

Student Attendance Tracking and Analytics System

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STUDENT ATTENDANCE TRACKING AND ANALYTICS SYSTEM

RESEARCH PROPOSAL

CHENG CHEN

PREFERRED SUPERVISOR: TBC

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Contents

1. Introduction 2

2. Background to the Proposed Research 3

 2.1 Technologies and Trends in Attendance Systems..... 3

 2.2 Analytical and Predictive Dimensions 4

 Research Gap 4

3. Research Problem statement 5

5. Methodology 5

 5.1 Methods..... 5

 5.2 Materials..... 5

6. Project Plan..... 6

References 7

1.Introduction

In higher education, student attendance is a crucial sign of involvement, academic achievement, and institutional performance. Conventional spreadsheet-driven or paper-based approaches to attendance recording are laborious, error-prone, and inefficient. Automating attendance monitoring in contemporary learning environments can greatly increase accuracy, save administrative effort, and yield insightful data about student behaviours and academic engagement [1].

According to recent studies, automated attendance systems that make use of technologies like RFID, facial recognition, or QR codes have improved user comfort and data reliability[2] , [3]. Additionally, analytics of attendance data can help identify at-risk students early on, increasing retention rates and facilitating data-driven interventions [4].

The goal of this project is to provide a simple, safe, and easy-to-use tool for instructors and students to track attendance. Instructors will be able to create attendance sessions, students will be able to digitally record their attendance, and administrators will be able to view statistics like session summaries, attendance rates, and the frequency of tardiness. The project supports academic monitoring systems and increases the effectiveness of educational management by combining automation and analytics.

2. Background to the Proposed Research

An essential part of monitoring student participation and institutional administration is attendance management. Consistent attendance has a strong correlation with increased academic achievement and retention in higher education, according to an expanding body of evidence [11]. Nevertheless, a lot of organizations continue to use manual or semi-digital systems, which are laborious, error-prone, and wasteful [1], [5].

A new breed of intelligent attendance systems that automate record-keeping and offer insightful data on student behaviours has been spurred by the rise of digital transformation, cloud computing, and data analytics [2], [3]. In addition to increasing accuracy, these technologies give schools the ability to spot attendance patterns and take prompt action to boost student achievement.

2.1 Technologies and Trends in Attendance Systems

Numerous technology strategies have been investigated to increase the usability and accuracy of attendance.

One of the most popular and reasonably priced approaches in educational settings is the usage of QR code-based systems. To increase accessibility and data accuracy, recent research has investigated online and cloud-based attendance platforms that integrate databases and QR codes [5]. These systems are still susceptible to problems with network dependencies and sporadic proxy attendance, but [6].

Biometric systems provide better accuracy and fraud resistance, especially those that use facial recognition. Accurate real-time attendance detection has been achieved by the widespread use of recent deep learning techniques, especially CNN-based architectures [8], [14]. However, privacy and ethical issues still exist, particularly when retaining student biometric data [7], [9].

Networked communication and embedded sensors are combined in RFID and IoT-based systems to automatically identify student IDs [3], [9]. Although these systems are more automated, they require specialized infrastructure and technology. Large groups can benefit from RFID techniques, but smaller classrooms might not be able to afford them.

Due to its accessibility and low infrastructure needs, mobile-based and Wi-Fi hybrid solutions are becoming increasingly popular. For contactless and energy-efficient student identification, Wi-Fi-based attendance systems, like those that use Wi-Fi Direct or hotspot verification [7], take advantage of the campus networks already in place. It has also been demonstrated that smartphone apps that combine GPS and NFC can provide accuracy levels that are comparable to RFID systems while requiring less money to deploy [6].

Lastly, the scalability and data integrity of cloud-based attendance technologies have garnered interest [10]. Additionally, current studies show that the quick transition to online learning environments during COVID-19 made it difficult to sustain engagement and attendance [11]. These results highlight the significance of creating systems that facilitate distant and hybrid involvement in addition to recording attendance.

2.2 Analytical and Predictive Dimensions

Modern study highlights the analytical and predictive possibilities of attendance data in addition to automation. Institutions can identify early indicators of disengagement or dropout concerns with the use of learning analytics frameworks [12]. Proactive academic support is made possible by the modelling of relationships between attendance rates and academic outcomes using data mining and machine learning approaches [12], [13].

To infer attendance without explicit user input, some study even looks at ambient data like classroom occupancy and Wi-Fi signal strength [15]. These techniques seek to offer a data-driven, non-intrusive manner of engagement tracking.

Despite these developments, most current systems are devoid of functionalities that integrate visual analytics, predictive insights, and automated collecting into a single, portable package. Many prototypes are proof-of-concept and have not been extensively tested for usability or implemented in actual educational settings [2], [4]. Furthermore, issues with data privacy, interoperability, and the moral application of location or biometric data still exist [8], [9].

Research Gap

Three key gaps are revealed by the literature:

1. Integration Gap: Not many systems combine data visualization, analytical reporting, and attendance recording into a single interface [10], [12].
2. Accessibility Gap: Adoption in small or resource-constrained environments is limited by the fact that existing systems frequently rely on expensive hardware or institution-specific infrastructure. [3], [6].
3. examination Gap: Usability, accuracy, and scalability in real-world scenarios have not received much empirical examination [2], [4], or [7].

To overcome these constraints, the main goal of this project is to create a simple, web-based application for recording and analysing attendance. In addition to incorporating data visualization for trend analysis and user evaluation for usability validation, it will showcase effective, secure attendance tracking.

3. Research Problem statement

Traditional attendance management solutions lack real-time analytical insights and are inefficient. A digital attendance tracking system that is affordable, safe, and expandable is required to streamline record-keeping and give teachers the ability to examine attendance patterns to facilitate prompt academic interventions.

4. Research Aim & Objectives

Aim:

To create and implement an online system for tracking and analyzing attendance that improves accuracy, automates the process, and uses data visualization to assist in educational decision-making.

Objectives:

1. To investigate current attendance management systems and identify existing functional and usability gaps.
2. To design a secure and user-friendly web interface for attendance tracking.
3. To implement the system using suitable front-end and back-end technologies.
4. To integrate analytical tools for reporting attendance rates and engagement statistics.
5. To evaluate the system's usability, performance, and data accuracy through testing and feedback.

5. Methodology

5.1 Methods

The Design Science paradigm serves as the foundation for this project's Development-based Research methodology. Since the Rapid Application Development (RAD) methodology is iterative and appropriate for short academic schedules, it will be used.

The research approach includes developing a prototype and assessing it using usability and functional metrics. Performance testing will gauge response speed and data correctness, while feedback from test takers (lecturers and students) will verify usefulness.

5.2 Materials

- Software tools include Firebase/Node.js with Express or MySQL (backend), React.js or Flutter (frontend), and Power BI or Chart.js for analytics.
- Hardware: A smartphone and a typical laptop.
- Ethical Considerations: To guarantee adherence to privacy and ethical guidelines, only synthetic data will be used during testing.
- Evaluation methods include performance benchmarking, usability testing, and functional testing.

6. Project Plan

Weeks	Task	Milestone
1–3	Writing proposals and conducting literature reviews	Proposal submission
4–6	Analyzing system requirements and designing UI/UX	Design prototype completed
7–11	Create the essential features (data storage, attendance, and login).	Prototype functional
12–14	Combine visualization and analytics	Analytical dashboard ready
15–18	Testing and gathering of comments	Interim Viva
19–24	System documentation and improvement	Final report draft
25	Submission and final viva	Project completion

References

- [1] N. S. Ali, A. H. Alhilali, and M. A. Fadhil, "Automated attendance management systems: Systematic literature review," *International Journal of Technology Enhanced Learning*, vol. 14, no. 2, pp. 187–205, 2022, doi: 10.1504/IJTEL.2022.120559.
- [2] B. A. Abdalkarim and D. Akgün, "A literature review on smart attendance systems," *International Journal of Computer Science and Mobile Computing*, vol. 11, no. 6, pp. 56–63, 2022.
- [3] K. Ishaq and S. Bibi, "IoT based smart attendance system using RFID: A systematic literature review," *arXiv preprint*, arXiv:2308.02591, 2023.
- [4] P. Sharma and R. Gupta, "A review paper on advanced attendance and monitoring systems," *International Journal of Engineering Research and Technology*, vol. 10, no. 7, pp. 554–559, 2021.
- [5] S. Alghamdi, A. Alsulami, and F. Aljohani, "Development of an Online Attendance System Using QR Code and Cloud Database," *International Journal of Computer Science and Mobile Computing*, vol. 12, no. 3, pp. 45–54, 2023.
- [6] T.-W. Chiang, C.-Y. Yang, and G.-J. Chiou, "Development and evaluation of an attendance tracking system using smartphones with GPS and NFC," *Journal of Internet Technology*, vol. 23, no. 5, pp. 987–996, 2022.
- [7] D. S. Pambudi and T. Bariyah, "Student attendance system using Wi-Fi Direct and temporary Wi-Fi hotspot," *Jurnal Ilmu Komputer dan Informasi*, vol. 13, no. 1, pp. 1–8, 2020, doi: 10.21609/jiki.v13i1.750.
- [8] S. Kakarla, P. Gangula, M. S. Rahul, and C. S. Singh, "Smart Attendance Management System Based on Face Recognition Using CNN," in *Proceedings of 2020 IEEE-HYDCON*, Hyderabad, India, 2020, pp. 1–5, doi: 10.1109/HYDCON48903.2020.9242847.
- [9] S. H. V. K. Ashok, N. D. Divya, F. Samuel, and U. Mande, "RFID Based Attendance System," *International Journal of Research in Applied Science and Engineering Technology*, vol. 10, no. 5, pp. 45–52, 2022, doi: 10.22214/ijraset.2022.48092.
- [10] A. Dutta and V. Raj, "A comprehensive and systematic review on employee attendance management systems based on cloud computing," *Journal of Management and Organization*, vol. 29, no. 1, pp. 24–39, 2023, doi: 10.1017/jmo.2022.52.
- [11] K. A. Bird, B. L. Castleman, and M. L. Quach, "Negative impacts from the shift to online learning during COVID-19: Evidence from a college transition program," *AERA Open*, vol. 8, no. 1, pp. 1–15, 2022, doi: 10.1177/23328584221081220.
- [12] S. R. Hussain, F. Hussain, and A. M. Shaikh, "Predicting student performance using data mining and learning analytics," *Applied Sciences*, vol. 11, no. 1, p. 237, 2021, doi: 10.3390/app11010237.

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[13] M. M. Al-Dabbagh, "A Review of Students Attendance Management Systems," *Eurasian Journal of Science and Engineering*, vol. 10, no. 3, pp. 136–145, 2024, doi: 10.23918/eajse.v10i3p13.

[14] A. Rao, "AttenFace: A real-time attendance system using face recognition," *arXiv preprint*, arXiv:2211.07582, 2022.

[15] Z. Zheng, S. Li, and H. Fan, "Classroom Attendance Detection Using a Wi-Fi Positioning Algorithm," in *Proceedings of the 2022 IEEE International Conference on Computer Science and Education (ICCSE)*, Nagoya, Japan, 2022, pp. 1–6, doi: 10.1109/ICCSE.2022.9750047.

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GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

74/100

PROJECT PROPOSAL – ACCA6020 INDEPENDENT PROJECT

Student **CHENG CHEN**____
2305261_____Mark
74_____

Intro / A&O (400 words)		
Project title; Identification of a specific problem to be investigated; Well-defined aims and SMART objectives; Explaining why this project is worth doing; Discussion of what the project needs to do in order to be a success; Description any deliverables that will be produced at the end of the project	20	18
The project's aim is clearly stated, to devise a useful web based attendance monitoring/tracking app to include a statistical analysis tool to provide meaningful real time insights into attendance patterns.		

The project outline has clear aims and SMART objectives indicated by a useful time line of proposed activities, ensuring the final working app is delivered on time as a measurable outcome. The student feels that the current methods of monitoring attendance are a little outdated and cumbersome and do not provide opportunities for meaningful analysis which could be used for timely interventions. The deliverable working app, will be a better more enhanced attendance tracking app to provide improved attendance monitoring, and to provide insight into attendance patterns leading to notified timely interventions if necessary.		
Background to the Project / Literature Review (400 words)		
Description of how the work to be done by in the project relates to the work identified in the literature review; Discussion of any ethical issues raised by the project Identifying what has already been done within the field; Topic familiarity; Brief literature review	20	17

using appropriate sources – 6-8 journal papers and book chapters rather than just websites; Selection of relevant models & concepts The student has taken time to review some the current strategies for attendance tracking and monitoring in terms of cost, availability and functionality and other perspectives. Relevant journal articles are cited as well as other sources. A brief outline of the methodology and functionality of each attendance monitoring system currently utilised is commented upon along with their strengths and weaknesses in terms of cost, ease of use, security etc. Gaps in current attendance monitoring strategies are highlighted and used as the basis for this project. Ethical issues are briefly highlighted and addressed in terms of data security, sensitivity and compliance with current legislation.		
Project Design (500 words)		
Clear statement of which development methods are to be used and why they are appropriate; Clear statement of which tools are to be used and why they are appropriate; Clear description of how data collected will be analysed	30	13

The project's aims and objectives are clearly stated along with gaps in currently used attendance monitoring applications which are used to postulate a better enhanced attendance tracking tool, but how the RAD method will be used to undertake and complete the project is weakly described. Although a time line of what work needs to be undertaken is provided, little description is given of what this involves at each stage. Once the app is working it will be tested and appropriate statistical metrics applied to measure its functionality and response.		
Resources / Planning (200 words)		
List of any deliverables; Clear diagram showing both timing and resource use; Completed ethics form; Limited and relevant appendices The project aims to deliver an enhanced, modern, web based app for monitoring student attendance with an insightful statistical tool, providing real time data allowing timely interventions for sporadic or erratic attendance patterns.	15	13

A useful table providing a SMART outline of how the project's objectives will be carried out in a timely manner is provided, ensuring the app will be delivered within the allotted time scale. The student has considered the resources necessary to undertake and complete the project from both a designer and client standpoint, the use of a phone/PC/ secure network, most suitable programming language etc. The ethics form has been successfully completed.		
Document Presentation		
Correct spelling, grammar and punctuation; Flow of narrative/fluency; Coherence; Word processed ; Correct use of referencing with bibliography; Strict word limit The student's written proposal is well written, has good punctuation, spelling and grammar on the whole, reads well, flowing quite nicely and communicates their thoughts and analysis in a coherent manner.	15	13

Referenced articles and given in an appropriate manner, and the written proposal is within the word limit.		
TOTAL	100	74

PAGE 1
PAGE 2
PAGE 3
PAGE 4
PAGE 5
PAGE 6
PAGE 7
PAGE 8
PAGE 9