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Smart Attendance Management System using CNN

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***Abstract*—In this Digital life, face recognition system plays an important role in every sector. Face Recognition, iris, finger print are human biometrics. Face Recognition based Attendance marking is the monitoring system for students in the class. This eliminates the unusual marking of false attendance of the students. Generally, Face recognition is mainly used for the security, authentication and some real time applications like mobile lock system but it can also be used for implementing for Attendance System in Educational Institutions and Organizations. This system aims to build an automated classroom attendance system as manual attendance is time consuming and clumsy to draft. This system uses CNN for face detection which works more efficiently compared to other algorithms in almost all differently angles. It requires high computational power but is more accurate. This system will obtain the Facial Landmarks using inbuilt face landmarks detector in Face recognition package in the python libraries. There by obtaining 128 face encodings for each face in the image there by comparing the two face value sets will result in the face recognition using Open CV.**

***Index Terms*— Convolution Neural Network (CNN), Face detection, Face recognition, Face landmarks, encoding values.**

I. INTRODUCTION

Many advances in technology have led to new inventions and innovations, which makes human life better than the age-old lifestyle. However, some security challenges have stirred up in security systems which make the use of human biometrics like fingerprint, iris and face recognition. These have many advantages and are used in attendance, security, criminal justice system and vehicle threat. Face recognition is the updated version for biometrics. Thus, many algorithms for face detection came into existence. Algorithms like LBPH (Local Binary Pattern Histogram), PCA (Principal component Analysis), CNN (Convolution Neural Network) and Viola Jones algorithm (popularly HAAR Cascades) are the available works of the scientists from past years for Face Detection. This system targets for face recognition-based attendance system with the efficient algorithm like CNN for face detection. These will detect the face of the student in almost all different angles which is available python dlib (Digital Library). Thus obtain the face locations which are used to obtain the facial landmarks and encoding values.

II. PROPOSED MODEL

This paper explains the implementation of CNN detector model and its uses for attendance marking. The Convolutional Neural Network has more accuracy when compared to the other algorithms which are used for

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Face detection. It is available in python dlib architecture which use HOG plus SVM and CNN as the face detectors. We now understand the usual face Recognition and marking attendance process that is clearly explained using the Figure 1. First, start with the detection process, face alignment from the given input image, then from that obtained face is trained and extracted the facial feature points and encoding values which will be matched with the available dataset encoding values, this task is done through algorithms like Facial land mark detectors. Firstly, we create a Database using each student image, train them and obtain face encodings of each student and store them in a file. These facial encodings are obtained using facial feature points or facial landmarks algorithm. The faculty member has to upload the image of students in the class in the input images folder and run the program then excel sheet of the attended students will be generated.

A. Face Detection

The processing starts with giving image as input for face load image with the mode of RGB. This image is taken as the array of RGB Values. The CNN face detector is the efficient detector for detecting the faces in the odd angles, but it requires high computing power and it is not applicable for the real time video application due to its complexity and time taking but the accuracy requirements we can use the CNN detector which is available in the python dlib. This detector wills upsample the image for detecting the location of the face. This detection can also be done with Hog + SVM due its low accuracy but due its fast implementation on CPU's brought huge number of users. Let us learn about the CNN face detection architecture.

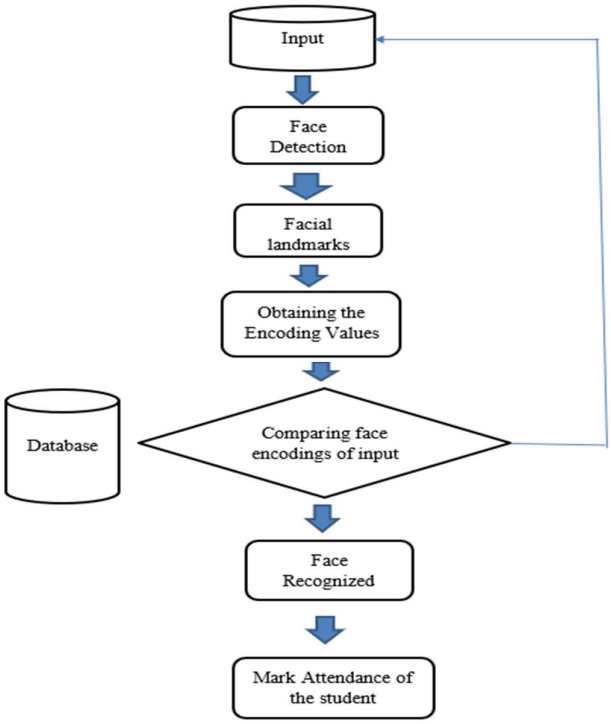

Figure 1: Flow Chart

B. Convolutional Neural Network (CNN)

CNN is the sub part of Deep Learning. We use CNN for obtaining facial locations and obtain encoding values according to the algorithm's architecture. We will get the locations of the facial features and then generating the encoding values of the given dataset for each individual image, these encodings contain the facial features of each person. This set of features which would capture certain facial structures like eyebrows or the bridge between both the eyes, and the lips etc. These values are now used for the recognition of the individuals. This Convolutional Neural Network contain a Sequence of layers as shown in Figure 2.

1. Convolution Layers
2. Pooling Layers
3. Fully connected Layers

4. SoftMax

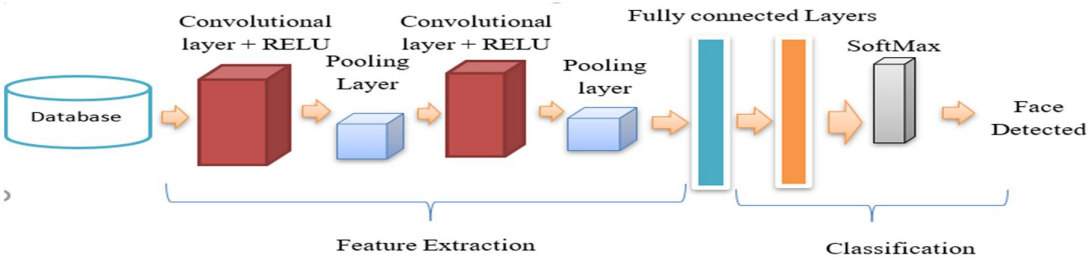

Figure 2: CNN Architecture

C. Convolution Layers

The main building block of CNN is the convolutional layer. Convolution is a mathematical operation to combine two sets of values. In our model the convolution is applied on the input image using a convolution filter to produce a feature map. This is to obtain the feature encoding values to extract useful features from the input image. In image processing, there is a wide variety of different types filters one could select for convolution. Each type of filters is used to extract different aspects or features from the input image.

D. Pooling Layer

Pooling layers are used to reduce the dimensions of the feature maps of the student images. Thus, it reduces the number of parameters to understand and the amount of computation executed in the network. The pooling layer consists the features present in a region of the feature map generated by a convolution layer. This makes the model more powerful to variations in the locations of the features in the input student image. There many types of pooling to bring down the feature for further accessing. Types of pooling are:

1. Max Pooling
2. Average Pooling
3. Global pooling

E. Fully Connected Layer

After feature extraction done classification of the data into various classes, this can be done using a fully connected (FC) neural network. The conventional classifier like SVM can be used in the place of fully connected layers. But we generally ended up adding FC layers to make the system end-to-end trainable. The fully connected layers learn a (possibly non-linear) function between the high-level features given as an output from the convolutional layers.

F. SoftMax

SoftMax layer is the important layer in any deep learning Neural networks. SoftMax is a classification layer. The system will retrain the network with SoftMax classifiers. This will classify the face of the human from other objects in the Image. SoftMax's input is the output of the fully Connected Layer. SoftMax turn a vector of numbers, called logits, into probabilities which are used for the classification.

G. Obtaining the facial Landmarks

Facial landmarks use a Face alignment approach in the image, which was implementation of the kazemi and Josephine in their research paper "One millisecond face alignment with an ensemble of the regression trees" in 2014. This dlib contains the pre trained models for training facial. The landmarks were extracted from student image form the database images, as we discussed above this whole process are done through face alignment and facial landmarks detection framework. These landmarks will be used to obtain in the form of a 68 coordinate points from these landmarks we obtain the face encoding which are 128 measurements. Facial landmark detection is a detection of face landmarks like eyes, nose, mouth and length of the Jaw line. Here we are going to use facial landmarks this module in the face recognition package will take the input as face image and face locations obtained from the detection process (Figure 3). This is done to extract the features out of the face.

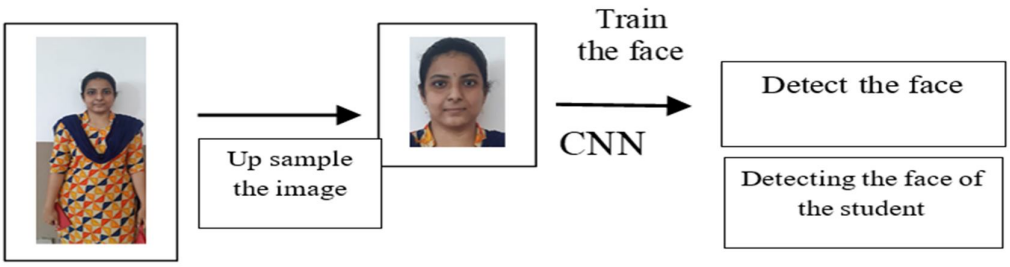

Figure 3: Process of the Face Detection

H. Comparing Encoding Values

Face Recognition is a branch of AI which uniquely identifies the faces in a given image, analyses the images and recognizes the person. Unlike face detection, face recognition requires more programming statements to identify the face of a person which is here done using python libraries. Many uses of Face recognition are to find the valid user, to diagnose diseases like Cancer, to have access to sensitive areas. Let us know how our module works. It requires the feature vector algorithms to obtain the exact results. In the above explanation we discussed how the face encodings of input are calculated, these values will be compared with the encoding values of the database image face's values using face_recognition_compare faces taking face encodings as input (Figure 4).

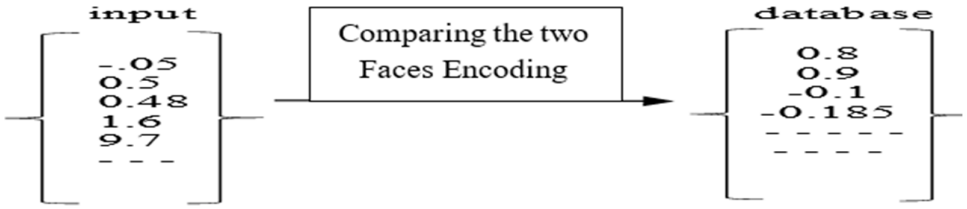

Figure 4: Comparison of Encoding Values

III. Motivation of Work

The motivation behind this proposed work comes from the advancement of technologies like image processing, AI and machine learning and face unlock features given by smartphone manufacturers. The classroom consists of a huge number of students which usually takes time thus creating a system which will automatically detect the present students and then marking the students accordingly will be very helpful. Just like staff Id scanning but way easier than that. This system will also reduce manipulation of attendance records by the students.

IV. Further Advancements

Almost all academic institutions require attendance records of students and maintaining attendance manually can be a hectic and time-consuming task. Hence maintaining attendance automatically with the help of face recognition will be helpful. The future scope of the proposed work can be, capturing multiple detailed images of the students and using any cloud technology to store these images. The system can be configured and used in ATM machines to detect frauds. Also, the system can also be used at the time of elections where the voter can be recognized by the face.

V. Experimental Results

A. Database of students

The results for recognizing of students for attendance are in the Figure 5. These are list of photographs taken for creating database. This is our database taken with the high-definition camera which is helpful for the extraction of the features of the student's face. For each image we obtain 128 encoding values for each person. Note that these images have to be stored in the form of .jpeg so that they can be accessed easily. These images are stored in the Database file and act as input for the training program where we extract the encoding values.

Figure 5. Database of Students

B. Encoding Values

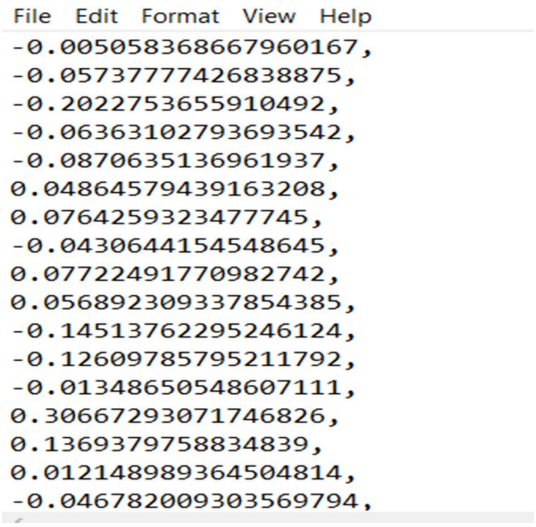

Figure 6. Encoding Values for face

These are encoding values (Figure 6) for each person in the image for training. To train our neural network, we should have huge amounts of data. Now, the model we generate should be able to measure similarity between two faces. It should be able to map an image of a face to a vector space such that images of the same person are closer to each other irrespective of the other parameters. The system explained will have the property to generate individual names for giving names to individuals in a group photograph which is our input.

C. Recognition of faces in the image and Generation of Excel Sheet:

Figure 7: Recognized Faces of Students

		9-10	10-11	11-12	12-13	13-14	14-15	15-16	16-17	17-18
1										
2	anudeep									
3	bhavana									
4	gopi									
5	madhuri									
6	rasi									
7	sahithya									present
8	sai krishna									
9	sindhu									
10	siri									present
11	vineetha									present
12	yamuna									present
13	yashu									
14										
15										

Figure 8. Attendance Sheet of Students

The detected students are recognized with a red box with the name of the student. This will prove the system works in a perfect condition for marking Attendance of the students. This is the ultimate end result for our project to work successfully which is to procure the individuals present in the input image for which we have to apply the face recognition process. The excel sheet will give the result of attendance marking of the students in the photograph in the Figure 8. Further we can implement this system with the today's invention like mobile apps and uploading images through this technology. These new technologies will help people for easy and non-invasive face recognition and attendance marking. This is our main intension for proposing this approach for peaceful and non-interactive attendance.

VI. Conclusion

This paper proposes a system that work efficiently for Attendance Marking of the students it also reviews the exiting algorithms for face recognition and their performance percentages. This system eliminates the false attendance in the classroom. Automated attendance system will be time saving and secure, we can further implement for flexible usage of the faculty by developing an application for effortless uploading of the image from smart phone which are widely used by many people. Then the image is uploaded into the system and the process continues.

This system will have good accuracy, the main advantage of our system is it is portable and works in any kind of situation but the particular system requirements are necessary. This may help students and faculty to save their time and use that time for improving their knowledge.

References

[1] Aljafaar, Khansaa. (2020). Face recognition using Viola-Jones depending on Python. Indonesian Journal of Electrical Engineering and Computer Science. 20. 1513-1521. 10.11591/ijeecs.v20.i3.pp1513-1521.

[2] M. Khan, S. Chakraborty, R. Astya and S. Khepra, "Face Detection and Recognition Using OpenCV," 2019 International Conference on Computing, Communication, and Intelligent Systems (ICCCIS), 2019, pp. 116-119, doi: 10.1109/ICCCIS48478.2019.8974493.

[3] Dr. Priya Swaminarayan, Mr. Manoj Nath, Miss. Bipasha Mandal "Face Detection with Machine Learning and Open CV Classifier", Journal of Science and Technology ISSN: 2456-5660 Volume 5, Issue 6, Nov-December 2020, DOI: https://doi.org/10.46243/jst.2020.v5.i6.pp100-106.

[4] Georgescu, Daniel. (2011). A Real-Time Face Recognition System Using Eigen faces. Journal of Mobile, Embedded and Distributed Systems. 3.

[5] Khem Puthea, Rudy Hartanto[1] and Risanuri Hidayat "The Attendance Marking System based on Eigenface Recognition using OpenCV and Python", Journal of Physics: Conference Series, Volume 1551, 2nd International Conference on Recent Advancements in Science and Technology 2019 28-30 October 2019, Putrajaya, Malaysia

[6] Goyal, K., Agarwal, K., & Kumar, R. (2017). Face detection and tracking: Using OpenCV. 2017 International Conference of Electronics, Communication and Aerospace Technology (ICECA).

[7] DwiSunaryono, Joko Siswantoro, RadityoAnggoro "An android-based course attendance system using face recognition", Journal of King Saud University – Computer and Information Sciences 33 (2021) 304–312.

[8] Nurul Azma Abdullah , Md. JamriSaidi, Chai Wen Chuah " Face recognition for criminal identification: An implementation of principal component analysis for face recognition" The 2nd International Conference on Applied Science and Technology 2017 (ICAST'17).

[9] Shinwari, A. R., Jalali Balooch, A., Alariki, A. A., &Abduljalil Abdulhak, S. (2019). A Comparative Study of Face Recognition Algorithms under Facial Expression and Illumination. 2019 21st International Conference on Advanced Communication Technology (ICACT)

[10] Boyko, N., Basystiuk, O., &Shakhovska, N. (2018). Performance Evaluation and Comparison of Software for Face Recognition, Based on Dlib and Opencv Library. 2018 IEEE Second International Conference on Data Stream Mining & Processing (DSMP).
[11] Suma S L1, Sarika Raga2"Real Time Face Recognition of Human Faces by using LBPH and Viola Jones Algorithm"
[12] Damale, R. C., & Pathak, B. V. (2018). Face Recognition Based Attendance System Using Machine Learning Algorithms. 2018 Second International Conference on Intelligent Computing and Control Systems (ICICCS)
[13] Rekha, E., &Ramaprasad, P. (2017). An efficient automated attendance management system based on Eigen Face recognition. 2017 7th International Conference on Cloud Computing, Data Science & Engineering - Confluence.
[14] Lukas, S., Mitra, A. R., Desanti, R. I., &Krisnadi, D. (2016). Student attendance system in classroom using face recognition technique. 2016 International Conference on Information and Communication Technology Convergence (ICTC).
[15] Puthea, K., Hartanto, R., &Hidayat, R. (2017). A review paper on attendance marking system based on face recognition. 2017 2nd International Conferences on Information Technology, Information Systems and Electrical Engineering (ICITISEE).
[16] Jagtap, A. M., Kangale, V., Unune, K., &Gosavi, P. (2019). A Study of LBPH, Eigenface, Fisherface and Haar-like features for Face recognition using OpenCV. 2019 International Conference on Intelligent Sustainable Systems (ICISS).
[17] Okokpujie, K., Noma-Osaghae, E., John, S., Grace, K.-A., &Okokpujie, I. (2017). A face recognition attendance system with GSM notification. 2017 IEEE 3rd International Conference on Electro-Technology for National Development (NIGERCON).