Student Attendance System Using Face Recognition

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***Abstract*—One of the most crucial and difficult things is to keep students' attendance at school. Facial recognition technology is used to track student attendance during class because the traditional method of recording attendance, in which faculty members call out each and every student individually, is used in the majority of schools and colleges. According to this article, the college's attendance excel file will incorporate the students' attendance records. Facial recognition software from Matlab and Computer Vision are combined to monitor the presence of students. The programme that is necessary as well as the factors that affect the device's accuracy and efficacy are examined in this study. The systems for tracking student attendance can be developed using this approach.The main goal of this study is to quickly, easily, and efficiently identify students who have attended the session and record them as present. Based on this, a system for facial recognition attendance can be created using a collection of lightweight deep convolutional neural networks that have been fine-tuned (CNN). The suggested model validates with 87% accuracy utilizing 221 face samples from 27 individuals. The study shows that the suggested face recognition system and model correctly recognises the student and updates the attendance record.**

***Index Terms*—Face Recognition, Students, Attendance**

I. Introduction

An essential component of the educational system is student attendance. A child's attendance history has an impact on graduation rates. It is typical for the attendance system to accurately and error-free record pupils' presence or attendance. The expansion of technical tools has led to an evolution of processes from human to automated or intermediate. Research scientists and engineers can design new combinations of operations by combining various sensing equipment, such as cameras. In university instruction, a variety of recording methods, including manual, semi-automatic, and even electronic, are used. There are already many different ways to track students' attendance, and each has advantages and disadvantages.

RFID, barcodes, wireless, fingerprints, and near-field communication (NFC) are a few examples of the technologies used to track attendance. There were many scholars and software developers involved in the development of this timekeeping system. Depending on the many different sensor technologies available, autonomous systems can take on a number of shapes. Face recognition plays a significant role in the educational sector in order to efficiently automate and maintain the attendance system. A significant difficulty in the education sector is keeping track of the attendance and data of many students, since the number of students enrolling in universities climbs yearly. The attendance of students during class sessions can be monitored using face detection and recognition.

Consequently, in this paper, we describe a useful method for automatically recording students' attendance by identifying their faces. Traditional face recognition technology has a number of difficulties, including fluctuating light intensity, facial expressions, significant position variations, partial occlusions caused by the presence of objects, changes in hairdo or beard, and changes in facial features brought on by ageing. Since faces are intricate and have a multidimensional perspective, it is challenging to design an efficient model for face detection and recognition. However, we have attempted to do so here.

II. Related Work

Digital image processing is computer vision [9]. is order for computers to perceive objects the same way that people do [10]. As a result, the machine is capable of object recognition, decision-making, action, and object counting [11].

Computers learn from existing data and self-learn using computer vision [12], enabling them to observe the world like humans do [8]. Through this capacity, people utilise computers for a variety of tasks requiring object observation and attention, eventually taking machine use up a notch and incorporating student attendance systems into lectures.

The use of fixed and moving graphics for various operations required by people and their developers has expanded, as has the existence and development of an accelerated Graphics Processing Unit (GPU) [13], which is currently one of the growing technologies [14].

One of the technologies used is deep systematic learning [15], [16]. As the deep learning field matures, this technology is being used increasingly frequently in natural language processing to process information, including capability extraction and visualisation processes.

Deep Learning technology excels in handling tasks related to facial recognition, particularly when used in computer vision. One method for categorising the items in an image is a convolutional neural network (CNN) [17], [18].

There are many options available for the detection of objects presented as images, and the success of the regional proposal approach and the RCNN [19] are just two examples.

III. Proposed Methodology

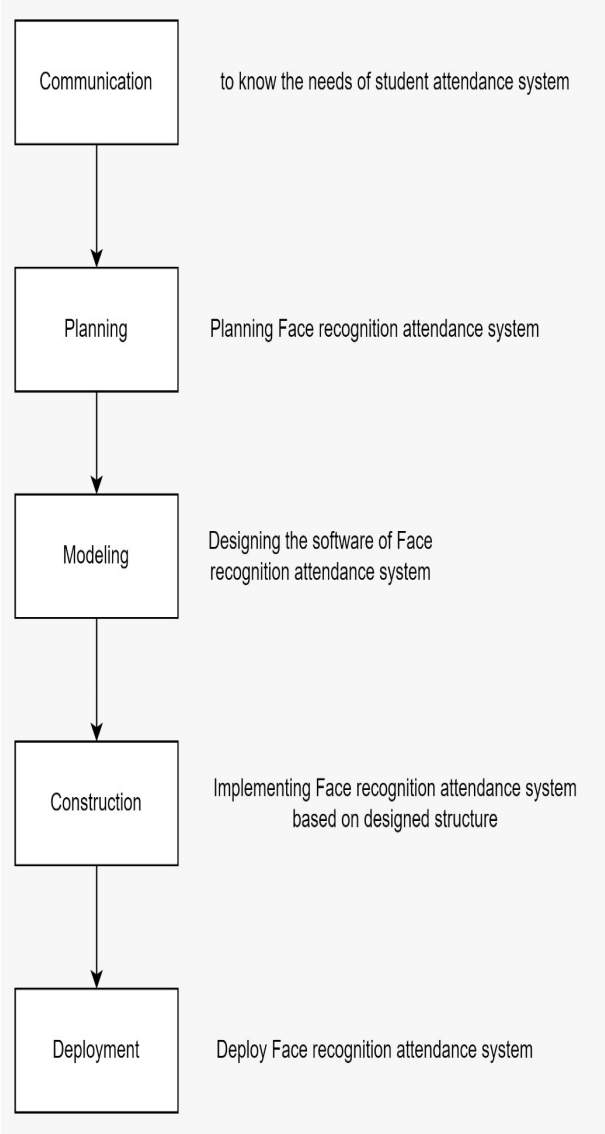


fig 1. Waterfall model for attendance system using face recognition

Reading a variety of books from various publishers forms the foundation for knowledge and communication. Figure 1's depiction of the SDLC, which serves as the framework for the research phases, All of the following are involved in this process: planning, modelling, production, and implementation. The implementation step includes establishing the specifications for the participation system. To put the system into place, a number of linked tasks need to be planned during the planning stage. Now that everything has been prepared, it has been turned into a model. Infrastructure, equipment, and software are all included in the project. However, distribution includes putting the solution to use so that it can be productively applied. The programme may be able to search for and save tasks that have been assigned to it, collect and analyse faces, and perform other activities automatically using machine learning. For a facial recognition software-based attendance tracking system, the first four minimum necessary components are the education subsystem, video camera, attending module, and facial capture component. Data from each pupil are first acquired before the method is put into practise. The approach is then assessed using tools from the CNN toolkit using this training dataset. Technology is used in the student attendance process if efficiency is greater than 90

IV. Algorithm

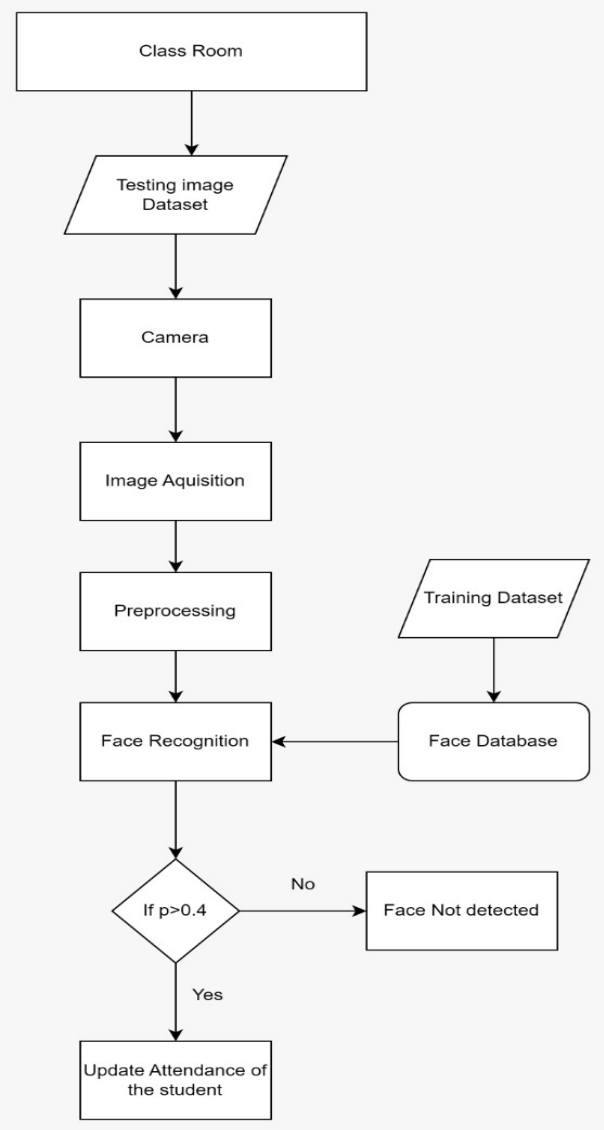


fig 2. Proposed Architecture

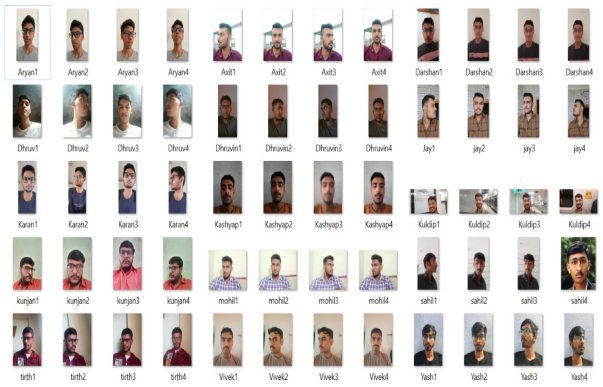


fig 3. Training Database

Architecture of the proposed system is:
A)Image Acquisition High-end web cameras with a 1280x720 resolution are used to capture images of the students in a class. After being captured with web services, the image is transferred to a server for processing.

B)Pre-processing Region of Interest is cropped from the acquired image in image cropping and then image resizing takes place where the cropped photos are scaled to 224 by 224 pixels.

C)Face Data Base Generation Original Face Database comprises of 8 photos for each of 27 different people. Each image is 224 by 224 pixels in size. The original database images are acquired over a range of time intervals as a result of changes in light intensity and various facial expressions.The database is shown in Fig 3.

D)Training CNN Model Using a convolution neural network(CNN) models the images in the database are trained on the model and many models are tried where the best model is selected atlast where validation accuracy is greatest and loss is minimum.

E)Face Recognition The image is first cropped to the area of interest before being compared to other images that have been registered in the face database. The CNN trained model is used to individually verify each face in order to perform face recognition.The attendance is only marked if similarity index is greater than 0.4 .

F)Automated Attendance Marking Following successful face verification and identification, each person's attendance will be automatically recorded on a Microsoft Excel sheet

G)Displaying Output When the face is verified and identified the face of person and corresponding name of that person along with the similarity index of the person and name is displayed.

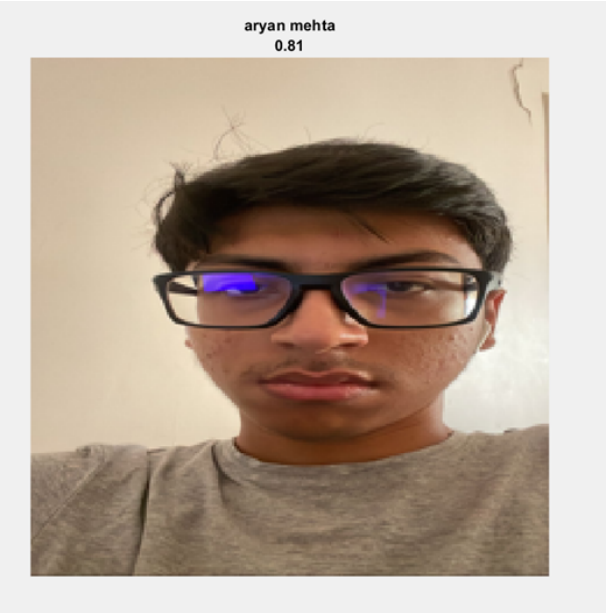


fig 4. Face Detection Result and probability

V. Result and Discussion

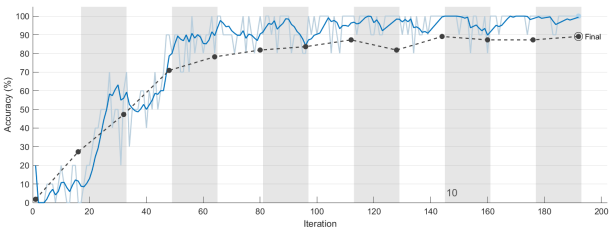
A. Experimental Setup and Tools

The proposed architecture is implemented by using different libraries and tools. For the implementation of student attendance system using face recognition, the platform MATLAB version 9.12.0.2039608 (R2022a) Update 5 is used. Different packages used for the development are:

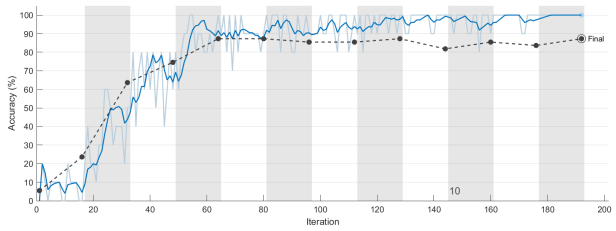
- MATLSB support package for USB webcams: for accessing device camara
- Deep Learning Toolbox: for using pre-trained deep convolution neural network GoogLeNet and ResNet50
- Deep Learning Toolbox for VGG-16: for accessing pre-trained VGG-16 neural network

System used to run the MATLAB application has specifications like:

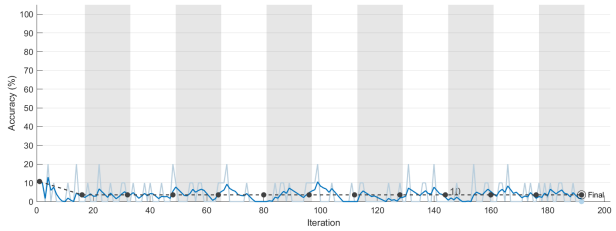
- Processor: Intel(R) Core(TM) i7-10750H CPU @ 2.60GHz 2.59 GHz
- Installed RAM: 16.0 GB (15.8 GB usable)
- Graphics Card: Nvidia GTX 1650



a). GoogLeNet

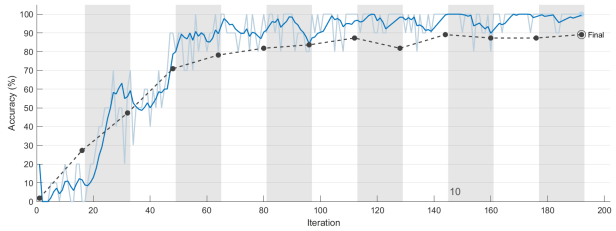


b). VGG-19

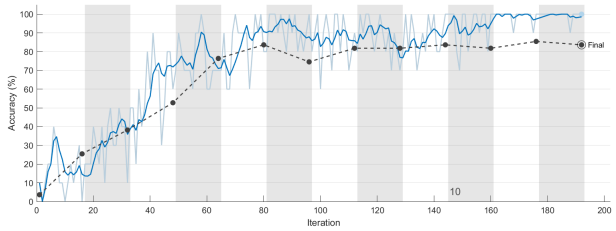


c). SqueezeNet

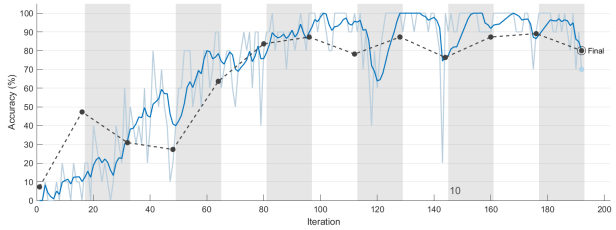
fig 5. Validation Accuracy



a). SGDM



b). Adam



c). Rmsprop

fig 6. Validation Accuracy of Optimizers

B. Performance Analysis

Fig.5. illustrates the training accuracy of the three CNN models ie. GoogLeNet,VGG-19, and SqueezeNet. It can be seen that the models are trained for 12 epochs.

- a. is giving 89.09% validation accuracy
- b. is giving 87.27% validation accuracy
- c. is giving 3.57% validation accuracy

As we can see that GoogLeNet model is giving highest validation accuracy it is the best model amongst all.

Fig.6. illustrates comparing the training accuracy of three main optimizers ie. sgdm,Adam,Rmsprop,Adagrad.

- a. is giving 89.09% validation accuracy
- b. is giving 83.64% validation accuracy
- c. is giving 80% validation accuracy

Therefore it can be observed that GoogLeNet with SGDM as the optimizer is the best model.

VI. Conclusion

In today's society, creating a secure and effective environment is of utmost importance, and facial recognition systems aid in attaining this goal. When compared to conventional approaches, facial recognition technology has a significant advantage over all other biometric techniques in the field of education since it can update and maintain attendance automatically and securely. By offering a seamless and effective approach to manage attendance and update the attendance sheet, this technology may revolutionise the system for keeping track of attendance and simplify the job of professors.

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