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Review Paper on Attendance Capturing System using Face Recognition

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***Abstract*—Maintaining attendance is required at many places like educational institutions, offices, or gyms, etc. But marking attendance can sometimes be a tedious, repetitive and time-consuming task. A lot of research has been carried out on face detection and recognition systems which can be used to automate the task. Also, a number of algorithms have been created and using these techniques different ways to capture attendance are proposed considering different scenarios and requirements. We have reviewed some research papers to study various attendance capturing systems based on computer vision and image processing and analyse their dataset, algorithm, advantage, disadvantage and performance. This deep learning enabled method not only saves time to record attendance but, in some cases, also proves to be better than conventional methods of taking attendance manually.**

Keywords—Convolutional Neural Network CNN; face recognition; face detection; deep learning, Attendance Capturing System ACS

I. INTRODUCTION

The ACS is a web portal. All datasets for the ACS are modified using driver programs. These programs include face creation, face detection, face recognition and other such models. This system is deployed on a webpage using flask and html. There are 2 interfaces, one for the student which takes the students face video as an input and the other web page for the teachers to input their class photos and get the attendance as a result in table format. They can also download the attendance.

In this system, we maintain two drivers. These drivers include face creation (driver 1) and attendance capturing (driver 2). The student's face information is processed by the driver 1 and the model is trained accordingly after which we can capture attendance.

II. MOTIVATION

The main motivation of making this project is to help teachers all around the globe to perform a task that might seem easy at first but will get more and more frustrating over time. This task of taking attendance can be made convenient by implementing our machine learning model implemented with our user interface.

III. LITERATURE SURVEY

[1] In Face Recognition System Based On CNN (2020), Convolutional Neural Networks with 8 layers are used. The dataset used were of three Chinese actresses where 200 photos were collected for each actress giving a total of 600 high quality photos. The advantage was that the training speeds were very fast due to SGD but creates noise while randomly selecting the gradient so the direction of weight might be incorrect. The model has a decent accuracy of 79.41%.

[2] In Smart Attendance Management System Based on Face Recognition Using CNN (2020), uses CNN architecture containing 20 layers that include Conv2D, Batch Normalization, Max Pooling and Dense layers. The dataset consists of 10,029 face images with 4 classes consisting of 2,500 images per class except for class-3 that has 2,529 images, which in turn will give a good accuracy because of the huge dataset used to train the model but training will consume a lot of time. The model results in a 99.86% accuracy and a 0.0057 loss.

[3] In Research on Face Detection Technology Based on MTCNN (2020), the MTCNN algorithm is used to detect faces. The wider face dataset is used which is majorly obtained from the public dataset wide which contains 32,203 images with 393,703 faces in total where each image contains around 12 faces. This algorithm avoids huge performance consumption but for ideal results, the training time has to be longer.The algorithm scored an accuracy of 85.7%.

[4] In Automatic Face Detection and Recognition for Attendance Maintenance (2020), they created their own dataset from images and frames from video of individuals/classmates. Compared and evaluated various combinations of models like MTCNN, YOLO, FACENET, SVM etc. They selected the optimum combination and got training accuracy of 99.21% in least time to train and test as compared to other combinations of algorithms. Images augmentation> Pre-processing (de-noise filter and quality check assessment). For detection, authors used YOLO + MTCNN and for face recognition they used pre-trained FaceNet and SVM. By using this combination of models they increased efficiency, durability and reliability.

[5] In Face Recognition for Attendance System Detection (2018), authors used the Haar Cascade algorithm with skin color detection to create an authentication process with the help of face recognition. Firstly, the skin color is detected from the images and then it is converted to grayscale. Then, the Haar Cascade method is used to detect faces and a bounding box is drawn once a face is detected. After that, feature extraction is done by aligning the ROI face input from the previous process. The LBPH algorithm was used for this purpose due to its less resource utilization, real-time face detection and high accuracy of nearly 98.2% for fairly luminated images and 94.7% for little dim images. Limitations include no face detection if face tilt is greater than 30%, etc.

[6] Realtime Face-Detection and Emotion Recognition using MTCNN and miniShuffleNet V2 (2019), authors combined face detection and emotion recognition into one model that can carry out the task in real time. They used the FER2013 dataset which contains 48 by 48 pixel grayscale images with annotations of seven emotions. MTCNN and ShuffleNet V2 architecture is used for advantages of both models, that is, detecting face and creating bounding box and emotion recognition with optimum depth. Maximum accuracy on test data achieved was 71.19% with scope for further improvement.

[7] In Face Recognition-based Lecture Attendance System (2005), Kawaguchi introduced a lecture attendance management system using a new method called continuous monitoring, in which the camera that records the photo of a student in the class automatically marks the student's attendance. The system's construction is straightforward, with two cameras mounted on the classroom wall. One is a capturing camera, which is used to capture the image of a student in class, and the other is a sensor camera, which is used to determine a student's seat inside the class, and the capturing camera snaps the image of the student. According to the different approaches they utilised, this paper gave three different levels of accuracy. Method 1 has a 60.0 % (9/15) success rate. Method 2 (11/15): 73.3 % ,80.0 % (12/15) in Method 3.

[8] A survey on face detection in the wild: Past, present and future (2015), the author reviewed the past, present, and future of face detection techniques. The community's efforts, as well as advances in algorithm development, are publicly available. The authors of this work review current improvements in real-world face identification techniques as well as other face detection methodologies.Many face detection and identification systems exist, but the majority of these early research were unable to deliver the best results in uncontrolled environments and were not effectively implemented in real-world settings. This flaw is solved by the Viola and Jones algorithm, which has made significant applications practical. Viola Jones face detection method; Local Binary Pattern algorithm for face recognition and Yale database techniques are being used which gives an overall efficiency of 83.2%.

[9] In Real Time Computer Vision Algorithms in Automatic Attendance Management Systems (2010), In automatic attendance management systems, a real-time computer vision algorithm is introduced. The system deployed a non-intrusive camera in the classroom that can snap photographs, and compared the retrieved face from the image captured by the camera with faces inside the system.HAAR CLASSIFIERS were also utilised to train the images captured by the camera. The image of the face captured by the camera will be converted to grayscale and subtracted before being uploaded to the server and processed later.PCA algorithm is used in this paper. The detection performance is 56%, with students in years 3 and 4 having difficulty being recognised. Face recognition is implemented using the HAAR Classifier and a computer vision algorithm.

IV. WORKING

Firstly, the user provides their face video (minimum 20 seconds) with their names and roll numbers through the front-end interface provided that will be stored in the directory.

Secondly, Driver Code 1 is run where, after all users have provided their videos, faces will be detected and saved in individual directories (Train, Val) with their names. Then, the images are converted to arrays and stored where embeddings are created from these images which are stored as well.

Thirdly, Driver Code 2 is run where the Class photo is taken as input and Faces will be detected and saved in another directory. Images are converted to arrays and embeddings are created from these images. Faces are recognized from the detected faces after which names of the recognized faces are added to the attendance report as present or 1 while the other faces are marked as absent or 0. This report is then displayed on the frontend and a download button is also provided for downloading the report.

IV. FUTURE SCOPE AND CONCLUSION

In conclusion, this project will help teachers worldwide, and will display efficiency in the education sector. The ease of just uploading the class photo on a website and receiving an instant attendance report would prove useful for teachers in a hurry. The future scope of this project is very large. An SQL server can be used to send attendance to the college database and that would lessen even this task of teachers taking attendance. We hope that with our project several schools would take this at use and implement it in their systems.

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