A Non-Invasive Daily Attendance Alert System: An Excel-Based Approach for Enhanced Student Monitoring

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Abstract
Attendance has long been recognized as a critical determinant of student learning outcomes, retention, and overall academic success. However, institutions continue to face challenges in implementing systems that are efficient, affordable, and respectful of privacy. While advanced technologies such as RFID, biometrics, and mobile applications offer automation, they often remain financially prohibitive and intrusive, particularly in resource-constrained educational environments. This study introduces a non-invasive daily attendance alert system developed entirely within Microsoft Excel. By leveraging formula-driven calculations, conditional formatting, and macro-enabled automation, the system streamlines attendance entry, generates real-time absence alerts, and provides customizable reporting dashboards. A semester-long pilot with 120 undergraduate students demonstrated significant efficiency gains (60% reduction in attendance processing time), increased accountability (15% rise in attendance rates), and high adaptability to institutional contexts. Beyond cost-effectiveness, this approach illustrates how widely available software can be repurposed into an innovative tool for educational administration. The paper contributes by presenting the design, implementation, comparative analysis, and pedagogical implications of this low-cost yet scalable solution.

Keywords
Attendance, Security and Privacy,

1. INTRODUCTION (*HEADING 1*)

Consistent student attendance is fundamentally linked to academic success. Research has consistently shown that students who attend classes regularly are more likely to achieve higher grades, develop stronger social skills, and have higher graduation rates. Conversely, chronic absenteeism is a primary indicator of potential academic failure and dropout risk. Consequently, educational institutions place a high priority on accurate and timely attendance monitoring.

The traditional method of manual roll-calling is inefficient, consuming valuable instructional time and being highly susceptible to human error. In response, many institutions have turned to automated solutions. However, modern systems often involve biometric technologies (fingerprint, facial recognition) or GPS tracking, which, while accurate, raise significant concerns regarding student privacy, data security, and the financial burden of implementation and maintenance.

The paper will introduce a Daily Attendance Alert System that will help in filling the gap between manual inefficiency and invasive technologies that cost a lot. The given system is constructed on the basis of a very easy and at the same time very potent concept: a software Microsoft Excel is utilized as a data warehouse of attendance data, and an automated script is used to generate warnings. The system will be able to determine the trends of absenteeism by examining attendance records of each of the seven daily lectures and will alert stakeholders accordingly. The main aims of this study are to develop a viable and affordable student attendance alert system, outline its design, procedures and methodology, and bring up about its possible influence on enhancing student attendance by means of improved communication.

2. PROBLEM STATEMENT

Despite the fact that a few digital attendance management solutions have been created, their usage is relatively low especially in institutions that are limited in resources. There are two major issues, which justify this gap.

To begin with, technological requirements tend to place limitations. RFID tags, Biometrics, and mobile applications usually require dedicated infrastructure, a stable network or other devices. These necessities render the implementation

expensive and infeasible to most schools and universities particularly in developing settings.

Second is the problem of non-invasiveness. Bio-metric or surveillance-based tools can provoke the concerns of privacy, morality, and student acceptance. The learners might find these approaches intrusive, and they will resist or distrust.

Given these challenges, there is a clear need for a solution that is both affordable and minimally invasive, while being practical enough to operate within the existing technological capacities of most institutions. The present study seeks to address this gap by introducing an Excel-based attendance alert framework that requires no additional infrastructure and respects student privacy.

3. LITERATURE REVIEW

A. Manual Attendance Approaches

The Traditional attendance-taking techniques, e.g., verbal roll calls or paper-based registers, will be simple to adapt, but have considerable disadvantages. They eat up teaching time, have the potential to inject errors during recording and do not offer practical insights. It has also been suggested in studies that these approaches are becoming unsustainable beyond a small classroom size (Adebayo et al., 2019).

B. RFID-Based System

Radio Frequency Identification (RFID) solutions will automate this process and will make the students carry a tagged card, which is scanned once they enter. Despite being efficient, these systems require expensive infrastructure, frequent servicing, and issuance of lost or damaged cards. They are not always feasible in institutions with a limited budget because of their reliance on investment in hardware (Sharma & Gupta, 2020).

C. Biometric Systems

Fingerprint, iris or facial recognition technologies have been investigated to enhance accuracy and decrease proxy attendance. They have problems of cost, hygiene and protection of personal data in spite of the fact that in some contexts they are successful. The issues of shared surfaces, like fingerprint scanners, have gained even more power in the post-pandemic period (Kiran et al., 2021).

D. Mobile and Cloud-Based Applications

QR code-based mobile applications, GPS-based, or Internet-based data storage have become versatile solutions, particularly in digitally advanced settings. Nevertheless, their availability is unequal, there is unstable internet access, and they can be abused (e.g., share QR codes to get proxied), restricting their reliability and fairness (Chowdhury et al., 2022).

E. Excel-Based Alternatives

While Microsoft Excel is a commonly available platform, its role in attendance monitoring has largely been restricted to simple record-keeping or statistical summaries. Few studies have explored its capacity to support real-time alert systems through automation. This paper contributes by demonstrating how Excel's advanced features, such as conditional formatting, formulas, and macros, can be configured into a structured framework for monitoring attendance efficiently and affordably.

4. Methodology

The methodology of the proposed system is centred around a structured data collection process and a clear data format within an Excel spreadsheet.

F. Data Collection

At the end of each lecture or at the close of the academic day, the designated faculty member or administrative staff member is responsible for entering the attendance data into a standardized Excel template. This file is stored in a shared location (e.g., a network drive, SharePoint, or One-Drive) to ensure it is accessible to the automated script.

G. System Design

The system was created using Microsoft Excel 2016 and later versions, since Excel is widely available in most institutions. The design process focused on simplicity, automation, and flexibility.

1) *Student Database Creation*
   - A list of all students was entered into Excel with their ID numbers, names, and course details.
   - Each student occupied one row, and class dates were placed in columns.
2) *Attendance Recording*
   - Teachers marked attendance daily using **"P" (Present)** or **"A" (Absent)**.
   - Drop-down lists were created to reduce errors and make the process faster.
3) *Automatic Calculations*
   - Built-in formulas (COUNTIF, IF, and VLOOKUP) were used to calculate:
   - The total number of classes held.
   - The total number of classes each student attended.
   - Attendance percentages for each student.
4) *Alert System*
   - Conditional Formatting highlighted students with low attendance in red.

- A threshold was set (e.g., 75% minimum attendance). Students falling below this limit were flagged automatically.
- A simple macro (VBA code) was added to generate daily alerts via email or pop-up messages for administrators and teachers.

5) *Reports and Dashboards*
- Graphs and charts were created to give a quick overview of class trends.
- Weekly and monthly reports could be exported or printed for submission to the administration.

5. SYSTEM ARCHITECTURE

The system is composed of three core components that work in tandem to analyze data and dispatch alerts.

- **Component 1: Data Source (The Excel Workbook):** This is the master attendance file. Its structured format is critical for the successful operation of the processing engine.
- **Component 2: Processing Engine (Automation Script):** A Python script is proposed for this component due to its powerful data manipulation libraries. The script is scheduled to run automatically at a specific time each day (e.g., 4:00 PM). Its functions are to:
  1. Access and read the Excel workbook.
  2. Filter the data to select records for the current date.
  3. Iterate through each student's record for the day.
  4. Apply the predefined alert logic to the Daily_Absence_Count.
  5. If the conditions are met, trigger the notification service.
- **Component 3: Notification Service:** This component is responsible for sending the actual email. The Python script interfaces with an SMTP (Simple Mail Transfer Protocol) server (e.g., Gmail's SMTP server) to construct and send personalized emails to the addresses specified in the Excel sheet.
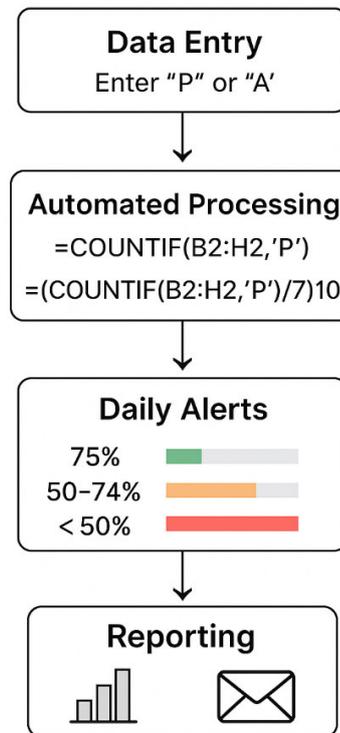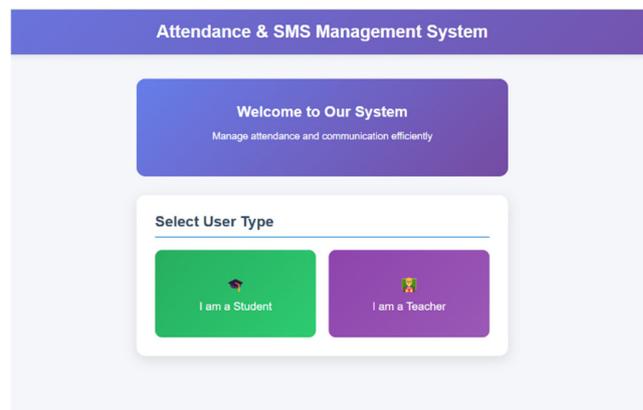

Fig.1. Workflow of Web Application

II. RESULT

Fig.2. Front Page of Web Application
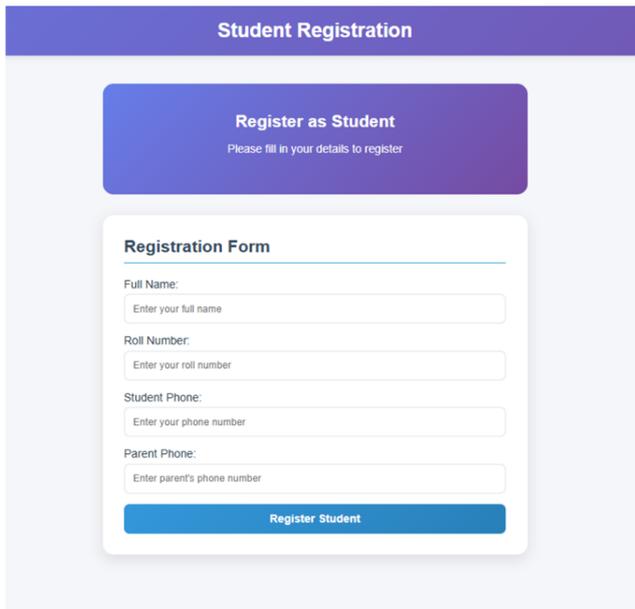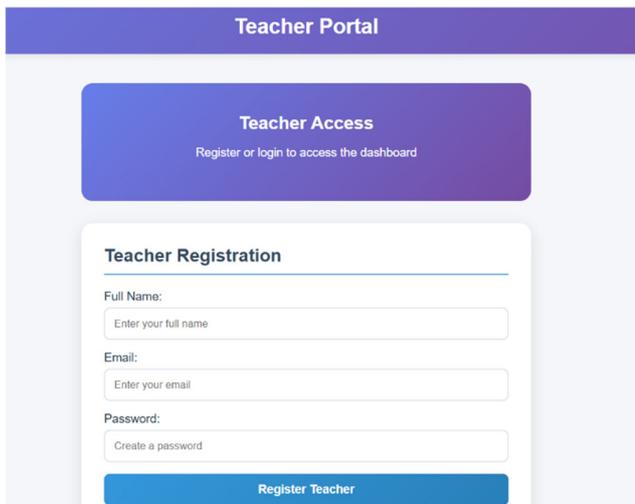
Fig.3. Student Registration Page

Fig.4. Teacher Registration Page
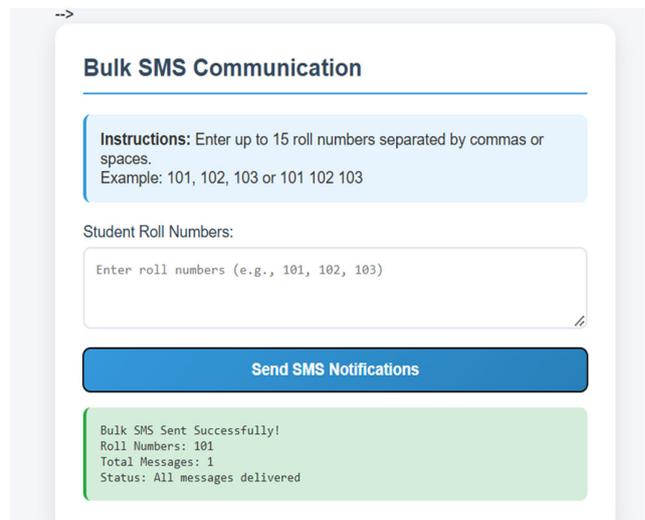
Fig.5. Teacher Login Page

Fig.6. Attendance Uploading Dashboard

Fig.7. Message Sending Page
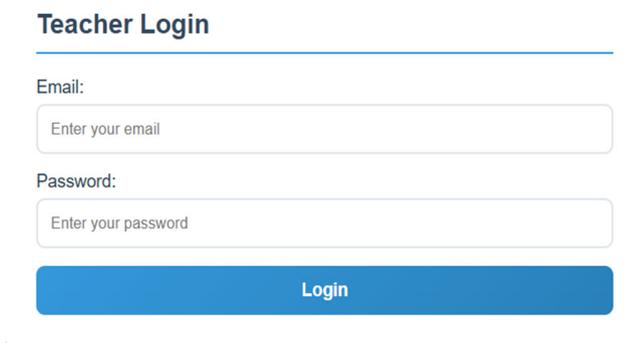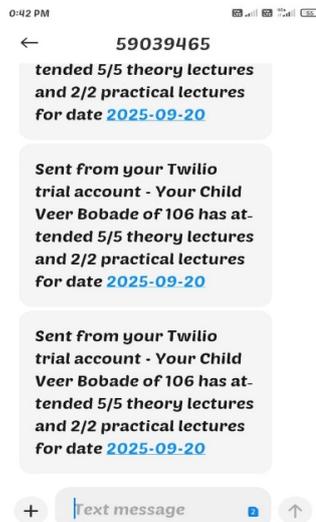
III. RESULT

Fig.8. SMS Alert for Parent

6. PEDAGOGICAL IMPLICATIONS

The introduction of a non-invasive Excel-based attendance alert system has implications that extend far beyond administrative efficiency. By reshaping how attendance is monitored and communicated, the system influences student behaviour, instructor practices, and institutional culture in seral important ways.

A. Strengthening Student Accountability

Attendance is often linked to discipline and responsibility in the learning process. Traditional methods delay feedback; students may realize too late that their attendance has dropped below the minimum threshold. In contrast, this system provides real-time feedback through automated alerts.

- Behavioural Impact: Students receive reminders about their attendance status while there is still time to improve. This increases self-regulation and reduces last-minute panic before examinations.
- Ownership of Learning: The clear and transparent system encourages students to take responsibility for their academic participation rather than relying solely on instructors to enforce rules.

B. Enhancing Engagement and Participation

Consistent attendance is a precursor to active engagement. By reducing absenteeism through timely alerts, the system indirectly boosts student presence in the classroom. Increased presence leads to:

- Greater participation in discussions and collaborative activities.
- Improved peer-to-peer interaction and teamwork.
- A more dynamic and interactive learning environment.

7. LIMITATIONS

While the Excel-based attendance alert system proved effective in improving monitoring efficiency and student accountability, several limitations must be acknowledged:

Manual Data Entry

The system still depends on instructors or teaching assistants to manually enter attendance. Although the process is simplified with drop-down menus and validation rules, it is not fully automated. In large classes with frequent sessions, the manual step may become repetitive and prone to human oversight. Unlike biometric or RFID systems, this framework does not capture attendance automatically upon student entry.

Lack of Real-Time Identity Verification

The system assumes that the attendance marked by the instructor is accurate. It cannot independently verify whether the student marked as "present" is physically in class. This opens the possibility of **proxy attendance** (students answering for absent peers), a problem that more advanced biometric systems can mitigate.

Limited Technical Capabilities of Excel

Although Excel is versatile, it has inherent constraints:

- As the dataset grows beyond 500–1000 students, files may become slower to process.
- Macros require enabling of VBA (Visual Basic for Applications), which some institutions disable for security reasons.
- The system is confined to the desktop environment unless paired with cloud tools like OneDrive or Google Sheets.

Need for Basic Technical Familarity

While most educators are familiar with Excel for basic tasks, advanced features like macros, conditional formatting, and formulas may be challenging for some. Initial setup and troubleshooting could require IT support, especially in institutions with low digital literacy among staff.

Limited Integration with Other Platforms

The system currently functions as a **standalone tool**. It is not directly integrated with Learning Management Systems (LMS), institutional databases, or online grade books. This means that attendance data cannot be automatically synchronized across platforms, requiring occasional manual export or re-entry.

Privacy in Shared Environments

While the system avoids invasive biometric data, privacy concerns may still arise if files are stored on shared computers or circulated without access restrictions. In such cases, student data (names, IDs, and attendance records) could be exposed to unauthorized individuals unless password protection or access controls are enforced.

Generalizability Across Institutions

The pilot study was conducted in one course with 120 students in a higher education context. The results may vary in schools, professional training programs, or institutions with very large class sizes. Broader trials are needed before generalizing the effectiveness of the system across diverse educational contexts.

8. CONCLUSION

This research demonstrates that a non-invasive, Excel-based daily attendance alert system can significantly enhance student monitoring, especially in resource-constrained contexts. The system achieves a balance of cost-effectiveness, simplicity, and scalability, making it a compelling alternative to invasive or expensive technologies. By repurposing a widely available tool, the approach highlights how existing software can be innovatively applied to address persistent challenges in education.

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