HUMAN FACE RECOGNITION USING HAAR CASCADE CLASSIFIER AND GENDER RECOGNITION USING CAFFEMODEL WITH SMTP

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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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APPROVAL

This Project titled "Human Face Recognition Using HAAR Cascade Classifier and Gender Recognition Using Caffemodel with SMTP", submitted by MD. Belal Hossain, ID: 173-15-10477 and Nurun Nahar, ID: 181-15-10739" to the Department of Computer Science and Engineering, Daffodil International University, has been accepted as satisfactory for the partial fulfillment of the requirements for the degree of B.Sc. in Computer Science and Engineering and approved as to its style and contents. The presentation has been held on 4th January 2022.

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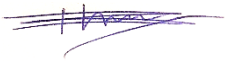

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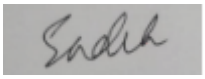

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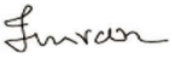

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We hereby declare that, this project has been done by us under the supervision of **Shah Md. Tanvir Siddiquee, Assistant Professor, Department of CSE** Daffodil International University. We also declare that neither this project nor any part of this project has been submitted elsewhere for award of any degree or diploma.

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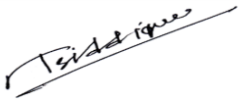

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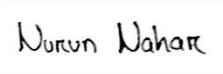

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ABSTRACT

Due to the non-modeling nature and wide range of applications, facial recognition has always been a persistent study field. Computer vision is now a broad subject that uses high-level programming to automatically execute tasks such as detection, identification, and classification using input images/videos. They are superior than the regular human visual system, even using deep learning approaches. A computer system that detects or confirms a person based on their facial characteristics from a digital picture or video source is known as face recognition. This technology enables us to influence security systems, biometric identification, gait analysis, social networking, and other areas. Because of its non-intrusiveness, accuracy, and speed, live face recognition has gained a lot of traction in security systems. In our project, we created a facial recognition system that uses the Local Binary Pattern Histogram (LBPH) approach to treat real-time human face recognition in low and high-level images. Our research was specifically focused on developing a system that is based on a human gesture known as Face. This is a four-step process. Face detection using the Haar cascade classifier is the first. Face recognition using LHBP classifiers, which are produced from learned faces, is the second option. The third step is to identify the person's gender, and the last step is to record the attendance with the date and time, save it in a database, and email it to the owner by using SMTP. A graphical user interface (GUI) was also employed to make it more user-friendly.

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CHAPTER 1
Introduction

1.1 Introduction:

Image mining is a development in the field of data mining in the image processing arena. Image processing is an effective technique for applying operations on an image in order to improve it or extract relevant information from it. It has a few of uses in facial recognition and video analysis, as well as image segmentation and standard language preparing. Here the system performs facial identification & face recognition on people by image processing. In general face recognition with detecting gender, identification can help people to ensure security and characterization. This project develops a real-time, GUI-based automatic Face detection and identification system. To find a match, facial recognition compares the data to a database of real-life appearances. We focused on the employee, whose attendance will be tracked, their gender will be recognized, and the data will be sent to the owner, which will be extremely useful for workplace management.

1.2 Motivation:

Facial recognition technology is being used in a variety of fields, including payment, improved security, criminal identification proof, marketing, human healthcare, and so on. As a result, real-time facial recognition systems for access control are projected to be in high demand, not just for investigating illegal actions but also for stopping illegal or terrorist operations. For a work place there are some employees who have to daily deal with the attendance system and also some places that have access control only for selected staff also they have to report time to time to their boss. Also, for different gender they provide different access like restroom and pray room for female employee and male employee. To solve this a simple management tool can help. So, we build a GUI based automated system that will save the data of the employee and only the selected stuff will get the access and every time they come in front of the camera the project will take their record and sent it to the boss.

1.3 Objectives:

Our main concern is to build something that will coordinate with the existing security system, to make sure the workplace more efficient and secure. We're working on creating a fast and accurate face recognition system that can recognize persons entering the working areas.

We need to identify faces in an image or a real time video by using Haar Cascade classifier. the face detection will be done initially and it will be saved to the database. after that we will train the system with the image data. By utilizing Local Binary Patterns for each picture, a feature vector is to be figured. A CAFFEMODEL file is a Caffe-created machine learning model that we use to develop a sophisticated neural network and train it to distinguish gender. Also utilized the SMTP application to deliver e-mail messages to the owner's PC.

The project separates people by regulating their access by recognizing their gender. As a result, it can be utilized in regions where only males or females are permitted. A GUI will make the system more adaptable. Furthermore, our primary goal is to develop a secure workplace where no unauthorized individuals are allowed to enter, and the owner will be updated on a regular basis.

1.4 Research Questions:

There are various phenomena that assist in bringing up some questions about our work. We can improve our research by asking these questions, and anybody can receive a clear idea & impression.

- Is it possible to detect numerous faces at once?
- Is it feasible to recognize the face when wearing a mask or wearing glasses?
- Will gender recognition work in the case of children?
- Is there anything particular that needs to be done with the background while shooting a picture?
- Is the system capable to store multiple data at the same time?

1.5 Expected Outcomes:

Face recognition is a straightforward and non-intrusive approach for verifying a person's identity. Because of its noninvasive nature and because it is people's preferred means of person identification, face recognition has long been a prominent focus of research.

A few perspectives derived from our projects are presented below.

This system can be used in the entrance off different areas for security and access control purpose. The system may be used to recognize people's faces at universities, schools, offices, train stations, bus stops, and residential entrances. As well It can be used in such places where we need to separate people by gender. As example public toilet, prayer rooms, hospitals etc.

When our system detects any suspicious faces, it will issue an internal warning or signal and it will be notified to the owner, allowing them to take appropriate action. it fully eliminates unwanted entry caused by unauthorized people while also assisting in the security of the region. The system guarantees the safety of every place where it is used.

1.6 Report Layout:

Chapter 1: Introduction

In this chapter, we go over the introduction, motivation, objectives, expected outcomes, and report layout for our project.

Chapter 2: Background

In Chapter 2, we discuss the background of our suggested technique. In this section, we also go over the literature review, relevant works, issue discussion, and assertions about our project.

Chapter 3: Research Methodology

This section contains the general technique that we utilized to construct the proposed system. Techniques are gradually clarified in this section.

Chapter 4: Experimental Results and Discussion

The results of our experiments are displayed alongside the presentation investigation carried out by the proposed system. In this section, we've also covered the outcomes overview.

Chapter 5: Impact on Society, Environment and Sustainability

This section discusses the advantages of our strategy in terms of enhancing the environment around us, as well as a solution for social security and its long-term sustainability.

Chapter 6: Summary, Conclusion, Recommendation and Implication for Future Research

It is the final section of the paper where we discuss the study's summary, conclusion, implementation for additional research, recommendations, and implications for future research.

CHAPTER 2
Background

2.1 Introduction:

"Human face recognition using haar-cascade classifier and gender recognition using CAFFEMODEL with smtp" is a system that uses OpenCV and Python to recognize authorized and unauthorized persons along with their gender. It allows to recognize and confirm people who wish to enter a secure location, and it may be used for a variety of purposes. After recognizing the people, the system should allow the data to be sent to the authority via email. We reviewed various publications relating to our work before beginning to work on this topic.

We will review the previous study that has previously been done by several researchers in this sector. In addition, we will highlight the limitations of these works, and we have included the extent of our study as well as the problems in this area. We will also go into the background history of the approaches that we have used in our system.

2.2 Related Works

Farah Deeba et al. [1] used LBPH for enhance real time face recognition. The local binary pattern histogram [LBPH] is a descriptor for locating faces in images that is based on oriented gradients [HOG]. Local Binary Patterns (LBP) were first introduced by Ojala et al. as a texture analysis for gray-scale images [16] [17]. Face detection in RBG (colored) photos. They used LBPH to extract the histogram from the image and created a data vector to explain the patterns in the original image. They do not consider the entire image, but rather divide it into numerous image parts.

Mamata S.kalas et al. [2] executed real time face detection and tracking using OpenCV. To locate a human face, the system must collect an image using a camera and a frame-

grabber, process the image with a frame-grabber, search the image for relevant traits, and then use these features to establish the face's location. In this study, many face detection approaches and algorithms are discussed. Any study's face detection approach should be chosen depending on the application's specific requirements. For all applications, none of the present approaches is the best. Digital image features called Haar-like features are employed in object recognition. We found the one of examples of using Adaboost. Adaboost is a linear combination approach for generating a "strong" classifier. Adaptive Boosting, or Adaboost, is a machine learning algorithm developed by Yoav Freund and Robert Schapire. It's a meta-algorithm that may be combined with a variety of other learning algorithms to increase their performance.

Bollipelly pruthviraj goud et al. [3] had proposed Smart Attendance Notification System using SMTP with Face Recognition. Automated systems are being developed in the study to circumvent the difficulties of manually taking attendance. The purpose of this study was to create a secure attendance marking system. Face is a system that is based on one of the human gestures. The approach is implemented in two parts. Face detection using the Haar classifier is one example. Face recognition using LHBP classifiers, which are produced from learned faces, is the second option. The suggested system would automatically record the attendance of persons who are present in a classroom environment, which is the simplest way to perform the analysis, and the proof-oriented approach makes for dependable implementations.

Suma S L et al. [4] had proposed Real Time Face Recognition of Human Faces by using LBPH and Viola Jones Algorithm. They choose the viola-jones algorithm for face detection because of its high precision and real-time permit rate, and it is implemented in OpenCV using Python. The algorithm is trained with the samples of the image to be learned during the training phase. During the estimate step, the test picture is compared to all of the dataset's training samples. Local Binary Patterns Histogram extracts facial traits from observed faces in a live stream (LBPH). Face recognition for human faces is used in this paper using the Viola Jones method for face identification, the LBPH algorithm for

feature extraction, and the Euclidean distance classifier for face recognition. To do this, the following processes are used: establishing a dataset, face acquisition, feature extraction, and lastly classification. The entire project is written in OpenCV and python.

Nirmalya Kar et al. [5] had proposed Study of Implementing Automated Attendance System Using Face Recognition Technique. This paper describes a way for integrating a student's attendance system with face recognition technology using Personal Identification Numbers (PINs). PCA is a component analysis algorithm. The system will keep track of everything. the kids' attendance in a classroom context automatically, and it will give the professors with the necessary resources. By keeping a student information database, you can readily access the information of your pupils. Keep track of when you clock in and out.

Lahiru dinalankara et al. [6] worked on face detection & face recognition using open computer vision classifiers. This paper details the face detection and recognition mini-project completed as part of Plymouth University's visual perception and autonomy program. It summarizes the technologies in the Open-Computer-Vision (OpenCV) library and their applications. Python will be used to implement them. Haar-Cascades were utilized for face detection, and Eigenfaces, Fisherfaces, and Local binary pattern histograms were used for face recognition. The technique is presented in detail, with flow charts for each system level. The results, including charts and screen photos, are then shown, followed by a discussion of the issues that were faced. The study ends with the authors' thoughts on the research and its potential applications. Haar-Cascades were utilized for face detection, and Eigenfaces, Fisherfaces, and Local binary pattern histograms were used for face recognition. The technique is presented in detail, with flow charts for each system level. The results, including charts and screen photos, are then shown, followed by a discussion of the issues that were faced. The study ends with the authors' thoughts on the research and its potential applications.

Khansaa Dheyaa Ismael et al. [7] proposed in Face recognition using Viola-Jones depending on Python. The proposed software system based on face recognition is presented in this paper. The proposed technology can be used in a smart building or any VIP building that requires security monitoring. The human face will be detected from a stream of photos or video feed; this technology recognizes people using a specific algorithm; the technique used in this study is the Viola–Jones object detection framework, which is implemented in Python. The frames can be read or written to file with the cv2.imread and cv2.imwrite methods, which are both based on the OpenCV python by importing the cv2 technique for detecting the human face. Finally, the proposed software system can be used to regulate access in smart buildings in general, as well as the advancement of technologies associated with them. One of the most significant elements that must be fulfilled in smart buildings is the provision of a security system; this proposed system can be employed as a security system application in a smart building. OpenCV (Open-Source Computer Vision) is a prominent computer vision library that was founded by Intel in 1999. The platform library focuses on real-time image processing and offers non-patentable implementations of the most recent computer vision methods. Finally, the suggested system restricts access to the building to authorized individuals using a facial recognition algorithm.

Alen Salihbašić et al. [8] worked on Development of Android Application for Gender, Age and Face Recognition Using OpenCV. This document thoroughly outlines and illustrates the complete process of Developing an Android app to recognize a person's gender, age, and face. Face recognition and facial recognition the methods of recognition that have been employed are described and as well as the development tools that were used in the development of a mobile application for Android The application software The OpenCV library is described in full in this solution & displays the mobile application's actual results With the help of the OpenCV library, this study will investigate the feasibility of implementing a face recognition system, as well as gender and age recognition, on a mobile device in the form of an Android application. The remainder of the paper is organized in the following manner. In the second section,

the biometric system is briefly detailed. In the third section, the used algorithm for face detection and recognition is explained. In the fourth section, the design and application functionalities are discussed. In the fifth section, the software solution is provided and clearly discussed with code snippets and outcomes.

Prof. A. M. Jagtap et al. [9] worked on A Study of LBPH, Eigenface, Fisherface and Haarlike features for Face recognition using OpenCV. LBPH, Eigenface, and Fisherface are some of the facial recognition algorithms that have been developed. For facial recognition, the Haar cascade has been used. We used the same data set to train the algorithms and gained some insights from which we attempted to determine which method produces the best outcomes. The workings of several algorithms are contrasted and explored. Tabular comparisons are offered at the end. So that the differences between algorithms would be easier to explain.

Sander Soo et al. [10] proposed Object detection using Haar-cascade Classifier. One such possibility will be discussed in this study, namely the use of a Haar-cascade classifier. The case study of a vehicle detection and counting system will be the main topic. technology and the possibilities it will open up in a semi-enclosed space - both the positive and negative aspects Statistically speaking, as well as for the average person. The system's purpose is to be designed is to make our daily lives easier and more enjoyable. The cascade classifier is made up of a series of stages, each of which has a list of weak learners. By sliding a window over the image, the system recognizes the things in question. Each stage of the classifier identifies the precise region indicated by the current location of the window as positive or negative, with positive indicating the presence of an object and negative indicating the absence of the specified object in the image.

2.3 Comparative Analysis and Summary:

Many recharters have worked in the field of image processing. They've used a variety of algorithms for image detection, image recognition, gender recognition, and age detection. However, in our project, we incorporated all of the available elements to create a project that can be utilized for a variety of purposes, such as security and tracking, or an attendance system. At the outset of our project's research, we discovered that A study on Automated Attendance System Implementation was suggested by Nirmalya Kar et al. [5]. This paper describes a way for merging a student's attendance system with facial recognition technology by employing Personal Identification Numbers (PINs). This technology does not provide a sensible answer for a secure attendance system. Suma S L et al. [4] proposed combining the LBPH and Viola Jones Algorithm to recognize human faces in real time. In their work, they offered a superior method based on more accurate real-time visual data. Lahiru Dinalankara et al. [6] used open computer vision and classifiers to work on face detection and recognition. This is where we get our key ideas and lessons. A similar strategy is utilized effectively in this research to identify faces and eyes in combination, resulting in better face detection. Smart Attendance Notification System Using SMTP with Face Recognition was proposed by Bollipelly pruthviraj goud et al. [3]. The study is developing automated techniques to avoid the hassles of manually taking attendance. This study discovered that after collecting attendance, the data may be delivered through email using SMTP. This study offered a calculative work that differed from previous work on [1],[2]. Using OpenCV, Alen Salihbai et al. [8] developed an Android application that can helps to detect gender, age, and face recognition. One of the key ideas comes from this study. Object detection using Haar-cascade Classifier was proposed by Sander Soo et al. [10]. The usage of a Haar-cascade classifier is one such possibility that will be examined of our study. We found clear knowledge about Haar-cascade. Face recognition & gender detection is the common study on [9],[7]. These are the best study we found for achieving goal.

2.4 Scope of the Problem:

While conducting our research, we discovered that for an uninitiated individual, selecting a specific research subject from the vast ocean of knowledge fields is rather difficult. There are several domains of knowledge in which a researcher wants to conduct the study. The majority of the situations, however, were unable to pick the majority of the cases. Professors, graduate students, and other researchers have to identify the publications that are most relevant to their research projects in colleges, universities, and research institutes. Out of all the areas, we selected to concentrate on face detection and recognition, as well as gender recognition. There were many related works. However, no works, on the other hand, have included sufficiently relevant information regarding research articles in the request. and There were a lot of algorithms to pick from. In addition, the vast majority of researchers concentrate on the same data gathering. Choosing the optimal algorithm with the highest accuracy while taking the least amount of time was a difficult task, also we combined different approaches together in order to build a more accurate and better project.

2.5 Challenges:

Our system requires us to recognize strangers, remember them, and display all of the information we know about them, which is quite challenging for us. To recognize a person in a genuine method, we must meticulously train his or her image, which is a difficult task for us. To perceive a face match, a dataset was created by sparing captured photos immediately away. It was difficult to indicate persons relevant data that was recognized, to the point where we needed the right facial highlights for identification. Controlling a server with a large amount of data was a tough challenge for us. One of our worries was the timeliness of completing this assignment in the meanwhile. It will be a significant problem for us if the experiment is not set up in a timely manner. To complete all activities, we divided our working time and assigned duties to each of us. During the hour it took us to put our product together, we were bombarded with questions.

We met with the supervisor and co-supervisor in order to complete the arrangement. Expected skills to complete our full project task were suitably taken into account.

CHAPTER 3

Methodology

3.1 Research Subject and Instrumentation:

Human face recognition is a form of biometric verification that has been widely employed in a variety of applications, including video monitoring, human-computer interaction, door control, and network security.

The project's purpose is to develop a real-time GUI-based face recognition system that uses a camera to view the outside world and then employs the Haar Cascade classifier to detect and distinguish individual faces in the picture also used the coffee model to recognized the gender. As a result, a high-quality camera setup and a stable computer with Python installed are required as instrument for this project. The data will be delivered to the owner on a regular basis via the SMTP protocol, which requires a valid email address.

3.2 Data Collection Procedure:

Data collection is the most important part of in our project. For our work, we stored photos captured from real-time videos as data. The data for this project will be collected as photos from real-time video shot by the camera. The system will automatically take 400 pictures of the client from the video and will store it in the csv file. The GUI system will take the client's information manually, such as name, id, password at the moment of video input and save it with the image data. The password will keep the system secure from unauthorized entry. For testing the model, we are using real-time photos as data. To recognize and discern gender, a particular amount of data is gathered from a human face.

Figure 3.2.1: Collection of Image Data.

3.3 Proposed Methodology:

We need to be able to recognize and recall faces in order to function properly in our system. At first, we began to investigate various distinguishing calculations that can be used to develop a face detection and identification system after examining some relevant work of our system. Following that review, we decided on a certain algorithm.

We have used an OpenCV-cascade-classifier for identifying face and Local Binary Patterns histogram (LBPH) calculation for perceiving the face in addition we use the Caffe model for gender recognition. We use SMTP for sending data via email. When a person comes in front of the camera first the system will detect his/her face also it will detect his/her gender and save it into a CSV file as their attendance. After storing their attendance to the CSV file then the system is able to send the CSV file via email. We must cover the following advances in order to complete the entire system:

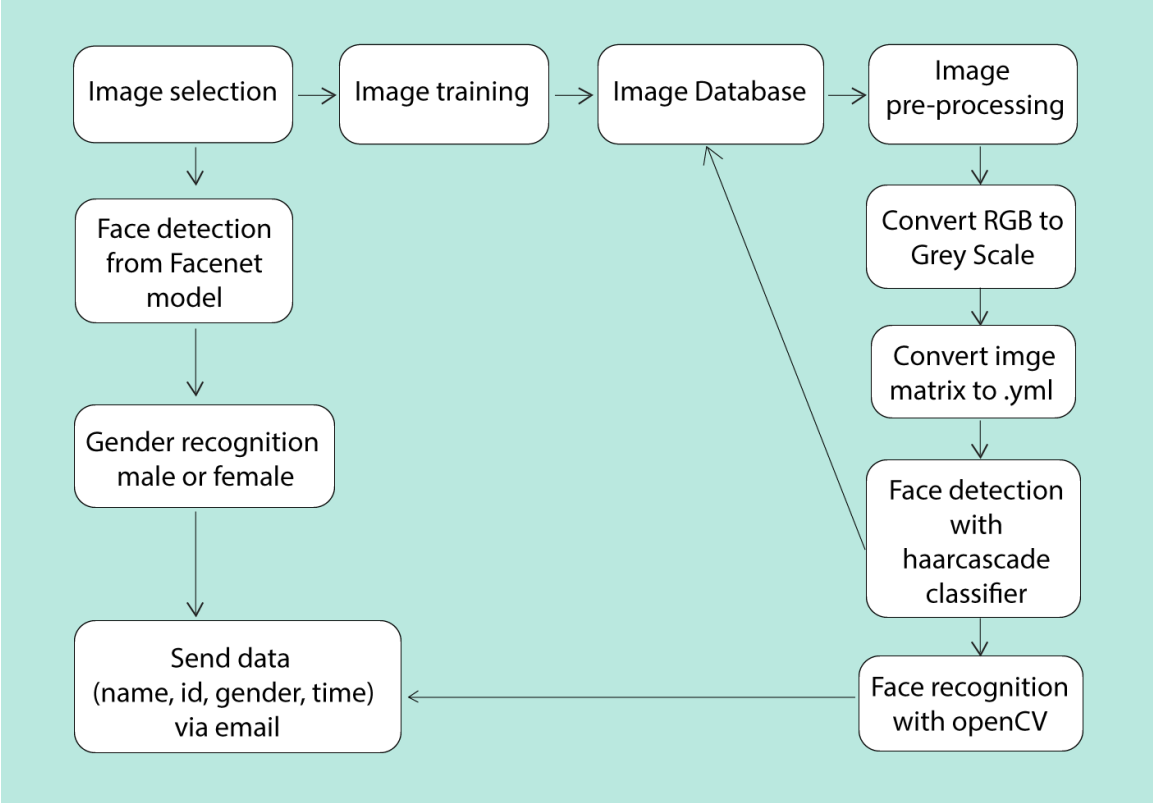

Figure 3.3.1: Structure of Face Detection and Recognition with gender recognition Using Haar-Cascade with OpenCV and caffe model.

Our entire approach was based on five central steps, which are detailed below:

A. Face data collection

B. Train the saved data

C. The LBPH (Local Binary Patterns Histograms) technique is used to recognize faces

D. CAFFE NETWORK ACRCHITECTURE is used to recognize gender

E. We use SMTP for transferring data over email

A. Face data collection

Discovering faces from a person's whole picture, recordings, or real-time video is the task of face detection. We can tell if the person is male or female by gender recognition. Haar cascade classifier is used to detect the faces. CAFFEMODEL is used for gender recognition. Haar cascade classifier has 4 stages:

- Haar features selection
- Creating integral image
- Adaboost training
- Cascading classifiers

Haar Cascade is a machine learning object recognition algorithm that can be used to recognize things in images or videos. It's best recognized for detecting faces and body features in photos, but it can be trained to recognize practically any item. It's a machine-learning approach in which a cascade function is learned using a large number of positive and negative photos. After then, it's utilized to find items in other photos. Negative photos are those without a face, while positive pictures are those having a face. The classifier will be trained using these images.

A Haar wavelet is a mathematical fiction that generates rectangular-shaped waves with a beginning and an end and is used to construct box-shaped patterns in order to recognize signals that undergo unexpected alterations. A cascade can be generated by mixing such numerous wavelets to recognize edges, lines, and circles with varying color intensities. Face detection on a human face is accomplished by matching a variety of Haar like features. A single classifier is insufficiently accurate. To create an accurate face detection system, several classifiers are merged. Inward photos are used to make this system super-fast. There can be a plethora of characteristics. ADA boost is a machine learning technique that evaluates many week classifiers on a given location and selects the best one.

It can even reverse the classifier's direction to improve results if necessary. In details, each stage of the cascade classifier is crammed with feeble learners. Choice stumps are a type of feeble learner that is also a basic classifier. Each step is prepared using a

technique known as boosting. Boosting uses a weighted normal of decision that feeble students make. It has the ability to create the most precise classifier. The domain is the current state of sliding windows for each phase of the classifier. It could be either positive or negative. If the result was positive, the item was discovered at that time. In the event that the answer is negative, the item will not be found. The grouping of the region is complete when the mark is negative. The identifier then transmits the windows to the net position. The region is usually passed to the net stage by the classifier. The stages get rid of unfavorable examples as soon as possible. A large number of positive and negative images will be required to prepare the course classifier.

Weight-update-steps can only be updated if there are misses in order to improve performance. For face detection, Viola Jones used Haar-cascades. Using an integrated image allows for a single pass over the image to match features. many classifiers were combined in the viola Jones approach to build stronger classifiers. Integral pictures can be thought of as two-dimensional query tables in the form of a matrix of the same size as the first image. Every component of the integral picture comprises the sum of all pixels in the first photo's upper left corner.

Depending on how it was classified, each Haar-like component may require numerous queries. Two-rectangle highlights require six queries, three-rectangle highlights require eight inquiries, and four-rectangle highlights require nine queries, according to Viola and Jones.

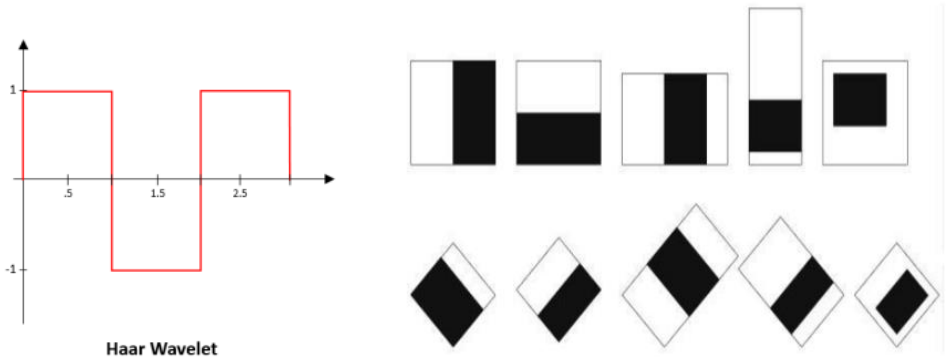

Figure 3.3.2: Haar-Cascade Classifier

B. Train Stored Images:

This is one of the most important sections. The cascade's training turned out to be a difficult undertaking. It is fundamental to create a database of images in the form of a "YML" file that is created by a machine that is enabled by OpenCV. Imported photos are transformed to grayscale and saved with unique IDs. Then, using contrast and the previously provided information, a face will be recognized.

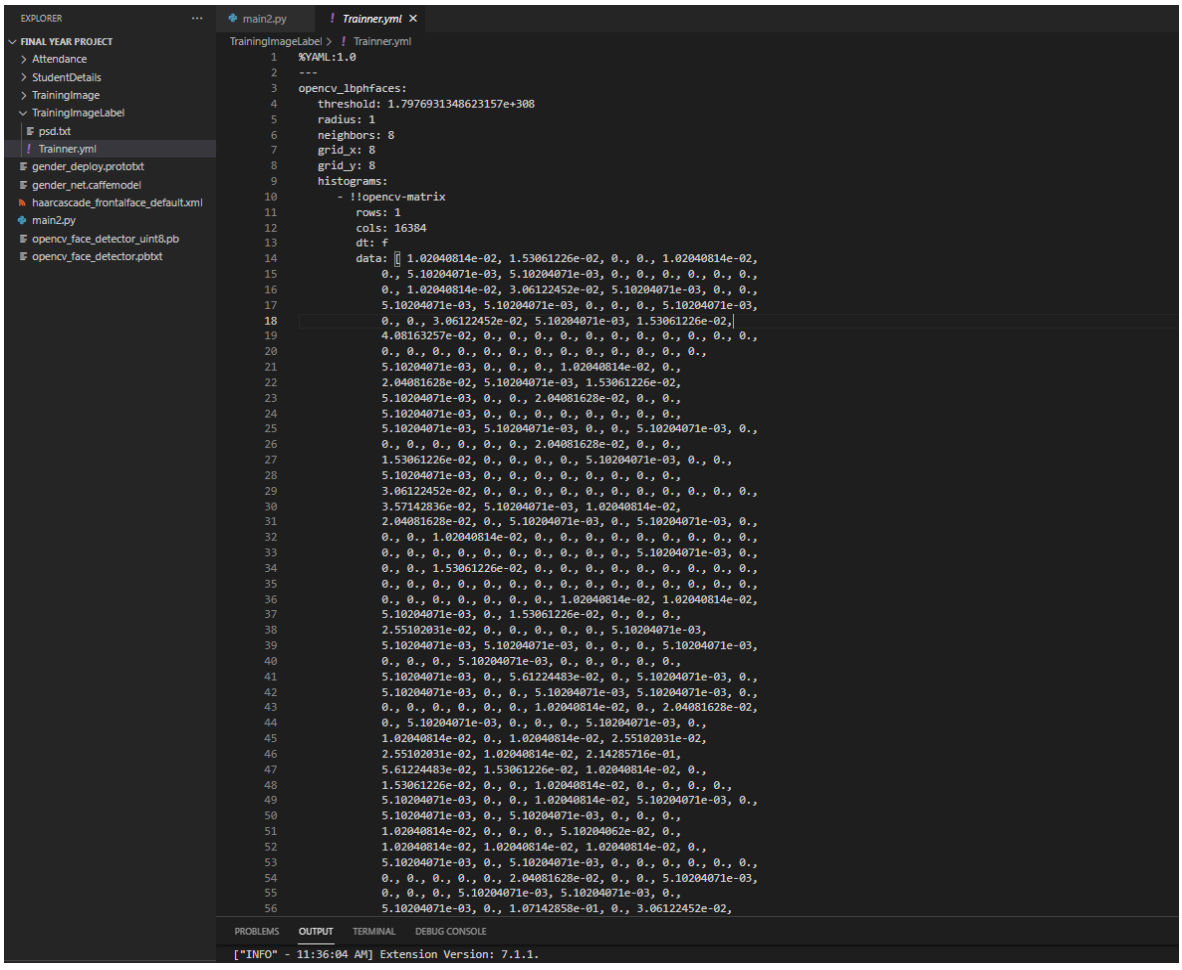

Figure 3.3.3: Matrix of Dataset in YML file

C: Face Recognize with Using LBPH:

Local Binary Patterns (LBP) and Histograms of Oriented Gradients (HOG) descriptors are combined in the BPH algorithm. LBP is a simple yet effective method for extracting and labeling pixels in an image. We can simply represent facial images with just a simple vector using the LBPH. The Neighbor P, Radius R, Grid X, and Grid Y parameters are used in the local binary pattern's histograms algorithm. We must train the algorithm from the beginning. We need to use a dataset that is used for recognition. Similarly, something else is necessary to identify each image. The photos of the same person must have the same ID.

Sliding windows are used in the LBP algorithm, with Radius and Neighbor. LBP (Local Binary Patterns) is a gray-scale image texture analysis algorithm. We must first convert an RBG (colored) image to a grayscale image in order to detect faces in it. It's a vector with three values that reflect the intensity of red, blue, and green. The RBG image is converted to a gray y-scale image. On a circle with radius R, the LBP operator compares the center value with its P neighbor values and assigns 1 to the neighbor if the center value is greater than the neighbor, and 0 to the neighbor if the center value is smaller.

Now, we've set P = 8 and R = 1. This program divides a picture into grids and matrices. This matrix and grid are both 3x3 pixels in size.

By thresholding the 8 neighbors, the LBP operator labels the central pixel.

The LBP operator outputs an 8-bit binary value for each center pixel, which we convert to a decimal between 0 and 255. By evaluating every pixel in a picture except the boundary pixels, the LBP operator eliminates the influence of illumination and returns the texture.in another word, converting binary number to decimal and using it as the matrix's middle value to obtain another picture of a unique picture with a better depiction of qualities

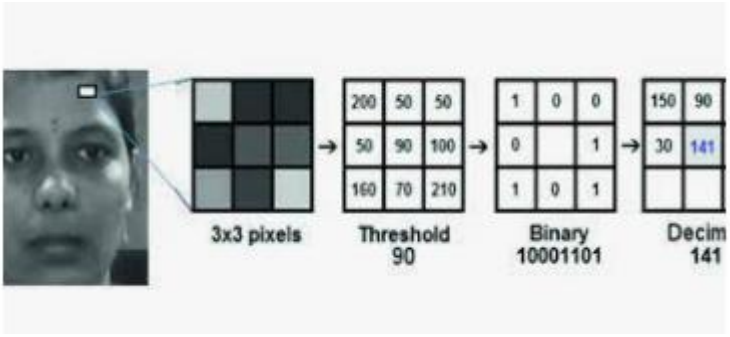

Figure 3.3.4: LBPH algorithm for face recognition

Using the LBP result, we can generate a histogram for this image and a data vector to characterize the original image's patterns. The Histogram shows the frequency of LBP results for each pixel and displays the intensity of each pixel. Every histogram has just 256 positions. After performing the LBP operator in the last section, the value of each pixel is between 0 and 255.

However, we are not immediately considering the entire image. We split the image into numerous parts.

The algorithm has been trained throughout this process. Every histogram is designed to speak for each image in the database. If we provide a new image as information, we repeat the process and create a new histogram to reflect the database image.

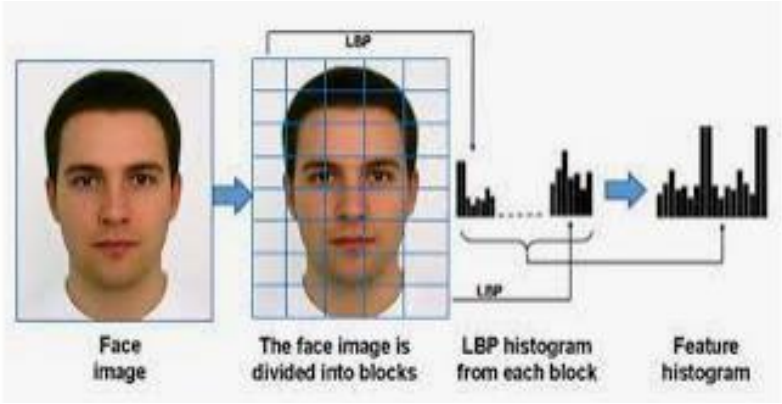

Figure 3.3.5: Histogram Extracting in LBPH

D. CAFFE NETWORK ACRCHITECTURE for recognize gender:

We choose a model which can first perform feature extraction on the input image which can classify eyes, lips, beard, hair, etc. Supported these features the model will classify the gender as male or female. Caffe is a deep learning framework made with expression, speed, and modularity in mind. The Berkeley Vision and Learning Center developed Caffe, a deep learning framework (BVLC). It's written in C++ and comes with Matlab and Python bindings.

For training a CNN using Caffe:

For data preparation, we first clean the photos and save them in a Caffe-compatible format. We'll develop a Python script to handle image pre-processing as well as storage. Then for Model definition we select a CNN architecture and define its parameters in a configuration file with the extension (.prototxt). Following that, the solver is in charge of model optimization. The solver parameters are defined in a configuration file with the extension (.prototxt). The model is then trained by issuing a single Caffe command from the terminal. We'll obtain the trained model in a file with the extension (.caffemodel). after we've trained the model Following the training phase, we'll utilize the (.caffemodel) trained model to make predictions about new data that hasn't been seen before. To do so, we'll develop a Python script.

E. We use SMTP for transferring data over email:

We can now identify a person and his or her gender with the use of facial detection and recognition systems. It's possible to save it in a database. To send the confirmation emails, we used SMTP. SMTP is a protocol for sending messages to an email server. The protocol is used to transport mail between mail servers, which are also known as mail transfer agents. The well-known port number 25 is reserved for SMTP. It is not the

protocol for a user to collect mail. Users often utilize one of two protocols to download their email. Post Office Protocol (POP) and Internet Message Access

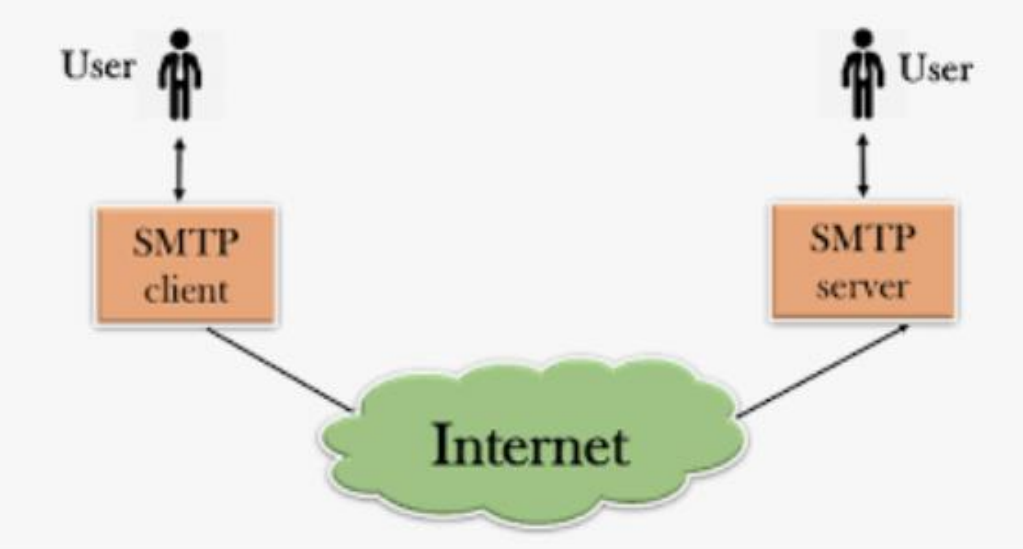

Figure 3.3.6: SMTP protocol

Protocol (IMAP) are the two protocols (IMAP). Both allow users to collect and see their email from a mail server locally.

3.4 Dataflow diagram:

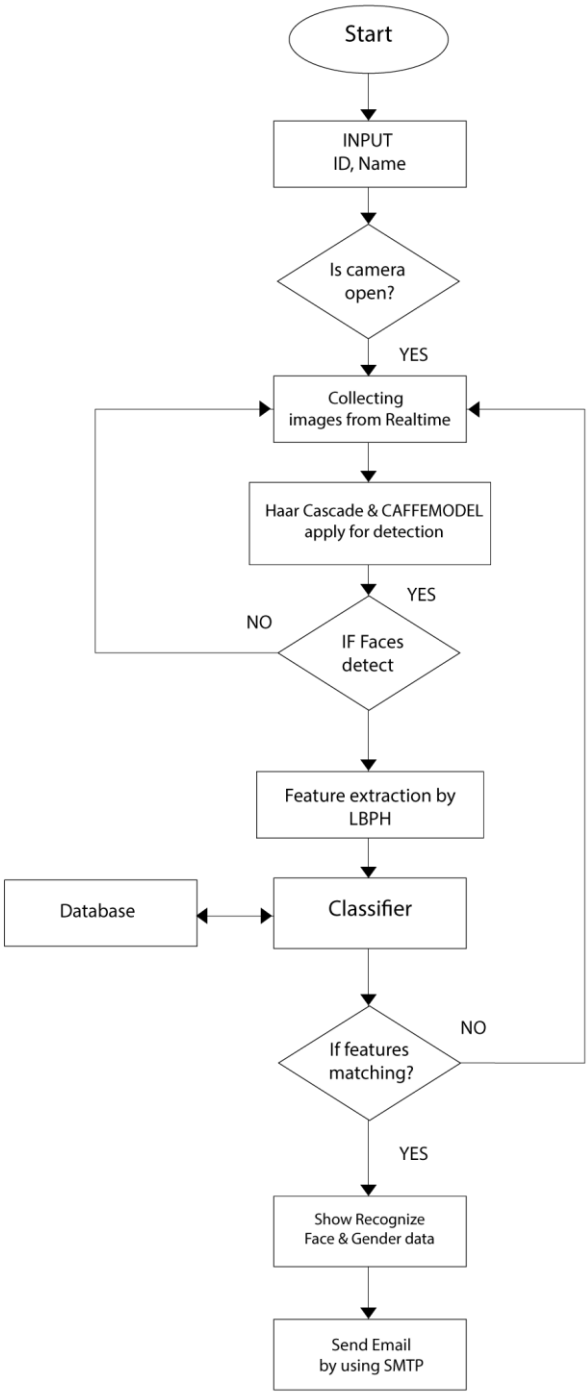

Figure 3.4.1: Flow diagram of entire system.

3.5 Implementation Requirements:

This task was foreign to us when we first started working on it. It was challenging to keep this test hidden. A computer is required to run the program, as well as a camera that can assist in image capture. Both of these devices must be connected to the same Wi-Fi network. Aside from that, it necessitates certain delicate abilities.

- Python
- OpenCV-python
- OpenCV-contrib-python
- NumPy (1.17.3)
- CSV
- Pandas
- SMTPLIB
- TKINTER
- YML

Database management should be cautious so that the database does not get too large due to information overload.

CHAPTER 4

Results and Discussion

4.1 Introduction:

Face recognition is a technology of identifying a person from a digital image of the person's face. It is based on the mathematical technique called computer vision, more specifically on pattern recognition techniques applied to images of faces.

Face Recognition Systems (FRS) are not limited to only humans, they can also identify animals and objects that might be used in crime or terrorism. The applications for FRSs are limitless and include security systems, automated teller machines, law enforcement and border control, passport control, driver license issuance and voting and identification systems.

4.2 Experimental Results & Analysis:

First and foremost, this system will be used to store data for training purposes, hence the GUI design should focus on that. The user must be able to enter their ID and name into the UI. After entering their ID and name, the user authorizes the system to take a large number of photographs in order to store and train the model. When shooting pictures, be sure the subject is facing the camera correctly.

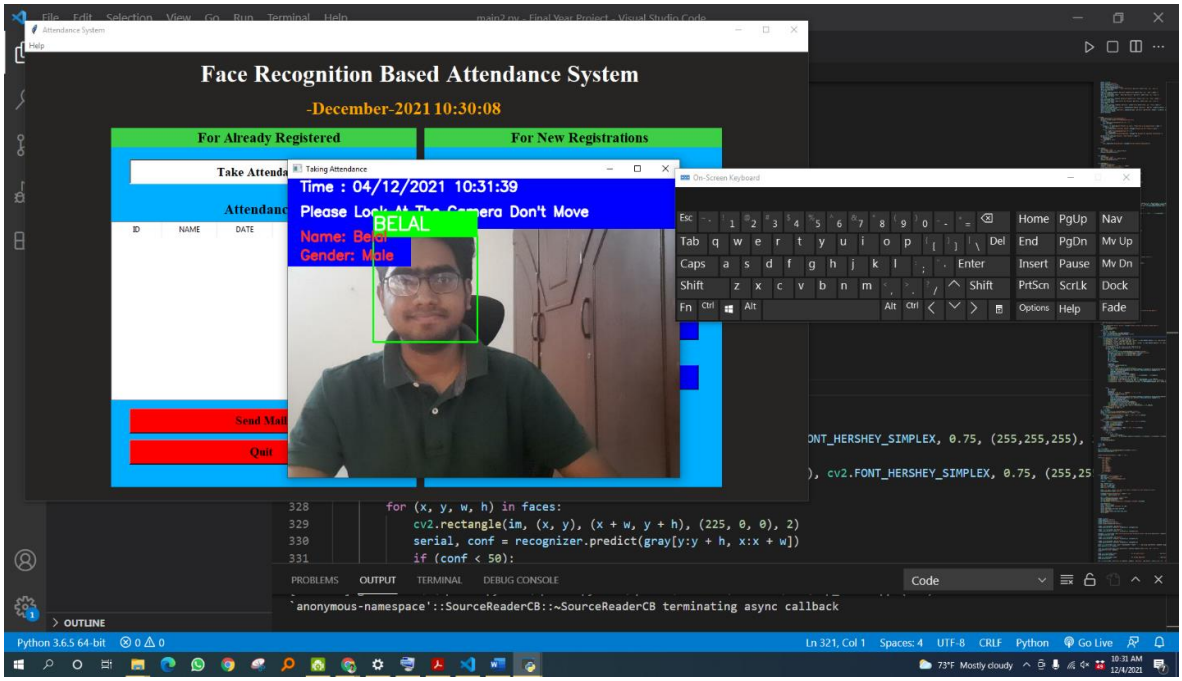

Figure 4.2.1: Face & gender recognition using real time footage. Detecting a male.

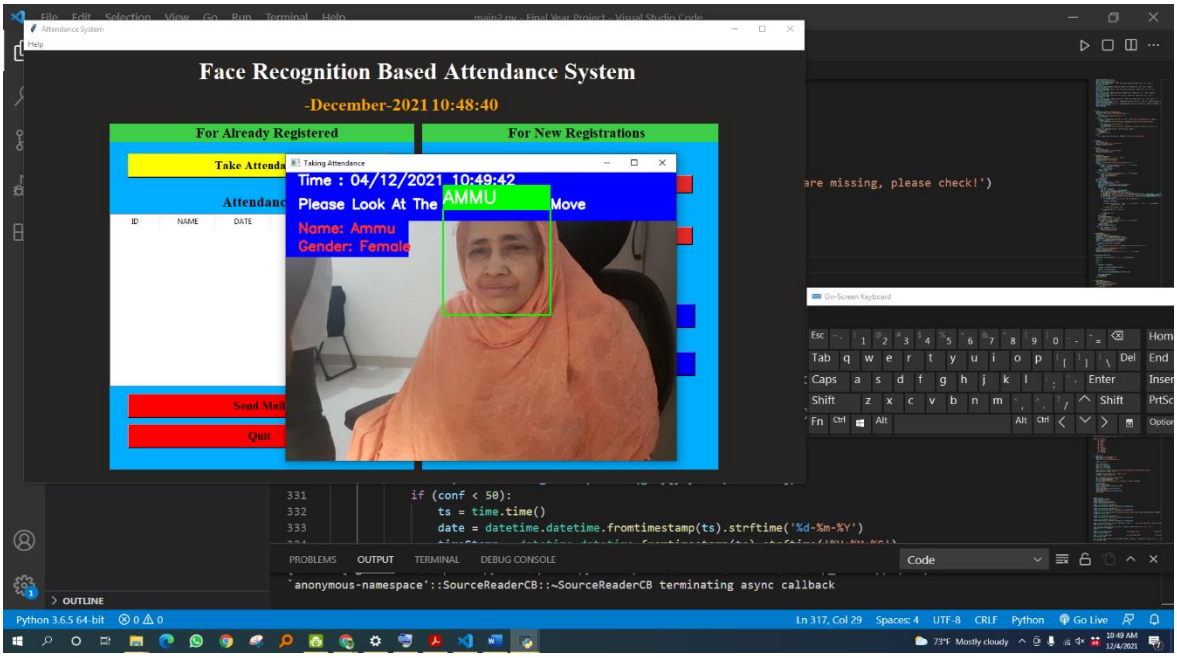

Figure 4.2.2: Face & gender recognition using real time footage. Detecting a female.

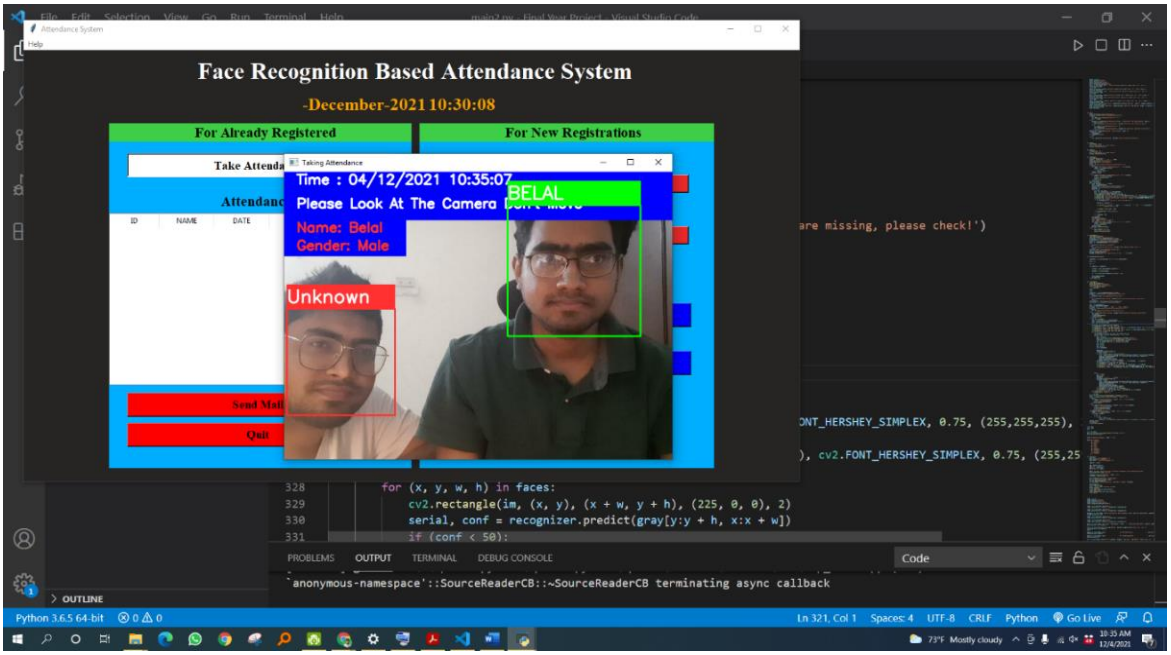

Figure 4.2.3: Face & gender recognition using real time footage. Detecting an unknown user.

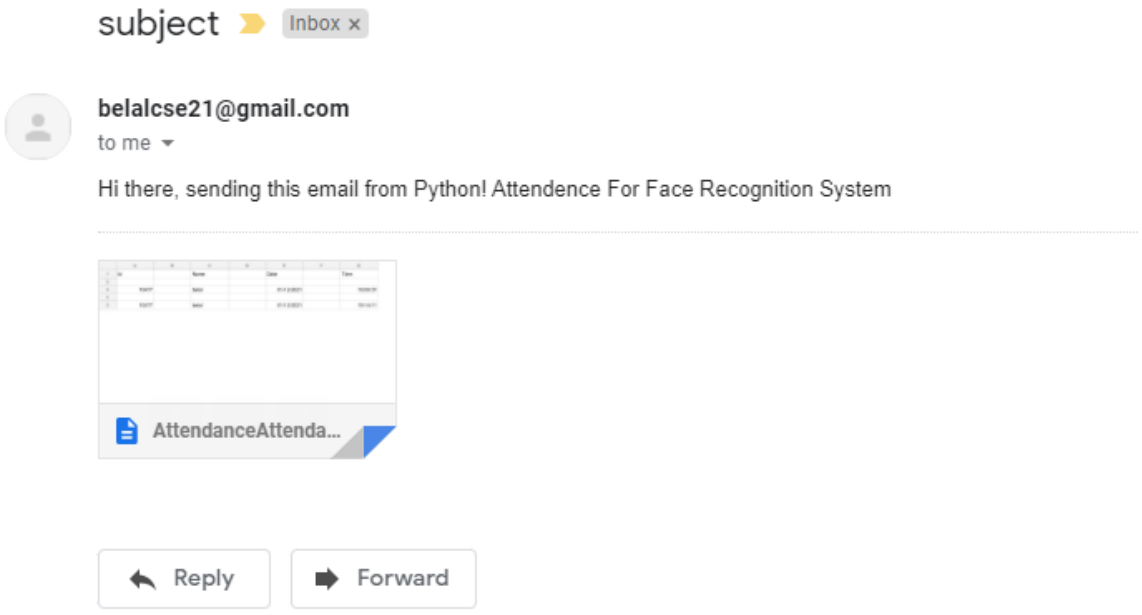

Figure 4.2.4: sending information via mail

4.2.1 Front Interface design:

We used Tkinter for UI for this project. The reason for using Tkinter is that it allows us to makes it simple to use preview data.

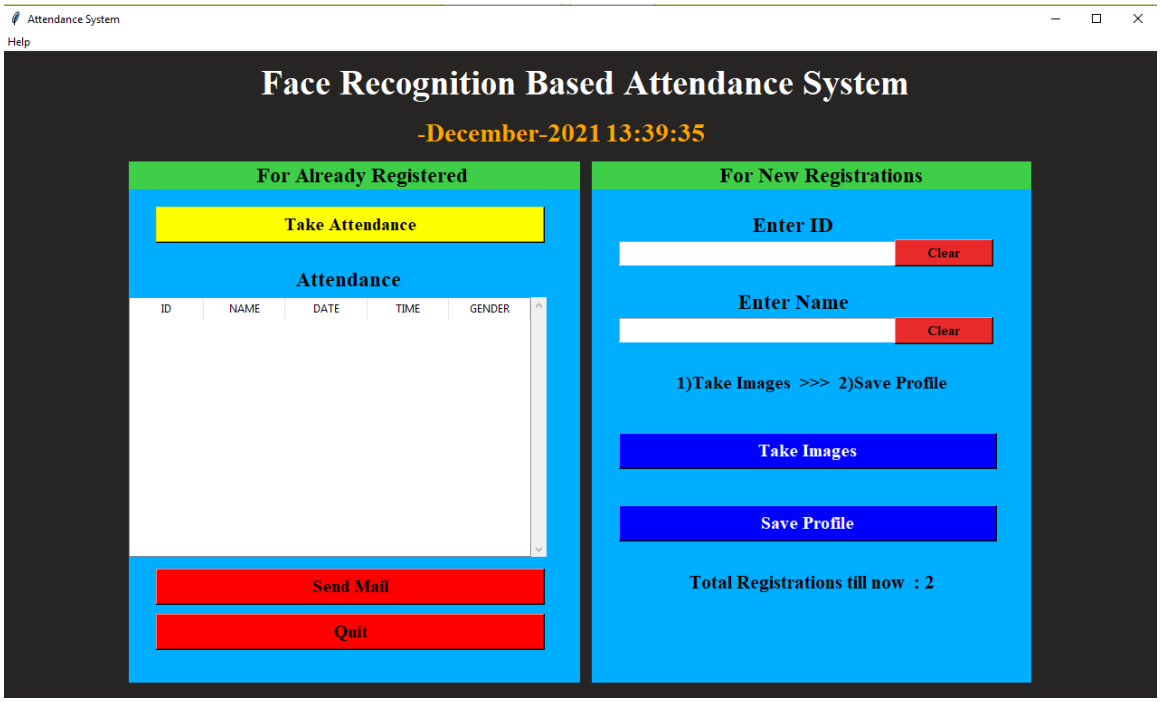

Figure 4.2.1.1: GUI design for face & gender recognition system.

4.2.2 Backend Development:

While taking the user's attendance, the system collects information from them. The data will be saved as a CSV file. This is how the data preview looks.

Si no	ID	Name	Date	Time	Gender
01	101	Belal	12/5/2021	12:09 pm	male
02	102	Nur	12/5/2021	12:12 pm	female
03	103	Madi	12/5/2021	01:05 pm	female
04	104	Shakib	12/5/2021	03:05 pm	male
05	105	Sadia	12/5/2021	03:30 pm	female
06	106	Ismail	12/5/2021	04:00 pm	male

Table 4.2.2.1: A look at the data in a CSV file

4.3 Discussion:

If the camera quality is good and the lighting setup is enough, our face and gender recognition technology can deliver reliable results. The accuracy is greater than 95%. It displays the person's name, ID, gender, and attendance time together with a recognized face. It immediately sends this information to the owner so that they can be tracked and any undesired events may be avoided. Also, when saving any data, our system uses a password to prevent any kind of unauthorized person from entering the system. So, in general, we attempted to make our system the finest in every way. So it can detect, recognize, and gender, track their activity time, store data, and report it to the owner, as well as secure the area from unauthorized visitors. However, there are some disadvantages to our project. when it comes to recognizing individuals of race, especially those who are darker. Because of the roughness, the machine learning system has problems reading their facial features. also a lack of lighting can lower the accuracy level.

CHAPTER 5

Impact on Society, Environment and Sustainability

5.1 Impact on Society & Environment:

Face recognition is a powerful technology that has the potential to improve lives by providing reliable ID verification, mobile payment authentication, and public safety. Privacy threats are inevitable with any new technology that relies on identifying people's faces. However, there are many benefits of the technology too. It can be used for security purposes and to improve public safety. This section will highlight what face recognition is, how it works, its benefits, as well as its drawbacks

Every society and work environment area are facing lots of security threats as like unauthorized access, terrorist's activism, missing cases and lot more. in our study we found numerous cases where this security system is available but they cannot detect gender also the data cannot deliver to the authority. So, it brings us the opportunity to develop a system that can help our community to find a simple solution that can help people to secure their surroundings. Face and gender recognition systems are important in the society. They help us to identify people with accuracy, improve our security, and achieve some technological breakthroughs.

In today's world, face recognition is growing increasingly prevalent. Security, law enforcement, face-based advertising, and business research are all places where it's applied. There are two sorts of facial recognition techniques:

1) static (or still) images;
2) dynamic (or moving) video frames.

Gender recognition system is also an important part of surveillance system. It can be used to identify the gender of a person automatically by analyzing their facial features like bone structure or skin coloration etc., without any human intervention.

5.2 Ethical Aspects:

Face recognition is a technique that analyzes the shape of a person's face to identify them. It's been used to tag friends and strangers in images on social media sites like Facebook and Google+. With the use of computer vision and machine learning techniques, its accuracy is also improving.

Security is another application for face recognition. Some cameras are capable of detecting people's faces and comparing them to a database of previously captured images. Some countries, such as China, use billboards to advertise specific products using this technology. Voice interfaces (speaking voice), automatic speech recognizers, and identifying authentication systems all use gender recognition technologies (biometrics).

The following are some of the issues that have arisen as a result of our system's implications.

5.3 Sustainability Plan:

Gender recognition employs the same technology as facial recognition, but uses different algorithms to determine gender. This method can be utilized in internet-connected personal devices such as computers, tablets, and wristbands. As a result of this development, privacy settings on these devices are required, which can be accomplished using pins or passwords. Individuals may become targets for discrimination because of their race or ethnicity, or sex discrimination if their gender identity does not match their biological sex, as a result of the use of these systems. This technology will become more advanced as time goes on, and it will play a significant role in the future.

CHAPTER 6

Recommendation and Implication for Future Research

6.1 Summary of the Study:

Face recognition is a machine learning-based technique that can recognize faces in photographs. It's one of the many technologies found in cellphones and social media platforms like Facebook.

Gender recognition is a technology that classifies the gender of a person based on their face. It can be used as an alternative to manual gender classification, which is done by persons who research and explain the qualities and characteristics of each sex in order to identify them.

In today's world, face recognition software is commonly employed. Law enforcement, security, advertising, and biometric passports and visas are just a few of the domains where face recognition is used.

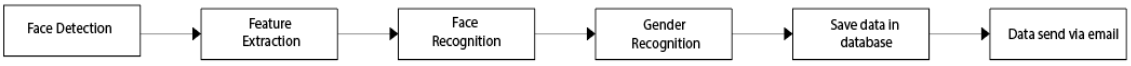

Figure 6.1.1: Block diagram of entire system.

6.2 Conclusions:

This project can create a healthy and safe working environment to assist in the security of any organizations. The background work for the project is described in this report also described the major result of past work that has been completed in a similar manner. The technology can capture real-time photos for model training. The CSV file is set up to collect data from the user. Python is utilized with OpenCV. Face detection is a strong suit for the Haar cascade classifier. One of our key concerns is gender differentiation. For gender recognition in this project, we used caffe model. This is one of the well-known models for used for gander recognition system. This allows as to compare between male

and female. This system supports SMTP. This module enables us to deliver data as a CSV file via email. Code will be used to declare the email.

6.3 Implication for Further Study:

We are capable of making this a large Platform that will allow users to have a significant impact on security systems now that the basic effort has been completed.

- We'll create a user-friendly interface by using pyQt or better GUI technology.
- We will build web & mobile application with a proper employee security system.
- We'll make certain that people able to use it.
- We'll add a voice recognition system to take our system to the next level.

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Appendix

Research reflection:

Working on this project has been a fascinating experience for us. We will use this opportunity to put our knowledge to work in order to create a system that will aid in the security of our society. When we started this project, the covid situation was at an all-time high. As a result, gathering data from people to train our model for maximum accuracy was quite difficult. So gather information from our relatives. It is simple for us to persuade our family members to allow us to collect their information. When we were collecting data, our parents were eager to assist us and learn more about the research. This very interesting experience for us. Our teacher assisted us in resolving the problem and also allowed us to apply our creative skills to make this project a success.

Md. Belal Hossain 173-15-10477

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