International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 09 Issue: 01 | Jan - 2025 SJIF Rating: 8.448 ISSN: 2582-3930

A Review on Face Recognition for Automated Student Attendance System Using IOT

Pradnya Achyutrao Chapke[1], Prof. Sunanda Kapde[2]

[1]*Electronics & Telecommunication Department, Deogiri Institution of Engineering and Management Studies, Cha.Sambhajinagar*
[2]*Electronics & Telecommunication Department, Deogiri Institution of Engineering and Management Studies, Cha.Sambhajinagar*

Abstract - The IoT-based smart attendance system recognises students' faces using biometrics captured by monitor cameras. Our smart attendance project uses a Raspberry Pi system to quickly and accurately recognise human faces in photos. The traditional approach of calling out students' names is time-consuming and may result in proxy attendance. The suggested system uses facial recognition to store student attendance records. When taking attendance, the system captures images of attendees and uses face detection and recognition to mark them as present. Attendance is updated with time, name, and register number. We utilised deep learning techniques to create this project.

To preserve discipline and allow students to learn the most in schools, colleges, and universities, an attendance system has been implemented. There are two common methods for determining the presence of students in a particular class. The first is by calling the roll number, and the second is by having the pupils sign a piece of paper next to their roll number.
As a result, it was important to improve this system so that it was more user-friendly, time-saving, and efficient. It is an automated technology that allows professors to participate in the full class without interruption or loss of time.

Key Words: Raspberry Pi, Camera, Face Recognition, OpenCV, Biometric Attendance

1. INTRODUCTION

Despite advancements in technology and automation, we continue to employ traditional classroom management practices. Attendance is the most crucial element in the classroom, and it is strongly tied to students' academic achievement. Recently, several students have reported that crowd control in the classroom improves their engagement during sessions. The more successful the attendance system, the more students participate and learn in class. Previously, we employed strategies such as phoning and signing for a certain roll number. These approaches have a significant proxy risk and are time-consuming. To attain a well-maintained and disciplined classroom, we devised a plan to automate this process using current technology. A facial recognition system equipped with the necessary hardware and software will aid in the achievement of this project's objectives. The facial recognition system is an image processing-related breakthrough. Image processing is the extraction of data that may be connected with a digital image and plays an important part in technological growth. Our primary objective will be to capture digital photos and then utilize computers and algorithms to extract relevant information from them. As the graphic information is sent in, image processing transforms it into something suitable for human understanding. This information comes from the picture Image processing is vital and useful in many different domains. Visual processing applications are diverse and may be used in a variety of settings where visual data can be coupled to predetermined algorithms. This was a powerful image processing tool, and it served as the foundation for our project. Our face structure was a classic example of multidimensional complexity that required some identification using advanced computer analysis.
Education institutes are focused on ensuring consistent student achievement. Lack of support might contribute to a reduction in student performance attendance. Taking attendance manually is time-consuming and might lead to human error. The paper-based attendance system will be passed out. This project intends to create a computer-based student attendance system to help institutions keep track of attendance. We suggest implementing a "Face Recognition-Based Smart Attendance System Using IoT." The current system incorporates facial identification, which saves time and prevents proxy attendance.
This method will be used in a segment that requires active involvement.
This system requires Raspberry Pi, Python, and OpenCV to function. The technology employs a camera to detect people's faces in real time.
This project intends to automate attendance by combining facial recognition and IoT technology to replace human systems. The suggested system stores all data online, eliminating the need for offline registers. This simplifies record maintenance. Attendance is

increasingly important for both students and educational institutions.
Manual attendance can be time-consuming, and teachers may overlook someone, or kids may respond numerous times due to the absence of friends (proxy attendance).
Biometric attendance uses physiological indicators like fingerprints or facial features, as well as behavioral elements, to validate a person's identification.
Biometric systems are difficult to counterfeit since they rely on biological features to identify individuals. Face recognition is a non-intrusive biometric method that mimics physiological processes.
Face Recognition is a biometric program that mathematically maps an individual's facial characteristics and saves them as a face print. The method employs deep learning to validate an individual's identification by comparing a live capture or digital picture to a previously recorded facial print.
When a face matches a saved image, attendance is recorded on the appropriate excel page for that person. Face recognition is a popular biometric parameter because it eliminates the need for physical contact with objects/records, creating a touch-free environment that is becoming more prevalent globally.
Our automated attendance system uses machine learning to recognize faces and mark attendance, saving time and keeping track of data.

2. Literature Review

This study offers a deep learning-based facial recognition attendance system that uses transfer learning and three pre-trained convolution neural networks (CNNs) trained on a dataset.

According to the research, when compared to alternative approaches, this system performs exceptionally well, with high prediction accuracy and a fair training time. This technique has potential applications in attendance and door access systems in a variety of industries, including government agencies, business organizations, airlines, schools, and universities. Future expansions of this study may include investigating additional pre-trained CNN models and increasing the dataset with more human facial photos. The paper's shortcoming is that it discusses the limits of the facial recognition system, such as its effectiveness under difficult lighting situations.[1]

This work gives a comprehensive review of class attendance algorithms, with an emphasis on CNN and LBPH. Out of 30 studies analyzed, CNN is the favored choice given to its excellent accuracy and stability, despite the fact that it requires large datasets. Despite similarities in implementation to LBPH, CNN performance can be influenced by external factors such as face location and illumination. Future study might look at optimizing accuracy by combining appropriate face detection algorithms with recognition algorithms, as well as researching aspects that influence both CNN and LBPH accuracy. The paper lacks performance under different environmental conditions.[2]

The article outlines the development of a barcode system to track student attendance and assets at a university.
This technology is more convenient and cost-effective than other technologies, simplifying the procedure and lowering data entering time. It improves productivity by automating operations and avoiding mistakes that occur with manual approaches. This system may be used to automatically record and update attendance and asset tracking data, giving useful information to teachers, students, and administrators. The disclosed barcode system has the potential problem of relying on physical barcode scanning, which is prone to difficulties such as barcode degradation, misplacement, or theft, resulting in inaccurate attendance and asset tracking.[3]

The study focuses on the use of face recognition technology to automate a variety of functions, including attendance monitoring, worker attendance management, and security applications such as detecting burglars from photos. The system features an attendance system for lectures, sections, and laboratories, which allows lecturers and teaching assistants to easily record student attendance. This saves time and effort, especially in lectures with big groups of students. The facial recognition algorithms used show the possibility for further uses beyond attendance tracking, such as exam-related operations. This article fails to address possible limits in the accuracy and reliability of facial recognition technology under various environmental circumstances, which are critical concerns for establishing a robust attendance system in real-world settings.[4]

The report describes a project that emphasizes the importance of automation using facial recognition technology. The project, which uses Python's OpenCV algorithm modules, achieves a high accuracy rate of 99.38% and provides a simple command line application for facial identification. Notably, the model stands out from generic algorithms by using only one picture and eliminating grayscale conversion. The project exhibits practical uses beyond facial recognition by leveraging Raspberry Pi's built-in email and IoT capabilities. Future plans may include significantly improving model

accuracy and speed. One limitation of this work is the lack of validation with current facial recognition attendance systems, which restricts the assessment of the proposed system's efficacy and performance in comparison to previous alternatives.[5]

3. PROPOSED SYSTEM

The suggested technology captures students' faces and stores them in a database for attendance tracking. Capture the student's face in a well-lit room to identify facial characteristics and recognize their seating and posture. This method eliminates the need for teachers to manually take attendance in class by recording a video and recognizing faces using image processing/training. The attendance database is then updated in a spreadsheet. The suggested system includes a Raspberry Pi computer and a webcam to capture photographs.

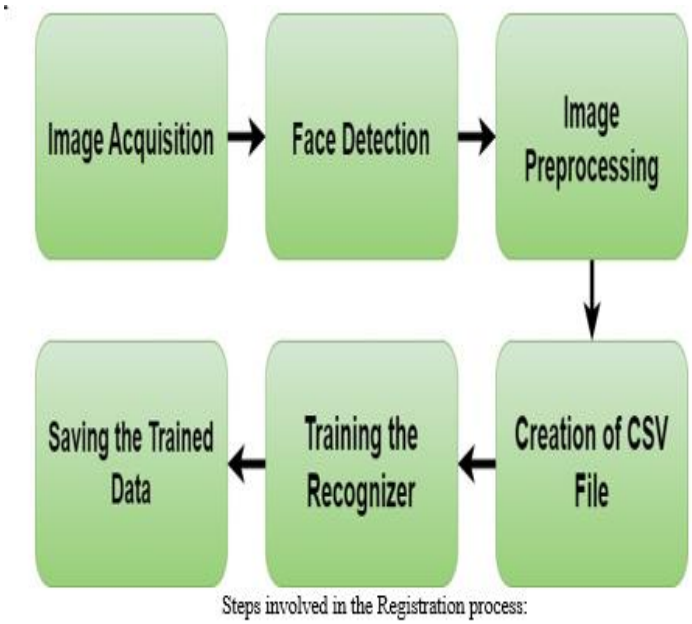

Table -1: Block Diagram of Proposed system

4. Methodology

Based on the literature study, we thoroughly researched several issues directly linked to our project and devised a potential solution to our problem. In this section, we present a technique for providing an overview of our project's strategy and methods to achieve it. Because the prior effort was insufficient, we resolved to build this project as efficiently and effectively as feasible. The suggested face detection module for this project is the Viola Jones method. Furthermore, for the face recognition modules, neural network architecture with LBPH is presented in this study. Figure 1 depicts the block diagram for the project system.

As we can see, there is also a teacher's desk that will be facing the pupils; therefore it will not be classified as a student. A camera is put in the centre of the classroom at an appropriate height to provide a full view of the room up to the last desk. Once the students are seated, the camera will snap an image and begin the face detection procedure, as stated in the methodology section. Following that, the application will automatically create a folder in the database for the pupils to be recognized. The image recognition database searches for and uses each student's previously posted photographs.

The photos will be retrieved and matched to each entry in the database, allowing us to determine if the student is present in class or not. If there is no match, the software will go to the next image. Figure 2 depicts the project system's flow chart.

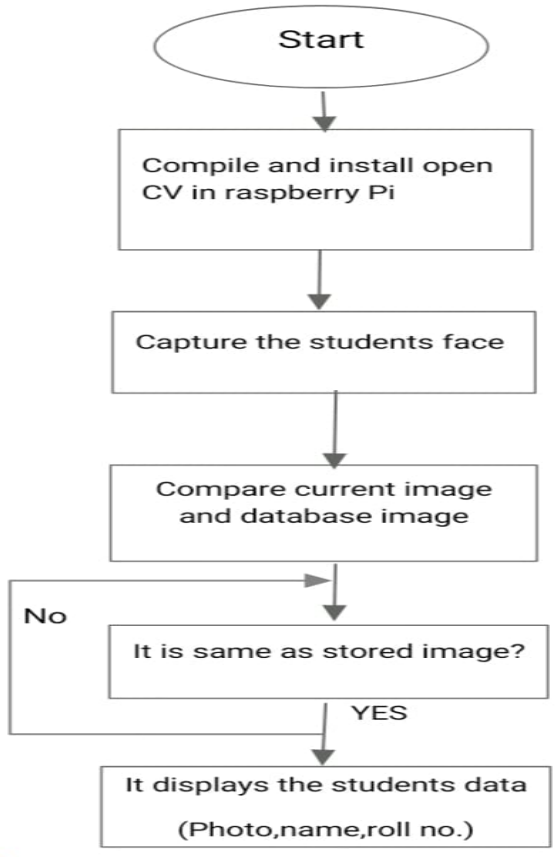

Fig -2: Flow Chart Of Proposed System

5. CONCLUSIONS

The automatic facial recognition attendance system with haar cascade provides several benefits that considerably improve attendance management operations in educational institutions and organizations. Using facial recognition algorithms and meticulously preserving an Excel sheet of attendance data, this system optimizes attendance monitoring, improves precision, and

efficiently manages time for educators, administrators, and students. The system's efficiency and precision assure dependable attendance statistics, and its real-time tracking capabilities allow for rapid decision-making. It integrates smoothly into current infrastructure and does not require specialized training. Furthermore, its interoperability with numerous operating systems enables broad accessibility and usage across several platforms.

By automating attendance management activities and minimizing administrative responsibilities, this solution not only increases operational efficiency but also encourages student and employee accountability.

REFERENCES

[1] Khawla Alhanaeea, Mitha Alhammadia, Nahla Almenhalia, Maad Shatnawia "Face Recognition Smart Attendance System using Deep Transfer Learning" in 25th International Conference on Knowledge-Based and Intelligent Information & Engineering Systems.

[2] Andre Budimana, Fabiana, Ricky Aryatama Yaputeraa, Said Achmada, Aditya Kurniwan "Student attendance with face recognition (LBPH or CNN)" in 7th International Conference on Computer Science and Computational Intelligence 2022.

[3] Salah Elaskariab, Muhammad Imrana , Abdurrazag Elaskric , Abdullah Almasoudi "Using Barcode to Track Student Attendance and Assets in Higher Educational Institution" in The 12th International Conference on Ambient Systems, Networks and Technologies (ANT) March 23-26, 2021, Warsaw, Poland

[4] Divya Pandey, 2Priyanka Pitale, 3Kusum Sharma "Face Recognition Based Attendance System using Python)" in 2020 JETIR October 2020, Volume 7, Issue 10

[5] Rama Krishna, Joseph Chandu, Srikanth, Siva Niteesh, Kishore Reddy "Smart Attendance Monitoring System using Raspberry Pi" in INTERNATIONAL JOURNAL OF ENGINEERING RESEARCH & TECHNOLOGY Volume 12, Issue 03 (March 2023)

[6] M. A. Turk and A. P. Pentland, "Face Recognition Using Eigenfaces"in Proc. IEEE Conference on Computer Vision and Pattern Recognition, pp. 586–591. 1991

[7] W. Zhao, R. Chellappa, P. J. Phillips, and A. Rosenfeld, "Face recognition: A literature survey," ACM Computing Surveys, 2003, vol. 35, no. 4, pp. 399-458

[8] Bhumika G. Bhatt, Zankhana H. Shah "Face Feature Extraction Techniques: A Survey", National Conference on Recent Trends in Engineering & Technology, 13-14 May 2011

[9] G. Yang and T. S. Huang, "Human face detection in complex background," Pattern Recognition Letter, vol. 27, no.1, pp. 53-63, 1994 [10] M. Zulfiqar, F. Syed, M. J. Khan and K. Khurshid, "Deep Face Recognition for Biometric Authentication," in 2019 International Conference on Electrical, Communication, and Computer Engineering (ICECCE), 2019

[11] N. Soni, M. Kumar and G. Mathur, "Face Recognition using SOM Neural Network with Different Facial Feature Extraction Techniques," International Journal of Computer Applications, vol. 76, no. 3, pp. 7-11, 2013.

[12] Shrestha R, Panday SP. Face Recognition Based on Shallow Convolutional Neural Network Classifier. In: Proceedings of the 2020 2ndInternational Conference on Image, Video and Signal Processing; 2020. p. 25-32.