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ACKNOWLEDGEMENT

We take this opportunity to express our deepest sense of gratitude to Almighty, our parents and our faculty members for their love and affection and for giving us encouragement, support and strength to complete this project successfully.

We express an unique pleasure and honour in thanking our secretary **Thiru R. MAHESH KUMAR** and our Principal **Dr. ANANT ACHARY M.E, Ph.D.,** Kamaraj College of Engineering and Technology for giving us an opportunity to undertake this project work.

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We would like to thank the entire teaching and non-teaching faculty members in the Department of Computer Science and Engineering for their encouragement in the completion of this project.

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ABSTRACT

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Daily attendance marking is a common and important activity in schools and colleges for checking the performance of students. Manual Attendance maintaining is difficult process, especially for large group of students. Some automated systems developed to overcome these difficulties, have drawbacks like cost, fake attendance, accuracy, intrusiveness. To overcome these drawbacks, there is a need of smart and automated attendance system. Traditional face recognition systems employ methods to identify a face from the given input but the results are not usually accurate and precise as desired. The system described in this aims to deviate from such traditional systems and introduce a new approach to identify a student using a face recognition system, the generation of a facial Model. This describes the working of the face recognition system that will be deployed as an Automated Attendance System in a classroom environment.

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CHAPTER I
INTRODUCTION

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

There are now plenty of systems which differ in many aspects: core technology they are based on, way of use, cost, reliability, security and etc. Many of those depend on employees having to carry specific identification devices. One of the common types of the attendance systems is Radio Frequency Identification (RFID) where employees have to carry appropriate RFID cards. There are also location

based attendance tracking systems. The location of an employee can be determined via Global Positioning System (GPS).

The presence is determined by calculating the proximity between an employee's and the company's location. Both of the above mentioned types of the attendance systems have weaknesses. Employees could forget the RFID card or the location device, or someone else could check instead of them. This could also be a potential security issue. Therefore, there are systems that exclude the usage of external devices for attendance purposes by exploiting the individual attributes: fingerprints, iris, voice, face and etc. These types of systems are heavily based on computer vision and machine learning algorithms. Recent advances in these areas, especially in deep learning, provide possibilities to use these methods searching for practical solutions. These solutions could be more flexible and could reduce human errors.

1.2 IMPORTANCE OF WORK

Face is considered as most important part of human body. Research shows that even face can speak and it has different words for different emotions. It plays a very crucial role for interacting with people in the society. It conveys people's identity, so it can be used as a key for security solutions in many organizations.

Now-a-days, face recognition system is getting increasing trend across the world for providing extremely safe and reliable security technology. It is gaining

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significant importance and attention by thousands of corporate and government organizations only because of its high level of security and reliability. Moreover, this system is providing vast benefits when compared to other biometric security solutions like palm print and finger print.

1.3 OBJECTIVE

The main objective is to make a Face recognition system for classroom or office attendance. The system is based on a special type of CNN (convolutional neural networks) architecture. Such a network is trained to generate a very accurate and almost unique 128 vector are generated. The images of face which are fed to the network are properly aligned and cropped.

Then another dense neural network is trained taking input these embeddings. The second neural network is only for classification purposes. Then the person who is identified by the system, his/her attendance in the system is incremented by 1. An excel file consisting of attendance of all the students is generated.

1.4 PROJECT DESCRIPTION AND FEATURE

In the interest of recent accomplishments in the development of deep convolutional neural networks (CNNs) for face detection and recognition tasks, a new deep learning based face recognition attendance system is proposed. The entire process of developing a face recognition model is described in detail. This model is composed of several essential steps developed using today's most advanced techniques: CNN cascade for face detection and CNN for generating face embeddings. The primary goal of this research was the practical employment of these state-of-the-art deep learning approaches for face recognition tasks. Due to the fact that CNNs achieve the best results for larger datasets, which is not the case

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in production environment, the main challenge was applying these methods on smaller datasets.

A new approach for image augmentation for face recognition tasks is proposed. The overall accuracy was 95.02% on a small dataset of the original face images of employees in the real-time environment. The proposed face recognition model could be integrated in another system with or without some minor alternations as a supporting or a main component for monitoring purposes.

1.4 SOCIAL IMPACT

One of the big benefits of using facial biometric systems is that we won't have to worry about time fraud. It will be impossible for buddy punching to occur, since everyone has to have go through face scanning biometrics devices to clock in. Many companies like the fact that biometric imaging systems are automated. We won't have to worry about having someone there to monitor the system 24 hours a day.

1.5 CHALLENGES

A slight change in lighting conditions has always been known to cause a major impact on its results. If the illumination tends to vary, then; even if the same individual gets captured with the same sensor and with an almost identical facial expression and pose, the results that emerge may appear quite different.

An ideal Face recognition system should be tolerant to variations in illumination, expression, pose and occlusion. It should be scalable to large number of users with need for capturing minimal images during registration while doing away with complex architecture at the same time.

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1.6 DOCUMENTATION ORGANIZATION

This documentation is organized as follows,

- **CHAPTER 2** highlights Literature survey which discusses various exiting systems, working principles and their limitations
- **CHAPTER 3** discusses the system requirements that includes hardware and software specifications in detail
- **CHAPTER 4** discusses the System design which explains the architecture and flow diagram of the entire implementation and modules
- **CHAPTER 5** explains the implementation methodology that describes module explanation with algorithm or pseudo code
- **CHAPTER 6** shows the experimental setup, sample coding, snapshots of the proposed system with explanation
- **CHAPTER 7** includes conclusion and future work of the system

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CHAPTER 2
LITERARY SURVEY

CHAPTER 2

LITERATURE SURVEY

2.1 REVIEW OF LITERATURE

Dabhade S and et. al. [2], here the "Face Recognition using Principle Component Analysis and Linear Discriminate Analysis Comparative Study" is proposed. The recognition Rate some time enlarged sometime reduce, sometime stable. We have done various research like particular image for enrolment and particular image for testing, then we had keep the enrolment image as constant and change testing images such as two, three, four, up to nine. For taking the consequence we had used three databases ORL Database, KVKR-Face Database and IIT-Indian Database.

Mathana Gopala and et. al. [3], here the "Implementation of Automated Attendance System using Face Recognition" is proposed. The automated presence System has been envision for the purpose of falling the errors that occur in the

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conventional (manual) attendance taking system. The aim is to computerize and make a system that is useful to the institute such as an organization. The efficient and exact method of attendance in the office atmosphere that can reinstate the old manual methods. This technique is secure enough, reliable and available for use. No need for dedicated hardware for installing the system in the office. It can be constructed using a camera and computer.

Muhammad Fuzail and et.al. [4], here the "Face Detection System for Attendance of Class' Students" is proposed. An regular attendance supervision system is a essential tool for any LMS. Most of the existing system are time consuming and necessitate for a semi instruction manual work from the instructor or students. This approach aim to explain the issues by integrates face detection in the procedure. Even though this method still lacks the capability to identify each student in attendance on class, there is still much more room for enhancement.

Since we implement a modular approach we can get better different module until we reach an acceptable detection and identification rate. Another issue that has to be taken in consideration in the opportunity is a process to ensure users privacy. Whenever you like a representation is stored on servers, it must be impossible for a person to use that image.

Patil C S and et.al. [5], here the "Student Attendance Recording System Using Face Recognition with GSM Based" is proposed. Student footage system using face validation was considered and implemented. It was tested with dissimilar face images. This idea is working properly with different panel. All windows are running separately and equivalent. If appreciation is to participate as a viable biometric for validation, then a further order of improvement in detection score is necessary. Under controlled condition, when lighting and pose can be controlled, this may be possible. It is more likely, that future improvement will rely on making better use of video knowledge and employing fully 3D face models.

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Senthamil Selvi and et.al. [6], here the “Face recognition based Attendance marking system” is proposed. In this work, sort to find the attendance, positions and face descriptions in classroom lecture, we projected the presence administration system based on face detection in the classroom lecture. The system estimates the presence and the location of each student by continuous inspection and footage. The result of our beginning experiment shows continuous inspection improved the performance for estimation of the attendance.

Venkata Kalyan Polamarasetty andet. al [7] proposed that different types of face detection for detecting faces in different pose .Detecting face in different pattern based on techniques. Basic pattern for detecting face is nose, eyes, hair, ears and some time it based on tone of skin. Face detection is detecting face based on location of face and presences of face in images .Different types of detecting the face techniques they are Ada-Boost Algorithm for Face Detection, Viola Jones Face Detection Algorithm, SMQT Features and SNOW Classifier Method, Local Binary Pattern (LBP). Each have advantages and disadvantages discussed in that paper.

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CHAPTER 3

SYSTEM REQUIREMENTS

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CHAPTER 3

SYSTEM REQUIREMENTS

HARDWARE REQUIREMENTS

- Standard IP camera

SOFTWARE REQUIREMENTS

- Python 3.6.8
- Sublime Text
- Tensorflow
- MongoDB

3.1 SOFTWARE REQURIMENTS

3.1.1 PYTHON 3.6.8

Python is an interpreted, high-level, general-purpose programming language. Python has a design philosophy that emphasizes code readability, notably using significant whitespace. It provides constructs that enable clear programming on both small and large scales. Python features a dynamic type system and automatic memory management. It supports multiple programming paradigms, including object-oriented, imperative, functional and procedural. It also has a comprehensive standards library.

Python interpreters are available for many operating systems. CPython, the reference implementation of Python, is open source software and has a community-based development model, as do nearly all of Python's other implementations. Python and CPython are managed by the non-profit Python Software Foundation.

The Python Package Index (PyPI) hosts thousands of third-party modules for Python. Both Python's standard library and the community-contributed modules allow for endless possibilities.

- Web and Internet Development

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- Database Access
- Desktop GUIs
- Scientific and Numeric Education
- Network Programming
- Software and game development

3.1.2 Python OpenCV

OpenCV (Open Source Computer Vision Library) is an open source computer vision and machine learning software library. OpenCV was built to provide a common infrastructure for computer vision applications and to accelerate the use of machine perception in the commercial products. Being a BSD-licensed product, OpenCV makes it easy for businesses to utilize and modify the code.

3.2 SUBLIME TEXT

Sublime Text is a proprietary cross-platform source code editor with a Python application programming interface (API). It natively supports many programming languages and markup languages, and functions can be added by users with plugins, typically community-built and maintained under freesoftware licenses.

3.3 TENSORFLOW

Tensorflow is a free and open source for data differentiable programming across a range of tasks. It is a symbolic math library, and is also used for machine learning applications such as neural networks It is used for both research and production at google. It is a standard expectation in the industry to have experience in TensorFlow to work in machine learning. Tensorflow offers multiple levels of abstraction so you can choose the right one for your needs. Build and train models by using the high-level Keras API, which makes getting started with Tensorflow and

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machine learning easy. If you need more flexibility, eager execution allows for immediate iteration and intuitive debugging. For large ML training tasks, use the Distribution Strategy API for distributed training on different hardware configurations without changing the model definition.

Tensorflow has always provided a direct path to production. Whether it's on servers, edge devices, or the web, Tensorflow lets you train and deploy your model easily, no matter what language or platform you use. Use Tensorflow Extended (TFX) if you need a full production ML pipeline. For running inference on mobile and edge devices, use Tensorflow Lite. Train and deploy models in JavaScript environments using TensorFlow.js.

3.4 MONGODB

MongoDB is a cross-platform and open-source document-oriented database, a kind of NoSQL database. As a NoSQL database, MongoDB shuns the relational database's table-based structure to adapt JSON-like documents that have dynamic schemas which it calls BSON.

This makes data integration for certain types of applications faster and easier. MongoDB is built for scalability, high availability and performance from a single server deployment to large and complex multi-site infrastructures.

MongoDB became one of the most popular NoSQL databases, being used as the backend for many major websites including eBay, Craigslist, SourceForge and The New York Times. MongoDB is available under the GNU Affero General Public License while its language drivers are available under the Apache License. There are also commercial licenses being offered.

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MongoDB Features:

- Ad hoc queries - supports search by field, regular expression searches, and range queries.
- Indexing - any field in the BSON document can be indexed.
- Replication - provides high availability via replica sets which consists of two or more copies of the original data.
- Load balancing - sharding is the method used to allow MongoDB to scale horizontally, meaning that data will be distributed and split into ranges and then stored in different shards which can be located in different servers. Shard keys are used to determine how the data will be distributed.
- Aggregation - MapReduce can be applied to enable batch processing of data as well as perform aggregation operations.
- File storage - MongoDB can be used as file system which makes use of the above functions and acting in a distributed manner through sharding.

CHAPTER 4

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SYSTEM DESIGN

CHAPTER 4

SYSTEM DESIGN

4.1 SYSTEM DESIGN

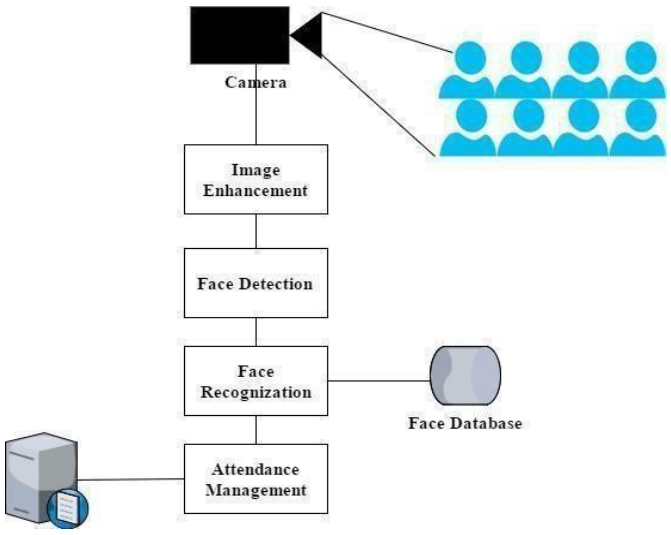

Figure 4.1 System Design

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4.1.1 IMAGE ENHANCEMENT

Although our own database should be used to design real time face recognition student attendance system, the databases that are provided by the previous researchers are also used to design the system more effectively, efficiently and for evaluation purposes.

MongoDB is used as both training set and testing set to evaluate the performance. Each image of the individual is in different condition. The conditions included centre-light, with glasses, happy, left-light, without glasses, normal, right- light, sad, sleepy, surprised and wink. These different variations provided by the database are able to ensure the system to be operated consistently in variety of situations and conditions.

A face recognition system can identify faces present in images and videos automatically .It can operate in either or both of two modes:

(1) Face Detection (2) face recognition.

4.1.2 FACE DETECTION

For face detecting, is achieved by using haar cascades of opencv. Face detection haar cascade is used to detect the face and this detected region is fed to the embedding generator. In here, there are several objects are present. These are there in the form of small blocks containing them. They are taken through an image and are moved through each and every block of the image and are checked for overlapping through them. The faces from the image captured is to be collected. The captured faces are cropped into small images of resolution 112x92. It would be around 11 KB of size. There are a few face detection methods that the previous researchers have worked on. However, most of them used frontal upright facial images which consist of only one face. The face region is fully exposed without obstacles and free from the spectacles.

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4.1.2.1 FACE DETECTION USING HAAR CASCADES ALGORITHM

Object Detection using Haar feature-based cascade classifiers is an effective object detection method proposed. It is a machine learning based approach where a cascade function is trained from a lot of positive and negative images. It is then used to detect objects in other images.

Here we will work with face detection. Initially, the algorithm needs a lot of positive images (images of faces) and negative images (images without faces) to train the classifier. Then we need to extract features from it. For this, Haar features shown in the below image are used.

They are just like our convolutional kernel. Each feature is a single value obtained by subtracting sum of pixels under the white rectangle from sum of pixels under the black rectangle.

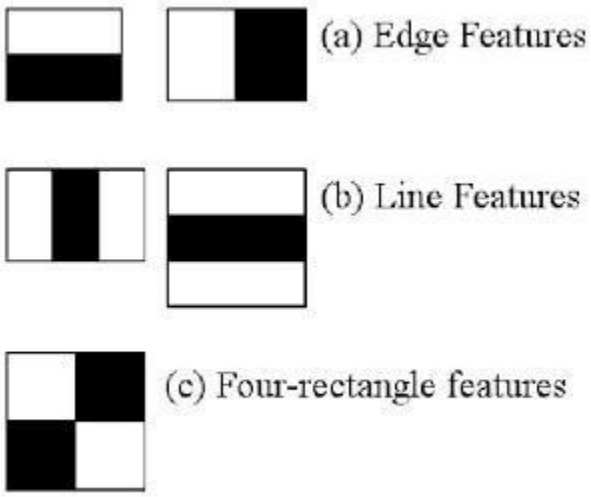

Figure 4.2 Image Features

4.1.3 FACE RECOGNITION

The first step of face recognition process is face detection. Face detection presents the well-studied field in the computer vision domain. As a result of decades of research, nowadays there are numerous machine learning algorithms applicable

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for this task. In recent years, CNNs achieved advanced results in image classification and object detection.

Due to its runtime performance, for this step, a state-of-the-art CNN cascade is used for a face detection task, intro. The cascade consists of 6 CNNs, 3 CNNs for binary classification (face and non-face) and 3 CNNs for bounding box calibration. Dlib a machine learning framework is used for developing this face detector used as the first step of face recognition model.

Due to the problem of turning the face in different directions, which could seem different to the machine, the second step deals with the positioning of the face. A human face has 68 specific points – face landmarks. The primary goal of this step is to detect the face landmarks and to position the image by applying an affine transformation in order to centralize these landmarks as much as possible without distorting the image. A Python script was used to automatically detect the face landmarks based on the algorithm proposed.

4.1.4 UPDATION OF ATTENDANCE USING MONGODB

For our own database, the images of students are captured by using laptop built in camera. The images captured by using laptop built in camera are categorized as low quality images, whereas mobile phone camera captured images are categorized as high quality images.

The database used is mongodb. Pymongo is used to add, delete records and also increment the attendance of the particular student. For the database, we need to capture the image from the webcam or the external camera. To do so, in GUI we need to install the drivers based on the type of camera we are using. Next, we need at least 50 captures of each person for getting higher percentage of accuracy and meet the purpose we are doing in this project. We can store the data in the form of separate folders distinguishing each person from others.

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CHAPTER 5
MODULE DESCRIPTION

CHAPTER 5

MODULE DESCRIPTION

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5.1 FEATURE EXTRACTION

Different facial images mean there are changes in textural or geometric information. In order to perform face recognition, these features have to be extracted from the facial images and classified appropriately. In this project, enhanced haar cascade is used for face recognition. The idea comes from nature of human visual perception which performs face recognition depending on the local statistic and global statistic features which extracts the whole image.

5.2 FEATURE CLASSIFICATION

The second neural network has a dense architecture and is used for classification. The second neural network take input the 128 dimensional vector and outputs the probability of the face to be one of the student. Classification involves the process of identification of face. Distance classifier finds the distance between the test image and train image based on the extracted features. The smaller the distance between the input feature points and the trained feature points, the higher the similarity of the test image and training image. In other words, the facial images with the smallest/minimum distance will be classified as the same person. Different databases are used in order to evaluate the system performance. The database provided by previous researchers with different variable conditions, for example, lighting and expression will be used to justify the system and for study purpose. Furthermore, our own database will be used to analyse the system for real time application.

5.3 MATCHING

This involves the matching features to give a result that is visually similar. The retrieval process is performed by different similarity techniques that match the

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resemblance between the image and stored image in database. The flow begins with the capture of image by using simple and handy interface, followed by preprocessing of the captured facial images, then feature extraction from the facial images, subjective selection and lastly classification of the facial images to be recognized.

Figure 5.3.1 Sample Images

Figure 5.3.2 Images of Students with or without wearing glasses

CHAPTER 6

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IMPLEMENTATION AND RESULTS

CHAPTER 6 IMPLEMENTATIONS AND RESULTS

6.1 GENERATING TRAINING DATA

Acquire training set for number of images at the initial stage. In this project the images are of 92*112 pixels each.

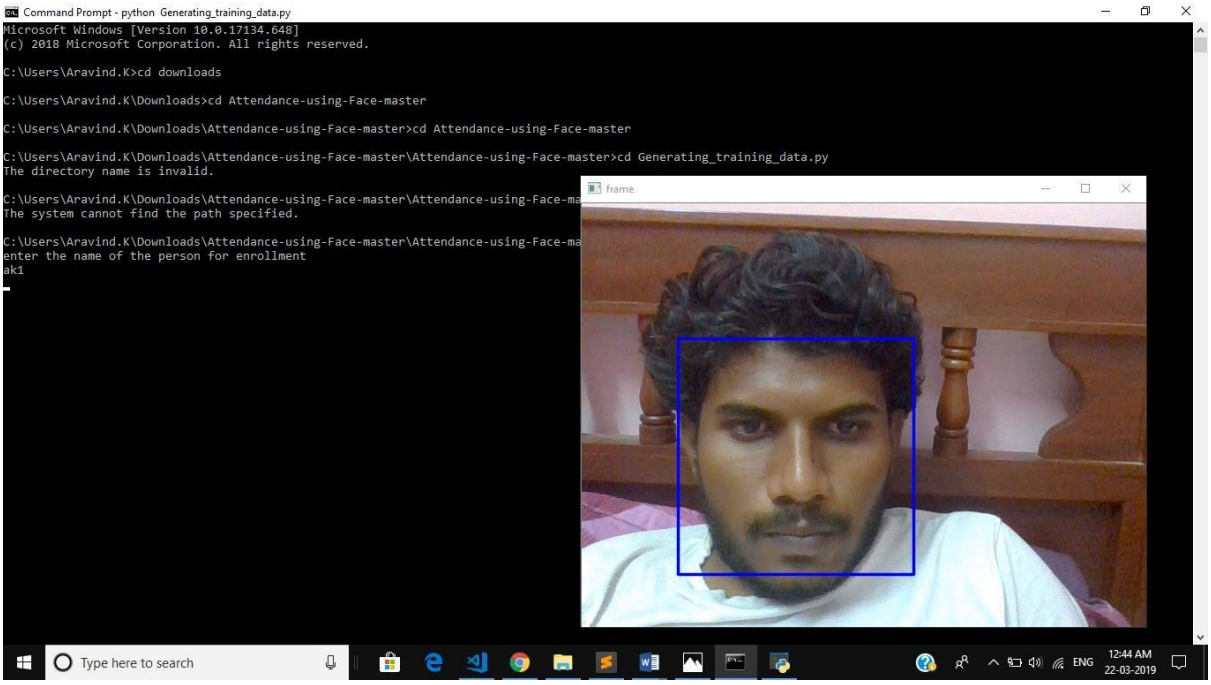

Figure 6.1.1 Enrolment of the student name

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6.2 SHOWING IMAGES OF THE TRAINING SET

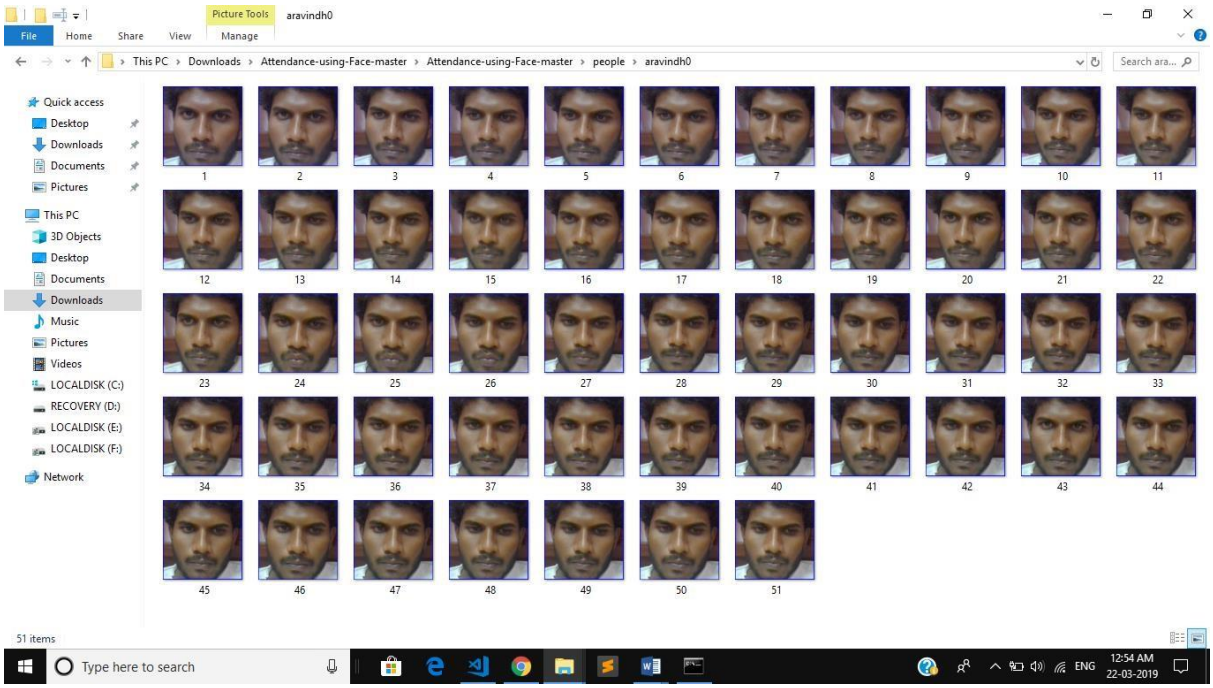

Figure 6.2.1 captured images of training set

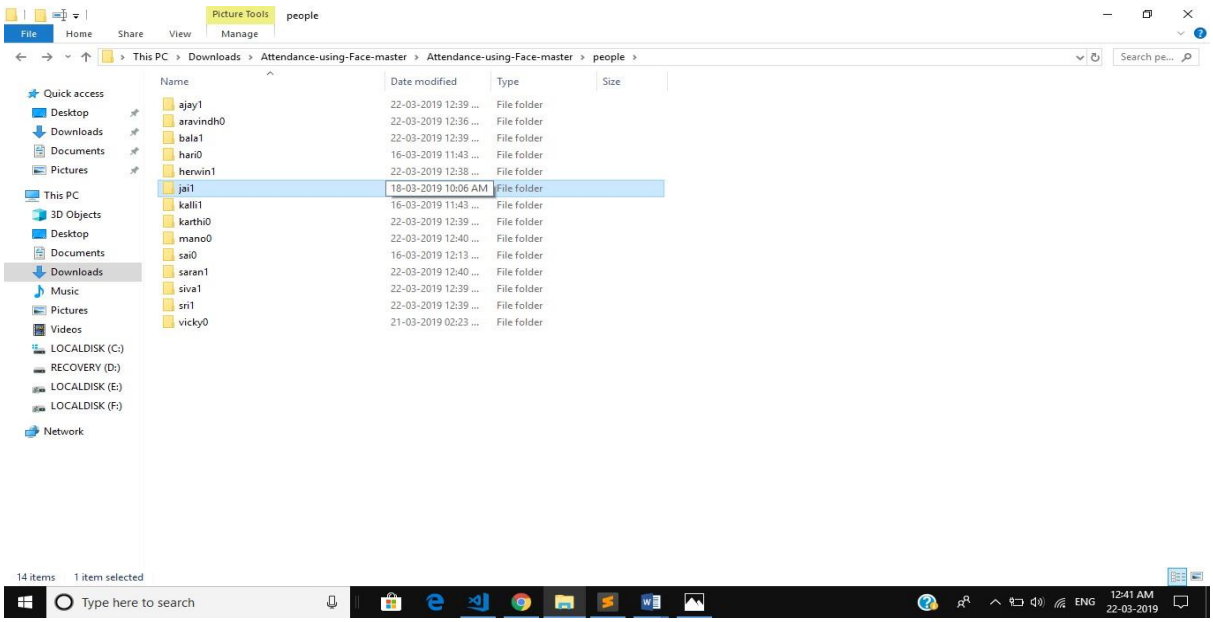

Figure 6.2.2 Checking correct person from the database

6.3 GENERATING TRAINING DATA WITH PYTHON

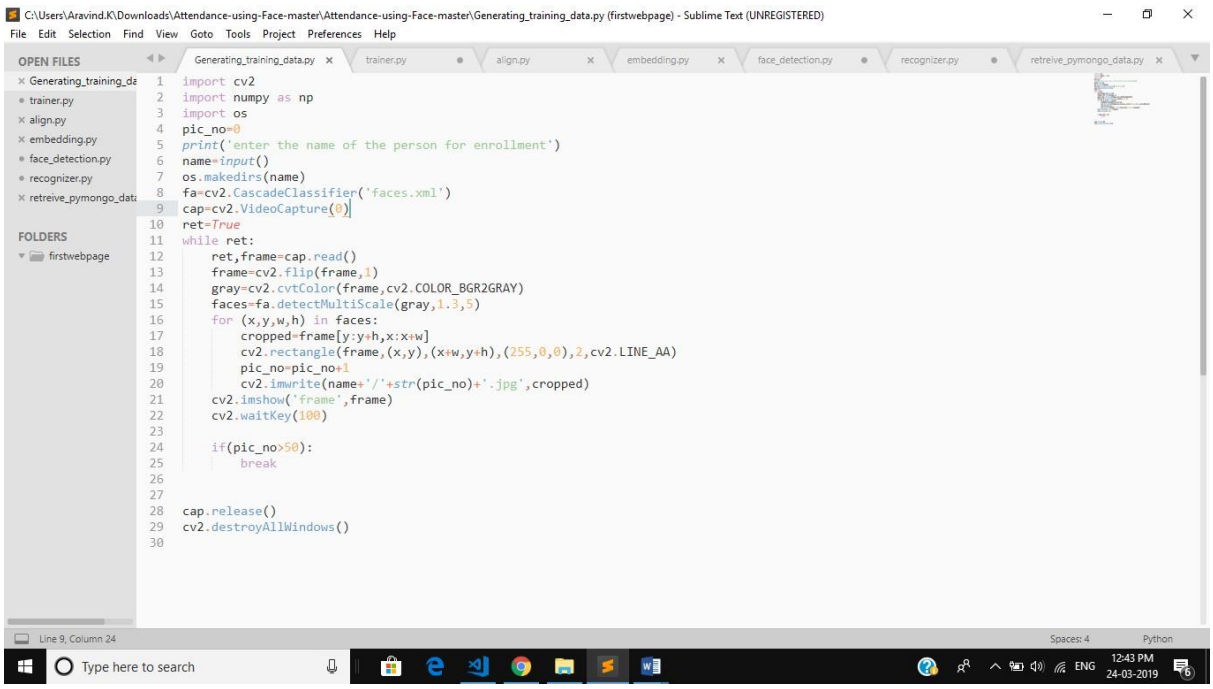

Figure 6.3.1 code for generating training data

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6.4 TRAINING DATA WITH PYTHON

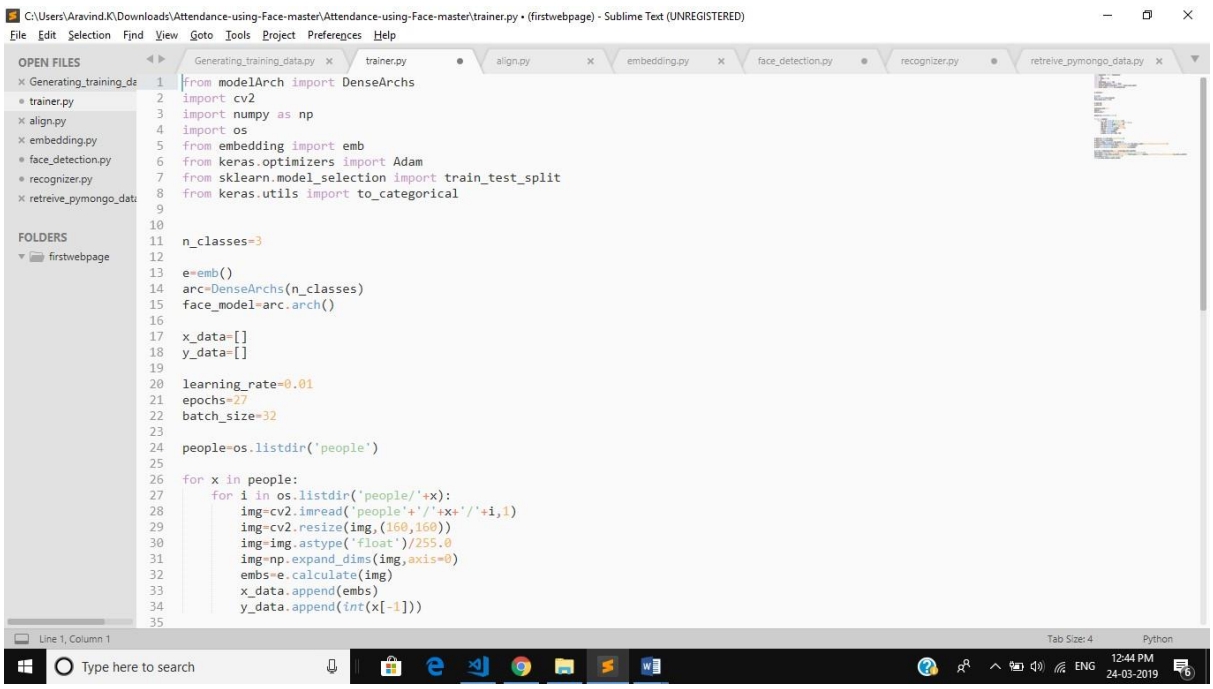

Figure 6.4.1 code for training data

```
epochs=27
batch_size=32

people=os.listdir('people')

for x in people:
    for i in os.listdir('people/'+x):
        img=cv2.imread('people'+'/'+x+'/'+i,1)
        img=cv2.resize(img,(160,160))
        img=img.astype('float')/255.0
        img=np.expand_dims(img,axis=0)
        embs=e.calculate(img)
        x_data.append(embs)
        y_data.append(int(x[-1]))


x_data=np.array(x_data,dtype='float')
y_data=np.array(y_data)
y_data=y_data.reshape(len(y_data),1)
x_train,x_test,y_train,y_test=train_test_split(x_data,y_data,test_size=0.1,random_state=77)
y_train=to_categorical(y_train,num_classes=n_classes)
y_test=to_categorical(y_test,num_classes=n_classes)

o=Adam(lr=learning_rate,decay=learning_rate/epochs)
face_model.compile(optimizer=o,loss='categorical_crossentropy')
face_model.fit(x_train,y_train,batch_size=batch_size,epochs=epochs,shuffle='true',validation_data=(x_test,y_test)
face_model.save('face_reco1.MODEL')
print(x_data.shape,y_data.shape)
```

Figure 6.4.2 code for generating training data

6.5 ALIGNING THE DATA WITH PYTHON

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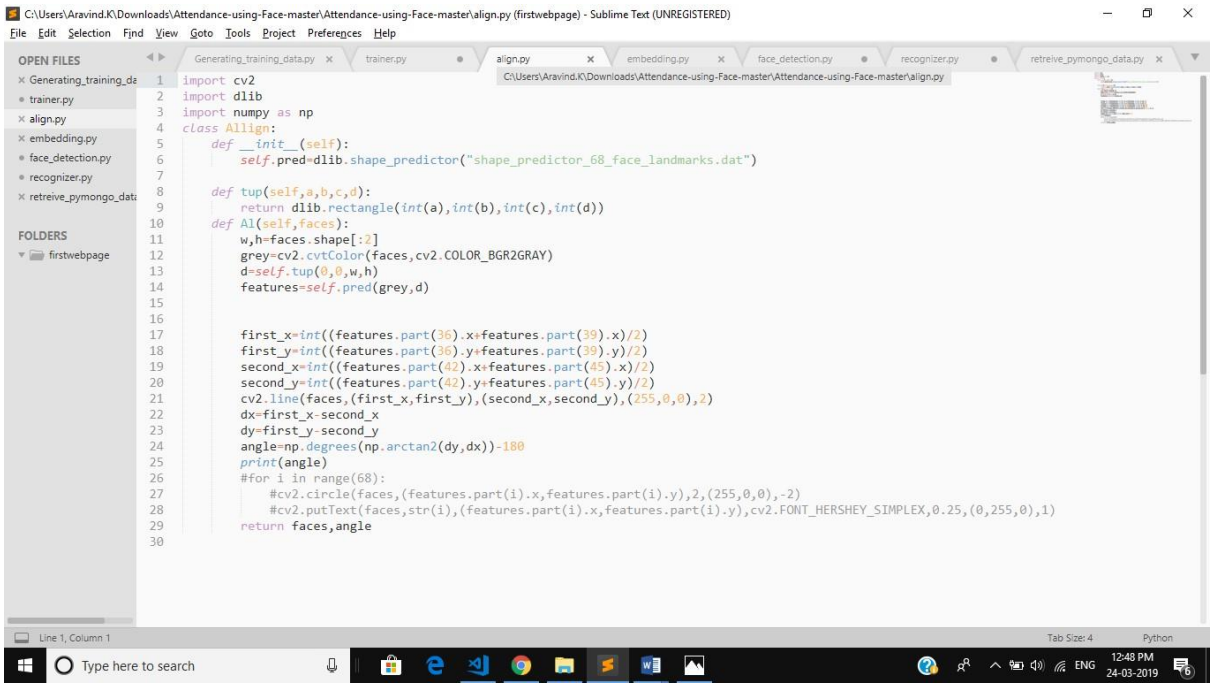

Figure 6.5.1 code for aligning the data

6.6 EMBEDDING IMAGES BY PYTHON

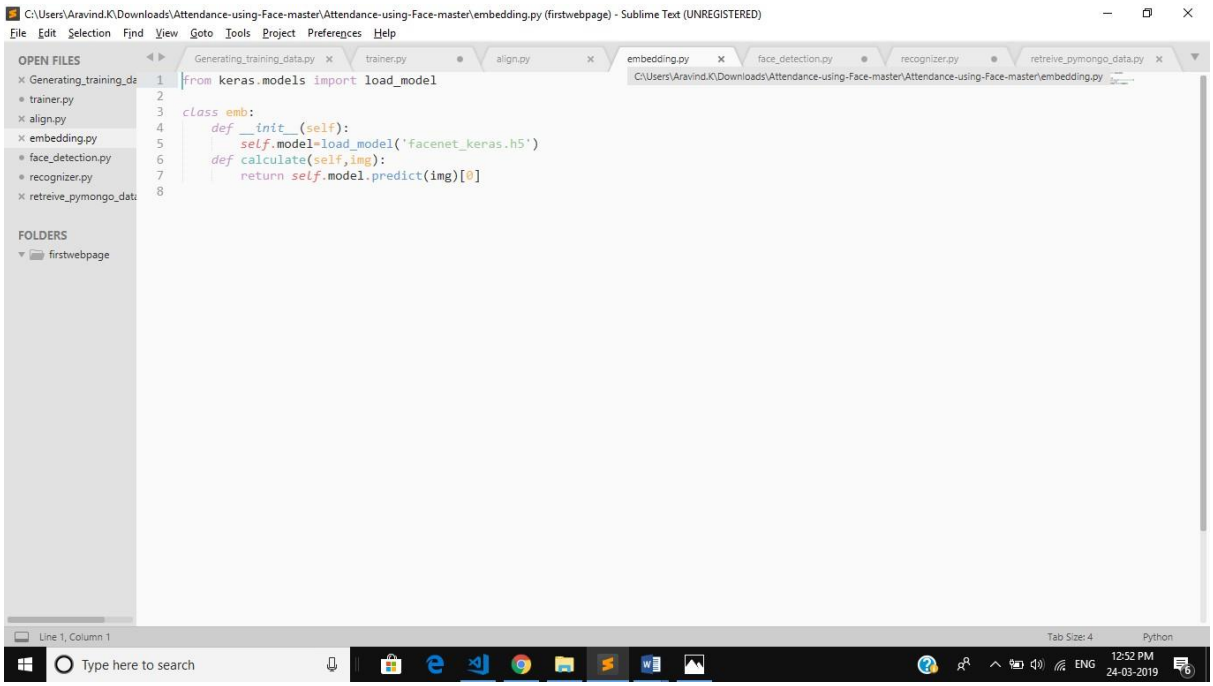

Figure 6.6.1 code for embedding the images

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6.7 FACE DETECTION WITH CASCADE CLASSIFIER

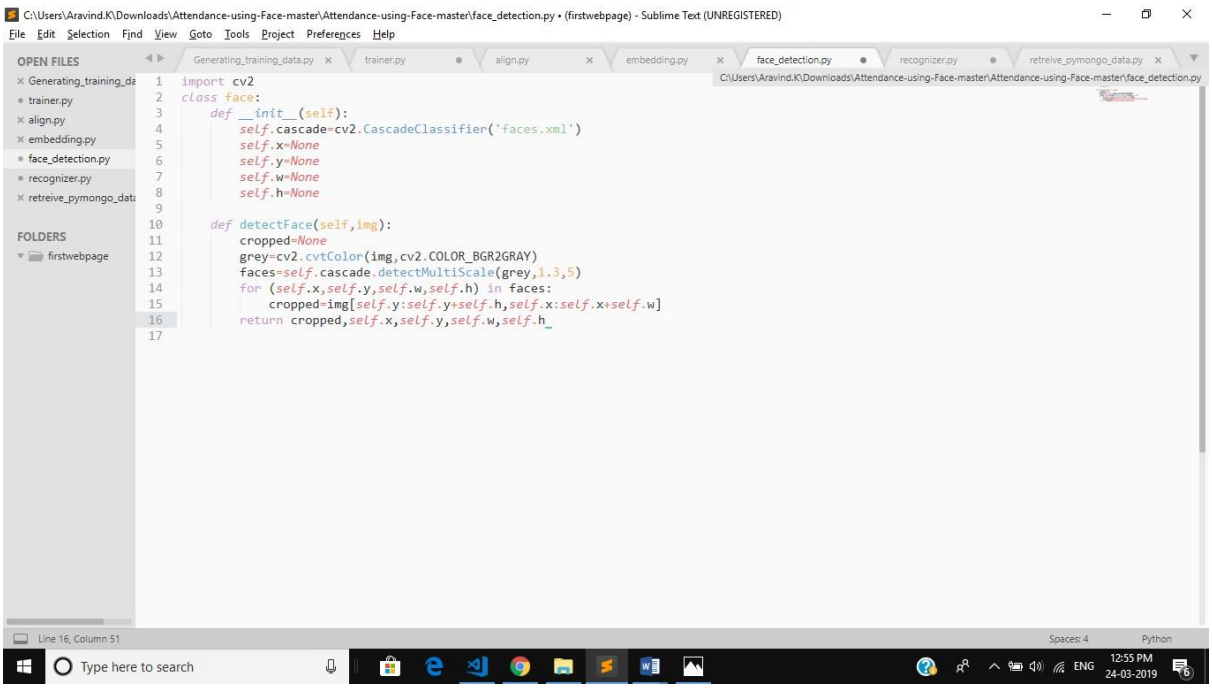

Figure 6.7.1 code for detecting the face

6.8 FACE RECOGNITION FROM THE DATABASE

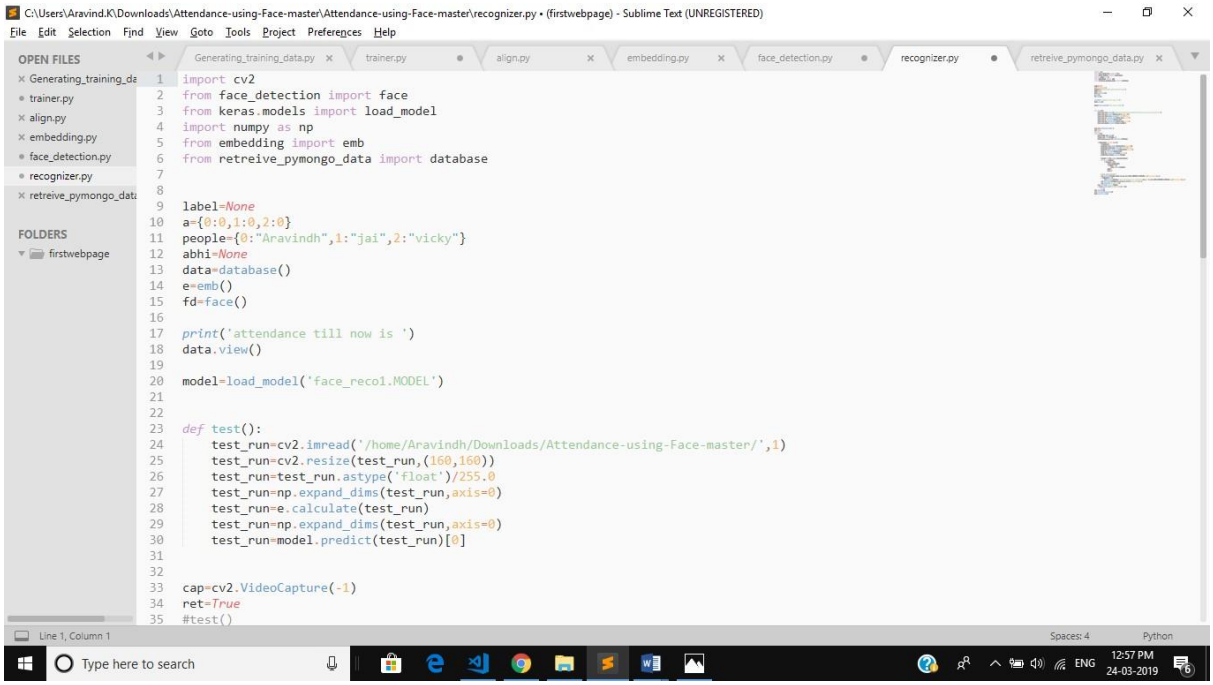

Figure 6.8.1 code for recognizer

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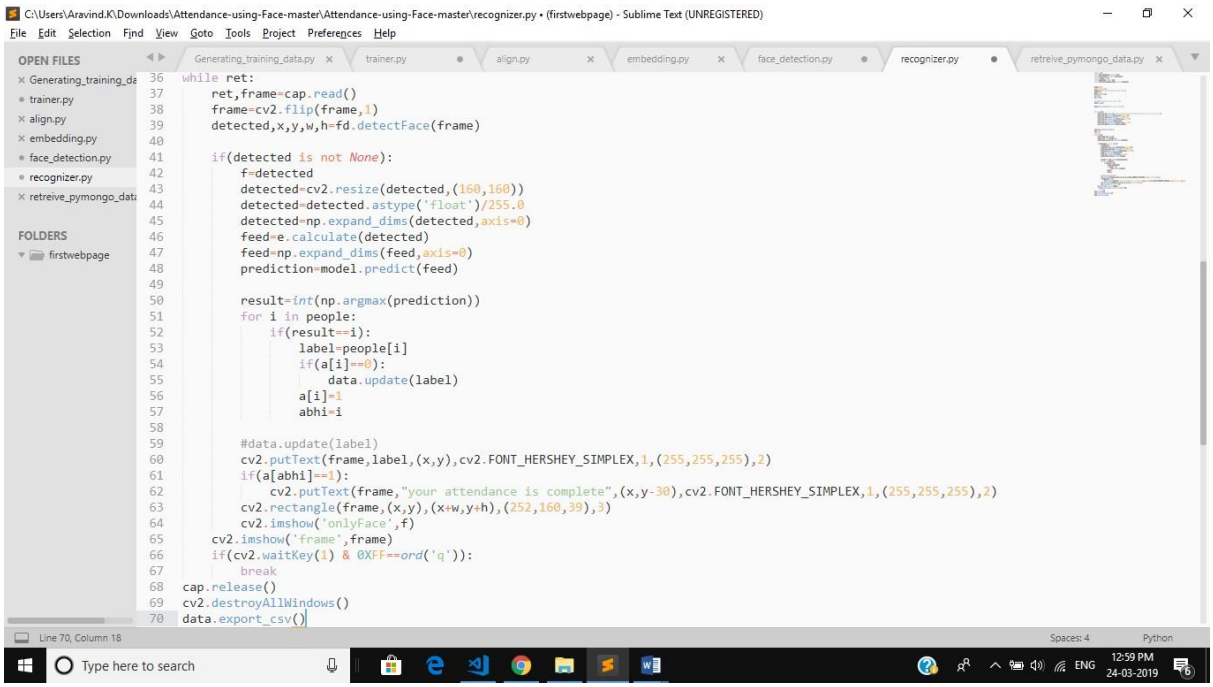

Figure 6.8.2 code for recognizer

6.9 RETRIEVING PARTICULAR STUDENT IMAGE FROM MONGODB

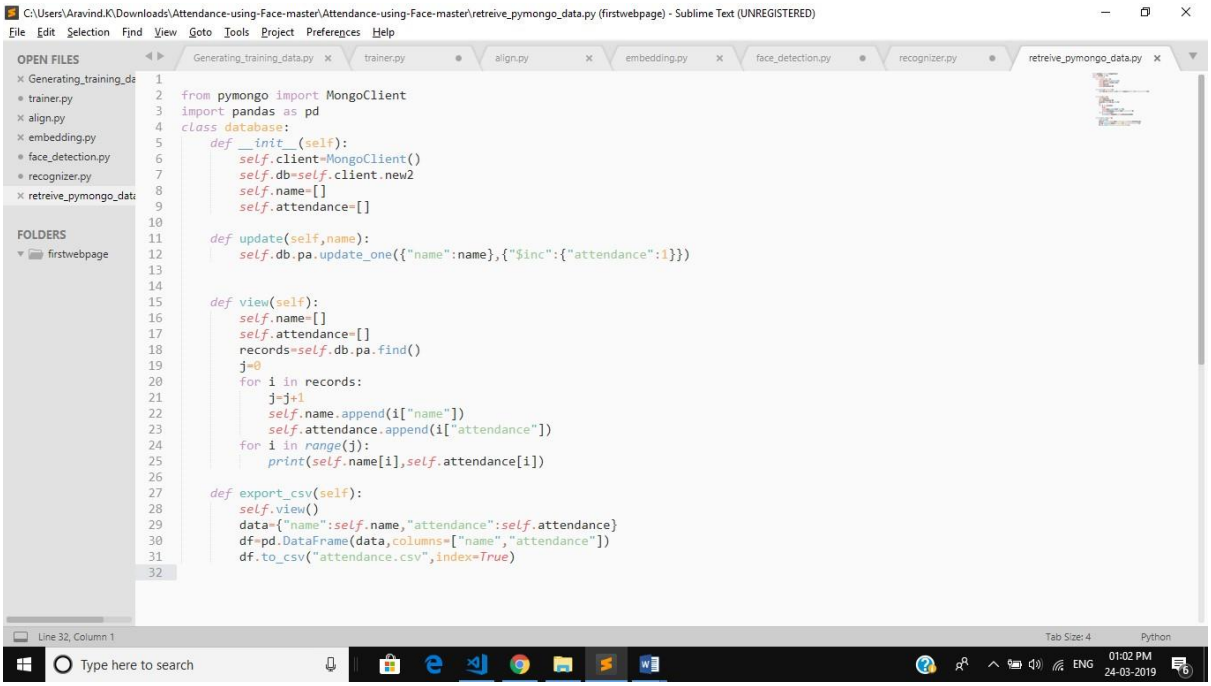

Figure 6.9.1 code for retrieving particular student image **6.10 CSV FILE GENERATION**

An excel file is generated. This excel file contains the attendance of all the student.

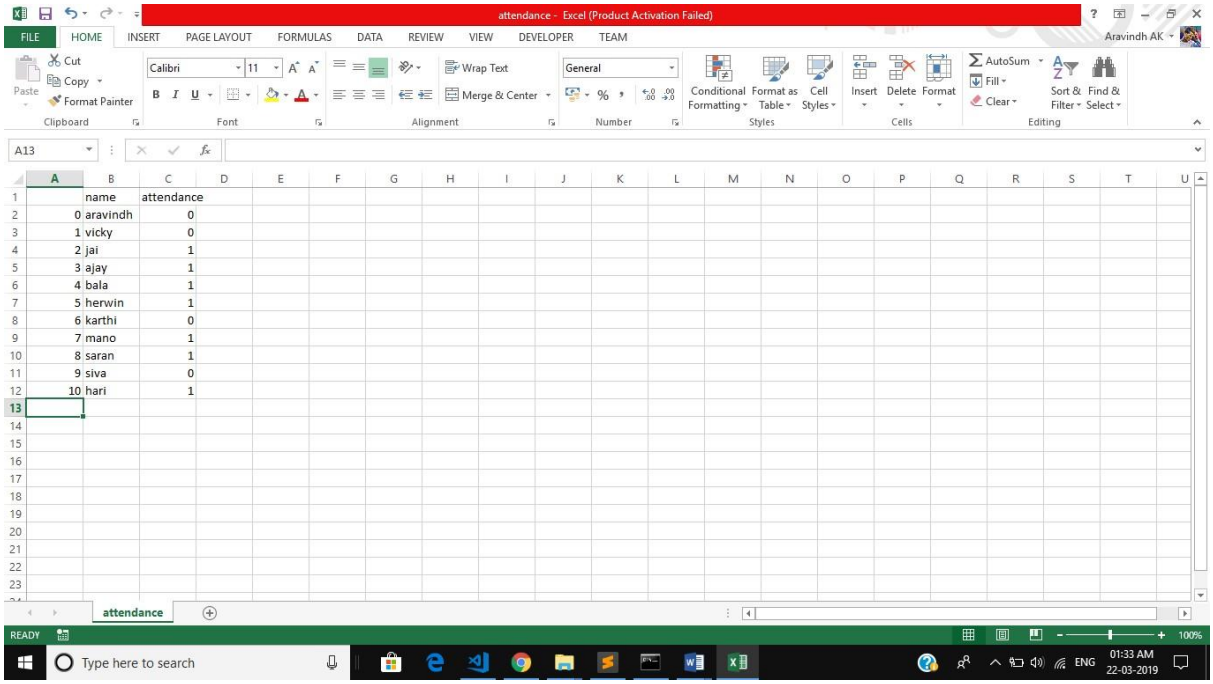

Figure 6.10.1 Students attendance in a excel file

CHAPTER 7

CONCLUSION AND FUTURE ENHANCEMENT

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CHAPTER 7

CONCLUSION AND FUTURE ENHANCEMENT

7.1 CONCLUSION

Capturing the images from camera or cc camera and applying techniques face detection and recognition can decrease the manual work from human and increase the security safety, taking the decision from this recognition result. Based on this face detection and recognition can used in implement so many application like automatic attendances system based on face recognition, worker attendances, security, safety, police application like finding thief in image that help to catching thief. In this system we have implemented an attendance system for a lecture, section or laboratory by which lecturer or teaching assistant an record student's attendance. It saves time and effort, especially if it is a lecture with huge number of students. This attendance system shows the use of facial recognition techniques for the purpose of student attendance and for the further process this record of student can be used in exam related issues.

7.2 RECOMMENDATION

In this proposed approach, there are a few limitations. First, the input image has to be frontal and a upright single facial image. Second, the accuracy might drop under extreme illumination problem. Third, false recognition might occur if the

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captured image is blurred. In fact, a better camera with a better lighting source able to reduce the illumination problem and also able to avoid the captured of blurred images. In this proposed approach, laptop built in camera is a default device. However the lighting source of the laptop camera is very dim, this cause the system to be unstable. For future work, a better camera and a better lighting source can be used in order to obtain better result.

7.2 FUTURE SCOPE

Besides, we can simplify the system and make more efficient by taking advantage of multiple face detections to mark attendance of all the visible faces in single attempt. This will be economical and more efficient use of face recognition for attendance marking. We also consider to develop an android application for this system in near future.

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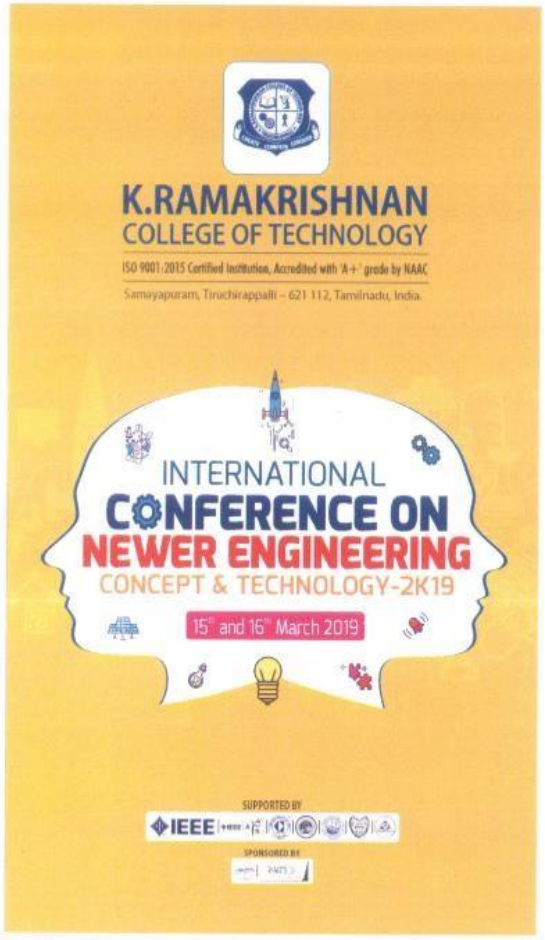
APPENDIX

APPENDIX

CONFERENCE DETAILS

K.ARAVINDH, M.VIGNESWARAN, V.JAI SRI RAM under the guidance of Mrs.P.SWATHIKA AP/CSE presented a paper entitled "QR CODE BASED SCHOOL BUS TRANSPORTATION SAFETY SYSTEM" in International Conference on Newer Engineering Concepts and Technology ICONNECT-2K19 organized by K.Ramakrishnan College of Technology on 15th March 2019.



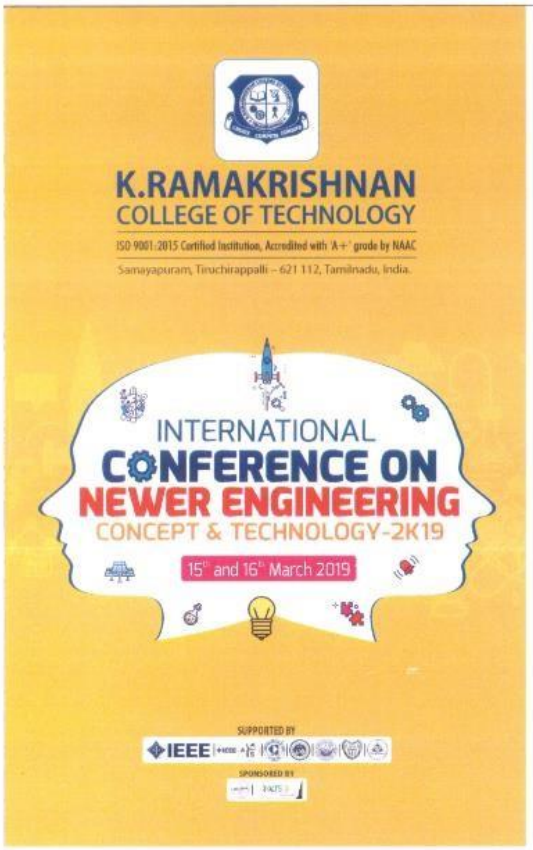
KR

Certificate Of Presentation

This is to certify that Dr/Mr/Ms/Mrs K. ARAVINDH of KAMARAJ COLLEGE OF ENGG. & TECHNOLOGY has made the presentation of paper entitled ATTENDANCE SYSTEM BASED FACE RECOGNITION in the International Conference on Newer Engineering Concepts and Technology ICONNECT-2k19, conducted during 15th and 16th of March 2019 at K.Ramakrishnan College of Technology, Kariyamanikam Road, Samayapuram, Trichy, India.

Coordinator

Principal



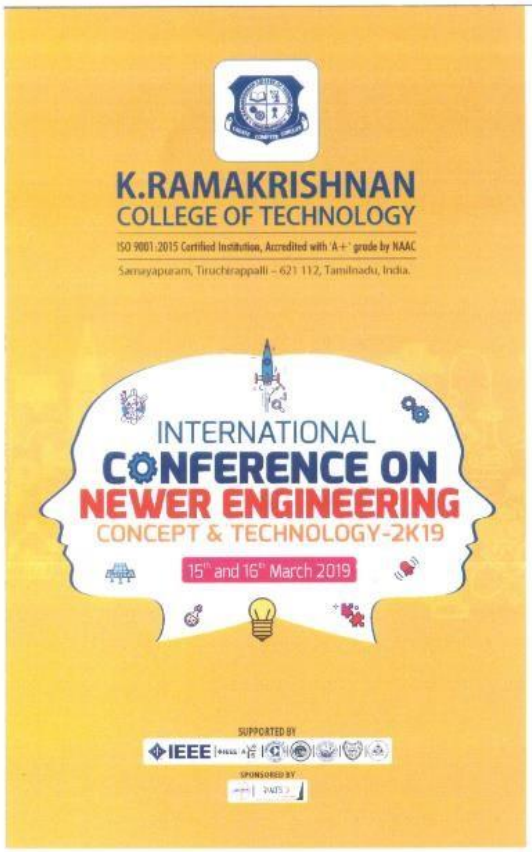
KR

Certificate Of Presentation

This is to certify that Dr/Mr/Ms/Mrs M.VIGNESH NARAN of KAMARAJ COLLEGE OF ENGG. & TECHNOLOGY has made the presentation of paper entitled ATTENDANCE SYSTEM BASED FACE RECOGNITION in the International Conference on Newer Engineering Concepts and Technology ICONNECT-2k19, conducted during 15th and 16th of March 2019 at K.Ramakrishnan College of Technology, Kariyamanikam Road, Samayapuram, Trichy, India.

Coordinator

Principal



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Certificate Of Presentation

This is to certify that Dr/Mr/Ms/Mrs V. JAISRIRAM of KAMARAJ COLLEGE OF ENGG. & TECHNOLOGY has made the presentation of paper entitled ATTENDANCE SYSTEM BASED FACE RECOGNITION in the International Conference on Newer Engineering Concepts and Technology ICONNECT-2k19, conducted during 15th and 16th of March 2019 at K.Ramakrishnan College of Technology, Kariyamanikam Road, Samayapuram, Trichy, India.

Coordinator

Principal

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REFERENCE

REFERENCES

[1] Bhumika G. Bhatt, Zankhana H. Shah “Face Feature Extraction Techniques: A Survey”, National Conference on Recent Trends in Engineering & Technology, 13-14 May 2015.

[2] C. Kotropoulos and I. Pitas, “Rule-based face detection in frontal views,” Proc. Int’l Conf. Acoustics, Speech and Signal Processing, vol. 4, pp. 2537-2540, 2017

[3] E. Saber and A.M. Tekalp, “Frontal-view face detection and facial feature extraction using color, shape and symmetry based cost functions,” Pattern Recognition Letters, vol. 17, no. 8, pp. 669-680, 2017.

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[4] Sanjay singh et.al, “A robust skin color based face detection algorithm”, Tamkang Journal of Science and Engineering vol.6, no.4,pp227-234, 2010

[5] G. Yang and T. S. Huang, “Human face detection in complex background,” Pattern Recognition Letter, vol. 27, no.1, pp. 53-63, 2016.