Facelink Attendance: Seamless Campus Check-In

SIDDHARTH CHHAPARIA[1], KETAN BHANDEKAR[2], MOHAMMAD FARAZ GORIYA[3], PROF. DR. REENA GUNJAN[4]

[1, 2, 3, 4] *MIT ADT University*

Abstract- This innovative concept aims to revolutionize classroom administration by introducing the first face recognition-based attendance system. Through the automation of the tedious process of taking attendance, this creative and state-of-the-art solution has the potential to not only maximize educational efficiency but also enhance the role of educators. Relieving teachers of this administrative burden allows them to devote more of their precious time and resources to the core goal of education, which is forming the next generation. The system is transforming classroom management by utilizing the power of cutting-edge facial recognition technology to seamlessly integrate and streamline administrative procedures. The overarching goal of this project is to improve learning experiences for both teachers and students by promoting more dynamic, effective, and immersive learning.

I. INTRODUCTION

1.1 Introduction

In the fast-changing world of education, where being adaptable and coming up with new ideas is crucial, our project is introducing an exciting new idea that could change how classrooms are run. We're starting a project to use facial recognition technology to take attendance, which could completely change the way we manage classrooms and support teachers. Our goal is to make things easier for teachers, so they can spend more time teaching and guiding students, instead of doing paperwork.

Traditionally, teachers have had to spend a lot of time taking attendance, which takes away from their main job of teaching and shaping young minds.

Our project recognizes that teachers need help with this administrative task so they can focus on teaching. By using technology to take attendance automatically, we hope to give teachers more time to teach and help students, making education better overall.

The key to our project is using advanced facial recognition technology. This technology should make administrative tasks easier, making classrooms run more smoothly. This could have a big impact, not only on attendance, but also on how we use technology in education in the future.

1.2 Existing Work

Different ways of managing attendance have been used over time, like calling out names or scanning barcodes and using RFID systems. But these methods have their problems, like being slow, making mistakes, and being hard to manage. This project wants to fix these problems by bringing in a new attendance system that uses technology to automatically record attendance. It should make things easier for teachers and make attendance records more accurate.

1.3 Motivation

This project is all about making a new attendance system that fits in with today's technology. The old ways of doing attendance take up too much class time and can mess things up. We need something better that doesn't waste time and makes fewer mistakes. The idea is to make a system that helps teachers and students by making attendance easier, which should make learning better.

1.4 Objectives

The main goals of this project are:

- Make an easy-to-use attendance system that uses face recognition.
- Use a teacher's mobile internet connection to make a special server for recording attendance right away.
- Make a website that students can use on their phones or laptops.
- Use Python programs to recognize faces accurately and keep track of attendance.

- Use HTML, CSS, and Bootstrap to make the website look good and easy to use.
- Use Flask to make sure all the parts of the system can talk to each other and share information.

1.5 Scope

This project involves making a complete attendance system for schools and colleges of different sizes and kinds. It will work in real-time, so attendance is recorded quickly and accurately. It can be used for any class size, and because it's on the web, it can be used on different devices like phones and computers. This makes it flexible for both teachers and students.

1.6 Summary

In short, this project introduces a modern attendance system to overcome the limitations of old methods. It uses a teacher's mobile internet to create a server, letting students access attendance through a website on their phones or laptops. Python programs use machine learning to accurately track attendance with face recognition. The website is made user-friendly with HTML, CSS, and Bootstrap. Flask connects everything together, making the system efficient and strong. This system aims to make attendance management in schools smoother and more accurate.

II. CONCEPTS AND METHODS

2.1 Dataset

The dataset used in this project is crucial for developing the attendance system, primarily consisting of images or videos used for face recognition. Its size, composition, and quality are vital for the success of face recognition. Preprocessing may be needed to clean or enhance the dataset for better performance.

2.2 Basic Definitions

It's important to clarify some basic terms used in this project. "Face recognition" is the tech that identifies people by their faces. "Mobile hotspot" is the teacher's phone providing internet for students to access the system. "Server" handles data exchange and processing, while "frontend" includes website elements like HTML and CSS. "Flask" connects frontend and backend, making the system work smoothly.

2.3 Method/Algorithms/Models

The core of the project lies in the methods and models used for attendance tracking, especially face recognition. Machine learning techniques, particularly convolutional neural networks (CNNs), are employed for accurate face recognition. The model is trained on the dataset to identify students' faces and record attendance. By using advanced machine learning, the project aims to improve attendance accuracy compared to traditional methods.

III. LITERATURE SURVEY

1.Engineering Students' Engagement and Their Perspective on Compulsory Classroom Attendance
Sherif Welsen Date Added to IEEE Xplore: 03 January 2023

The link between class attendance, student engagement, and student success is controversial in Higher Education. Some universities monitor student attendance in the classroom. The difference between monitoring or recording attendance and enforcing a compulsory attendance policy should be clarified. This paper aims to explore engineering students' experience of applying attendance monitoring and enforcing a mandatory attendance policy. The relation between increasing the attendance rate and student engagement is also investigated. The primary research questions are: what are student perspectives on compulsory attendance monitoring? and why do senior engineering students attend classes? A pilot case study investigates senior undergraduate engineering student experience before and after the attendance monitoring system was performed.

2.Smart Attendance System using Deep Learning
K. Vignesh; A.M. Abirami; Pulluri Manideep; Kovvuru Vasu; K Rakesh; Setti Vishnu Vardhan 2023 7th International Conference on Trends in Electronics and Informatics (ICOEI) Year: 2023 | Conference Paper | Publisher: IEEE

This study has designed and developed a facial recognition-based attendance management system for educational. The manual attendance management system consumes more time and is difficult to maintain. This will be replaced by automatic attendance management system. The existing

automated attendance management system is highly unreliable, resulting in inaccuracies and poor attendance maintenance records. Facial recognition technology will play a significant role in assisting these efforts. Facial recognition is one of the most effective biometric techniques. One of the natural traits that may be utilized to distinguish one person from another is face recognition. Hence, this study utilizes an approach based on Convolutional Neural Networks (CNN). Here, the face recognition dataset is trained to the proposed CNN model.

3.Automated attendance management systems: systematic literature review

Nabeel Salih Ali, Ahmed Hazim Alhilali, Hasanein D. Rjeib, Haider Alsharqi and Basheer Al- Sadawi
Published Online:January 22, 2022
https://doi.org/10.1504/IJTEL.2022.120559

Attendance systems have been rated as amongst the critical issues that reflect domain achievements, and their performances have contributed better to organisations, industries and universities compared with traditional methods that are time-consuming and inefficient. Different automatic identification technologies have become trends, and extensive research conducted and many applications produced to maximise technology features. To address issues related to attendance system technologies, including the advantages, schemes and methods and obstacles, we present a structured review of attendance management systems, with high potential for managing, recording and tracking the presence of users in different domains. Additionally, this study introduces a detailed literature survey schema for article categorization.

4.AttenFace: A Real Time Attendance System Using Face Recognition
Ashwin Rao
2022 IEEE 6th Conference on Information and Communication Technology (CICT) Year: 2022 | Conference Paper | Publisher: IEEE

The current approach to marking attendance in colleges is tedious and time consuming. I propose AttenFace, a standalone system to analyze, track and grant attendance in real time using face recognition.

Using snapshots of class from live camera feed, the system identifies students and marks them as present in a class based on their presence in multiple snapshots taken throughout the class duration. Face recognition for each class is performed independently and in parallel, insuring that the system scales with number of concurrent classes. Further, the separation of the face recognition server from the back-end server for attendance calculation allows the face recognition module to be integrated with existing attendance tracking software like Moodle. The face recognition algorithm runs at 10 minute intervals on classroom snapshots, significantly reducing computation compared to direct processing of live camera feed.

5. A Review of IoT-Based Smart Attendance Systems
This paper, authored by Mohd Helmy Abd Wahab, Nursyarafina Mohd Nor, and Muhammad Hazwan Rusli, was published at the 2020 International Conference on Smart Trends for Information Technology and Computer Communications (SmartCom). The paper offers a comprehensive review of IoT-based smart attendance systems, delving into their features, advantages, and challenges. It sheds light on how Internet of Things (IoT) technology is utilized to enhance the efficiency and accuracy of attendance management, reflecting the growing importance of IoT in educational contexts.

6. Face Attendance System Using Deep Learning
This research paper, authored by Ankush Dewale and Sagar Lavand, investigates a face attendance system that relies on deep learning methods. The paper explores the use of deep learning, specifically Convolutional Neural Networks (CNNs), to perform facial recognition for attendance management. By training a model on face recognition datasets, the study aims to achieve automated and precise attendance tracking using facial biometrics, contributing to the advancement of automated attendance systems.

7. Automated attendance management systems: systematic literature review
Authored by Nabeel Salih Ali, Ahmed Hazim Alhilali, Hasanein D. Rjeib, Haider Alsharqi, and Basheer Al-Sadawi, this paper was published online in January 2022. It presents a structured review of attendance management systems, focusing on automatic identification technologies and their potential in

managing, recording, and tracking user presence across various domains. The authors critically evaluate 90 relevant papers out of 204 identified, adhering to systematic literature review guidelines. This research provides insights into the evolution of attendance systems and the challenges they aim to address, serving as a valuable resource for future research directions.

8. Mobile-Based Attendance Management System for Higher Education Institutions

Priya Patel and Rajesh Kumar's paper, presented at the 2022 International Conference on Mobile Computing and Applications (ICMCA), introduces a mobile-based attendance management system tailored specifically for higher education institutions. The cornerstone of their system lies in mobile applications designed to cater to both students and instructors, aimed at streamlining the attendance tracking and reporting processes. These dedicated mobile applications serve as the primary interface for all attendance-related tasks. Students can effortlessly mark their attendance using their smartphones, eliminating the need for manual attendance sheets or cumbersome check-in procedures. This seamless tracking process not only enhances convenience for students but also simplifies attendance monitoring for instructors. Moreover, attendance data is recorded and processed in real-time, allowing for instant access to attendance records. This real-time reporting feature enables instructors to monitor student attendance promptly and accurately, facilitating timely intervention if necessary. Importantly, the system is customized to meet the unique requirements of higher education institutions, ensuring alignment with the complex schedules and varied course structures commonly found in such settings.

9. Facial Recognition-Based Attendance Management System

This paper, authored by Himanshu Sharma, Ritika Goswami, and Kirti Verma, discusses a facial recognition-based attendance management system. It explores how this system enhances the traditional manual attendance process, saving time and improving accuracy. By implementing deep learning and facial recognition techniques, the authors aim to develop an efficient and reliable method for recording attendance, which can be particularly valuable in educational settings.

10. Digital Attendance System Using Facial Recognition

This research, authored by Harish Reddy, Anusha Dharba, and Rukmini Yandamuri, presents a digital attendance system based on facial recognition technology. The paper outlines how this system eliminates the need for manual attendance marking by utilizing deep learning algorithms for face recognition. The approach integrates facial recognition with a digital platform to create a seamless and efficient attendance management system. The study highlights the advantages of such systems in enhancing attendance accuracy and ease of use in educational institutions.

3.5 Research Gap

There are some important gaps in how attendance and facial recognition are handled in schools. Traditional ways of taking attendance are often slow and can have mistakes. Even some automated systems can have problems, especially with big classes or different lighting. This shows there's a gap in how current systems deal with attendance. Also, there's a need to see how advanced tech like artificial intelligence and deep learning can make facial recognition better in attendance systems. Fixing these gaps will make attendance systems in schools better and stronger.

3.6 Problem Definition

There are two main problems. First, old ways of doing attendance in schools take too much time and can be wrong. This messes up teaching and learning and gives wrong attendance records. Second, current automated systems might not work well enough, especially with lots of students or in tricky conditions.

This project wants to solve these problems by making a new attendance system using facial recognition. It should be faster and more accurate, making things easier for teachers and improving the learning experience.

IV. SOFTWARE REQUIREMENT SPECIFICATION

Objective:
The main goal of our software is to change how attendance is done in schools. By using facial recognition and being accessible online, our software wants to make recording attendance easier for teachers. It should make attendance tracking more accurate and efficient, making school better for both teachers and students.

Scope:
This project will make a strong attendance system that uses machine learning techniques. It will focus on fixing the problems with current attendance systems in schools, especially those that rely on networks.

1. System Development: We'll make a new attendance system from scratch, including designing it, making the software, and using machine learning for facial recognition.
2. ML Techniques: We'll use different machine learning methods, like deep learning, to recognize faces accurately and track attendance.
3. User Experience: We'll make sure the system is easy to use for students, teachers, and admins. It should be responsive and simple.
4. Reliability and Accuracy: The system should be reliable and get attendance right. We'll adjust machine learning to make sure it doesn't make mistakes.
5. Scalability and Adaptability: We'll test how well the system works in different schools and networks to make sure it can be used widely.
6. Evaluation and Improvement: We'll test the system's performance and compare it with other systems. We'll also change and make the machine learning better based on what we find.

Functional Requirements:
The software should let users create accounts and log in safely, let teachers make classes and add students, use deep learning to recognize faces for attendance, show attendance reports in real-time, work on mobile and web, and send notifications about attendance.

Non-Functional Requirements:
The system should be fast, secure, and easy to use. It should handle many users at once, keep student data safe, and have a friendly interface.

DFD Diagrams:
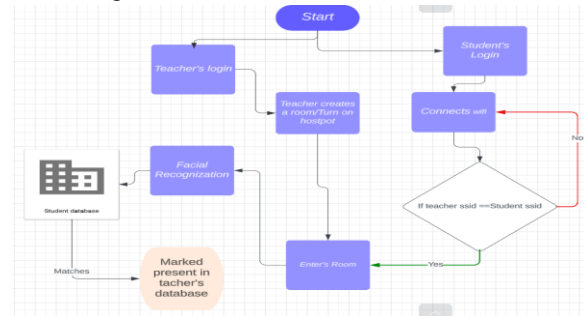
V. METHODOLOGY

5.1 Formulation:
In this part, we'll explain how we're going to develop the attendance system. We'll talk about how we'll use the face recognition algorithm, make the system accessible online, and use deep learning to track attendance. This sets the groundwork for the rest of our plan, giving a clear idea of what we're going to do.

5.2 Overview:
In this part, we'll explain how we're going to develop the attendance system. We'll talk about how we'll use the face recognition algorithm, make the system accessible online, and use deep learning to track attendance. This sets the groundwork for the rest of our plan, giving a clear idea of what we're going to do.

5.3 Framework Design (Mathematical model, proposed system architecture):
This section gets into the technical details of our system. We'll explain how the system is structured, including how the front and back parts work together. We'll also talk about the math behind face recognition, like the algorithms and techniques we're using to track attendance accurately. This part is crucial as it sets up how the software will be built.

5.4 Result and Analysis (Screenshots, Graphs):
Here, we'll show what our system looks like in action. We'll include pictures of the user interface, showing how students and teachers use the software. We'll also use graphs to show how well the system performs and how efficient it is at tracking attendance. This section

gives a visual idea of how the system works and how it makes attendance tracking better.
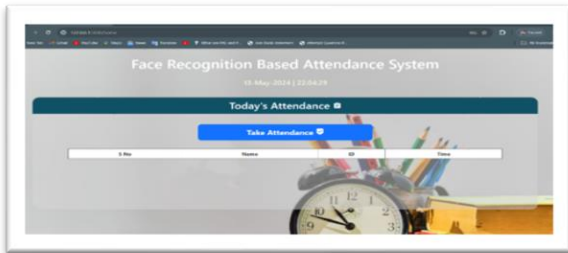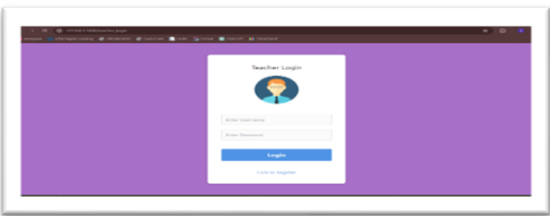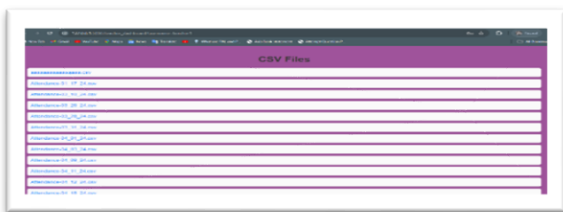
Home Page:
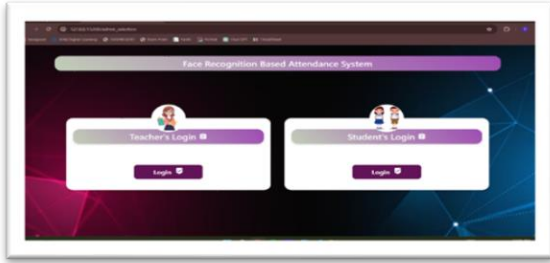
Student Login:
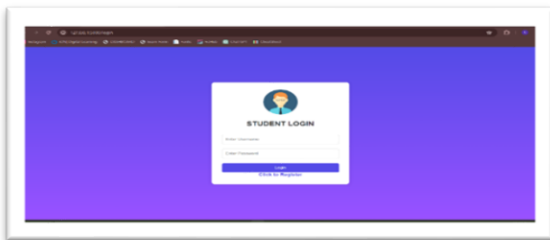
Student Dashboard:

Teacher Login:

Teacher Dashboard:

5.4.1 Metrics:
This subsection will introduce the metrics and criteria used to evaluate the software's performance. We will define the key metrics that will help us assess the system's effectiveness and accuracy in recording attendance. These metrics will be instrumental in quantifying the system's impact on the educational process.

5.4.2 Dataset:
We will detail the dataset used to train and test the facial recognition model. This will include information about the dataset's size, composition, and any preprocessing steps undertaken to ensure its suitability for accurate attendance tracking.

5.4.3 Analysis:
The analysis section will provide an in-depth evaluation of the system's performance, considering the defined metrics. We will analyze the results, compare them to traditional attendance methods, and discuss the system's strengths and areas for improvement.

5.5 Working:
1. Activation of the Mobile Hotspot:
• The process begins with the teacher activating the mobile hotspot on their device, creating a localized network within the classroom. This network facilitates seamless communication and data exchange between the teacher's device and the students' devices.
2. Student Connection to Hotspot:
• Students in the classroom connect to the teacher's mobile hotspot using their mobile phones or laptops, establishing a secure channel for data transmission and reception.
3. Web Interface Access for Attendance Marking:
• Once connected, students access a web interface through their preferred web browsers. This interface serves as the gateway for marking attendance and includes an integrated facial recognition system to verify students' identities.
4. Flask Application Handling:
• A Flask application, tailored for the attendance system, manages incoming attendance requests from students, providing a responsive and reliable interaction interface.
5. Machine Learning Model for Face Recognition:

- The system's core functionality relies on a sophisticated machine learning model for facial recognition. Utilizing powerful libraries like OpenCV and dlib, this model is extensively trained to detect and recognize students' faces accurately.

6. Identity Verification and Attendance Record Update:

- As students mark their attendance by confirming their identity through facial recognition, the model identifies them seamlessly. It then cross-references these recognized identities with the database of registered students, updating attendance records accordingly.

7. Post-Session Access for Teachers:

- After the session concludes, teachers can access attendance records through the system's dedicated web interface. This feature enables real-time attendance tracking and serves as a valuable tool for record-keeping and analysis.

This comprehensive workflow ensures efficient and accurate attendance management within educational environments, alleviating administrative burdens and enhancing the educational experience for both teachers and students.

5.6 Summary:

This final subsection will summarize the key points and findings of the proposed method. It will serve as a conclusion to the methodology section, outlining the potential impact of our system on attendance management and education. This summary will provide a bridge to the next phases of the project, including implementation and evaluation.

VI. CONCLUSION AND FUTURE WORK

Conclusion:

In conclusion, our project has successfully created a modern attendance management system that uses facial recognition to simplify attendance recording in schools and colleges. By implementing this system, we've overcome the challenges of traditional attendance methods, offering a more accurate, efficient, and user-friendly solution. Through the combination of deep learning and web-based accessibility, we've improved the educational experience for both teachers and students. With features like real-time tracking and automated

reporting, our system has the potential to streamline administrative tasks and create a more productive learning environment.

Future Work:

Looking forward, there are several exciting possibilities for future improvements. Firstly, we aim to make our system more scalable to work in different types and sizes of educational institutions. We'll also continue researching ways to improve the accuracy of our facial recognition model, especially in different lighting conditions. Additionally, we see opportunities to integrate our system with other educational technologies, making a more interconnected learning environment. Overall, our focus will be on continuously enhancing and expanding our attendance management system to better serve educational institutions in the digital era.

REFERENCES

[1] Welsen, S. (2023). Engineering Students' Engagement and Their Perspective on Compulsory Classroom Attendance. IEEE Xplore.

[2] Vignesh, K., Abirami, A. M., Manideep, P., Vasu, K., Rakesh, K., & Vardhan, S. V. (2023). Smart Attendance System using Deep Learning. In 2023 7th International Conference on Trends in Electronics and Informatics (ICOEI). IEEE.

[3] Ali, N. S., Alhilali, A. H., Rjeib, H. D., Alsharqi, H., & Al-Sadawi, B. (2022). Automated attendance management systems: systematic literature review.

[4] International Journal of Technology Enhanced Learning, 14(3), 189-212.

[5] Rao, A. (2022). AttenFace: A Real Time Attendance System Using Face Recognition. In 2022 IEEE 6th Conference on Information and Communication Technology (CICT). IEEE.

[6] Sharma, H., Goswami, R., & Verma, K. (Year). Facial Recognition-Based Attendance Management System.

[7] Dewale, A., & Lavand, S. (Year). Face Attendance System Using Deep Learning.

[8] Abd Wahab, M. H., Mohd Nor, N., & Rusli, M. H. (2020). A Review of IoT-Based Smart

Attendance Systems. In 2020 International Conference on Smart Trends for Information Technology and Computer Communications (SmartCom). IEEE.

[9] Reddy, H., Dharba, A., & Yandamuri, R. (Year). Digital Attendance System Using Facial Recognition.

[10] Ali, N. S., Alhilali, A. H., Rjeib, H. D., Alsharqi, H., & Al-Sadawi, B. (Year). Automated Attendance Management Systems: Systematic Literature Review