AUTOMATIC ATTENDANCE USING FACIAL RECOGNITION

Seminar(IT290) Report

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In
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by

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D E C L A R A T I O N

I hereby *declare* that the Seminar(IT290) *R*eport entitled "AUTOMATIC ATTENDANCE USING FACIAL RECOGNITION", which is being submitted to the *National Institute of Technology Karnataka, Surathkal* in partial fulfilment of the requirements for the award of the Degree of *Bachelor Of Technology*,is a ***bonafide report of the work carried out by me.*** . The material contained in this thesis has not been submitted to any University or Institution for the award of any degree.

M Sai Srinivas (201IT233)
Shlok Bhosale (201IT258)

Signature of the Students

Place: National Institute of Technology Karnataka , Surathkal

Date: May 5,2022

CERTIFICATE

This is to *certify* that the Seminar entitled "Automatic Attendsnce using Facial Recognition ", has been presented by *M Sai Srinivas(210IT233) and Shlok Bhosale(201IT258)* , students of IV semester B.Tech. (IT), Department of Information Technology, National Institute of Technology Karnataka, Surathkal, on 5th May , during the even semester of the academic year 2021 - 2022, in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology in Information Technology.

Mentor Professor: Dinesh Naik

Signature of the Guide Professor with Date

Place: NITK, Surathkal

Date: May 5, 2022

ABSTRACT

For every organization, today attendance is the most important thing to record the presence of someone. The presence of someone in an organization is a sign that the person is carrying out their obligations to come to the agency or organization. Usually, attendance is done manually. It can be signed or called one by one. In this digital age, there must be a change from this absence to be able to accelerate and provide time efficiency. We can use face recognition to record attendance from everyone present in an organization. In this face recognition, many algorithms are performed to dissect and capture images of someone's face,such as Machine Learning and Deep Learning. With this algorithm, the system can recognize a person's face and record attendance from that person so that attendance activities are more efficient and faster.

Keywords: —Face recognition ; face detection ; DNN ; HOG algorithm;SVM algorithm

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Chapter 1

Introduction

1.1 Seminar topic and its motivation

Computer vision is a field of artificial intelligence (AI) that enables computers and systems to derive meaningful information from digital images, videos and other visual inputs — and take actions or make recommendations based on that information. If AI enables computers to think, computer vision enables them to see, observe and understand.A facial recognition system is a technology capable of matching a human face from a digital image or a video frame against a database of faces, typically employed to authenticate users through ID verification services, works by pinpointing and measuring facial features from a given image

It is much easy to understand the **motivation** for impementing an attendance system using facial recognition as it can make buildings and premises safer and efficient if we understand how the technology works. It also saves the time of manually overheading everyone present in a classroom while calling them out roll number wise. A computer vision based attendance system finishes this task in an instant. As soon as the the students enter a classroom their attendance will be recorded.

This project has been implemented keeping a real environment in mind and can be deployed immediately. The camera always stays on scanning for faces. As soon as it detects a face it will go through the encoded data and verify if that person belongs to the institution or not. If he does then his entry time and name will automatically be added to an excel. Since the camera is always on it will detect everyone entering the room and update their attendance

in the excel sheet.

Fingerprint scanning systems are almost the standard for attendance systems but recent struggle with the pandemic has brought forth the issue with systems that require physical contact. A facial recognition attendance system is a contactless technology that provides freedom from any physical interaction between the man and the machine. Due to all the above stated reason we realised that it was essential to build a project to solve the above problem and therefore we implemented automatic attendance system using facial recognition.

1.2 Face Recognition Methods

There are two methods for detecting a face:

1.Holistic Matching Methods:

In holistic approach, the complete face region is taken into account as input data into face catching system. One of the best example of holistic methods are Eigenfaces (most widely used method for face recognition), Principal Component Analysis, Linear Discriminant Analysis and independent component analysis etc.

2. Feature-based (structural) Methods:

In this method, the local features such as eyes, nose and mouth are first of all extracted and their locations and local statistics (geometric and/or appearance) are fed into a structural classifier. A big challenge for feature extraction methods is feature ”restoration”, this is when the system tries to retrieve features that are invisible due to large variations, e.g. head Pose when we are matching’ a frontal image with a profile image. Distinguishes between three different extraction methods: I. Generic methods based on edges, lines, and curves II. Feature-template-based methods III. Structural matching methods that take into consideration geometrical Constraints on the features.

Chapter 2

Literature Review

2.1 Face Recognition Applications

Face Identification:

Face recognition systems identify people by their face images. Face recognition systems establish the presence of an authorized person rather than just checking whether a valid identification (ID) or key is being used or whether the user knows the secret personal identification numbers (Pins) or passwords. The following are example. To eliminate duplicates in a nationwide voter registration system because there are cases where the same person was assigned more than one identification number. The face recognition system directly compares the face images of the voters and does not use ID numbers to differentiate one from the others. When the top two matched faces are highly similar to the query face image, manual review is required to make sure they are indeed different persons so as to eliminate duplicates.

Access Control:

In many of the access control applications, such as office access or computer logon, the size of the group of people that need to be recognized is relatively small. The face pictures are also caught under natural conditions, such as frontal faces and indoor illumination. The face recognition system of this application can achieve high accuracy without much co-operation from user. The following are the example. Face recognition technology is used to monitor continuously who is in front of a computer terminal. It allows the user to leave the terminal without closing files and logging out. When the user leaves for a predetermined time, a screen saver covers up the work and disables the mouse and keyboard. When the user comes

back and is recognized, the screen saver clears and the previous session appears as it was left. Any other user who tries to logon without authorization is denied.

Security:

Today more than ever, security is a primary concern at airports and for airline staff office and passengers. Airport protection systems that use face recognition technology have been implemented at many airports around the world.

General identity verification:

Electoral registration, banking, electronic commerce, identifying newborns, national IDs, passports, employee IDs.

Surveillance:

Like security applications in public places, surveillance by face recognition systems has a low user satisfaction level, if not lower. Free lighting conditions, face orientations and other divisors all make the deployment of face recognition systems for large scale surveillance a challenging task.

2.2 Literature Survey:

Base Paper - Smitha, Hegde, Pavithra Afshin,. (2020). Face Recognition based Attendance Management System. International Journal of Engineering Research and. V9.

- https://www.researchgate.net/publication/341876647Face. Recognition.based.Attendance.Management.System
- L. Li, X. Mu, S. Li and H. Peng, ”A Review of Face Recognition Technology,” in IEEE Access, vol. 8, pp. 139110-139120, 2020, doi: 10.1109/ACCESS.2020.3011028.
- . Dev and T. Patnaik, ”Student Attendance System using Face Recognition,” 2020 International Conference on Smart Electronics and Communication (ICOSEC), 2020, pp. 90-96, doi: 10.1109/ICOSEC49089.2020.9215441.

Chapter 3

Technical Discussion

3.1 Methodology

Face recognition comes under supervised learning where Deep Neural networks (DNNs) can be defined as neural networks with multiple hidden layers, which adds more accuracy with the drawback of increasing the complexity of the architecture. DNNs have been proved to be more effective in many fields than simpler machine learning algorithms. One of these fields, which is the main concentration of the research, is the ability to detect faces from images challenge. Generaly the hidden layers are convoluitional layers as they are mostly used for face recognition , below is an image of neaural network

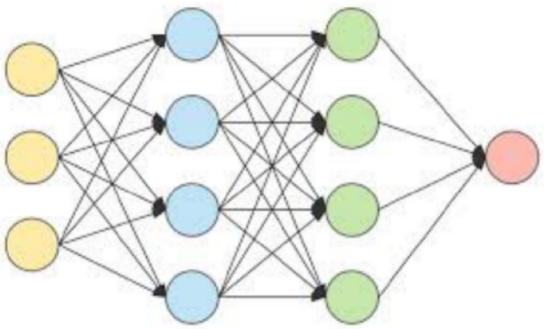

Figure 3.1

The OpenCV DNN face detector is considered one of the top-notch approaches, given its high accuracy and relatively reasonable timing. Additionally, the researchers noticed that there is no adequate information related to theOpenCV DNN face detector architecture or dataset used for training. However, there is a brief description of how to train the model using

any available dataset with face bounding boxes annotation. As the models are developed using Caffe, which is a deep learning framework developed by Berkeley AI Research, the architecture of the model can be deduced from the pretrained model prototext files. It was created using the Single Shot-Multibox Detector (SSD) and the backbone of the detector is a Residual neural network – 10 (ResNet-10). ResNets, originally proposed by [15], provides residual layers that can be optimized in training significantly deeper networks than those used before .

List Of Libraries used:

• cv2 (for image processing like conversion faceDetection)
• cmake (in backend is used by face recognition)
• dlib (in backend is used by face recognition)
• face recognition (as name suggest is used for recognise
the face) • os (to deal with directory)
• numpy (for operations on arrays)

In our implementation we are giving one image for each label for training and the model on its own is augmenting the data for the training.All the images required for training are stored along with their names and then converted from BGR to RGB.
Main steps involved in face recognition are:

1)Identification of face in a given image:

Face in an inage can be in different ways it can be zoomed in or out,rotated,tilted,etc hence to find the location and identifying the face is important.

HOG Algorithm :

It is used to convert the original image into a very simple representation that captures the basic structure of a face in a simple way First the image is converted into black and white as colour is not required to identify the face.Then we'll look at every single pixel in our image one at a time. For every single pixel, we want to look at the pixels that directly surrounding it.Our goal is to figure out how dark the current pixel is compared to the pixels directly surrounding it. Then we want to draw an arrow showing in which direction the image is getting darker.If you repeat that process for every single pixel in the image, you end up with every pixel being replaced by an arrow. These arrows are called gradients and they show the flow from light to dark across the entire image

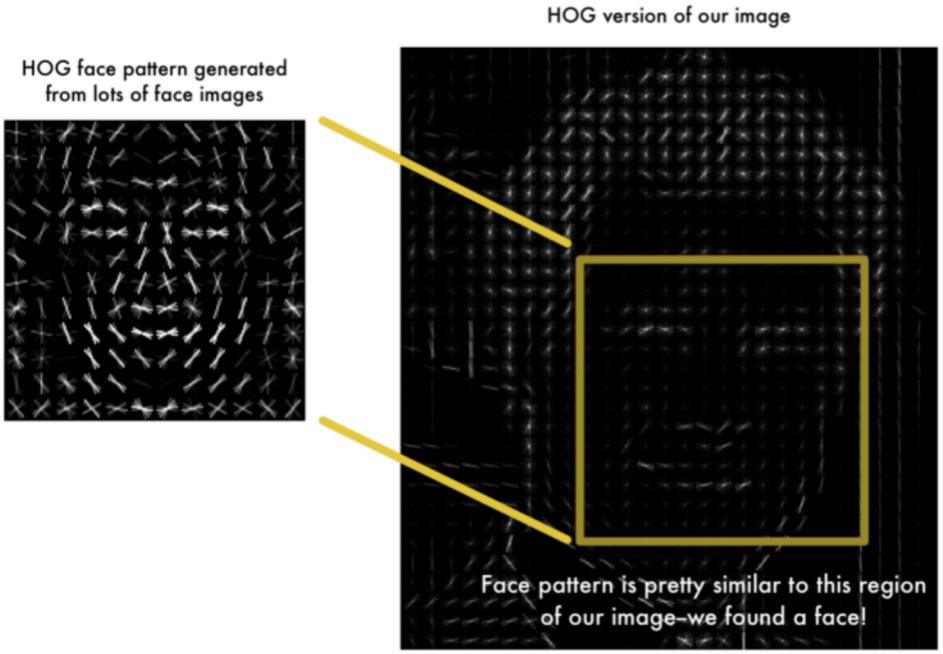

Figure 3.2

To deal with problem that faces turned different directions look totally different to a computer we use an algorithm called as **face landmark estimation.**The basic idea is to come up with 68 specific points (called landmarks) that exist on every face — the top of the chin, the outside edge of each eye, the inner edge of each eyebrow, etc. Then we will train a machine learning algorithm to be able to find these 68 specific points on any face

Figure 3.3

2)Encoding:

128 features of a face or orthogonal components of a face such as color,size,slant of eyes,gap between eyebrows ,etc are all calculated for each image and its being stored in an array.

But how does the network actually compute the face embedding? The answer lies in the training process itself, including. To train a face recognition model with deep learning, each input batch of data includes three images:

•The anchor

•The positive image

•The negative image

The anchor is our current face and has identity A.

The second image is our positive image — this image also contains a face of person A.

The negative image, on the other hand, does not have the same identity, and could belong to person B, C, or even Y!

The point is that the anchor and positive image both belong to the same person/face while the negative image does not contain the same face.

The neural network computes the 128-d embeddings for each face and then tweaks the weights of the network (via the triplet loss function) such that:

•The 128-d embeddings of the anchor and positive image lie closer together

•While at the same time, pushing the embeddings for the negative image father away

In this manner, the network is able to learn to quantify faces and return highly robust and discriminating embeddings suitable for face recognition.

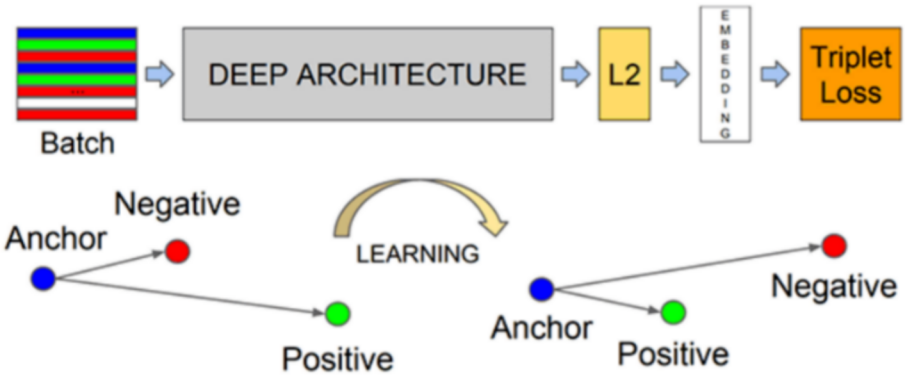

Figure 3.4

3)Face recognition:

Now when a new image is displayed to the model the encodings are generated and these are compared to the encodings of different images which the model has already found the values and the encodings to which the current image values are closer that name is displayed as output.

4)Attendance:

The given output is sent to a csv file and the ouput along with the time is copied in to the file which forms the attendance sheet

3.2 Experimental Results

The following two pictures of output illustrates how the program detects and identifies two different faces infront of the camera.

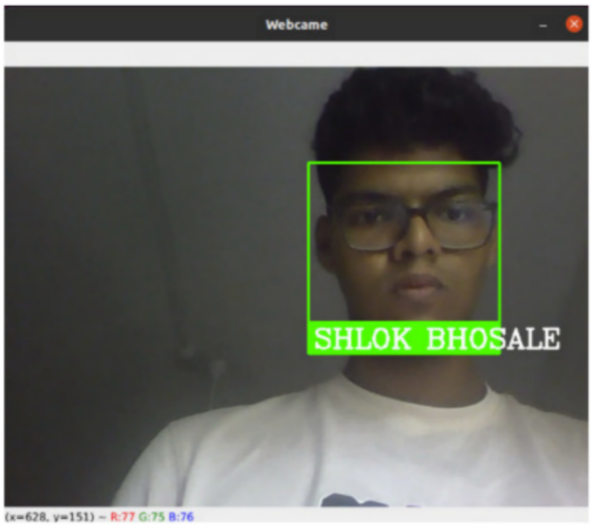

Figure 3.5

Figure 3.6

The attendance automatically gets marked into an excel sheet along with the time when it was detected.

	A	B
1	Name	Time
2		
3	SHLOK BHOSALE	18:45:08
4	VAISHNOVI	18:59:33
5	RAGHURAM KANNAN	19:20:26
6	ANNANT MAHESHWARI	08:50:49
7	VAISHNOVI PANDITH	08:53:30

Figure 3.7

Chapter 4

4.1 Conclusions

This project where we implement computer vision to automatically fill in attendance using face detection is complete and working perfectly. Its ready to be implemented in any building. Since we used python's already existing open source libraries like opencv and dlib for face detecion and verification, the project's accuracy is preety and is calculated at 99.3 /.

4.2 Future Trends

To mkae this project future prooj we can also add iris detection. Coupled with face detection this would increase its accuracy even more and eliminate the chances of proxy attendance. Currently even if we show a picture of the person through a mobile phone, they are marked as present. With iris detection however, this wont be possible. The aforementioned person will need to be infront of the camera to ensure he gets his/her attendance.

4.3 References

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