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Attendance System using Facial Recognition

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Abstract— The focus of the content is on the use of facial recognition technology for automating attendance management in educational institutions. It highlights the drawbacks of traditional manual attendance systems due to human errors and time consumption. The content introduces facial recognition technology as a solution that uses Machine Learning algorithms to accurately identify and track students' attendance without additional hardware. It discusses the benefits of using facial recognition technology, such as reducing the workload on teachers, improving accuracy, generating real-time insights into student performance, and providing a safer option for attendance management. The content emphasizes the importance of implementing facial recognition technology for modernizing attendance management in educational institutions.

Keywords: Face recognition, Attendance, College, Schools, Automation

I. INTRODUCTION

The Covid-19 pandemic has fundamentally altered how education is provided, and maintaining attendance is one of the key difficulties that institutions now face. Conventional attendance management techniques, such as manual entry and biometric authentication necessitate physical contact, making it challenging to guarantee that social distancing norms are upheld.

A real-time attendance management system that tracks attendance using various camera angles can be put in place to solve this problem. Advanced technologies like computer vision and machine learning can be used by this system to automatically identify students and track their attendance. The technology is capable of taking pictures of the students from various angles and analysing them to confirm their identity. The initiative has several benefits, particularly in the post-Covid era. First off, since there is no longer a need for physical contact, it is a safer alternative for both students and staff. The second benefit is that it takes less time to mark attendance, giving educators more time to spend educating.

The real-time attendance management system has the additional benefit of minimizing human mistakes during attendance recording. Because of improper data entry, uncertainty over roll numbers, or even the chance that students marked attendance for missing colleagues, mistakes might happen when using traditional manual attendance tracking systems. Based on facial recognition technology, this automated system reliably records attendance, eliminating these inaccuracies.

Moreover, the system may produce real-time statistics and analytics that give students knowledge of student attendance statistics, including punctuality, absence, and participation in class. This data can help identify students who might need more help, and it can also give teachers feedback on their pedagogical approaches.

In conclusion, a real-time attendance management system that makes use of face recognition software and various camera positions can give educational institutions a reliable approach to tracking students' attendance in the post-Covid future. This initiative can decrease human error, improve safety, free up important teaching time, and give teachers insightful information on student attendance statistics.

II. LITERATURE SURVEY

For face detection and face matching, the project uses a method known as a multi-task cascaded convolutional network (MTCNN). MTCNN uses convolutional networks in three phases to identify face characteristics such as the eyes, nose, and mouth. The suggested technique uses multi-task learning to integrate facial alignment and detection. A shallow CNN is used in the first step to quickly create candidate windows, and a more complicated CNN is used in the second stage to refine the candidates. Third CNN is utilized in the third step to significantly enhance the output of face landmark positions. With this method, attendance management systems can properly recognize and align faces[1].

A face recognition and identification system that includes both face detection and recognition is created using a deep learning technique. The whole process of creating this system, from training the data using a CNN method through facial recognition, is described in the paper. According to the study's findings, the classifier can recognize faces with an accuracy of 91.7% in still photos and 86.7% in the real-time video when a significant number of face images are used to train it. Nevertheless, several things, such as insufficient light intensity, can alter how accurate the system is. The classifier is a key component of the recognition process, and the more training time it receives, the more effective it becomes. The study emphasizes the significance of building a strong classifier that can recognize faces by training them with photographs taken under various lighting conditions[2].

Convolutional Neural Networks (CNNs) are used in the research to propose a real-time facial recognition system that increases recognition accuracy. The CNN architecture is designed to maximize recognition accuracy, and by varying the CNN parameters, the system's performance is analyzed. The findings demonstrate that the suggested system achieves maximum recognition accuracy for ATT and real-time inputs of 98.75% and 98.00%, respectively. Also covered are the system's adaptability and potential for usage in a range of consumer applications, including home automation, device management, attendance systems, and intruder detection[3].

The project's hardware is covered in the paper. Facial recognition is a valuable biometric tool since it is contact-free. It's crucial to give the customer highly accurate results promptly in real-time circumstances like criminal record databases. The current hardware solutions using FPGAs offer more accuracy than their software counterparts. Because of their significant resource usage (many LUT, BRAMS, and DSP slices), however, and their low identification rates, such systems are not scalable. Using two-dimensional principal component analysis (2DPCA) and the stochastic optimization technique ADAM, we offer a unique low-precision representation of pictures and system parameters (feature vectors and network weights) in this research. The size of the image has no bearing on the suggested design. The Artix-7 XCA100T FPGA, running at 135.26 MHz, is used to implement the Face Recognition System (FRS). For photos with a size of 112 x 92, it can recognize 5500 images per second with 98.75 percent accuracy[4].

To meet the issues brought on by the COVID-19 pandemic, a smart attendance management system was developed and put into use, as described in the paper. The system makes use of facial and temperature detection technology to provide a secure workplace for both staff and guests. By implementing such technology, businesses may save money and automate several processes that would otherwise be done by hand. The system is cloud-based, which guarantees effectiveness and makes it possible to identify, record, track, monitor, and analyze employee data in real time. The solution may also be linked with current HRMS systems to reduce downtime and guarantee company continuity. Many uses for the system exist, including home security, access control, digital signs, ordering devices, point-of-sale, smart retail, and home defence.

It may also be used to optimize walking and driving routes, monitor bar sound levels, monitor levels of cars and people in a given area, monitor levels of focused zones in real time, and monitor weather and intelligent adaptive lighting. The system delivers a more precise and dependable security solution than conventional attendance management systems by utilizing retina scanning and face recognition technology. The system's ease of use and user-friendliness result in time savings decreased staff overhead and superior labour data for wise decision-making. This system can be used in a variety of locations, including airports, hospitals, subways, schools, train and bus stations, shopping malls, businesses, universities, and other crowded places. It also offers a comprehensive solution to the problems that organizations faced in managing attendance during the pandemic. To validate and use the system model in other companies, more study is required[5].

In this research, a novel method for facial recognition-based real-time attendance tracking is presented. With the proposed system, automatic attendance monitoring for each class replaces the need for human attendance taking. The method is built to make sure that students remain in class for a set amount of time to be counted as present. It also provides for some instructor-determined flexibility in how attendance is calculated. But, several variables, like illumination and facial positioning, may have an impact on how accurate the system's face recognition algorithm is. Despite this, improvements in facial recognition algorithms can be made to the suggested system to increase its performance and flexibility. By streamlining the attendance procedure and giving teachers more time to concentrate on other learning activities, the system has the potential to be advantageous to both students and instructors[6].

III. PROPOSED METHODOLOGY

4.3.1 Procedure 1 - Registering Student:

In this procedure, the admin will register the student in the database.

Steps:

1: The Admin will open the registration portal on the web. 2: Admin will enter the student information in the portal like student name, class no, seat no., roll no etc. 3: Admin will take a photo of the student from the camera. 4: After that admin will register the student. 5: Compare the compatibility and priority of previous results.

4.3.2 Procedure 2 - Storage of Student Information:

The goal of this procedure is to store the student information properly so that it can be retrieved easily.

1: In this using the Machine Learning model, the student image will be converted into 128 measurements.
2: This 128 measurement will be stored in the database along with student information like student name, roll no, seat no. etc.

4.3.3 Procedure 3 Attendance Marking:

The goal of this procedure is to mark the student attendance.

Input: Image from Camera

1: From the image, all the faces will be detected.
2: After detecting the faces, a Machine learning model is made to run for every face128 measurements generated.

2.1: These 128 measurements are matched to the 128 measurements present in the student database using Support Vector Machine Algorithm

2.2: After recognising the student, his/her attendance is marked.

4.3.4 Procedure 4 - Sending Attendance Mail to the Student:

This procedure will take send attendance mail to the student.

1: In this during class time, the student's attendance is marked.
2: After the class is over, each student will get a mail regarding his/her attendance

IV. SYSTEM ARCHITECTURE

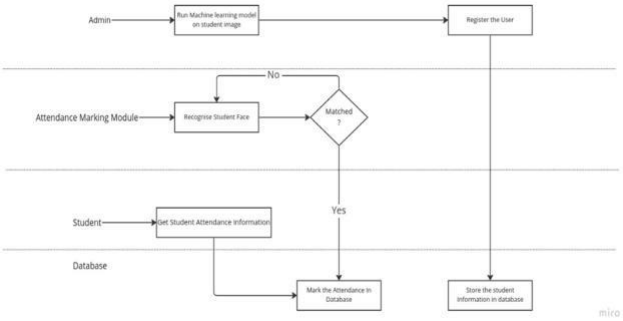

Fig. System Diagram

V. CONCLUSION AND FUTURE SCOPE

In this paper, we proposed a Machine Learning based automated face recognition solution to manage attendance in institutions, schools, and colleges. We have developed an application that records attendance by automatically recognizing faces. We introduce the algorithm for testing and validation details. The first step is to register the faces and student details to store the encodings of students and their details in a database. Now that all the data is available, recognition is the next logical step. The faces of students or employees can be scanned to detect the faces and mark attendance.Further, we plan to add a notification system in the future scope of the project. Also, automation helps eliminate malpractices while recording attendance. PICT, Pune 17 Dept. of Information Technology

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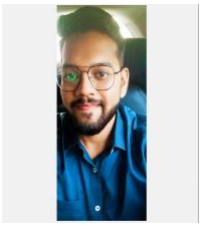

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