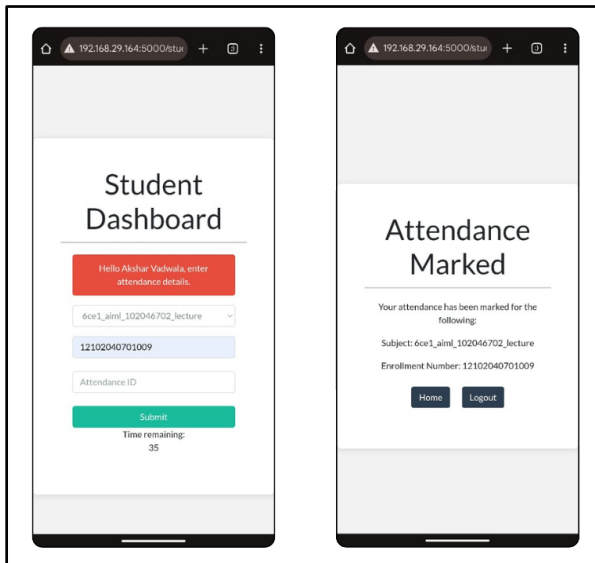


Figure 9: Student's Panel

When the corresponding ID is entered within the specified time, it is validated on the server side, and the student's attendance is recorded. Faculty can then instantly download the lecture's attendance spreadsheet.

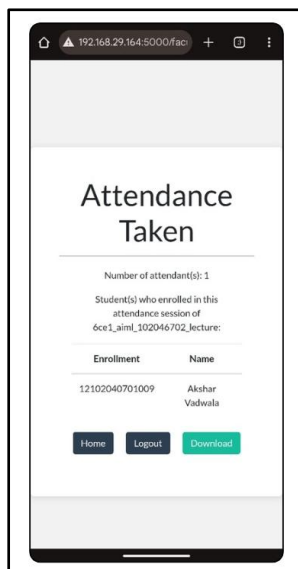


Figure 10: Attendance Sheet Download

This technique simplifies record management by minimizing the steps required to take attendance. With the specified session timing, attendance can be completed quickly and efficiently. Even if the time field is left empty, attendance can still be recorded within few minutes accurately.

IV. RESULTS

The results of this research indicate that the attendance system achieves high accuracy with minimal effort. The device efficiently logs the attendance of 15–20 students every session when tested under a 60-second time limit. In larger

classes of 40-50 students, attendance can be accurately recorded without a time constraint. Scalability can be ensured only if there is appropriate Wi-Fi bandwidth and a sufficient capacity of the servers to handle hundreds and thousands of transactions per hour. It is important to note that the current system is susceptible to cheating, as it does not verify the physical presence of students in the classroom. This limitation can be overcome when geolocation is incorporated; then the approach will be to that followed by Taju et al. [11], where the system is more dependable and sustainable.

V. CONCLUSION AND FUTURE WORK

In this study, we proposed and implemented a network-based digital attendance system for students in educational institutions. This system reduces the hours, paper consumption, and labour by the faculties and administration in handling attendance. By simply verifying the attendance ID within a specified time frame, taking attendance becomes a streamlined process. Attendance data is securely stored and easily managed, allowing faculty to view and modify records from their designated dashboards. The solution also makes it possible to manage timetables digitally and integrate student details straight from spreadsheets into the database, which reduces administrative workloads.

Looking ahead, we plan to enhance the system by integrating geofencing and machine learning algorithms to accurately trace student locations. Such development would bring out whether the student is in class or seated elsewhere. In short, our aim is to establish an attendance system that is sure, secure, and smart, whose use can be confidently engaged both by a teacher and the students themselves.

REFERENCES

- [1] Abdalkarim, B. A. A., & Akgün, D. (2022). A Literature Review on Smart Attendance Systems.
- [2] Samaddar, R., Ghosh, A., Sarkar, S. D., Das, M., & Chakrabarty, A. (2023). IoT & cloud-based smart attendance management system using RFID. *International Research Journal on Advanced Science Hub*, 5(3), (pp. 111-118).
- [3] Adjhi, D. P., Hanafi, M. R., Nanditama, R. W., Alamsya, R., Fahriza, H. R., & Adiwilaga, A. (2023). Teacher and Student Attendance System at Noor Faqih Usman Foundation Based on RFID Integrated with Raspberry Pi. *Journal of Computer Engineering, Electronics and Information Technology*, 2(2), (pp. 111-122).
- [4] Patil, A., Mahla, A., & Sonawane, S. (2017). IoT based attendance system, *International Research Journal of Engineering and Technology (IRJET)*, 4(2), (pp. 2395-0056).

- [5] Mekala, V., Vinod, V. M., Manimegalai, M., & Nandhini, K. (2019). Face recognition-based attendance system, *International Journal of Innovative Technology and Exploring Engineering*, 8(12), (pp. 520-525).
- [6] Bhalla, V., Singla, T., Gahlot, A., & Gupta, V. (2013). Bluetooth based attendance management system, *International Journal of Innovations in Engineering and Technology (IJIET)*, 3(1), (pp. 227-233).
- [7] Choi, M., Park, J. H., & Yi, G. (2015). Attendance check system and implementation for Wi-Fi networks supporting unlimited number of concurrent connections, *International Journal of Distributed Sensor Networks*, 11(7), (pp. 508698).
- [8] Ramakrishnan, N., Ajil, A., Ali, A., & Sanju, V. (2023, November). Wi-Fi Based Smart Attendance Monitoring System. In *2023 7th International Conference on Computation System and Information Technology for Sustainable Solutions (CSITSS)* (pp. 1-6). IEEE.
- [9] Narzullaev, A., Muminov, Z., & Narzullaev, M. (2021). Wi-Fi based student attendance recording system using logistic regression classification algorithm, In *AIP Conference Proceedings* (Vol. 2365, No. 1). AIP Publishing. <https://doi.org/10.1063/5.0057464>.
- [10] Anand, S., Bijlani, K., Suresh, S., & Praphul, P. (2016). Attendance monitoring in classroom using smartphone & Wi-Fi fingerprinting, In *2016 IEEE Eighth International Conference on Technology for Education (T4E)*, (pp. 62-67). IEEE.
- [11] Taju, S. W., Mamahit, Y. P., & Pongantung, J. A. (2024). Implementing QR code and Geolocation Technologies for the Student Attendance System. *CogITo Smart Journal*, 10(1), (pp. 221-232).
- [12] Hasan, M., Saha, D., Ferdosh, J., Nur, F. N., Moon, N. N., & Saifuzzaman, M. (2019, December). Bssid based monitoring class attendance system using wifi. In *2019 Third International conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud)(I-SMAC)* (pp. 243-248). IEEE.
- [13] Puckdeevongs, A., Tripathi, N. K., Witayangkum, A., & Saengudomlert, P. (2020). Classroom attendance systems based on Bluetooth low energy indoor positioning technology for smart campus, *Information*, 11(6), (pp. 329).
- [14] Wijaya, R., Kristianto, S., Hasibuan, Y. B., & Alexander, I. (2022, October). Contactless Student Attendance System Using BLE Technology, QR-Code, and Android. In *Conference on Innovative Technologies in Intelligent Systems and Industrial Applications* (pp. 527-537). Cham: Springer Nature Switzerland.
- [15] Chew, C. B., Mahinderjit-Singh, M., Wei, K. C., Sheng, T. W., Husin, M. H., & Malim, N. H. A. H. (2015). Sensors-enabled smart attendance systems using NFC and RFID technologies, *Int. J. New Comput. Archit. Appl*, 5, (pp. 19-29).

Citation of this Article:

Akshar Vadwala. (2024). Network Based Smart Attendance System for Students. *International Research Journal of Innovations in Engineering and Technology - IRJIET*, 8(8), 287-291. Article DOI <https://doi.org/10.47001/IRJIET/2024.808035>
