

# Face Attendance System

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This Report Presented in Partial Fulfillment of the Requirements for the Degree  
of Bachelor of Science in Computer Science and Engineering.

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## DECLARATIONS

**We hereby declare that, this project has been done by us  
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**Abstract:**

The main purpose of this project is to build a face recognition-based attendance monitoring system for educational institution to enhance and upgrade the current attendance system into more efficient and effective as compared to before. The current old system has a lot of ambiguity that caused inaccurate and inefficient of attendance taking. Many problems arise when the authority is unable to enforce the regulation that exist in the old system. The technology working behind will be the face recognition system. The human face is one of the natural traits that can uniquely identify an individual. Therefore, it is used to trace identity as the possibilities for a face to deviate or being duplicated is low. In this project, face databases will be created to pump data into the recognizer algorithm. Then, during the attendance taking session, faces will be compared against the database to seek for identity. When an individual is identified, its attendance will be taken down automatically saving necessary information into a excel sheet. At the end of the day, the excel sheet containing attendance information regarding all individuals are mailed to the respective faculty. Keywords- Smart Attendance System, OpenCV, Numpy .

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## Chapter-1

### 1.1 Introduction:

This is a project about Face-recognition Attendance System for our Daffodil International University. In this chapter, the problem and motivation, research objectives, project scope, project contributions and the background information of the project will be discussed in detail.

The main intention of this project is to solve the issues encountered in the old attendance system while reproducing a brand new innovative smart system that can provide convenience to our institution. In this project, an application will be developed which is capable of recognizing the identity of each individual and eventually record down the data into a database system. Apart from that, an excel sheet is created which shows the students attendance and is directly mailed to the respected faculty.

In order to solve the drawbacks of the previous system, the existing system will need to evolve. The proposed system will reduce the paperwork where attendance will no longer involve any manual recording. The new system will also reduce the total time needed to do attendance recording. The new system will acquire individual attendance by means of facial recognition to secure data accuracy of the attendance.

### 1.2 Literature

#### **Attendance System Using NFC Technology with Embedded Camera on Mobile Device:**

According to research journal "Attendance System Using NFC (Near Field Communication) Technology with Embedded Camera on Mobile Device". The attendance system is improved by using NFC technology and mobile application. According to the research paper, each student is given a NFC tag that has a unique ID during their enrolment into the college. Attendance of each class will then be taken by touching or moving these tags on the lecturer mobile phone. The embedded camera on the phone will then capture the student's face to send all the data to the college server to do validation and verification. The advantages of this method is where the NFC is simple to use, and the speed of connection establishment is very high. It indeed speeds up the attendance taking process a lot. However, this system couldn't automatically spot the violation when the NFC tag is not personally tagged by the original owner.

#### **Face Recognition Based Attendance Marking System:**

The second research journals "Face Recognition Based Attendance Marking System" is based on the identification of face recognition to solve the previous attendance system's issues. This system uses camera to capture the images of the employee to do face detection and recognition. The captured image is compared one by one with the face database to search for the worker's face where attendance will be marked when a result is found in the face database. The main advantage of this system is where attendance is marked on the server which is highly secure where no one can mark the attendance of other. Moreover, in this proposed system, the face detection algorithm is

improved by using the skin classification technique to increase the accuracy of the detection process. Although more efforts are invested in the accuracy of the face detection algorithm, the system is yet not portable. This system requires a standalone computer which will need a constant power supply that makes it not portable. This type of system is only suitable for marking staff's attendance as they only need to report their presence once a day, unlike students which require to report their attendance at every class on a particular day, it will be inconvenient if the attendance marking system is not portable. Thus, to solve this issue, the whole attendance management system can be developed on a portable module so that it can be work just by executing the python program.

### **1.3 Problem Statement and Motivation:**

According to the previous attendance management system the accuracy of the data collected is the biggest issue. This is because the attendance might not be recorded personally by the original person, in another word, the attendance of a particular person can be taken by a third party without the realization of the institution which violates the accuracy of the data. For example, student A is lazy to attend a particular class, so student B helped him/her to sign for the attendance which in fact student A didn't attend the class, but the system overlooked this matter due to no enforcement practiced. Supposing our institution establish an enforcement, it might need to waste a lot of human resource and time which in turn will not be practical at all. Thus, all the recorded attendance in the previous system is not reliable for analysis usage. The second problem of the previous system is where it is too much time consuming. Assuming the time taken for a student to sign his/her attendance on a 3-4 paged name list is approximately 1 minute. In 1 hour, only approximately 60 students can sign their attendance which is obviously inefficient and time consuming The third issue is with the accessibility of those information by the legal concerned faculty. For an example, most of the parents are very concerned to track their child's actual whereabouts to ensure their kid really attend the classes in University/college/school. However in the previous system, there are no ways for the parents to access such information. Therefore, evolution is needed to be done to the previous system to improve efficiency, data accuracy and provides accessibility to the information for those legal faculty.

## **2.1 System Design:**

The design part of the attendance monitoring system is divided into two sections which consist of the hardware and the software part. Before the software the design part can be developed, the hardware part is first completed to provide a platform for the software to work. Before the software part we need to install some libraries for effective working of the application. We install Open-cv and Numpy through Python.

### **Hardware Development**

- Camera Module with good mega pixels.
- Power Supply Cable
- 16Gb Micro SD Card

### **Libraries Development**

#### **OpenCV**

OpenCV is a library of programming functions mainly aimed at real-time computer vision. The OpenCV project was initially an Intel Research initiative to advance CPU-intensive applications, part of a series of projects including real-time raytracing and 3Ddisplay walls.

#### **OpenCV's application areas include:**

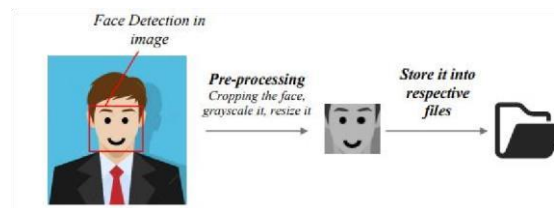
- 2D and 3D feature toolkits
- Facial recognition system
- Gesture recognition
- Human–computer interaction (HCI)
- Mobile robotics
- Motion understanding
- Object identification
- Motion tracking

#### **NumPy**

NumPy is a package that defines a multi-dimensional array object and associated fast math functions that operate on it. It also provides simple routines for linear algebra and fft and sophisticated random-number generation. NumPy replaces both Numeric and Numarray.

## 2.2 Methodology:

Before the attendance management system can work, there are a set of data needed to be inputted into the system which essentially consist of the individual's basic information which is their ID and their faces. The first procedure of portrait acquisition can be done by using the Camera to capture the faces of the individual. In this process the system will first detect the presence of a face in the captured image, if there are no face detected, the system will prompt the user to capture their face again until it meets certain number of portraits which will be 10 required portraits in this project for each student. The decision of storing only 10 portrait per student is due to the consideration of the limited storage space in the raspberry pi because the total amount of students in the university is considered heavy. Then, the images will undergo several pre-processing procedures to obtain a grayscale image and cropped faces of equal sized images because those are the prerequisites of using the Faces Recognizer. Both of the processes mentioned above can be represented in the diagram below.



### Image Acquisition and Pre-processing procedures

After the images are being processed, they are stored into a file in a hierarchy manner. In this project, all the faces will be stored in a hierarchy manner under the photos folder. When expanding through the photos database folder, there will consist of many sub-folders which each of them will represent an individual where a series of face portrait belonging to the same individual will be stored in that particular sub-folder. The subfolders that represent each individual will be named upon the ID no. of that individual which is unique for every single individual in our institution. The whole process of image resize, pre-processing, storing mechanism is done by the script named `facerecognition.py`

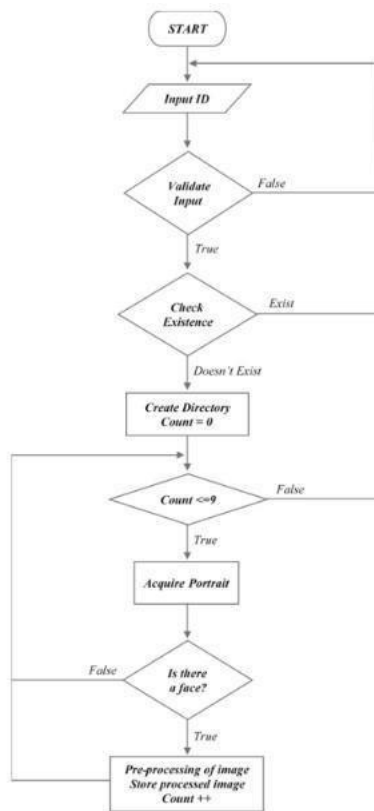
### Structure of the content in the csv file

After having sufficient images in the database, those images will then be inserted into a training mechanism. There are generally 3 different types of training mechanism provided in OpenCV which are Faces, and Local Binary Patterns Histograms. The recognizer that will be focused in this project will be the Faces recognizer. The concept behind EFaces is simple – it recognizes a particular face by catching the maximum deviation in a face and then turning those identified variations into information to be compared when a new face arrives. In the training process, the csv file will be read to provide the path to all of the images where those images and labels will be loaded into a list variable. Then, the list will be passed into the training function where the training process will take a measurable time to run. The larger the face database, the longer the time will be needed to train those images.



### 2.3 Flow Chart:

The development of the face database is an important phase before any face recognizing process can be carried out. It acts as a library to compare against with whenever the system wanted to identify a person. In the image retrieval process, the system will first prompt for an input from the user to enter their ID number. The system will then validate the entered input and then check for duplication in the system.



### Flow Chart of the image resize process

The above flowchart is only the program flow for the image acquisition process which describes the program flow for the face-recognition.py. There are two more python scripts that responsible for the remaining execution.

## 2.4 Overview:

The proposed system is a software system which will mark attendance using facial recognition. In this project we used Open-CV module integrated with Python which will helps the institution to make the attendance process easy and efficient. The system comprises of Computer, HD Video Camera and Wi-Fi module or Internet.

### Steps of Working:

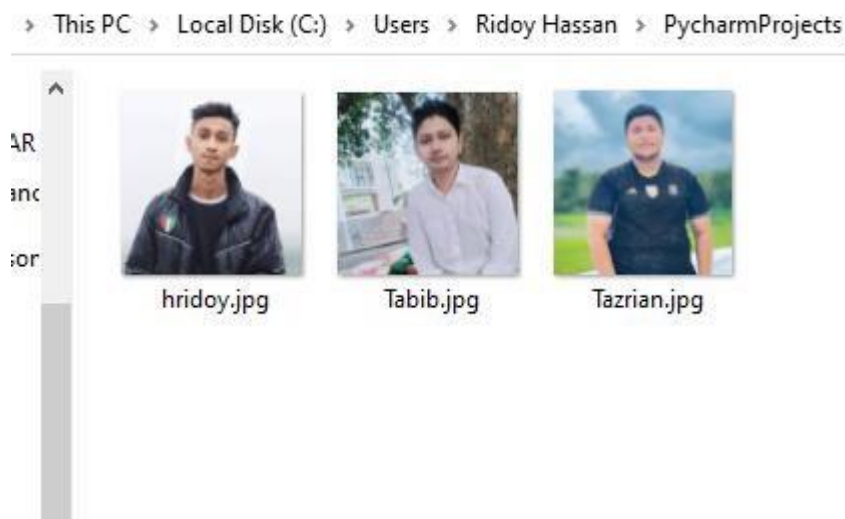
- Initiate project.py python file.
- Create a Data set of the student by entering his ID Number/photos.
- Train the dataset, face\_encoding.
- Attendance is taken by cropping the faces in the picture and comparing with the faces in the database.
- If a face is matched, the responding name with PRESENT status is marked in a EXCEL file with the current date and time.

## Content

This PC > Local Disk (C:) > Users > Ridoy Hassan > PycharmProjects > smart-attendance

| Name           | Date modified       | Type            |
|----------------|---------------------|-----------------|
| .idea          | 11/27/2023 1:01 AM  | File folder     |
| photos         | 11/26/2023 10:20 AM | File folder     |
| venv           | 11/22/2023 12:47 AM | File folder     |
| 2023-11-22.csv | 11/22/2023 10:26 PM | Microsoft Excel |
| 2023-11-24.csv | 11/24/2023 5:02 PM  | Microsoft Excel |
| 2023-11-26.csv | 11/26/2023 1:31 PM  | Microsoft Excel |
| 2023-11-27.csv | 11/27/2023 1:01 AM  | Microsoft Excel |
| main.py        | 11/27/2023 12:54 AM | JetBrains PyC   |

## Database



## In-put



## Real Time Out-put

| A1 |        |         |   |   |
|----|--------|---------|---|---|
|    |        |         |   |   |
|    | A      | B       | C | D |
| 1  | Hridoy | 0:56:01 |   |   |
| 2  |        |         |   |   |
| 3  |        |         |   |   |
| 4  |        |         |   |   |
| 5  |        |         |   |   |
| 6  |        |         |   |   |

## Chapter-3

### 3.1 Conclusion:

Before the development of this project. There are many loopholes in the process of taking attendance using the old method which caused many troubles to most of the institutions. Therefore, the facial recognition feature embedded in the attendance monitoring system can not only ensure attendance to be taken accurately and also eliminated the flaws in the previous system. By using technology to conquer the defects cannot merely save resources but also reduces human intervention in the whole process by handling all the complicated task to the machine. The only cost to this solution is to have sufficient space in to store all the faces into the database storage. Fortunately, there is such existence of micro-SD that can compensate with the volume of the data. In this project, the face database is successfully built. Apart from that, the face recognizing system is also working well.

At the end, the system not only resolve troubles that exist in the old model but also provide convenience to the user to access the information collected by mailing the attendance sheet to the respected faculty.

### 3.2 Future Work:

Our Face attendance system using Python project is a promising approach to automating attendance management. However, there are several areas where the project can be improved and extended in the future. Here are some potential directions for future work:

#### 1. Enhance Face Recognition Accuracy:

Explore more advanced face recognition algorithms, such as deep learning-based techniques, to achieve higher accuracy and robustness against varying illumination, poses, and facial expressions.

#### 2. Integrate with Attendance Management Systems:

Develop a mechanism to seamlessly integrate the face recognition attendance system with existing attendance management systems, allowing for data synchronization and centralized reporting.

#### 3. Implement Multi-Camera Support:

Extend the system to support multiple cameras simultaneously, enabling attendance tracking for larger classrooms or lecture halls.

#### 4. Real-time Attendance Monitoring:

Implement real-time attendance monitoring capabilities, providing instant updates on attendance status and allowing for timely interventions in case of attendance irregularities.

#### 5. Mobile Attendance Tracking:

Develop a mobile application that allows students to mark their attendance using their smartphones, expanding the system's reach and flexibility.

#### 6. Integration with Access Control Systems:

Combine the face recognition system with access control systems to grant or deny access to restricted areas based on attendance records and authorized personnel.

#### 7. Cloud-based Deployment and Scalability:

Explore cloud-based deployment options to enhance scalability and enable remote access to attendance data and system management.

#### 8. Privacy and Security Considerations:

Implement robust security measures to protect student data and privacy, adhering to data privacy regulations and ensuring ethical data handling practices.

#### 9. Development on Laboratory:

Implement this project on laboratory and I want to make this project as a smart device. I will make this project more smart with the help of smart device like Arduino uno/Esp 32 or Raspberry-Pi.

#### **References:**

1. Attendance System Using NFC Technology with Embedded Camera on Mobile Device.
2. Face Recognition Based Attendance Marking System.
3. Face Based Attendance System Using Camera, Microcontroller and LabView.
4. OpenCvDocumentation -<https://opencv.org>
5. Numpy - <https://numpy.org>