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## A Review On: Face Recognition and Artificial Neural Network Based Attendance System

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**ABSTRACT:** The face of a person displays his or her originality and distinctiveness. Real-time attendance may be calculated using a person's face in this project. Students' attendance is critical to the success of every university, college, and school. As soon as a student's name or roll number is called, attendance is taken. An important concern is how long it will take to complete this task. If a lesson is an hour long, recording attendance will take about five to ten minutes per class. This is a complete waste of a tutor's time. This study uses a loss-avoidance strategy based on image processing to circumvent these drawbacks. This study makes use of facial detection and recognition software. In order to locate a face, facial detection is performed, while facial recognition is used to keep track of the understudy's attendance. When a student's face matches one in the database, their attendance is recorded. The database contains all of the students in the class.

**KEYWORDS:** Automatic Face Recognition, AFR, Smart Attendance, ANN

### I. INTRODUCTION

Many schools and colleges still use the old-fashioned system of attendance marking, which is time consuming and error-prone. Additionally, faculties will be burdened with having to physically call out the names of students in order to mark attendance, which might take up to 5 minutes of the entire session. This will take a long time. There's a risk a proxy will show up. This led a lot of colleges and universities to start employing new methods of tracking attendance, such as Radio Frequency Identification (RFID), iris recognition, and even fingerprint identification. These solutions, on the other hand, are queue-based, which means they will take longer and be more obtrusive. Face recognition has established a significant biometric characteristic that is easy to obtain and does not impose any burden on the user. Face recognition-based systems are mostly unaffected by subtle changes in expression. Two types of facial recognition systems exist: verification and identification. It compares the face picture to the template face image in a 1:1 matching procedure, while it is a 1:N matching problem that compares a query face image to the template face image. Face plays a significant role in our day-to-day lives, especially when it comes to identifying someone. In biometric identification, face recognition involves extracting the facial features of a person and storing them as a unique face print that can be used to identify them. Many academics are interested in biometric face recognition because of the wide range of applications it has. In comparison to other biometric recognition technologies such as fingerprint, palm print, or iris scan, face scanning is superior due to the non-contact method. A person can be recognized from a distance using face recognition algorithms, even if they aren't in close proximity to the individual being recognized. Face recognition software is already in use on popular social media sites like Facebook, as well as at airports and train stations throughout the world. In the field of criminal investigations, this is the case. Face recognition can also be used in crime reports to identify a suspect using a photograph that was taken and saved in a database. Facebook automates the process of tagging people by using facial recognition technology. In order to identify a person under all lighting circumstances, age, pose, and so on, we need a vast dataset and complicated attributes. Recent studies suggest that facial recognition systems have improved. Reorganization techniques have advanced dramatically in the recent decade.

These days, technology is geared toward imparting enormous knowledge-based technical advancements. With Deep Learning, a machine may train itself by feeding it datasets and then deliver a suitable output during testing by applying various learning algorithms. Deep Learning is a fascinating area to explore. Nowadays, attendance is seen as a critical

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criterion for success in educational institutions by both students and educators. Students' attendance performance is automatically detected and recorded by the machine thanks to advancements in deep learning technology. In general, the attendance system of the student can be maintained in two different forms namely,

- a. Manual Attendance System (MAS)
- b. Automated Attendance System (AAS)

It is a method in which the instructor in charge of the specific subject has to call the students' names and personally register their attendance. When taking manual attendance, it's possible that the teacher will miss someone or that pupils will answer more than once about the absence of a friend. In the Automated Attendance System (AAS), students' attendance or absence in the classroom is automatically estimated through the use of face-recognition technology. Additionally, it's feasible to tell whether or not a student is dozing off during class, and the system can be used in exam sessions to make sure they're there. This makes it possible for the machine to know that all of the pupils in the classroom are there just by capturing their faces on a high-definition monitor streaming service.

## II. LITERATURE REVIEW

**Dominique et. All (1994)** Using statistical and/or connectionist frameworks in conjunction with image-based coding of the faces, authors have reviewed current attempts to model face processing. Distributed rather than localized face representation is used in these models. Faces share the same "storage space" when stored in this way, and as a result, images of similar people may clash. To put it another way, a model's performance is dependent on the statistical structure of the data set from which it was trained. It's been demonstrated that these models all implement a principal component analysis of the cross product matrix of the set of faces on which they were trained, whether explicitly or implicitly. A set of learned faces is represented as a weighed combination of so-called "macro features" (referred to as eigenvectors, Eigen faces, or Eigen images, depending on the authors). These macro characteristics cover the full face when exhibited visually, making it appear to be a face. Faces can be classified, recognized, and identified using the information they give. [1]

**Paul Juell et. All (1996)** This report presents the findings of a study on human facial recognition. Law enforcement and security professionals could employ a system to locate human faces in photographs, notably as a front-end for a human face identification system. The system proposed here is a hybrid one that makes use of an edge-enhancement preprocessor as well as four hierarchically structured back-propagation neural networks. The proposed method was successful in identifying people wearing glasses as well as all of the people in photos with multiple people. The findings are presented, along with suggestions for how to make the system even better. Personal identification is greatly aided by the use of human faces. Maybe that's why the human brain is so good at what it's designed to do. Humans can quickly recognize the faces of people they know no matter what the viewing conditions are, how old they are, or how many different expressions they can make. It's even more astounding when you consider that the average individual has a library in their head of several hundred faces. [2]

**Shang-Hung Lin et. All (1997)**. This study proposes a system for automatically recognizing faces. Eye localization and facial recognition are all performed in near-real time by this system. The PDBNN, a probabilistic version of the decision-based neural network, is used to implement the system's key modules. In this modular neural network, each object class has its own subnet, so the decision area for each class may be approximated locally and effectively. This area's uniqueness makes it ideal for biometric identification (face recognition, for example). Due to the probability limitation in its discriminant function, PDBNN offers additional desirable qualities like low false acceptance and rejection rates. [3]

**Chiunhsiun Lin et. All (2005)** Face detection in various types of face photos is provided in this study as a robust and effective face detection system. Because of the close resemblance between r, g, and b's relative values under varied lighting conditions and different skin tones. When segmenting human skin colour, we start with a grayscale image and

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then convert it to a black-and-white binary image using the values 1 and 0, respectively. To put it another way, instead of converting colour photos to grey level images, we employ the colour segmentation procedure to directly binarize RGB colour images. As a result, our system is extremely adaptable to a wide range of lighting situations. Because just 2-9 percent of the original image needs to be processed further, this method considerably speeds up the subsequent face detection operation in challenging lighting conditions. In addition, our technology is capable of handling a wide range of sizes, poses, and expressions all at once. Experimental evidence shows that the proposed method outperforms conventional methods in light of the new circumstances, as well as being more efficient and precise. We hope to employ this face detection method in the future as a preprocessing step toward tackling the problem of facial recognition. [4]

**Haoxiang Lit et. All (2015)**For accurate face detection in the real world, a sophisticated discriminative model is required because of the wide range of visual variations, such as those caused by stance, expression, and lighting. As a result, computationally efficient models of the problem are hard to come by. We propose a cascade architecture based on convolutional neural networks (CNNs) with very strong discriminative capabilities to meet these two competing difficulties while yet maintaining good performance. Using a CNN cascade, the authors demonstrate fast face detection. At low resolution, our detector screens out non-face regions rapidly, and at greater resolution, it processes the problematic regions for accurate detection. A calibration net is added to the detection chain to speed up the process and increase the accuracy of detected bounding boxes. As with CNN, the suggested face detector is unaffected by wide fluctuations in the quality of the image being analyzed. The proposed detector outperforms current algorithms on the Fddb public face detection benchmark. On CPU, the suggested detector achieves 14 frames per second (FPS) for common VGA images, and this can be boosted to 100 frames per second (FPS) on graphics processing units (GPU). [5]

**Ghazi Mohammed et. All (2014)**The problem of using holistic approaches to face identification is that the deviations obtained may not be important aspects of the face. Facial recognition is, in fact, a challenging problem to solve because faces can vary greatly in terms of their position, facial expression, and lighting circumstances. This study aimed to provide an overview of contemporary holistic techniques to face detection in addition to earlier studies. Holistic approaches such the Eigen face-based method, spatial matching detector method, neural networks method, and fuzzy theory-based method have been summarized. When using holistic techniques, the key advantage is that the most prominent aspects in the given facial photos are clearly captured, making it possible to uniquely identify individuals from the given group; additionally, features are automatically found. However, drawbacks include the possibility that face recognition ability will be adversely affected by factors such as illumination, orientation, and scale, or that features gleaned from faces may not actually belong to the subject's face but rather to another object. For example, elements from a facial image's background can be utilized. [6]

**PriyankaWaghete. All (2015)**Smart and automated attendance systems have been shown to be effective in ensuring students are in class. Fake attendance and proxy use can be minimized using this technique. The face recognition system has the best performance out of all the biometrics systems that may be used to track attendance at an event. A dependable and efficient classroom attendance system is needed, one that is capable of handling several face recognition tasks at once. In order to employ the Illumination Invariant algorithm, we have to solve the light intensity problem and the head posture problem. Additionally, no specific hardware is needed to implement this system. The smart attendance system can be built with just a camera and a standalone PC and database server. [7]

**Lin-Lin Huang et. All (2001)**authors present a novel approach to face detection in crowded photos in this work. Authors employ a polynomial neural network (PNN) to separate patterns with and without faces, while principal component analysis reduces the PNN's complexity (PCA). With the PNN, sliding windows can be classified on different scales and labelled based on whether or not they contain a face. When trained on a large number of data, the PNN excels in differentiating between face and non-facial patterns. The suggested approach utilizes a neural network for classification and principal component analysis (PCA) to extract relevant features. Experimental results showed that the approach worked on both basic and complicated images. Adding more representative samples and using more effective feature extraction techniques are two strategies to boost performance even further. [8]

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**JavadHaddadniaet. All (2004)**An effective method for recognizing human faces in two-dimensional digital photographs was provided in this research. The proposed approach is based on a new structure called the HNFNN.. There are two factors, FCT and CIR, that are introduced in this research for an effective and reliable feature extraction method. The effect of changing these factors on the identification rate was thoroughly investigated through a series of exhaustive experiments. The optimal FCT and CIR settings for the best recognition results are also shown. Different learning techniques were employed to train the RBF neural networks before they were combined to arrive at a judgement. Classifier performance can be improved by layering multiple RBF neural networks. The suggested HNFNN method yielded recognition rates of 99.5% with the ORL database and 100% with the Yale database. The proposed technique's utility can be seen by comparing it to some of the more established traditional methods described in the same database's literature. [9]

**Masakazu Matsuguet. All (2003)**An important step toward realizing a perceptual user interface with autonomous perception of people is the accurate recognition of common facial expressions (such as a grin) despite individual and face appearance diversity. We provide a convolutional neural network-based rule-based system for robust facial expression recognition and detection. Subject independence, translation, rotation, and scale invariance are all issues we tackle in this research on face emotion recognition. More than 10 people were used in the experiment, and the results demonstrate that grins may be reliably detected with a recognition rate as high as 976 percent for 5600 still photographs. Using the saliency score derived from voting visual signals, the system was able to distinguish between smiling and talking. According to our research, it's the first facial emotion recognition model that combine subject independence with resilience against variations in facial appearance. [10]

## III. TRAINING AND NEURAL NETWORK

It's best to train a neural network on both ideal and noisy images if you want it to handle noisy input photos. It will be done by first training the network until it has a low sum square error on ideal images. After that, it will be used to train the network on tens of thousands of real-world and simulated photos. While training on noisy images, the network uses two copies of the noise-free database. To keep the network's capacity to categories ideal input images, two copies of the noise-free database are used. Unfortunately, the network may have learned to classify several tough noisy images at the expense of correctly classifying a noise free image following the training stated above. As a result, only perfect photos will be used to train the network once more. As a result, the network will react flawlessly to a perfect face. Back propagation with adaptive learning rate and momentum is used during all training.

### 3.1 Architecture of neural network

Many inputs and multiple neurons in the output layer are required for the neural network to correctly identify the faces.

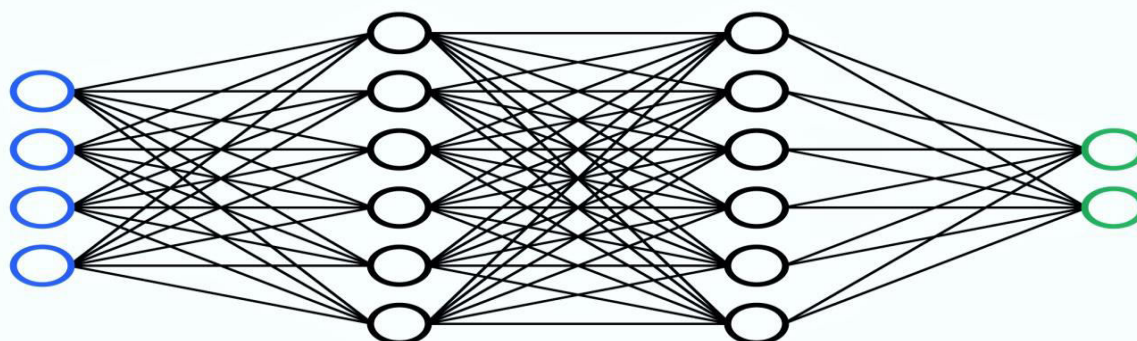


Figure: 1 Artificial Neural Network Architecture

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## IV. SYSTEM WORKING FLOW

### 4.1 Face Recognition

There are three steps in the facial recognition process. Prepare data for training, train a face recognizer, then make predictions based on that data. This dataset's photographs are going to be used as training data. The integer label of the student is placed on them. These images are then used to identify the person in the photograph. This system's face recognizer uses a Local Binary Pattern Histogram. To begin, we acquire the list of Local Binary Patterns (LBPs) for all of the faces. As soon as these LBPs are converted to decimal numbers, they are plotted in histograms as histograms of their decimal values. A histogram will be generated at the end for each image in the training data. Once the face's histogram is created during the recognition phase, it is compared to the previously obtained histograms to determine which student it belongs to.

### 4.2 Attendance Updation

A list of absentees will be mailed to the relevant faculties after face recognition is completed, with the recognized faces recorded as present in the excel sheet and the others designated as absent. At the conclusion of each month, faculty attendance sheets will be updated.

### 4.3 Face detection and recognition

Using a camera image, the face recognition and identification module recognizes and saves faces. Using the student's names and identifying codes, the module recognizes images of their faces in the database. Facial detection and recognition data are stored in the database.

### 4.4 Programming Language:

Python, Java, and MATLAB/OCTAVE all have bindings. These interfaces' API is documented in the online help files. Wider acceptance has been aided by the development of wrappers in languages including C#, Perl, Ch, Haskell, and Ruby. OpenCV.js has a JavaScript binding for a subset of OpenCV functions from version 3.4. It is designed for the web platform.

### 4.5 General Flow of the Approach

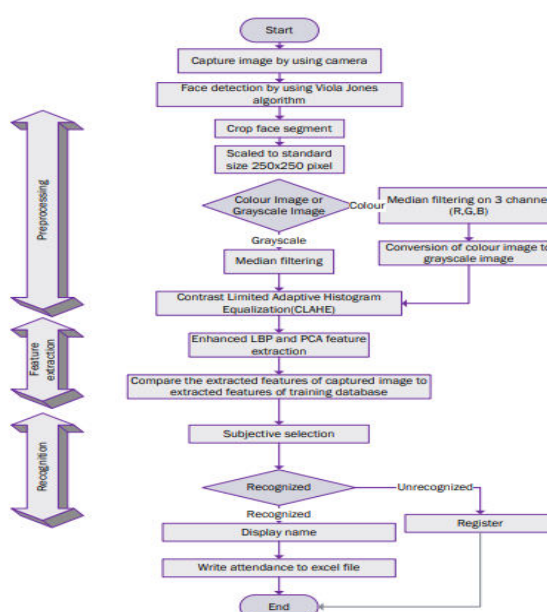


Figure: 2 General Flow Chart for Recognition

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## V. CONCLUSION

There is still more to be done in the field of face recognition, which is a difficult problem to solve. There has been an increase in interest in face recognition among scientists in the biometrics, pattern recognition, computer vision, and cognitive psychology fields in the last ten years. Researchers from a wide range of industries are becoming increasingly interested in face recognition technology, both because of its exceptional capacity to distinguish people and because of the increased focus on security applications. Many different industries use facial recognition software. Using a statistical and/or connectionist framework with image-based coding of the faces, we have reviewed current attempts to model face processing. These models describe faces in a distributed manner rather than a localized manner. Faces share the same "storage space" when stored in this way, and as a result, representations of identical faces may conflict with one another. As a result, the models' success is dependent on the set of faces used to train them (or the statistical structure of the collection). Smart and automated attendance systems have been shown to be effective in ensuring students are present in class. Fake attendance and proxy use can be minimised using this technique. The face recognition system offers the best performance out of all the biometrics systems that may be used to track attendance at an event or facility.

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