A student attendance system by Deep learning techniques- A comparative study

[1] **Ms. Rashmi Atul Hire**, [2] **Dr. Pawar U. B.**, [3] **Prof. Ramesh P. Daund**

[1] PG Student, [2] Asso. Professor, [3]Asst. Professor,
[1]Department of Computer Engineering,
[1]SNDCOERC, Yeola, India

Abstract: The main purpose of this project is to build a face recognition-based attendance monitoring system for an educational institution to improve and upgrade the current attendance system to be more effective and efficient than before. The current old system has many ambiguities that caused inaccurate and inefficient attendance taking. Many problems arise when the authority is unable to enforce the regulation existing in the old system. The technology behind this will be a facial recognition system. The human face is one of the natural features that can clearly identify an individual. Therefore, it is used for identity tracking because the possibility of face deviation or its duplication is low. In this project, databases of faces will be created to pump data into a recognition algorithm. Then, during the face-to-face session, the faces will be matched against the database to search for identity. When an individual is identified, their attendance will be automatically downloaded and the necessary information saved in an excel sheet. At the end of the day, an excel sheet is sent to the respective faculty with information on the attendance of all individuals.

Index Terms - **Smart Attendance System, CNN, OpenCV, Face recognition.**

I. INTRODUCTION

Attendance plays an important role in any organization, be it educational institutions or businesses. According to the previous attendance management system, the biggest problem is the accuracy of the data collected. Attendance does not have to be recorded personally by the original person, in other words, the attendance of a specific person can be taken over by a third party without the knowledge of the institution that violates the accuracy of the data. For example, student A is lazy to attend a particular class, so student B helped him to sign attendance, which in fact student A did not attend the class, but the system missed this matter because there was no enforcement. Suppose an institution implements enforcement, it may have to waste a lot of human resources and time, which in turn will not be practical at all. All recorded attendance in the previous system is therefore not reliable for analytical use. The second problem with the previous system is that it is too time consuming. Assume that the time required for a student to sign their participation on a 3–4-page list of names is approximately 1 minute. Only about 60 students can sign attendance in 1 hour, which is obviously inefficient and time-consuming. A third issue concerns the availability of this information to the authorized data subject. For example, most parents are very interested in tracking the actual whereabouts of their children to ensure that their child is actually attending college/school courses. However, in the previous system, parents have no way to access such information. Therefore, there is a need to develop the previous system to improve efficiency, data accuracy and ensure the availability of information to these legitimate parties. It is therefore very important to keep records of attendance. The problem arises when one has to manually withdraw the attendance that is not only time-consuming, but also exhausting. Each institute does it in its own way. Some of these institutes use old paper or file systems and some have adopted automatic attendance strategies using some biometric techniques.

A facial recognition system is a computerized biometric software that is suitable for identifying or authenticating a person by performing pattern matching based on their facial appearance. Facial recognition systems have greatly improved in their management

in recent years, and the technology is now widely used to secure various targets and in commercial operations. Face recognition is a powerful field of research that is a computer-based digital technology.

II. LITERATURE REVIEW

In recent years, many different kinds of work have been done in the field of image processing. Researchers from various fields such as computer vision, image processing, machine learning have come to the scene in the field of image processing. Here are some of the existing articles to find the most useful and advanced methods that have been used in existing articles recently. The literature review contains a total of 52 research articles that will discuss in detail about these articles and their work practices that are related to the work.

1) Attendance system based on facial recognition using machine learning
Author: Amritha, Sudhakar
Findings:

Attendance is an important part of daily control in the classroom for the teacher to make it run smoothly. Attendance is usually checked by the teacher at the beginning and end of the lesson, but a manual attendance system can result in the teacher missing someone or some students answering multiple times. Currently, machine learning is highly explored for computer vision applications. So, we use the concept of machine learning in Face - recognition for automatic attendance systems. In this project, we implement face recognition and face detection algorithms to give computer systems the ability to quickly and accurately recognize human faces in images or videos for use in providing attendance.[1]

2) Smart Attendance Monitoring System (SAMS): A facial recognition-based attendance system for the classroom environment
Author: Shubhobrata Bhattacharya; Gowtham Sandeep Nainala; Prosenjit Das; Aurobindo Routray
finding:

In the current academic system, regular attendance of students plays a significant role in performance evaluation and quality monitoring. Conventional methods used in most institutions are putting names or signing on papers, which is very time-consuming and insecure. This article presents an automated attendance management system for convenience or data reliability. The system is developed by integrating ubiquitous components that form a portable student attendance management device using Face Recognition technology.[2].

3) ATTENDANCE MONITORING SYSTEM USING FACE RECOGNITION FACE DETECTION
Author: P. Kowsalya, J. Pavithra, G. Sowmiya, C.K. Shankar's
findings:

The attendance system will remain primitive. Where the teacher calls out students' names to mark their attendance. This system can be easily manipulated to overcome the problems that student biometrics may involve. this camera method is fixed in class and its image capture and face detection. To save a data file and capture images. Otherwise, faces are recognized and indicating attendance.[3].

4) Automatic attendance system using facial recognition
By: Harshad Patil, Heena Khan, Saquib Ansari, Saimohan Sahu
Findings:

Student attendance is essential in the learning process. Student attendance can be recorded in several ways; one of them is through student signatures. This process has several drawbacks, for example, it requires a long time to attend; if the attendance sheet is lost, the administration has to enter the attendance data one by one into the computer. To overcome this problem, a web-based student attendance system using facial recognition was designed. In the proposed system, a convolutional neural network (CNN) is used to detect faces in images, deep metric learning is used to generate face embeddings, and to classify student faces. The computer can thus recognize faces. From the experiments conducted, the system was able to recognize the faces of the students who attended and their attendance data was automatically saved. We can send the attendance file by e-mail by clicking the button.[4].

5) Implementation of a facial recognition attendance tracking system for laboratory surveillance with hash encryption.
Author: F Hamami, I A Dahlan, S W Prakosa and K F Somantri
Findings:

Facial recognition (FR) is becoming popular for human identification. In fact, the FR scheme can be used to construct tracking tasks by recognizing people by their faces. This paper presents the implementation of face recognition as a biometric method for smart attendance, and we also designed an integrated scheme from capturing data from peripheral devices (CCTV), streaming data to a dedicated server, and then presenting the data in real time. via Android mobile devices. In this scheme, we proposed to use convolutional neural network (CNN) based deep learning algorithms. Through streaming CCTV data, faces are captured and compared to a database. Therefore, it is considered as their attendance logging. It is then marked and saved in the database. This system prototype is developed

III. SYSTEM ARCHITECTURE

The proposed system analyzes the application of supervised machine learning approaches the class with the highest probability is considered as a possible class. Here the category is nothing but the crop that is predicted for the given input parameters. Once the yield is predicted, it makes it easier for farmers to predict the available yield for their individual land. Then the farmers are guided by the mobile app to understand that what seeds we will tend to plant on the land to induce higher yield. As part of previous prior data, the crop forecast was calculated by analyzing farmers' prior expertise on climate conditions. Thus, correct data regarding the history of climatic conditions is a crucial factor for making selections in crop selection.
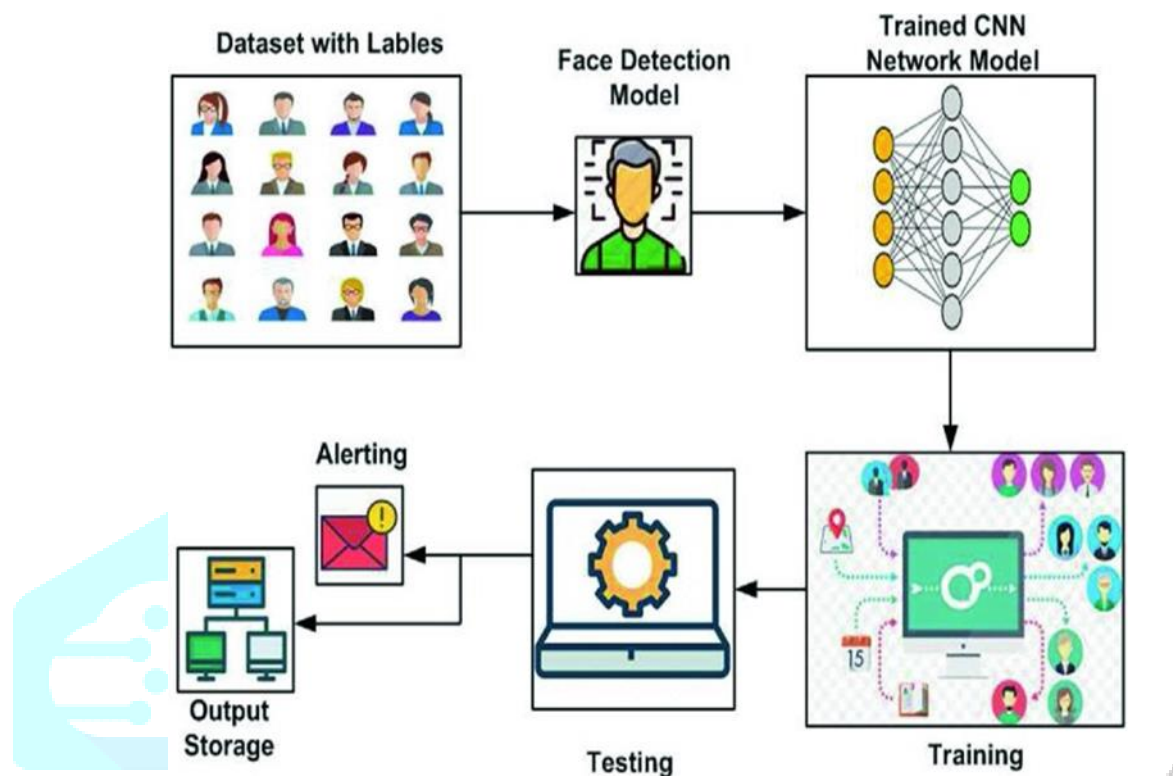

Figure. 3.1. System Overview

The proposed attendance system based on face recognition can be divided into five main modules. The modules and their functions are defined as follows.

Image capture

A high-definition camera is used to record video and take head-on pictures of students.

Database creation

The first step in an attendance system is to create a database of faces to be used. Different individuals are considered and a camera is used for face detection and frontal face recording. The number of frames to consider can be adjusted for accuracy levels. These images are then stored in the database along with the registration ID.

Face Detection

A correct and efficient face detection algorithm always improves the performance of face recognition systems. The data of the trained faces is saved.

Face recognition

The trained face data is stored and the detected faces are compared with the student IDs and recognized. Face registration is done in real time to guarantee the accuracy of the system. This system is exactly dependent on the condition of the camera.

Analytical models

The analytical model acts as a link between the system description and the design model. In the analytical model, the information function and behavior of the system are defined, which are translated into the interface of architecture and design at the component level in design modeling.

IV. METHODOLOGY & ALGORITHM

A Convolutional Neural Network (ConvNet/CNN) is a deep learning algorithm that can take an input image, assign importance (learnable weight and bias) to different aspects/objects in the image and be able to distinguish one from the other. The preprocessing required in ConvNet is much lower compared to other classification algorithms. While for primitive methods filters are hand-designed, with sufficient training, ConvNets have the ability to learn these filters/characteristics.
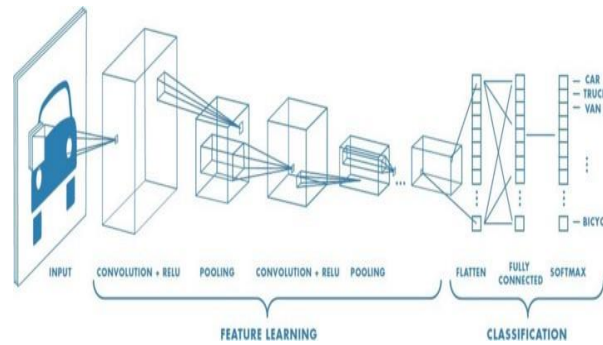

Figure: 4.1 C N N Algorithm

The architecture of the ConvNet network is analogous to the connection architecture of neurons in the human brain and was inspired by the Visual Cortex organization. Individual neurons respond to stimuli only in a limited area of the visual field known as the Receptive Field. A collection of such fields overlaps to cover the entire visual area.

The properties of CNN are as follows:

• The depth of the filter in the CNN must match the depth of the input image. The number of color channels in the filter must remain the same as in the input image.

• Different Conv2D filters are created for each of the three channels for the color image.

• Filters for each layer are randomly initialized based on a normal or Gaussian distribution.

• Various kernel functions can be specified for the decision function. You can use regular kernels, but it is also possible to specify custom kernels.

• The initial layers of the convolutional network extract high-level features from the image, so use fewer filters. As we build further deeper layers, we increase the number of filters to double or triple the filter size of the previous layer.

• Deeper layer filters learn more features, but are very computationally intensive.

Dataset

The person will be entered into the database using their name and facial images. The information will be stored in a folder with the folder name as the person's name. The registration process includes: Create a folder with the person's name as the folder name Capture images from the camera using OpenCV and python Save the images to the folder The image of the person is captured using a high-resolution camera and saved to the folder.

Train the system

To train the system, the image captured during recording is taken as input and the system is trained on these images. The steps for training the system are as follows: Face detection Face alignment Generate encoding Train the classifier The image captured in the previous phase is used as input in this phase. Face detection is done first and then face alignment and the aligned faces are cropped and saved.

V. CONCLUSION & FUTURE SCOPE

Smart attendance system has proven to be an effective class attendance system. This system is non-intrusive and reduces the chances of proxies and false attendance. Many approaches have been proposed for intelligent attendance systems, but it has been found that the best method for intelligent attendance systems is the face recognition-based approach. In order to receive attendance, a reliable system must be established. We achieved the same success in the classroom. Our system is very simple to set up and easy to use, requiring a simple camera module and a face recognition computer. Our system can also be implemented on internet enabled raspberry pi.

FUTURE SCOPE

In our research attempt, we focused on building a face recognition-based attendance tracking system for an educational institution to improve and upgrade the current attendance system to be more efficient and effective than before. Thus, our future work would be to improve the recognition rate of our system when students' faces are half-obscured or when they are partially visible.

REFERENCES

[1]Face Recognition Based Attendance Marking System" (SenthamilSelvi, Chi- trakala, Antony Jenitha, 2014)

[2]Fingerprint Attendance System for Educational Institutes (Alhothaily, Alradaey, Oqbah, Amin, 2015)

[3]Shubhobrata Bhattacharya, Gowtham Sandeep Nainala, Prosenjit Das and Au- robindaRoutray, Smart Attendance Monitoring System : A Face Recognition based Attendance System for Classroom Environment, 2018 IEEE 18th Interna- tional Conference on Advanced Learning Technologies, pages 358-360,2018.

[4]Arun Katara, Mr. Sudesh, V.Kolhe, Attendance System using Face Recognition and Class Monitoring System, IJRITCC, Volume: 5,Issues: 2 ,February 2017.

[5]Ashish Choudhary, Abhishek Tripathi, Abhishek Bajaj, Mudit Rathi, and B.M Nandini, "Automatic Attendance System Using Face Recognition", International Journal of Modern Trends in Engineering and Research , Volume: 03, Issue: 04, ISSN (Online):23499745; ISSN (Print):2393-8161,April 2016.

[6]K. Mohamed and C. Raghu, "Fingerprint attendance system for classroom needs," in India Conference (INDICON), 2012 Annual IEEE. IEEE, 2012, pp. 433–438 1842019.

[7]T. Lim, S. Sim, and M. Mansor, "Rfid based attendance system," in Industrial Electronics Applications, 2009. ISIEA 2009.IEEE Symposium on, vol. 2. IEEE, 2009, pp. 778–782.

[8]Kadry and K. Smaili, "A design and implementation of a wireless iris recognition attendance management system," Information Technology and control, vol. 36, no. 3, pp. 323–329, 2007.

[9]T.A.P.K.P.M.I.M.P.A.W.G.D.P.. Roshan-Tharanga, S. M. S. C. Samarakoon, "Smart attendance using real time face recognition," 2013.

[10]P. Viola and M. J. Jones, "Robust real-time face detection," International journal of computer vision, vol. 57, no. 2, pp. 137–154, 2004.