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Automated Student's Attendance Management Using Convolutional Neural Network

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Abstract - *Attendance recording of a student in an academic organization plays a vital role in analysing the student's performance and consistency. Attendance of students in a large classroom is hard to be handled by the traditional system, as it is time-consuming and has a high probability of error during the process of inputting data into the computer. In today's networked world, the need to maintain the security of information or physical property is becoming both increasingly important and increasingly difficult. The two conventional method currently in use are calling out roll numbers or signing in paper. These two methods have the disadvantage of loss in time or proxy atten- dance can be marked. Hence automated attendance management is required. In this paper, a system is proposed that takes the attendance of students for classroom lecture. This system takes the attendance automatically using face recognition. Continuous observation improves the performance for the estimation of the attendance. Using CNN algorithm construction of the lecture attendance system supporting face recognition is developed, and applied the system to classroom lecture. By using this technique attendance is updated automatically after comparing the detected face with original database.*

Key Words: **Attendance management, face recognition, opencv, CNN algorithm, PCA, biometric features**

1. INTRODUCTION

Attendance management is an important aspect within every institute. It helps in determining the consistency as well as the performance of the students. But all those research also have flaws such as the execution time and the optimal result of the classification of the ALL cells are slower then the method we propose i.e using FPGA board, as the execution time is in microseconds, due to arm7 processor. Also for the execution of the above methods, a dedicated software executer is required, whereas the FPGA board is an independent executable board. The previous research on this topic have been extensive and have been very helpful in implementation. This project is being administered thanks to the concerns that are highlighted on the methods which lectures use to require attendance during lectures. The utilization of clickers, ID cards swiping and manually writing down names on a sheet of paper as a way to trace student attendants has prompted this project to be administered. This is often not in any thanks to criticize the varied methods used for student attendance, but to create a system which will detect the amount of faces present during a classroom also as recognizing them. Also, an educator are going to be ready to tell if a student was honest as these methods mentioned are often employed by anyone for attendance records, but with the face detection and recognition system in situ, it'll be easy to inform if a student is really present within the classroom or not. The purpose of developing attendance management system is to computerize the normal way of taking attendance. Automated Attendance Management System performs the daily activities of attendance marking and analysis with reduced human intervention. The target of this project is Detection of unique face image amidst the opposite natural components like walls, backgrounds etc. Extraction of unique characteristic features of a face useful for face recognition. Detection of faces amongst other face characters like beard, spectacles etc.

2. LITERATURE SURVEY

According to [1]Among all the biometric techniques, Facial recognition has great advantage in field of education as it can be used to update and manage the attendance automatically in a secured way when compared to traditional methods. According to [2] To eliminate the manual labor involved in recording attendance, an automated Attendance Management System (AMS) based on hybrid face detection and face recognition techniques is proposed. The popular Viola-Jones algorithm and alignment- free partial face recognition algorithm together are used for face detection and recognition. Principal Common Analysis is used in this system as a method of extracting the feature of images. PCA is used because of simplicity and its high accuracy. Moreover, the matching rate of face recognition using PCA is good based on the past research. According to [3]Wide-range pose variation is a major challenge for fully- automatic face recognition. Among existing approaches, pose normalization is an effective solution, because it reserves high- fidelity facial textures at no cost of training data. The use of HMM with other feature extraction methods can be implemented and tested. This will need more time as it is only a trial that will be made taking into consideration the method that already exist in order to have a complete new idea. The result of our preliminary experiment shows continuous observation improved the performance for estimation of the attendance. This paper introduces the efficient and

accurate method of attendance in the classroom environment that can replace the old manual methods. This method is secure enough, reliable and available for use. No need for specialized hardware for installing the system in the classroom. It can be constructed using a camera and computer. There is a need to use some algorithms that can recognize the faces in veil to improve the system performance.

3. ENROLLMENT

First step in every biometric system is the enrollment of persons using general data and their unique biometric features as templates. This work uses the enrollment algorithm as shown in the figure 1.

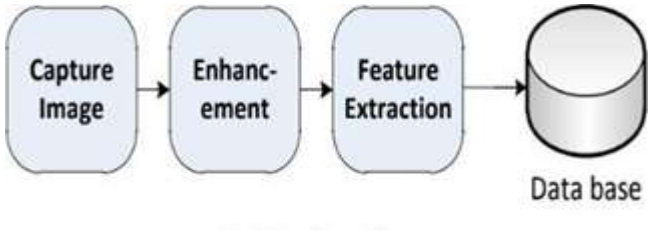

Fig -1: Enrollment process

4. PROPOSED METHOD

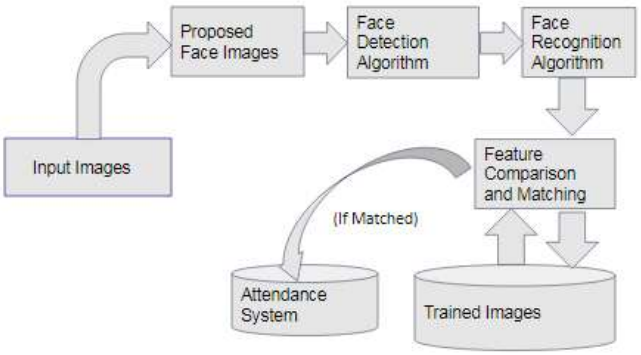

Fig -2: Proposed Model

5. CNN

When it comes to Machine Learning, Artificial Neural Networks perform really well. Artificial Neural Networks are used in various classification task like image, audio, words. Different types of Neural Networks are used for different purposes a convolutional neural network (CNN) may be a specific sort of artificial neural network that uses perceptrons, a machine learning unit algorithm, for supervised learning, to research data. CNNs apply to image processing, tongue processing and other forms of cognitive tasks. A convolutional neural network is also known as a ConvNet. CNN image classifications takes an input image, process it and classify it under certain categories (Eg., Dog, Cat, Tiger, Lion). Computers see an input image as array of pixels and it depends on the image resolution. Based on the image resolution, it'll see h x w x d (h = Height, w = Width, d = Dimension).A ConvNet is able to successfully capture the Spatial and Temporal dependencies in an image through the application of relevant filters. The architecture performs a better fitting to the image dataset thanks to the reduction in the number of parameters involved and reusability of weights. In other words, the network are often trained to understand the sophistication of the image better.

Fig -3: CNN

Convolution of an image with different filters can perform operations such as edge detection, blur and sharpen by applying filters. Now let's mention a touch of mathematics which is involved within the whole convolution process. Convolution layers contains a group of learnable filters (patch within the above image). Every filter has small width and height and therefore the same depth as that of input volume (3 if the input layer is image input).For example, if we've to run convolution on a picture with dimension 34x34x3. Possible size of filters are often axax3, where 'a' are often 3, 5, 7, etc but small as compared to image dimension. During aerial, we slide each filter across the entire input volume step by step where each step is named stride (which can have value 2 or 3 or maybe 4 for top dimensional images) and compute the scalar product between the weights of filters and patch from input volume. As we slide our filters we'll get a 2-D output for every filter and we'll stack them together and as a result, we'll get output volume having a depth equal to the number of filters. The network will learn all the filters.

5.1 Convolution Layer

Convolution is that the first layer to extract features from an input image. Convolution preserves the connection between pixels by learning image features using small squares of input file. It is a mathematical process that takes two inputs like image matrix and a filter or kernel.

Consider a 5 x 5 whose image pixel values are 0, 1 and filter matrix 3 x 3 as shown in below

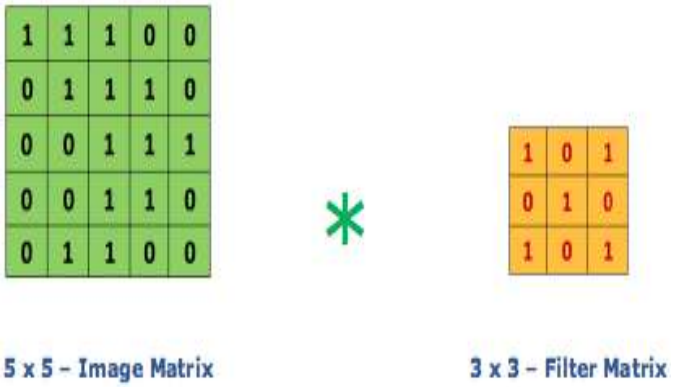

Fig -4: Convolution Layer

Then the convolution of 5 x 5 image matrix multiplies with 3 x 3 filter matrix which is named "Feature Map" as output shown in below

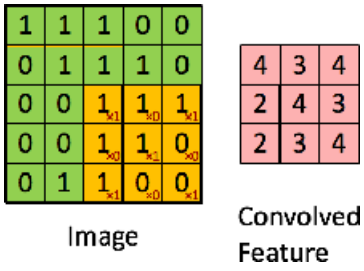

Fig -5: Convolved feature

5.2 Strides

Stride is the number of pixels shifts over the input matrix. When the stride is 1 then we move the filters to 1 pixel at a time. When the stride is 2 then we move the filters to 2 pixels at a time and so on. For example, if you do valid convolution of two sequences of length 10 and 6, in general you get an output of length 5 (10 -6 +1). It means that sequence 2 moves "step by step" along sequence 1, using a step size of 1 when doing convolution. But if you set the stride of convolution 2, the output would be of length 3 ((10–6) / 2 + 1), meaning that sequence 2 moves "step by step" along sequence 1, using a step size of 2

5.3 Padding

Padding is a term relevant to convolutional neural networks as it refers to the amount of pixels added to an image when it is being processed by the kernel of a CNN. For example, if the padding in a CNN is set to zero, then every pixel value that is added will be of value zero. If, however, the zero padding is about to at least one, there'll be a 1 pixel border added to the image with a pixel value of zero.

Padding works by extending the area of which a convolutional neural network processes an image. The kernel is the neural networks filter which moves across the image, scanning each pixel and converting the data into a smaller, or sometimes larger, format. In order to assist the kernel with processing the image, padding is added to the frame of the image to allow for more space for the kernel to cover the image. Adding padding to a picture processed by a CNN allows for more accurate analysis of images

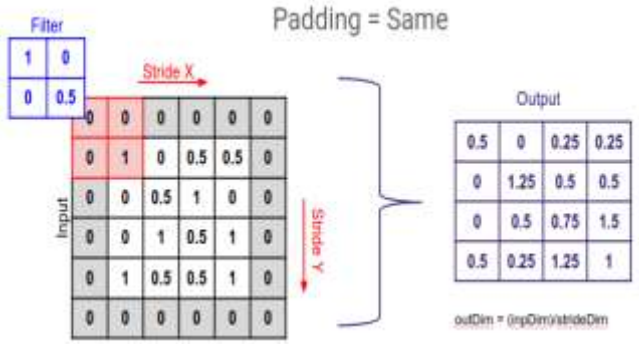

Fig -6: Padding

6. RESULT

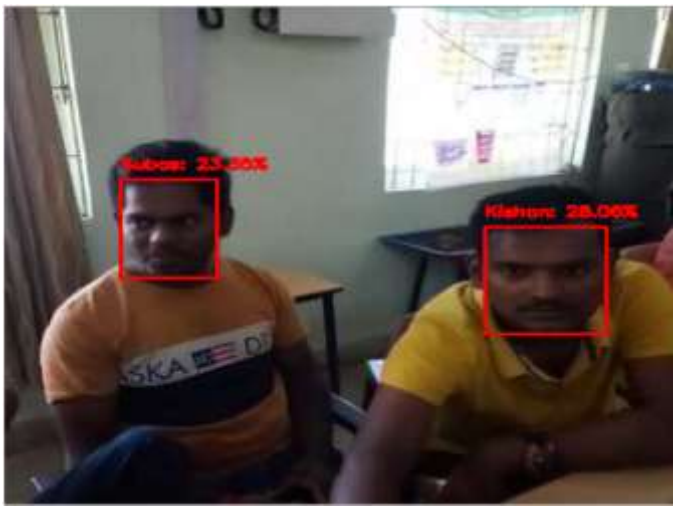

Fig -7: Result

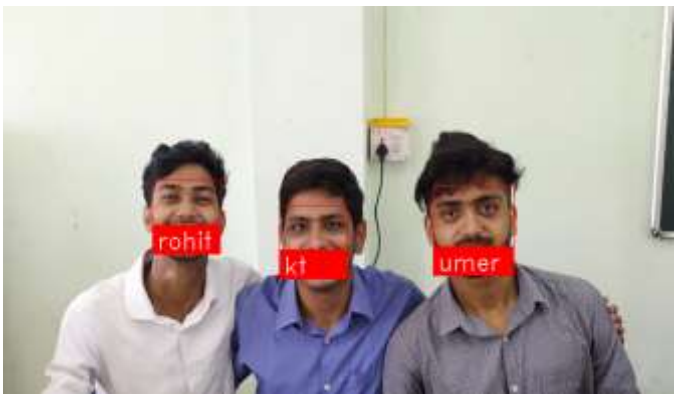

Fig -8: Result

7. CONCLUSIONS

There could also be various sorts of lighting conditions, seating arrangements and environments in various classrooms. Most of those conditions are tested on the system and system has shown better accuracy for many of the cases. There can also exist students portraying various facial expressions, varying hair styles, beard, spectacles etc. All of those cases are considered and tested to get a high level of accuracy and efficiency. Thus, it are often concluded from the above discussion that a reliable, secure, fast and an efficient system has been developed replacing a manual and unreliable system. This technique are often implemented for better results regarding the management of attendance and leaves. The system will save time, reduce the quantity of labor the administration has got to do and can replace the stationery material with electronic apparatus. Hence a system with expected results are going to be developed but there's still some room for improvement

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