

# Class Attendance System

## Using The Back Propagation Algorithm of a Multilayer Perceptron

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**Abstract--** The Traditional method for taking attendance is Roll Number of student and record the attendance in sheet which takes a lot of time. To overcome the issues like wastage of time and incorrect attendance, a proposed system of a smart attendance system is developed based on face detection and recognition algorithms that marks the attendance of student when he enters the class by extracting the image and recognizing him.

### I. Introduction

In this smart system, we will implement an artificial neural network architecture which take class attendance just by analyzing the orientation of the face this mean that is able to deal not only with frontal Facial image but also with images taken from the sides view and then recognize the face.[1] This smart system will also increase the accuracy of face detection.

### II. Related Work

#### II.1. Fingerprint Attendance System

[2] A fixed fingerprint device has been developed which allow students to place their finger on the sensor at the end of the lecture. This system guarantees a foolproof method for marking the attendance

#### II.2. Radio Frequency Identification based Attendance System

One of the most popular Radio Frequency Identification based Attendance Systems used in universities is the student ID card that is built-in with Radio Frequency Identifier [3] and by placing this ID Card on the card reader, it's take automatically the attendance on the system connected to the computer.

This system may give rise to the problem of fraudulent access. Unauthorized person may make use of authorized ID card and enter into the organization.

### III. Proposed Work

The proposed system will work in the following four Modules:

1. Database Development.
2. Image Capture.
3. Feature Extraction.
4. Face Recognition.

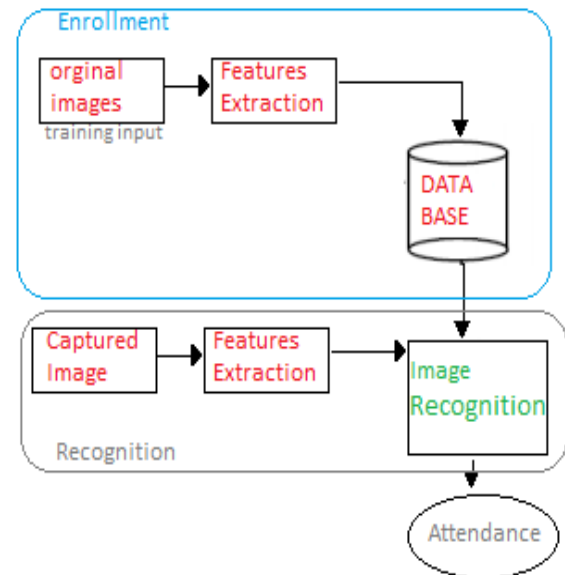


Figure 1. Block Diagram of the system

#### III.1. Database Development

This is the first step where we add information in the database. Details of student such his name and his id are added in database along with three photos of his face taken from three positions (one frontal and two from the sides) and later are enhanced using Feature extraction techniques and stored in the database as the training images.

### III.2. Image Capture

A fixed Camera is putted at a distance from the entrance of the class, to capture the facial images of the student, and further process goes for face detection.

### III.3. Features Extraction

the purpose of feature extraction is to extract features from any student's facial image that is applied on both; the training image in order to save the features in the data base, and also applied on the image captured each time at the entrance of the class in order to perform the task of this smart attendance system. Feature extraction process is completed by performing Grayscale Normalization, Histogram Equalization, and some Discrete Transformation to the image, by taking into consideration the size by pixels of the image, in our case we deal with  $64 \times 64$  pixels. The aim of this process is to improves the contrast of the image as it stretches the range of the intensities in an image by making it more clear.

Let's summarize the steps proceeded:

1. First of all, we know that any picture is a set of pixels, where each pixel contains 3 sub-Pixel (red, green and blue)
2. Then by applying Grayscale as cited above, we come able to convert 3 sub-pixels to a one with a range [0—255 bits]
3. Then we resize the image, by taking into consideration large image Like HD which require about 3millions input which is not feasible.
4. After many tries to be away from error, we come by 2048 as inputs number for the neural network developed for the image recognition.

### III.4. Face Recognition

Face detection makes use of artificial neural networks. As the human brain consist of complicated interconnected neurons to process the different task. Artificial Neural Networks learns the correlated patterns of input and target values. Neural networks inspired by the human biological nervous system and to be more precise for Face Recognition purpose. A back

propagation algorithm is applied on the learning process of the artificial network. Back Propagation is a feed forward supervised learning network [4].

The multilayered feed forward network is composed of three layers; input layer, hidden layer and output layer as shown in Figure 2

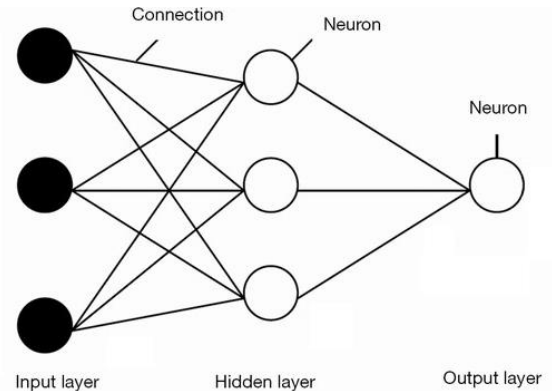


Figure 2. The basic architecture of multilayered Neural Network

These layers of processing parts make independent computation of information and pass it to another layer. The output is compared with the target value and the mean square error is calculated which is processed back to the hidden layer to adjust its weights. This method performs iteration for every layer to reduce the error by repeatedly adjusting the weights of every layer. Hence, it is referred to as back propagation. The iteration method carried on till the error falls below the tolerance level.

As already cited before that our network is based on **2048 inputs**, in order to reduce this number, we come with **2 hidden Layers**, where the **first one contains 200 neurons**, the **second 60 neurons and 10 neurons as output**, and weights are adjusted simply by applying the back propagation.

During the back propagation The input layer forward the data to the hidden layer which computes the data further and passes it to the output layer. Output layer compare data with the target value wish is the original images of the student already saved into the Data Base and during testing an error signals is calculated. These errors are sent back for adjusting the weights of

each layer to minimize the error as shown in the following Figure:

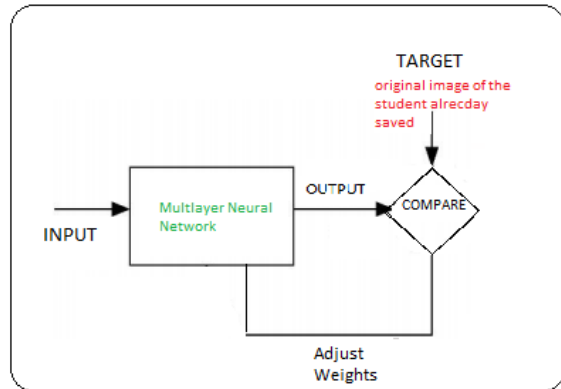


Figure 3. Back Propagation of multilayered Neural Network

When the output values of the Tested faces similar to the one of the training data, then the face of the student is detected or recognized and automatically the attendance is marked in the database corresponding to the matched face. If an unknown face is tested, the result shows no match found.

#### IV. Implementation and Results

The system is implemented using python languages, just starting by extracting the features of the image by converting it into 1-dimension array, as we know that the image is a set of pixels, this why we just started by converting each three sub-pixels into one using the Grayscale technic then the Extracted features compute the eigenfaces which are taken as input to the Artificial Neural Networks to train the neural networks, by taking 2040 neurons as input , and 2 Hidden layers with 200 neurons for the first and 60 neurons for the second, all this architectural of the network is coded using python to be able at the end to test image after filling the database with training images , the Results show that face is recognized by capturing images to the faces from the 3 direction(front + the 2 sides) also and the attendance is marked successfully when a match is found.

#### V. Conclusion

The automated student attendance system using human face recognition technique is a smarter way for marking attendance. The automatic attendance management will replace the traditional method, which takes a lot of time and is hard to maintain. In future we can add more features to the attendance system such as leave management system.

#### VI. References

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