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ATTENDANCE SYSTEM USING FACE RECOGNITION WITH MASK ON

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***Abstract*: Face detection and recognition has become popular and significant technology in recent years. As in 2020, the whole world had faced epidemic named Corona Virus (Covid-19) and it has also have adverse effects in 2021. Wearing face mask has became compulsion for everyone. So for such mask, traditional face recognitions are not feasible as they are not able to recognised masked faces. In such pandemic situation of coronavirus (COVID-19), face masks have played an important role. An approach has been proposed that consists of first detecting the facial regions using Multi-Task Cascaded Convolutional Neural Network (MTCNN).Then facial features extraction is done using Facenet embedding model. And finally, classification is done using Support Vector Machine (SVM). And as an image plays major role in detection, quality of image have its impact on accuracy. In proposed methodology, quality of image is improved using image processing techniques such as contrast adjustment, bilateral filtering. Experiments signify that it recognises masked faces.**

Keyword – Face detection, Face recognition, MTCNN, Facenet, Feature Extraction and SVM.

I INTRODUCTION

In epidemic situations such as the novel coronavirus (COVID-19) pandemic, face masks have become an essential part of daily routine life. The face mask is considered as a protective and preventive essential of everyday life against the coronavirus. Many organizations using a fingerprint or card-based attendance system had to switch towards a face-based attendance system to avoid direct contact with the attendance system. However, face mask adaptation brought a new challenge to already existing commercial biometric facial recognition techniques in applications suchfacial recognition access control and facial security checks at public places. Face recognition has been one of the famous and challenging topics among computer vision researchers for decades. With the rapid development of artificial intelligence (AI) in recent years, face recognition technology also evolved on a fast track. In our daily life activates like, in a passport checking, smart door, access control, voter verification, criminal investigation, and many other purposes face recognition is widely used to authenticate a person correctly and automatically. Face recognition has gained much attention as a unique, reliable biometric recognition technology that makes it most popular than any other biometric technique likes password, pin, fingerprint, etc. The face recognition-based attendance system has various advantages compared to traditional card recognition, iris recognition, and fingerprint recognition. Facial recognition techniques include high concurrency, noncontact and user-friendly systems. The face recognition system has many such systems used in different sectors such as employment in the government sector, security, e-commerce, retailing, and many other fields.

Since the emergence of face detection and facial landmark localization technology, many methods have been tried to accomplish these two tasks, and there are also many excellent algorithms. However, with the deepening of research, we are increasingly aware that problems such as large angle attitude, extreme illumination and occlusion add a lot of difficulties to the face and its landmarks detection process. Therefore, how to overcome these factors and improve the accuracy of detection has become the significance and focus of current research. The focus is to improve the accuracy of multi-view face detection. We present a methodology that can enhance existing facial recognition technology capabilities with masked faces.

II LITERATURE SURVEY

In 2020, Wenxuan Han [1] Object detection, which aims to automatically mark the coordinates of objects of interest in pictures or videos, is an extension of image classification. In this approach, to effectively prevent the spread of coronavirus they present an object detection method based on single-shot detector (SSD), which focuses on accurate and real-time face masks detection in the supermarket. First, they used lightweight backbone network for feature extraction which is based on SSD, then proposed a Feature Enhancement Module (FEM) to strengthen the deep features learned from CNN models. Finally, a large-scale COVID-19 mask dataset constructed to detect whether shoppers are wearing mask or not.

MatchaVenu Gopala Rao, Chiticasi Ganesh, Emani Sowjanya, Vaddi Sravya and Kotari Sai Kiran published paper in year 2020 [2]. In this paper, a simple and efficient automaic attendance management system using Principal Component Analysis (PCA) based facial recognition technique is presented. The proposed algorithm, consists of Training phase, Detection phase and Recognition and classification phase. The proposed system maintains a log document to keep records of all student‘s attendance and useful for both faculty and management to process without any mistakes and delay.

Towards Facial Recognition Problem in COVID-19 Pandemic named paper [3] was published in year 2020 and the authors are Imran Qayyum Mundial, M. Sohaib UI Hassan, M Islam Tiwana,Waqar Shahid Qureshi. In this paper, they used a supervised learning approach to recognize masked faces together with indepth neural network-based facial features. A dataset of masked faces was collected to train the Support Vector Machine classifier. In this method, MTCNN was used as facial detector. Then detected face images were resized and normalized. Then they used CNN feature extractor which gives compact features of an input image called as embeddings as an output. Then Support Vector Machine (SVM) classifier was trained with these embeddings. The SVM classifier distinguishes between two faces of different categories.

Facial Mask Detection using Semantic Segmentation named paper [4] was written by Toshanlal Meenpal, Ashutosh Balakrishnan, Amit Ver in year 2019. They design a binary face classifier which detects any face present in the frame irrespective of its alignment. They present a method to generate accurate face segmentation masks from any arbitrary size input image. The method uses predefined training weights of VGG – 16 architecture for feature extraction. Training was performed through Fully Convolutional Networks (FCN) to semantically segment out the faces present in the image. Gradient Descent was used for training while Binomial Cross Entropy was used as a loss function. Further the output image from the FCN is processed to remove the unwanted noise. This model shows great result in recognizing non-frontal faces along with this it was also able to detect multiple facial masks in a single frame.

Face Recognition Based Attendance System Using Machine Learning Algorithm named paper [5] was published in year 2018 by Radhika C.Damale, Prof. Bagashree V. Pathak. In this approach, three different methods such as SVM, MLP and CNN had been presented. The database is created by capturing videos of 11 persons looking in different directions. Then from these videos, face is detected and frames are extracted. The detected facial images are cropped and resize to 128x128 resolutions. The reshaped images are again reshaped to 1D array. DNN is used for face detection. For SVM and MLP based approach, the features are extracted using PCA and LDA feature extraction algorithms. In CNN based approach, the images were directly feed to the CNN module as a feature vector. The proposed approach shows the good recognition accuracy for CNN based approach.

In 2016, Shanshan Guo [6] they combine Convolutional Neural Network (CNN) and Support Vector Machine (SVM) to recognize face images. CNN is used as a feature extractor to acquire remarkable features automatically. They first pre-train CNN by ancillary data to get the updated weights, and then train the CNN by the target dataset to extract more hidden facial features. Finally, they use SVM as classifier instead of CNN to recognize all the classes. With the input of facial features extracted from CNN, SVM will recognize face images more accurately. The model that CNN combined with SVM spends less training time and obtains high recognition rate.

In 2012, Nirmalya Kar [7] This paper describes a method for Student‘s Attendance System which will integrate with the face recognition technology using Personal Component Analysis (PCA) algorithm. The proposed system has been implemented with the help of three basic steps: 1. detect and extract face image and save the face information in an xml file for future references. B. Learn and train the face image and calculate eigen value and eigen vector of that image. C. Recognizes and match face images with existing face images information stored in xml file. They used the eigenface approach for face recognition. The comparison of eigenface is used to identify the presence of a face and its identity. The system will record the attendance of the students in class room environment automatically and it will provide the facilities to the faculty to access the information of the students easily by maintaining a log for clock-in and clock-out time.

In 2015, Rajeev Ranjan [8] paper describes a deep learning pipeline for unconstrained face identification and verification which achieves state-of-the-art performance on several benchmark datasets. They proposed a novel face detector, Deep Pyramid Single Shot Face Detector (DPSSD), which is fast and detects faces with large scale variations (especially tiny faces). Additionally, they proposed a new loss function, called the Crystal Loss, for the tasks of face verification and identification. They provide evaluation results of the proposed face detector on challenging unconstrained face detection datasets.

In 2017, Anshun Raghuwanshi, Dr Preeti D Swami [9] this paper proposes and compares the methodologies for an automated attendance system using video-based face recognition. Here input to the system is a video and output is an excel sheet with attendance of the students in the video. . In this paper, attendance is registered from a video of students of a class by first performing Face Detection which separates faces from non- faces, and then Face Recognition is carried out which finds the match of the detected face from the face database (collection of student‘s name and images). If it is a valid match then attendance is registered to an excel sheet. Face recognition is performed and compared on the basis of the accuracy of recognition using Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) algorithm.

In 2017, Minjun Wang [10] paper presented a face recognition algorithm based on local binary patterns (LBP) model and deep convolution network, and used SoftMax regression method to classify and complete face recognition. In this paper, the improved depth convolution network as a feature extractor, capture the texture of the performance of better LBP features, help to accurately classify. LBP processing, convolution, pooling and full connection of the combination and improvement, so that the system can be a good representation of the face.

III PROPOSED SYSTEM

After reviewing various literatures, we have decided that implementing web based attendance system using face recognition will be more feasible in such pandemic situation where we have to be contactless. Our system will detect face from image and then will recognise the face from dataset.

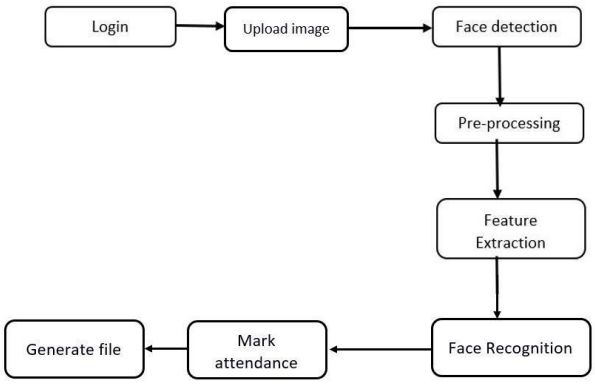

Fig 1. Proposed System

The system will detect the faces from the image and will pre-process them. After image acquisition, MTCNN will detect and crop the faces and rescale them. Then these are provided to FaceNet model for feature extraction and also image processing techniques are applied to make the images clearer hereby increasing the overall efficiency of the system and eliminating the need of high-quality camera. After facial feature extraction, SVM classification model will recognize the face and mark attendance accordingly.

IV SYSTEM ARCHITECTURE

The main module of this system is used to detect masked face and recognise it. Face detection from an image is done using MTCNN. MTCNN which consists of 3 stages which detects the bounding boxes of faces for feature extraction. Then an image is processed using various image processing techniques such as contrast adjustment and bilateral filtering. Processed image is passed for feature extraction which is done by Google FaceNet Model which will create embedding and that embedding is passed to Support Vector Machine (SVM) which will classify an image using available dataset.

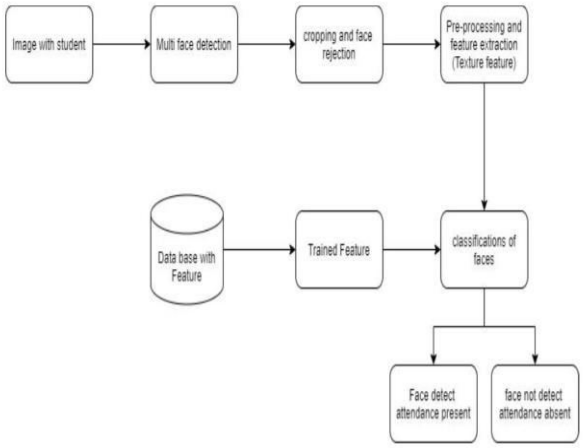

Fig 2. Architecture Diagram

V CONCLUSION

Thus, we successfully planned a system using MTCNN and SVM, in which FaceNet model has been used for improving masked face recognition. Image processing techniques such as Bilateral Filtering improves the quality of images, hence automatically increases the accuracy of recognition and reduces the use of high-quality camera ensuring overall low-cost system. The algorithms used understand the core idea of the face detection task and the problems to be solved in future. In future, other systems can be implemented to identify the disguising identities like, face of terrorists or goons that wear mask or other face covering objects. Methodology can still be extended to more complex and many other sources of occlusion. In later work, it is our importance to enhance and enlarge our work to address different extreme masks condition of face recognition.

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