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Face Recognition Based Attendance System using Deep Learning

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ABSTRACT: Deep Neural Networks (DNNs) have firmly established themselves as a leading machine learning approach. Image classification, audio recognition, and facial recognition are just a few of the tasks that DNNs have excelled in. Nearly all of the best performing algorithms on the Labeled Faces in the Real-Time dataset employed convolutional neural networks (CNNs). This research offers a deep learning strategy for smart face detection and recognition. We update the attendance of individual students based on the outcomes of the deep learning approach. The system uses deep learning and machine learning algorithms for object identification and facial recognition. Both methods give effective accuracy for the proposed system.

KEYWORDS: Deep Neural Networks, Convolutional neural networks, Polynomial Time, Hyper Text Transfer Protocol, Uniform Datagram Protocol, Transmission Control Protocol

I. INTRODUCTION

The task of recognizing faces, especially outside of controlled conditions, is an extremely difficult problem. In this research we propose smart face detection as well as recognition using deep learning approach, according to results of deep learning approach for individual student system update the attendance based on to respective id. System first detects the student face using camera and store into hard drive. The DCNN framework executes training module using feature extraction as well as feature selection technique and store individual feature into the tainting database. To detect the face from given input image and capture the frame for object recognition. The test feature has map with entire training dataset and generate the similarity weight for each object, and according to achieved weight system recommend the actual student id. Based on given id system automatically update the attendance for respective student.

Humans have a certain amount of time in which to complete tasks. Spending time on tedious and repetitive physical labor reduces productivity and draws focus away from more important topics. We suggest an automation-based strategy utilizing Deep Neural Networks to handle the mass surveillance issue, focusing especially on the subset problem of enhancing teacher efficiency by automating the attendance collecting process, in order to eliminate such worthless labour. This paper proposes to reduce teacher workload by implementing facial expression detection and face classification methods using Deep Learning frameworks, which provide a fast and accurate result while also overcoming the shortcomings of existing methodologies such as multiclass registration problems, multiple occurrences of the same person, luminescence variance, and obstruction.

II. LITERATURE SURVEY

According to [1] the automated attendance system's fundamental idea is to use face recognition more easily than other biometric systems. Based on face identification accuracy, the following three methods—Viola-Jones (Haar Cascades), Histogram Oriented Gradients (HOG), & Convolution Neural Network (CNN)—are examined. The Viola-Jones approach outperformed the others in terms of accuracy. Viola-Jones and CNN methods are used for face detection and identification in real-time attendance systems, respectively. The suggested technique has the advantage of getting over obstacles like alignments, fairly noticeable faces, and unfavorable lighting.

According to [2] a machine learning cascade classification approach is used to accomplish the face detection performance. The algorithm compares the faces in the picture to the trained faces in the database to identify them. Its attendance of a person are automatically recorded without any intervention upon recognition of a registered face also on collected picture collections.

According to [3] through these extensive applications, a "Smart Attendance System for Face Recognition" is integrated. Due to face authorization, the current implementation incorporates facial identification, which saves time and eliminates the possibility of proxy attendance. Now, this approach may be used to a situation where involvement is crucial. The prerequisites for this system are a Raspberry Pi, Open CV, and Dlib written in Python. To identify a person's face in real time, the system in use employs the LBPH face recognizer. Light has an impact on both Eigen faces & Fisher faces; hence it is impossible to guarantee ideal lighting in real life. To solve this issue, the LBPH faces need to be improved. This method decides who is present and who is not by



comparing the test picture to the training image. The technology automatically updates an excel sheet that contains the attendance data.

According to [4] a timekeeping system based on facial recognition. The manual attendance procedure may be made more efficient using a mobile platform and facial recognition technology. The last on the Android platform create and test a face recognition system of check on work attendees, by trying to compare the experiment results of face recognition accuracy. The above design divides into the face recognition system of verification on work attendance information input, attendance sign-in, & average attendance three function module, and introduces a concept of face detection and classification, analyses the procedure of the construction of the face recognition classifier.

According to [5] Real-time facial recognition is used to create a video-based attendance system. The technology provides simultaneous face liveness detection and multi-user attendance. The technology has the ability to automatically gather facial information, which is recorded in the database along with attendance data. The face recognition portion of the system is based on the FaceNet algorithm, while the face detection portion of the system is based the MTCNN (Multitask Convolutional Neural Network) method. The facial liveness identification component of the method is based on the ERT (Ensemble of Regression Tree) algorithm, which can determine whether the user blinks, and is implemented using the TensorFlow framework. Python is used to create the attendance system, and the Qt library is used to create the user interface.

According to [6] an Automatic Attendance System powered by IoT (IAAS). IAAS is a facial recognition-based attendance monitoring system. Students' images are captured by a device (such as a smartphone or tablet PC) and analyzed by a face recognition system. This system determines who is present in the class and emails a notice of their presence to a database system for tracking attendance.

According to [7] Two colleges in a province are chosen for the real-time check-in and examination of student attendance under a facial recognition attendance system based on real-time video processing. Real-time video processing makes it difficult to examine the facial recognition attendance system's interface settings. The video facial recognition system's accuracy, according to research, is roughly 82 percent. Class skipping is greatly decreased compared to the control group, with only around 13 percent, thanks to the facial recognition time attendance system & manual fingerprint punching. Efficiency has significantly increased as compared to the control group, which may deter students from leaving early and skipping class.

According to [8] when recognizing unfamiliar people and saving their photos, a facial recognition-based attendance system may achieve a lower false-positive rate by utilizing a threshold of confidence, or Euclidean distance value. Local Binary Pattern Histogram (LBPH) method is superior to other Euclidean distance-based algorithms like Eigenfaces & Fisher faces. Due of their robustness, they employed the LBPH algorithm for face recognition and the Haar cascade for face detection. It can withstand monotone grayscale conversions. To assess our system, scenarios such the false-positive rate for face recognition, the false-positive rate for that, and the false-positive rate when and when employing a threshold in identifying unfamiliar individuals are taken into consideration.

According to [9] it is suggested that a unique CNN architecture be used for face recognition, along with a procedure for gathering student face data. It has been shown experimentally that the suggested CNN design offers accuracy. The "Smart Attendance Management System (SAMS)," a web-based programmed that uses facial recognition to give attendance of students in real-time, is also developed utilizing the suggested CNN architecture. The suggested application is simple to deploy and keep up with.

According to [10] a system for automatically recording attendance is created and put into use. Two distinct face identification algorithms—HaarCascade and Histogram of Oriented Gradients—are used, and their results are contrasted. Convolutional neural networks (CNNs) are used in deep learning to identify the pupils in a classroom. A mask checking tool is also provided as an additional precaution against the Covid-19 epidemic. Python is used to create a visual user interface (GUI) system.

III. PROPOSED METHODOLOGY

Figure 1 depicts the system architecture, which focuses on optimization techniques for face identification administration, with a focus on public methods. The system uses the camera to recognize the student's face and saves it to the hard drive. The DCNN framework runs the training module and stores individual features in the training database using feature extraction and feature selection techniques. To recognize objects by detecting the face in a given input videos and capturing the frame. The test feature maps the complete training dataset and generates a similarity weight for each item, then recommends the real student id based on the weight system. The attendance for each student is immediately updated based on the specified id.

A. Architecture

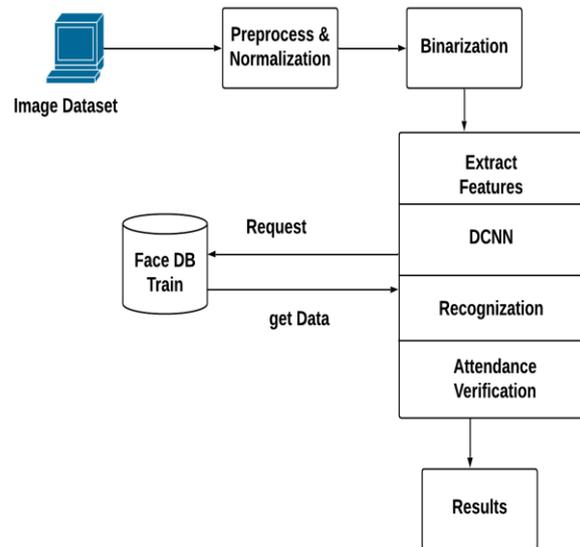


Figure 1. System Architecture

The above figure demonstrates a system architecture and overall execution in detail. In below section we discuss each step of the execution;

- System first detects the student's face using a camera and store it on the hard drive.
- The Deep CNN framework executes training modules using feature extraction and feature selection techniques and stores individual features into the taining database.
- To detect the face from the given input image and capture the frame for object recognition.
- The test feature has a map with the entire training dataset, generates the similarity weight for each object, and recommends the actual student id according to the achieved weight system.
- Based on the given id system automatically update the attendance for the respective student.
- Deep Convolutional Neural Network (DCNN) for training and testing respectively. Euclidian distance for optimization

Expected Outcome

- Automatic attendance management based on face detected images.
- Provide better accuracy for face recognition as well as detection.
- Generate various feature vector of faces during the face recognition.

B. Algorithms

DCNN

Input: Various test examples are included in the test dataset. TestDBLits [], Train dataset created during the TrainDBLits[] training phase, and Threshold Th

Output: HashMap all occurrences when the weight falls below the threshold value for similarity.

Step 1: Records for each test are included in the equation below.

$$testFeature(k) = \sum_{m=1}^n ([featureSet[A[i] A[n]] \leftarrow TestDBLits)$$

Step 2: Utilize the following method to create a feature vector from testFeature(m)..

$$Extracted_FeatureSetx [t.....n] = \sum_{x=1}^n (t) \leftarrow testFeature (k)$$

For the testing dataset, Extracted FeatureSetx[t] contains the extracted feature for each occurrence.

Step 3: Using the following function for each instance of a train



$$trainFeature(l) = \sum_{m=1}^n ([featureSet[A[i] \dots \dots A[n]] \leftarrow TrainDBList)$$

Step 4: Create a fresh feature vector from trainFeature(m) using the following function.

$$Extracted_FeatureSet_Y[t, \dots, n] = \sum_{x=1}^n (t) \leftarrow TrainFeature (l)$$

Extracted_FeatureSet_Y[t] holds the extracted feature of each instance for training dataset.

Step 5: Now evaluate each test records with entire training dataset

$$weight = calcSim (FeatureSetx || \sum_{i=1}^n FeatureSety[y])$$

Step 6: Return Weight

C. Problem statement

To design and develop an method for face detection system from large scale image dataset using deep learning approach. This system is much useful large face dataset, to improve the accuracy of system

D. Objectives of system

- To design and developed approach for face detection using deep learning to smart attendance system.
- To design and developed an algorithm to detect and recognize the student face and update the attendance respectively.
- To develop custom deep learning algorithm to enhance the system accuracy.
- To explore and validate the proposed system on synthetic as well as real time dataset for attendance management.

IV. RESULT AND DISCUSSIONS

The system categorization graph is shown below. The graphs show how the system categorizes the aggregate inputs into separate cases. The suggested system uses a Deep CNN combination that produces good results in all areas. The projected outcomes are compared to two distinct current systems in this system.

The below Figure 2,3 and 4 demonstrates real time evaluation of proposed model. How it detects the face with candidate id.

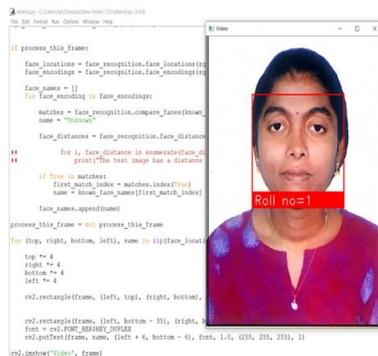


Figure 2 : experiment I for face detection with candidate role no.

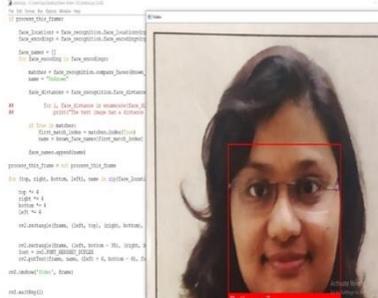


Figure 3 : experiment II for face detection with candidate role no.

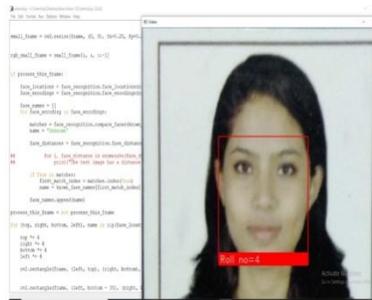


Figure 4 : experiment III for face detection with candidate role no.

The below figure 5 shows the detection view for proposed system.



Figure 5 : Face detection view

Computer vision algorithm will run after faces have been discovered successfully, recognizing individual individuals and updating attendance accordingly.

Table 1 : Dataset Description

Dataset Name	Description and size	Train	Test
With 5 Face Objects	2048*2048, 1600*1600	8850	1000
With 3 Face Objects	1024*1024	7000	3000
With 2 Face Objects	1500*1500	1402	622

Figure 6 shows the accuracy of face recognition using different computer vision techniques.

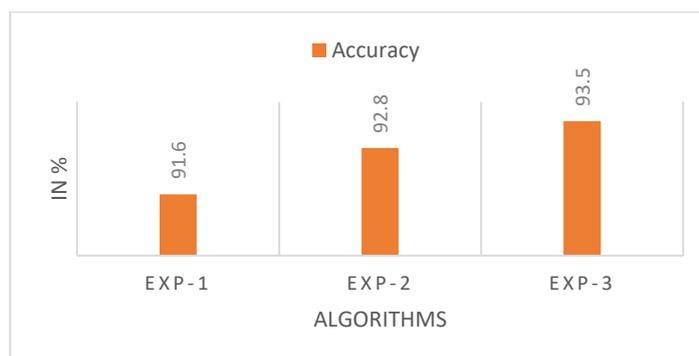


Figure 6 : Face detection and classification accuracy.



Deep CNN obtains higher accuracy over machine learning-based SVM and deep learning-based CNN classification algorithms in the entire experimental analysis. The experimental I achieve 91.6% accuracy, and experimental II gives around 92.8% accuracy, while experimental III achieves 93.5% detection accuracy for heptageniids as well as real-time dataset also.

V. CONCLUSIONS

Our objective was to develop a full-Face Recognition system that could function with any picture and was continually improving. This improvement had to be self-contained, and it had to be able to detect and integrate new individuals. Furthermore, time constraints were a concern since this recognition had to be done near real-time as feasible. Face recognition is challenging to solve, particularly outside of controlled settings. In reality, there have been several failed attempts throughout history. Apart from differences in expression, lighting, and facial hair across photos of the same face, determine what makes a face identifiable. As a result, our goal at the outset of this project was to utilize some of the current research rather than starting from scratch. This would enable us to speed up the procedure while also increasing the likelihood of obtaining high-quality findings. Using different machine learning and deep learning techniques, extract variously simulated as well as some real-time characteristics and automatic attendance the student faces.

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