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A Comprehensive Survey on Smart Attendance Monitoring System

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Abstract: *It is obligatory to talk over to a fruitful system that sets down the attendance of a student spontaneously. To focus on the attention of students and make them associated with discovering technologies, we try to move on to the latest upcoming trends on advancing the attendance systems. Without student intercession, this system operates on the face recognition method for automatic attendance of the students in a classroom environment. Traditionally, a roll-call is called to check if the student is present in the class or not, which ultimately takes our crucial time. So, in an urge to save time, the idea to measure individuals in a class spontaneously depending on face recognition is assimilated. To recognize the face of an individual we will be using face recognition technology.In this paper, using Deep Learning Algorithm we have evaluated a procedure for a precise smart attendance monitoring system. The in and out of individuals in a university or an organization is spotted in this approach as the first step. When an individual proceeds towards a CCTV camera near the doorway, automatically Individual's face is going to be detected and thus the arrival time is going to be put down. In the same way, while leaving their faces are going to be detected in other deep learning model imbibed in CCTV cameras ,and hence the leaving time is going to be put down. With the assistance of this method, we can get the attendance in terms of percentage for the time for which we have attended the lecture. The smart attendance monitoring system anticipated a bonus for the current method of attendance management.*

Keywords: Attendance, Convolutional Neural Network, Deep Learning, Image Processing

I. INTRODUCTION

In the Era of digital technology, where we are acting like computer's slaves. But by this, the life of humans has become much easier there's not necessarily safer. Within the whole world, one of the core problems is fake identity. In Today's technologies, more popular technology is digital biometric technologies for managing attendance most effective biometric is Face Detection. Traditional attendance system is longer monopolized because it needs time to sign on paper or call respective IDs. There is also a problem of getting a hardcopy of the attendance records when the attendance sheet may get misplace. [1] For supervising attendance tracking, a bio-metric approach allows the in-charge to track the in and out time only. Perhaps it does not count the real-time they are present if irregular in and out are not permitted. [2]Usually the image processing means process of constructing a picture finer along with variousother methods. A system of components or software which are in position to mark and detect an individual is called Face RecognitionFacial Recognition methods tends to figure in diversified appearance, but the one concept that holds true for any method is that the equivalent of facial expressions are selected uniquely [3] In general Face Recognition is built as a two-part problem, the primary is to detect a face within the image andthe second is to properly categorize the image. This could be translated into an Object Detection problem and ObjectClassification Problem. The matter statement for an object detection framework may be raised a hardship ofimage localization, meaning the neural network needs to know during which a part of the image lies the thing to be detectedand in addition to the boldness with which the Neural Network anticipates that the article is owned by a selected class [4] CNN is that the most popular and commonly employed algorithm. The benefit of CNN compared to its previous methods is that it spontaneously recognizes the appropriate features with no human supervision. CNN's are commonly used in a range of various fields, including computer vision, speech processing, Face Recognition, etc. [5] In this paper, we had reviewed various research papers for the Attendance Management System approach.

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II. RELATED WORK

Halder et al [2] have proposed "Deep Learning-based Smart Attendance Monitoring System" based on Dense Neural Network. This system will be recording the entry and exit time of the individual by recognizing the face.

Yang, et al [18] have proposed "Face recognition attendance system based on real time video processing", and two colleges in a sector are selected for real-time check in and inspection of student attendance.

Anggoro et al [6] proposed "An Android-based course Attendance System using Face Recognition". For this system we have two Android applications that are developed, one for student and one for faculty.

Vasanthi, et al [11] proposed "Facial image recognition for biometric authentication systems using a combination of geometrical feature points and low-level visual feature" which is based on multivariate correlation analysis.

Hegde et al [13] proposed "Face recognition based attendance management system" in which three options are provided for user such as, student registration, faculty registration and mark attendance.

Athanesious et al [4] "Deep Learning based Automated Attendance System". It uses a Neural Network named as single-shot multi-box detector for face detection and VGG network for multi-class face recognition purpose.

Paper Number	Technologies Used	Methodology Used	Advantage	Disadvantage	Accuracy
[1]	• OpenCV • PCA/LDA	• Haar Cascade Algorithm • LBPH Algorithm	Separate conformation technique for Identification	Do not perform well with less light strength	
[2]	• Max pooling 2D Layering, • Motion Triggered System, • Keras, • Numpy, • OpenCV, • Tensorflow	• Dense Neural Network	Depending on the Validation efficiency of recognizing faces, this model works well.	If surveillance cameras are not fixed, then it may affect the working of the model.	96-98%
[3]	• OpenCV • Digital Image Processing	• Convolutional Neural Network	High accuracy even with smaller number of images.	The extracted images are enhanced, Which therefore reduces Quality, resolution or colour density	82%
[4]	• Tensorflow • Shot MultiBox Detector • WIDER • Dataset • VIT Dataset	• ResNet base network • VGG Network			94.66%
[5]	• ML Algorithm • AlexNet Network • HR.Net	• Convolutional neural network • Deep Learning	With CNN, Large scale network implementation is easier	Multi-complex modelling of data is difficult	

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[6]	• Raspberry PI • Logistic Regression classifier • K-NN method	• Viola and Jones Algorithm • Linear Discriminant Analysis(LDA) Method	Best classification accuracy with the use of LR(Logistic Regression)	More Computational Time	94%
[7]	• LBPH • PCA/LDA • OpenCV	• Haar Cascade algorithm • Viola Jones face detection technique • Eigenfaces		Different lightning conditions affects the result.	
[8]	• OpenCV • CXCORE • CV • ML • CVAUX • HighGUI • CVCAM	• Eigen face using Grayscale images • Haar cascade classifier	Computation is fast	For improving accuracy, one needs to add more pictures of the same person which is not much efficient as the complexity of the model increases ultimately	95%
[9]	• DSDM • OpenCV • Numpy • Pandas • Datetime	• Local Binary Pattern Histogram Algorithm	LBPH algorithm characterises local feature of images. LBPH Algorithm gives significant output.		70-80%
[10]	• Raspberry PI3 • OpenCV • MATLAB • Python GUI	• Principle Component Analysis • Linear Discriminant Analysis • Jacobi method • Haar Cascade Classifier	It gives precise output and payroll data		
[11]	• Active Shape Model • Hetero-PSO-Adaboost-SVM • Tensorflow • OpenCV	• Multivariate correlation analysis • Canonical correlation method • SVM classifier		Sensitivity-Specific	94.20%

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		• Principle component analysis • Independent component analysis			
[12]	• Radio frequency identification • Multi scale structural similarity(MS_SSIM) • Extreme learning machine(ELM)	• Haar cascade classifier • Principal component analysis • Local binary pattern histogram	Quick response and highly accurate.		99%
[13]	• HOG • OpenCV • CV toolbox • Tensorflow • Ada-boost	• Viola Jones face detection algorithm • Principal component analysis • CNN	Exhibits robustness towards recognition		
[14]	• OpenCV • MATLAB GUI	• Haar cascade classifier • Local binary pattern histogram			
[15]	• Support vector machine(SVM) • OpenCV • Radio frequency identification	• Viola Jones algorithm • Haar cascade classifier • Principal component analysis • CNN	Highly reliable		90%
[16]	• OpenCV • Support vector machine • Eigenfaces • HOG descriptor • Ada-Boost	• CNN • Haar cascade classifier • ResNet neural network	Real-time reporting gives productivity insights and eliminates errors.		98%
[17]	• OpenCV • Java development kit • Android development kit	• Haar cascade classifier • Linear discriminant analysis	Provides real time records and automated inputs for payroll processing		89%

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	• Google cloud	• Euclidean distance(ED)			
[18]	• MYSQL • OpenCV • Python • Support Vector Machine(SVM)	• CNN • Recursive Neural Network • LDA	High processing time	Unnecessary errors often occurs	
[19]	• OpenCV 2.4.13 • Tensorflow • Haar Templates • Ada-Boost	• Viola Jones algorithm • Fisher face algorithm	Helps to achieve stability towards lighting conditions	Low reliability	45-50%
[20]	• Deep learning • HOG • Inter personal communication(IPC)	• Haar Cascade classifier			

III. PROPOSED METHODOLOGY

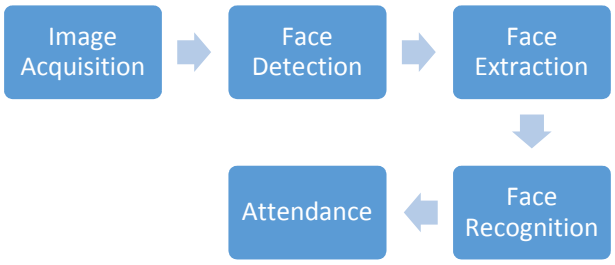

Figure 1: Block Diagram of Proposed System

3.1 Image Acquisition

Image is acquired is that the action of retrieving an image employing a high Resolution CCTV that is fitted in the class. This image is then fed as an input to the system.

3.2 Face Detection

The specified face pattern of the person are identified like eyes, nose, and mouth. The tactic first detects eyes, so eyebrows, nose, mouth, etc. Once it is finished it, multiple algorithm training is carried out on large datasets to spice up the algorithm's efficiency to recognize the faces and their position.

3.3 Feature Extraction

After the face is recognized, the software is instructed to recognize the facial landmarks. These landmarks are the key to differentiating each face present within the database. After this, the registered face within the database is recognized in position, size, and scale to match with the user's face. It had helped every time the user's face moves or expressions are altered; the software will precisely detect it.

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3.4 Face Recognition

After a facial feature is extricated and landmarks, face position, orientation & all key elements are provided into the software. The database has all the knowledge of registered users. If the software recognizes the replica for an accurate feature within the database, it provides all the person's details.

3.5 System Configuration

We will need a system with Intel Core i5 7th gen processor with 8GB of RAM, Windows 10 OS, Graphics ard and Anaconda Environment. Along with that Jupyter notebook and Sublime text editor are also needed and Python 3.6 Version is used. [2]

3.6 Technology Stack

OpenCV

System which discovers and grants the faces with a webcam which is emerged using OpenCV libraryenacted in python. OpenCV is in demand computer vision library which is out there in python and C++.OpenCV-Python could be a library of Python which is obligated to resolve computer vision issues. OpenCV-Python is a highly optimized library for numerical operations. [8]

CNN

Convolutional Neural Network is a Deep Learning algorithm specified for working with Images and videos. It takes images as inputs, brings out and grasp the features of the image, and categorizes them, and assists the grasped features. CNN has various filters, and every filter extricate some information from the image like edges, different types of shapes (vertical, horizontal, round), then all of those are added up to spot the image. [8]

Data processing

Preprocessing of data is done by image reshaping into 50*50 of pixels of image and labels are drawn out and stuffed into CNN model in the structure of a matrix of 2 columns.

Model Building

The preliminary deep learning approach has two convolutional layers, each of 64 nodes.The output form is compressed. Two of the fully connected dense layers of 64 nodes are computed. The Activation function is applied for Final classification. The loss function is used and an optimizer is used to get the best performance. [2]

Motion Detection

When motion is detected in the camera, this system activates and real-time attendance is taken. Motion detection is done by using background subtraction. [2]

Result and Analysis

The different models are differentiated by picking up the hyper-parameters including a number of dense layers and nodes and the result is displayed. [2]

IV. CONCLUSION

In this paper, we introduced an automatic attendance management system. This attendance system technique will provide an easy way to conduct attendance. It will be helpful for the record without wasting time in form of calling IDs. By using face recognition technology will help to determine student or employee's presence in lectures or institution.

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