

ABSTRACT

Smart Attendance using Real-Time Face Recognition is a real-world solution which comes with day to day activities of handling student attendance system. Face recognition-based system is a process of recognizing the students face by using face biometrics. The purpose of developing this system is to computerize the traditional way of taking attendance. It consumes a lot of time for a teacher when it is done manually, but this system helps in reducing the time taken for the entire process by using face detection. This system helps in resolving the issue of fake attendance & proxies and helps in regulating the process.

The concept of face recognition is to give a computer system the ability of finding and recognizing human faces fast and precisely in images. The face recognition is an integral part of biometrics. In biometrics, basic traits of human are matched to the existing data. Facial features are extracted and implemented through algorithms, which are efficient and some modifications are done to improve the existing algorithm models.

Keywords: Smart Attendance, Face Recognition, Face Detection, Attendance, Facial Features.

TABLE OF CONTENTS	PAGE NO
ABSTRACT	5
LIST OF FIGURES	8
1. INTRODUCTION	10
1.1: Artificial Intelligence and Machine Learning	11
1.1.1: Introduction to Data in Machine Learning	12
1.1.2: How we split data in Machine Learning?	13
1.1.3: Framework for approaching the Machine Learning process	13
1.2: Python	14
1.2.1: Machine Learning in Python	15
1.2.1.1: Numpy	15
1.2.1.2: Python pillow	16
1.2.1.3: Cmake	17
1.2.1.4: Moviepy	17
1.2.1.5: Open CV	17
1.2.1.6: Python Certifi	18
1.2.1.7: Dlib	18
1.3: Problem Statement	19
2. LITERATURE SURVEY	
2.1 : PAPER-1: Classroom Attendance Using Face Detection and Raspberry Pi	20
2.2 : PAPER-2: Face Recognition Based Attendance System	21
2.3 : PAPER-3: Face Recognition based Attendance System using Machine Learning	23
3. METHODOLOGIES	
3.1 : Existing System	27
3.2 : Proposed System	27
3.2.1 : System Architecture	29
3.2.2 : CNN Architecture	32
3.2.2.1 : What is CNN?	32
3.2.2.2 : Pooling	33
3.2.2.3 : Fully Connected	33
3.2.2.4 : Feed Forward	34
3.2.2.5 : Back Propagation	34
3.2.3 : MTCNN Architecture	35

3.2.3.1: P-Net	37
3.2.3.2: R-Net	38
3.2.3.3: O-Net	39
3.2.4 : Face Detection	40
3.2.4.1 : Definition	40
3.2.4.2 : Applications	41
3.2.5 : Face Recognition	42
3.2.5.1 : Applications	42
4. EXPERIMENTAL ANALYSIS AND RESULTS	
4.1 : System Configuration	
4.1.1 : Software Configurations	43
4.1.2 : Hardware Configurations	43
4.2 : System Requirements	
4.2.1 : Software Requirements	44
4.2.2 : Hardware Requirements	44
4.3 : Sample Code	45
4.4 : Screenshots	48
4.5 : Outputs	49
5. CONCLUSION AND FUTURE SCOPE	
5.1 : Conclusion	50
5.2 : Future Scope	50
6. REFERENCES	51
7. APPENDIX	53

LIST OF FIGURES

Figure No	Name of the Figure	Page No
1.1	Artificial Intelligence and Machine Learning	11
1.1.2	Splitting of Data	13
1.1.3	Machine Learning process	14
3.2	Process of Proposed System	28
3.2.1	System Architecture	29
3.2.2.1	CNN Architecture	33
3.2.3	MTCNN Architecture	35
3.2.3	Detail MTCNN Architecture	36
3.2.3.1	P-Net	37
3.2.3.2	R-Net	38
3.2.3.3	O-Net	39

1. INTRODUCTION

An Attendance Management System which is developed using bio- metrics,in our case face, generally consists of Database development, Face detection, Pre-processing, Feature extraction and Face Recognition. The subsequent sections in this paper are literature survey, detailed description of various stages in the proposed model, results and conclusions and scope for improvement.

Automated Attendance System (AAS) is a process to automatically estimate the presence or the absence of the student in the classroom by using face recognition technology. It is also possible to recognize whether the student is sleeping or awake during the lecture and it can also be implemented in the exam sessions to ensure the presence of the student. The presence of the students can be determined by capturing their faces on to a high-definition monitor video streaming service, so it becomes highly reliable for the machine to understand the presence of all the students in the classroom. The two common Human Face Recognition techniques are,

1. Feature-based approach
2. Brightness-based approach.

The Feature-based approach also known as local face recognition system, used in pointing the key features of the face like eyes, ears, nose, mouth, edges, etc., whereas the brightness-based approach also termed as the global face recognition system, used in recognizing all the parts of the image.

The main objective of this project is to develop face recognition based automated student attendance system. In order to achieve better performance, the test images and training images of this proposed approach are limited to frontal and upright facial images that consist of a single face only. The test images and training images have to be captured by using the same device to ensure no quality difference. In addition, the students have to register in the database to be recognized. The enrolment can be done on the spot through the user-friendly interface.

1.2.1 : Machine Learning in Python

Machine learning is learning based on experience. As an example, it is like a person who learns to play chess through observation as others play. In this way, computers can be programmed through the provision of information in which they are trained, acquiring the ability to identify elements or their characteristics with high probability.

There are various stages of machine learning:

- Data collection
- Data storage
- Data analysis
- Algorithm development
- Checking algorithm generated
- The use of an algorithm to further conclusions

Machine learning algorithms are divided into two groups:

- Unsupervised learning
- Supervised learning

With Unsupervised learning, your machine receives only a set of input data. Thereafter, the machine is up to determine the relationship between the entered data and any other hypothetical data. Unlike supervised learning, where the machine is provided with some verification data for learning, independent Unsupervised learning implies that the computer itself will find patterns and relationships between different data sets.

Unsupervised learning can be further divided into clustering and association. Supervised learning implies the computer ability to recognize elements based on the provided samples. The computer studies it and develops the ability to recognize new data based on this data. For example, you can train your computer to filter spam messages based on previously received information.

1.2.1.1 : Numpy

NumPy is the fundamental package needed for scientific computing with Python.

This package contains:

- A powerful N-dimensional array object
- Sophisticated (broadcasting) functions
- Basic linear algebra functions
- Basic Fourier transforms

1.2.1.6 : Python Certifi

Python Certifi provides Mozilla's thoroughly curated collection of Root Certificates for validating the trustworthiness of SSL certificates while verifying an identity of TLS hosts. It has been plucked from the Requests project.

The Python Requests library uses its own CA file by default or will use the certifi package's certificate bundle if installed. If you have installed requests library already, then there are 100% chances that the certifi library is also installed, but you have to check it. So, if you hit the following command, then either it will tell us that the requirement is already satisfied or it will install on your machine.

While it's possible to pass your own CA bundle to Requests to override the default CAs, several third-party packages use Requests under the hood, and there is no way you can tell them to use the custom location for verify.

1.2.1.7 : Dlib

Dlib is a modern C++ toolkit containing machine learning algorithms and tools for creating complex software in C++ to solve real world problems. It is used in both industry and academia in a wide range of domains including robotics, embedded devices, mobile phones, and large high performance computing environments. Dlib's open source licensing allows you to use it in any application, free of charge.

To follow or participate in the development of dlib subscribe to dlib on github. Also be sure to read the how to contribute page if you intend to submit code to the project.

To quickly get started using dlib, follow these instructions to build dlib

1.3 Problem Statement

Attendance is an important part of daily classroom evaluation. At the beginning and ending of class, it is usually checked by the teacher. This includes ,time consumed by the students to find their name on sheet, some students may mistakenly signed another student's name and sometimes the sheet may get lost. For avoiding these problems, Face recognition-based attendance system is a solution to recognise faces for taking attendance by using face recognition technology. A complete face recognition system includes face detection, face pre processing and face recognition processes. Therefore, it is necessary to extract the face region from the face detection process and separate the face from the background pattern, which provides the basis for the subsequent extraction of the face difference features. The recent rise of the face based on the depth 8 of learning detection methods, compared to the traditional method not only shorten the time, and the accuracy is effectively improved. Face recognition of the separated faces is a process of feature extraction and contrast identification of the normalized face images in order to obtain the identity of human faces in the images.

2.LITERATURE SURVEY

2.1 : PAPER-1: Classroom Attendance Using Face Detection and Raspberry Pi

Objective:

Attendance Management System is based on face detection and recognition. Initially when staffs stand in front of the camera, it detects and recognizes that staff's face and generates attendance to that particular staff. The system architecture and algorithms used in each stage are described in this paper. When compared to traditional attendance marking this system saves the time and also helps in maintaining staff's attendance.

Keywords:

Face Recognition, Face Detection, Image capture, Feature Extraction, Feature classification.

Maintaining the attendance is very important in all the institutes for checking the performance of employees. Every institute has its own method in this regard. Some are taking attendance manually using the old paper or file based approach and some have adopted methods of automatic attendance using some biometric techniques. But in these methods employees have to wait for long time in making a queue at time they enter the office. Many biometric systems are available but the key authentications are same in all the techniques. Face detection and recognition are important application of Image processing owing to its use in many fields. Identification of individuals in an organization for the purpose of attendance is one such application of face detection and recognition. The prevalent techniques and methodologies for detecting and recognizing face fail to overcome issues such as scaling, pose, illumination, variations, rotation, and occlusions. The proposed system aims to overcome the pitfalls of the existing systems and provides features such as detection of faces, extraction of the features, detection of extracted features, recognition of face and analysis of staffs' attendance. Faces are recognized using Euclidean distance and k-nearest neighbour algorithms.

An Attendance Management System which is developed using bio-metrics, in our case face, generally consists of Database development, Face detection, Pre-processing, Feature extraction and Face Recognition. The subsequent sections in this paper are literature survey, detailed description of various stages in the proposed model, results and conclusions and scope for improvement.

The proposed attendance management system is based on face recognition .when a person stands in front of the camera, it detects and recognize the person based on already stored test samples and the ID given.

Based on the requirements of an automated attendance system this servers as a whole system for managing attendances in schools and colleges. It presents a design and framework for taking attendance and thereby making troublesome process of taking and compiling of attendance simple and efficient. So this prototype is not only cheaper, efficient, having low power design, upgraded for any other type of data acquisition system, easy to use.

2.2 : PAPER-2: Face Recognition Based Attendance System

Objective:

Automatic face recognition (AFR) technologies have made many improvements in the changing world. Smart Attendance using Real-Time Face Recognition is a real-world solution which comes with day to day activities of handling student attendance system. Face recognition-based attendance system is a process of recognizing the students face for taking attendance by using face biometrics based on high - definition monitor video and other information technology. In my face recognition project, a computer system will be able to find and recognize human faces fast and precisely in images or videos that are being captured through a surveillance camera. Numerous algorithms and techniques have been developed for improving the performance of face recognition but the concept to be implemented here is Deep Learning. It helps in conversion of the frames of the video into images so that the face of the student can be easily recognized for their attendance so that the attendance database can be easily reflected automatically.

Keywords:

Face recognition, Face detection, Deep Learning, Convolution Neural Network(CNN).

The technology aims in imparting a tremendous knowledge oriented technical innovations these days. Deep Learning is one among the interesting domain that enables the machine to train itself by providing some datasets as input and provides an appropriate output during testing by applying different learning algorithms. Nowadays Attendance is considered as an important factor for both the student as well as the teacher of an educational organization. With the advancement of the deep learning technology the machine automatically detects the attendance performance of the students and maintains a record of those collected data. In general, the attendance system of the student can be