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Attendance System Through Image Processing

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Abstract: In the technical world, face recognition is one of the most important image processing applications. Human face recognition is a contemporary issue for verification, especially when it comes to student attendance. A face biostatistics system based on high-definition monitoring and other computer technologies is used in a face recognition attendance system to identify students. The goal of this system's development is to digitally replace the antiquated practice of calling names and maintaining handwritten attendance records. Today's attendance procedures are laborious and time-consuming. Attendance data can be easily changed through manual recording. Both the traditional way of recording attendance and the modern biometric ones are vulnerable to proxies. Consequently, this article provides answers to all of these problems. In addition to Haar classifiers, the proposed system makes use of Gabor filters, KNN, CNN, SVM, and generative adversarial networks. After face recognition, attendance reports will be created and kept up to date in Excel format. Lighting, head motions, and variations in the pupil's distance from the cameras are some of the conditions in which the system is tested. Following extensive testing, the overall complexity and correctness are ascertained. Without requiring any time or physical labor, the recommended method turned out to be a dependable and efficient way to take attendance in a classroom. The developed technique is inexpensive and requires minimal setup.

Index Terms **- CNN, GN,CapsNets.**

I. INTRODUCTION

Attendance is a crucial component of administration, but it can occasionally become a tiresome, repetitive process that encourages mistakes. Because it is very difficult to call names and maintain a record, especially when the student-teacher ratio is large, the traditional way of conducting roll calls is clearly out of . Every organization measure student attendance in a different way. While some companies use a document-based approach, others have integrated technological technologies like as biometric fingerprinting and card switching However, because these methods force students to wait in a long queue, they end up being a statute of limitations. If the student forgets to bring his ID card, he will not be allowed to take attendance. In a world that is changing, developing technology have significantly enhanced a number of things. Usually, biometrics are used to implement the intelligent attendance system. Facial recognition is one biometric way to improve this system. Attendance was successfully taken using facial recognition. When it comes to addressing problems like scaling, location, illumination, variations, rotation, and occlusions, the conventional face recognition methods and techniques are inadequate. Addressing the inadequacies of current systems is the goal of the proposed framework. Even if face recognition has greatly improved, the most crucial stages are still face detection, feature extraction, and recognition. First, two or more cameras must be mounted on the ceiling so they can view the entire classroom, depending on the size and requirements. image created by these cameras will be regarded as system inputs.

II. LITERATURE SURVEY

Examining the many approaches proposed by authors to develop a real-time attendance system that solves the shortcomings of previous systems and provides the best choice is the primary objective of this research.

III. METHODOLOGY

Both mobile devices and CCTV cameras may be easily integrated with the attendance management system. The college administration has put this advanced system in place to make it easier to view the CCTV footage in the classroom. Students must use a password and unique identification code to enter in to this system, though they can change their password whenever necessary. Students can effectively record their attendance utilising the options offered after successfully logging into the assigned application. This creative method improves the overall security and monitoring procedures in the educational institution in addition to streamlining the attendance-taking procedure. This system's integration of state-of-the-art technology guarantees precision, responsibility, and effectiveness in monitoring student attendance, thereby fostering a more structured and safe learning environment.

Facial recognition technology will be used to record student presence during the attendance management process. With the use of this technology, the taken pictures are guaranteed to be saved in a manner that makes them simple to recognise and retrieve for later use. A broad dataset of facial photos must be compiled in order to improve the efficacy of the facial recognition system. The mobile device's camera should be used to take these pictures in a variety of settings, including different lighting, angles, and backgrounds. To increase accuracy, the artificial intelligence (AI) model will be trained using each student's face image at least ten times. The three-tiered approach to the attendance process will include manual verification, CCTV monitoring, and the use of phone cameras

with waving capabilities. An exhaustive list of to enable precise attendance tracking, pupils will be assigned to the appropriate teachers. Additionally, for effective monitoring and control, a user-friendly dashboard will be made available to instructors and students alike. With the use of cutting-edge technology, this comprehensive system seeks to expedite attendance processes while maintaining data security and accuracy. Teachers can effectively organise their tasks with the help of a handy dashboard. Creating a defaulter list for kids who have been absent frequently is one of the dashboard's helpful tools. Teachers can use the boomerang feature to take attendance by just waving their phones. With this creative method, teachers can capture a 20–30 second video of their classroom, depending on its size. of the class. After that, the video is divided into separate frames, each of which is processed at a normal frame rate of 24 frames per second. The frames are filtered to improve their clarity before being accurately analysed. The system's artificial intelligence component compares each video frame several times using the pupils' photos. The algorithm is able to assess the class strength and precisely calculate attendance thanks to this thorough comparison. This platform gives teachers the ability to effectively control attendance and gauge their students' involvement by utilising cutting-edge technologies. A thorough attendance list will be produced after the video processing mechanism has collected the student data. To maintain the pupils' knowledgeable, as soon as their attendance has been recorded, they will receive a timely notice or message. Additionally, the student will receive a message right away if they are missing due to unanticipated circumstances or are only partially visible in the video. Any inconsistencies in attendance may be readily resolved by the student contacting the faculty and updating them on their attendance status. Using a dataset of student photos for processing, a Convolutional Neural Network (CNN) model will be used to enable facial identification.

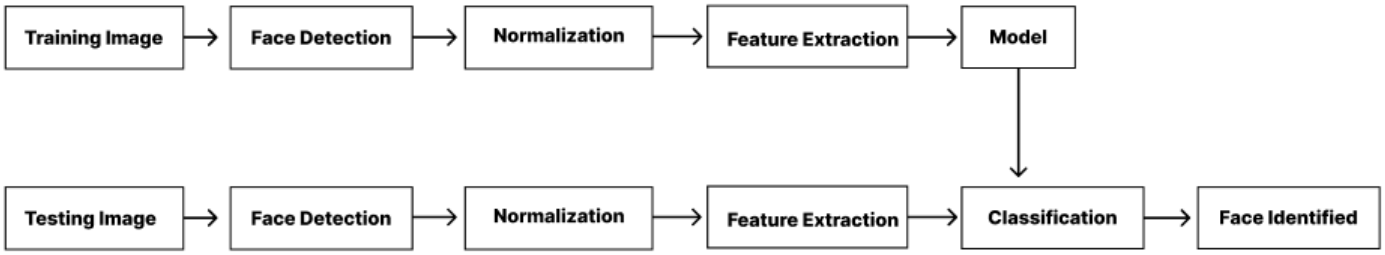

Fig1. FLOW CHART

IV. PROPOSED SYSTEM

The proposed system has obvious features, is extremely controllable, and is very straightforward to use. A database of student faces and details, such as name, course, and enrolment number, are included. To record the whole classroom, two or more cameras should be mounted on the ceiling, depending on the circumstances and the size of the room. These cameras will capture photographs several times throughout a presentation. Because other cameras will record some children's faces if the camera does not cover them, this will increase the system's efficacy. A student can choose from a variety of phrases and positions. Even if unfavorable stances prevent the system from recognizing faces at one moment, it can still do so later

4.1 Problems with Graph Neural and CapsNets Networks

Convolutional neural networks (CNNs) have some disadvantages as compared to graph neural networks (GNNs) and capsule neural networks (CapsNets) for developing attendance systems. The following are the main problems with GNN and CapsNets:

1] **Complexity for Representation of Data**
Attention data may not naturally be stated in graph structures, particularly when facial recognition is involved, since GNNs demand data to be represented in graph structures. It is challenging to transform attendance data—which often comprises of images or video feeds—into graph structures, and doing so might lead to inefficiencies or information loss.
2] **Insufficient Research**
Because Capsule Networks are a relatively new design, there is less research and fewer published applications for CapsNets than there is for CNNs. This lack of maturity may result in CapsNets having fewer resources, less community support, and fewer pre-trained models accessible than CNNs.
3] **Focused on Calculation**
GNNs may be computationally expensive, especially when dealing with large or dense graphs. Scalability problems may arise in high-person attendance systems due to the computational needs of GNNs becoming costly.
4] **Implementation Complexity**
Capsule Networks are more sophisticated in terms of architecture and training than CNNs. Implementing CapsNets may be more challenging for smaller teams or projects with less resources due to the possible requirement for additional expertise.
5] **Problems with scalability**
Capsule networks may be used for challenging tasks or enormous datasets. When the task or dataset gets more complex, CapsNets may struggle to maintain performance or may require a lot of processing power, which restricts their scalability when compared to CNNs.

4.2 CNN Over Any other Model

When it comes to building attendance systems, Convolutional Neural Network (CNN) models provide a number of benefits over other models.

1] **Feature extraction**

Because CNNs perform well in image processing tasks, they are ideal for evaluating visual data, such as camera images or facial recognition software. They can automatically extract relevant features, such as facial characteristics, from photographs, so they don't need human feature engineering.

2] **Flexibility in the Face of Change**

CNNs can tolerate changes in input data, such as shifts in locations, illumination, and facial expressions. They can consistently recognise faces in a range of environments and circumstances because to their resilience.

3] **Excellent Precision**

In a variety of computer vision applications, including facial recognition, CNNs have demonstrated state-of-the-art performance. CNN models may use deep learning methods and large datasets to identify individuals with high accuracy. This is significant as an attendance system depends on accuracy.

4]**Scalability**

Once trained, CNN models don't require significant changes to be used at a variety of sizes or locations. Due to their scalability, they may be utilised for attendance systems in a range of settings, including small schools and large office complexes.

5]**Processing in real time**

CNN models' real-time visual processing speeds up and improves attendance tracking. This real-time processing capability helps to address attendance-related issues and enables prompt attendance monitoring.

V. Future Scope

The field of attendance system projects that make use of CNN models has a lot of potential avenues for future development and enhancement. Above all, it is essential to consistently enhance identification and accuracy abilities. Investigating more intricate CNN architectures, fine-tuning model parameters, or enhancing training data can all help achieve this. Real-time processing skills are another frontier that has to be optimised for faster inference rates and seamless interaction with dynamic data processing pipelines. Combining other biometric modalities, such as facial recognition with fingerprint or iris recognition, can also improve security and accuracy. Ensuring robust privacy protections using methods such as encryption, anonymisation, or differential privacy is essential. The ability to adjust to a range of external conditions, such as shifting lighting or camera angles, is crucial for usability and effectiveness. A smooth interface with the existing infrastructure, which includes access control and HR databases, can simplify administrative processes. Furthermore, the system's edge computing and mobile versions offer deployment flexibility, particularly in settings with limited resources or remote locations. Continuous monitoring and analytics capabilities that offer insights into attendance trends and anomalies support decision-making. Greater acceptance is promoted by designing user-friendly interfaces for educators, administrators, and students. Last but not least, adherence to regulatory frameworks like GDPR and HIPAA emphasises how important data stewardship is. CNN-based attendance systems have the potential to become reliable, flexible tools that satisfy a variety.

VI. Conclusion

The function of CNN in facial recognition and its modification for posting attendance are officially presented in this work. The process of collecting and refining data to build the CNN model is described. The goal of the project is to create a complete intelligent real-time attendance tracking program that can handle more students in the future.

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