International Journal of Scientific Research in Engineering and Management (IJSREM)
Volume: 08 Issue: 05 | May - 2024 SJIF Rating: 8.448 ISSN: 2582-3930

Face Recognition Attendance System

Anuradha koli[1], Prajakta Narute[2], Sharvree Chougule[3], Vaishnavi Patil[4], Dr. Madhukar Chavan[5] Dr.S.S.Sankpal[6]

[1]Student, [2]Student, [3]Student, [4]Student, [5]Head Of Department, [6]Assistant Professor
Electronics And Telecommunication Engineering Department,
Padmabhooshan Vasantraodada Patil Institute of Technology, Budhgaon, Maharashtra

---

Abstract - Attendance taking is one of a tedious and important tasks in colleges, universities, organizations, schools, and offices, which must be done on a daily basis. The majority of the time, it is done manually, such as by calling by name or by roll number. The main goal of this project is to create a Face Recognition-based attendance system that will turn this manual process into an automated one. This project meets the requirements for bringing modernization to the way attendance is handled, as well as the criteria for time management. This device is installed in the classroom, where and student's information, such as name, roll number, class, sec, and photographs, is trained. The images are extracted using Open CV. Before the start of the corresponding class, the student can approach the machine, which will begin taking pictures and comparing them to the qualified dataset. Logitech C270 web camera and NVIDIA Jetson Nano Developer kit were used in this project as the camera and processing board. The image is processed as follows: first, faces are identified using a Haarcascade classifier, then faces are recognized using the LBPH (Local Binary Pattern Histogram) Algorithm, histogram data is checked against an established dataset, and the device automatically labels attendance. An Excel sheet is developed, and it is updated every hour with the information from the respective class instructor.

1.INTRODUCTION

Attendance is prime important for both the teacher and student of an educational organization. So it is very important to keep record of the attendance. The problem arises when we think about the traditional process of taking attendance in class room. This project introduces an involuntary attendance marking system, devoid of any kind of interference with the normal teaching procedure. The system can be also implemented during exam sessions or in other teaching activities where attendance is highly essential. This system eliminates classical student identification such as calling name of the student, or checking respective identification cards of the student, which can not only interfere with the ongoing teaching process, but also can be stressful for students during examination sessions. In addition, the students have to register in the database to be recognized. The enrolment can be done on the spot through the user-friendly interface. . Thus, face recognition attendance system is proposed in order to replace the manual signing of the presence of students which are burdensome and causes students get distracted in order to sign for their attendance.

2. LITERATURE REVIEW

Sk. Sharmila et. al. [1] compared the results of multiple machine learning methods for Automatic attendance system. This research work presents the working of a cascade classifier built with machine learning to improve the face detection results. This has been done by comparing the face images in the current image to a database of previously trained faces. The acquired image contributions are searched for a previously registered face, and once found, the person's attendance is recorded automatically. A face detection and recognition- based attendance monitoring system might very well rapidly and accurately locate and identify people in photographs or video footage. In addition to being laborious to maintain, the time-honored practice of physically ticking off attendees is inefficient.

Yenumaladoddi Jayasimha et. al. [2] analyses the structural features, and uses four machine learning algorithms for training .The whale optimization algorithm , Conventional neural network , etc are used . In this work a CNN based prototype is presented to estimate the age and to classify the gender of detected faces along with its emotions. The proposed model is implemented in three stages namely a hybrid feature extraction technique to identify the facial expressions by using SVM classifier. A combination of SIFT and Deep learning-based model is presented for identifying facial emotions. Whale optimization algorithm is applied to optimize the performance of face

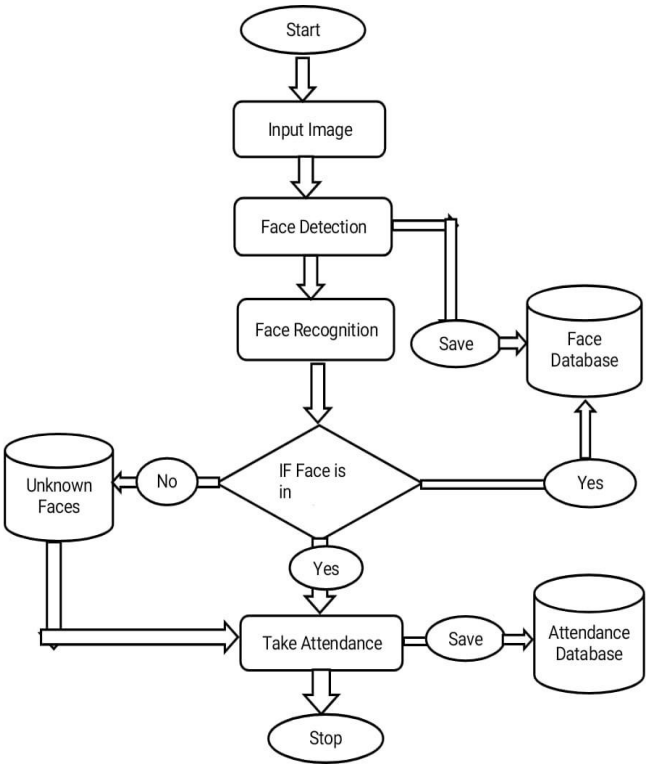
emotion recognition. This model gives a convolution neural network and introduces a novel technique for classification of facial emotions, age prediction and male-female identification.

Venugopal A et. al. [3] proposed research work has developed a model to recognize face . The proposed system captures the face of students attending the lecture by first detecting a face from the video input and with the help of an ensemble of deep learning models recognize the student and mark his/her attendance in the database . This system uses an ensemble of facial recognition models such as VGG-FACE, Facenet, Openface, DeepFace so that it may be able to yield a much higher accuracy while identifying the subject.

Gurlove Singh[4] procedure for authenticating any face data is sub-divided into two phases, in the first phase, the face detection is done quickly except for those cases in which the object is placed quite far, followed by this the second phase is initiated in which the face is recognized as an individual. Then the whole process is repeated thereby helping in developing a face recognition model which is considered to be one of the most extremely deliberated biometric technology.The Eigenface method basically make use of the PCA (Principal Component Analysis) to minimize the face dimensional space of the facial features. The area of concern of this paper is using the digital image processing to develop a face recognition system.

Samuel Lukas et al. in [5] proposed the HFR technique. HFR is a human face recognition system that is the issue of today's era. The HFR is used for many applications such as surveillance systems, and monitoring systems. Here they have used two approaches for face recognition I.e. feature-based and brightness based. They have used a technique that is a combination of DWT (Discrete wavelet transforms), and RBF (Radial basis function) the system accuracy increased by working more on feature extraction. The accuracy is about 82 percent.

3. BLOCK DAIGRAM



4. METHODOLOGY

4.1 Working :

The proposed system is designed for automating the attendance of the different organization and reduces the flaws of existing manual system. The system calculate the attendance subject wise, that is the data of students and subjects are added manually by administrator, and whenever time for corresponding subject arrives the system automatically starts taking snaps and find whether human faces are appear in the given image or not. We have used Histogram of Oriented Gradient for face detection and deep learning techniques to calculate and compare 128-d face features for face recognition. Once faces are detected and recognize with the existing database, system calculate attendance for the recognize students with the respective subject id in real time. And an excel sheet generated and saved by the system automatically.

Our system splits into two parts, First the front end side which consist of GUI which is based on Electron JS that is JavaScript stack which is serving as a client and the second is the backend side which consist of logic and based on Python which is serving as a server. And we know that both the languages cannot communicate with each other directly so we have used IPC (Inter Personal Communication) techniques with zero library as a bridge to communicate these two languages. The Electron JS call the python functions and interchange data via TCP with help of Zero PC Library

4.2 Data Acquisition:

Image is acquire using a high definition camera which is placed in the classroom. This image is given as an input to the system.

Dataset of students is created before the recognition process. Dataset was created only to train this system. We have created a dataset of 5 students which involves their name, roll number, department and images of student in different poses and variations. For better accuracy minimum 15 images of each students should be captured. Whenever we register student's data and images in our system to create dataset, deep learning applies to each face to compute 128- d facial features and store in student face data file to recall that face in recognition process. This process is applies to each image taken during registration.

4.3 Face Recognition Process:

4.3.1 Face Detection and Extraction:

Face detection is important as the image taken through the camera given to the system, face detection algorithm applies to identify the human faces in that image, the number of image processing algorithms are introduce to detect faces in an images and also the location of that detected faces. We have used HOG method to detect human faces in given image.

4.3.2 Face Positioning:

There are 68 specific points in a human face. In other words we can say 68 face landmarks. The main function of this step is to detect landmarks of faces and to position the image. A python script is used to automatically detect the face landmarks and to position the face as much as possible without distorting the image.

4.3.3 Face Encoding:

Once the faces are detected in the given image, the next step is to extract the unique identifying facial feature for each image. Basically whenever we get localization of face, the 128 key facial point are extracted for each image given input which are highly accurate and these 128-d facial points are stored in data file for face recognition.

4.4 Model Implementation:

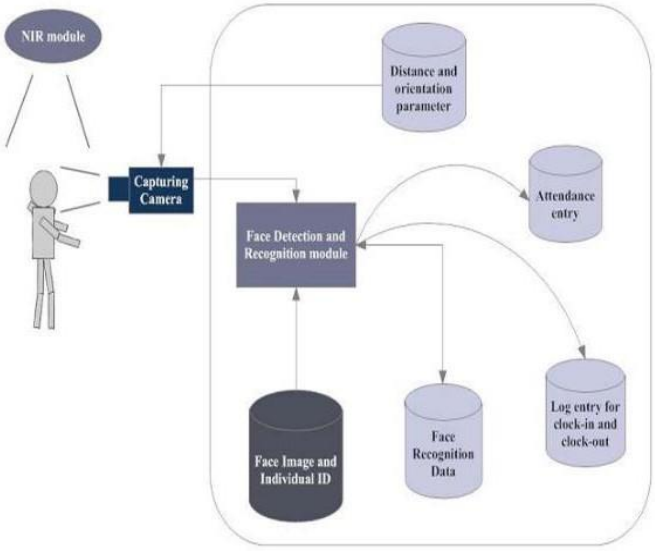


Fig.4.4.1 Model Implement

The main components used in the implementation approach are open source computer vision library (OpenCV). One of OpenCV's goals is to provide a simple- to-use computer vision infrastructure that helps people build fairly sophisticated vision applications quickly. OpenCV library contains over 500 functions that span many areas in vision. The primary technology behind Face recognition is OpenCV

•. The user stands in front of the camera keeping a minimum distance of 50cm and his image is taken as an input. The frontal face is extracted from the image then converted to gray scale and stored. The Principal component Analysis (PCA) algorithm is performed on the images and the eigen values are stored in an xml file. When a user requests for recognition the frontal face is extracted from the captured video frame through the camera. The eigen value is re-calculated for the test face and it is matched with the stored data for the closest neighbour.

•We used OpenCV 3 dependency for python 3. OpenCV is library where there are lots of image processing functions are available. This is very useful library for image processing. Even one can get expected outcome without writing a single code. The library is cross-platform and free for use under the open-source BSD license.

• If you have previous/other manually installed (= not installed via pip) version of OpenCV installed (e.g. cv2 module in the root of Python's site-packages), remove it before installation to avoid conflicts. Make sure that your pip version is up-to-date (19.3 is the minimum supported version): pip install --upgrade pip. Check version with pip -V. For example Linux distributions ship usually with very old pip versions which cause a lot of unexpected problems especially with the manylinux format.

• Tkinter is a standard library in Python which is used for GUI application. Tkinter has various controls which are used to build a GUI-based application. To install Tkinter, we need Python pre-installed. Tkinter actually comes along when we install Python. While installing Python, we need to check the td/tk and IDLE checkbox. This will install the tkinter and we need not install it separately . However, if we missed installing Tkinter while installing Python, we can do it later using the pip command.

• Pillow is the friendly PIL fork by Jeffrey A. Clark and contributors. PIL is the Python Imaging Library by Fredrik Lundh and contributors. As of 2019, Pillow development is supported by Tidelift.

docs Documentation Status tests GitHub Actions build status (Lint) GitHub Actions build status (Test Linux and macOS) GitHub Actions build status (Test Windows) GitHub Actions build status (Test MinGW) GitHub Actions build status (Test Cygwin) GitHub Actions build status (Test Docker) AppVeyor CI build status (Windows) GitHub Actions build status (Wheels) Code coverage Fuzzing Status package.

• Pandas is a Python package that provides fast, flexible, and expressive data structures designed to make working with "relational" or "labeled" data both easy and intuitive. It aims to be the fundamental high-level building block for doing practical, real world data analysis in Python. Additionally, it has the broader goal of becoming the most powerful and flexible open source data analysis / manipulation tool available in any language. It is already well on its way towards this goal.

• There are lots of IDEs for python. Some of them are PyCharm,Thonny, Ninja, Spyder etc. Ninja and Spyder both are very excellent and free but weused Spyder as it feature- rich than ninja. Spyder is a little bit heavier than ninja but still much lighter than PyCharm. You can run them in pi and get GUI on your PC.

```
sudo apt-get isntall
```

Through ssh-Y. We installed Spyder through the command line below.

• Haar Cascade classifiers are an effective way for object detection. This method waproposed by Paul Viola and Michael Jones in their paper Rapid Object Detectionusing a Boosted Cascade of Simple Features .Haar Cascade is a machine learning-based approach where a lot of positive and negative images are used to train the classifier.

Positive images – These images contain the images which we want our classifier to identify.

Negative Images – Images of everything else, which do

not contain the object we want to detect.

5. RESULT & DISCUSSION

5.1 Front Screen: This is the first screen which display on a screen to take enrollment and name of the student

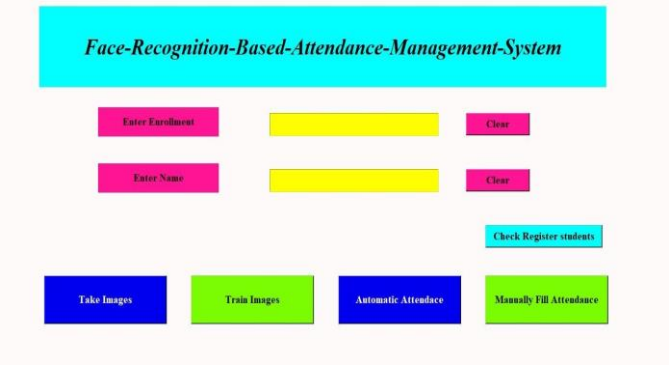


Figure 5.1 – Front Screen

5.2 Taking Input: Take Image- Introduction of new image illustrations called the Take image which allow the features used by our detector to be computed very quickly Train Image - The features of the face are to be extracted in the feature extraction module. The features are eyes, nose, and mouth. Then the training is done on the faces .Automatic Attendance - Click on Automatic Attendance will directly go in excel sheet which is automatically saves student data (Name , Enrollment No.)

Figure 5.2 – Taking input

5.3 Dataset: Dataset of every student saved for recognizing face while taking attendance.

Figure 5.3 – Dataset

5.4 Enter Subject : Enter the name of Subject for which you have to fill the Students Attendance.

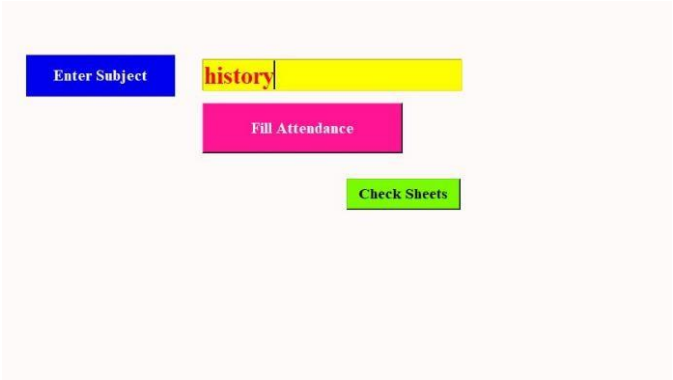


Figure 5.4 – Filling Attendance

5.5 Final Attendance Excel sheet: After taking attendance this is final attendance excel sheet.

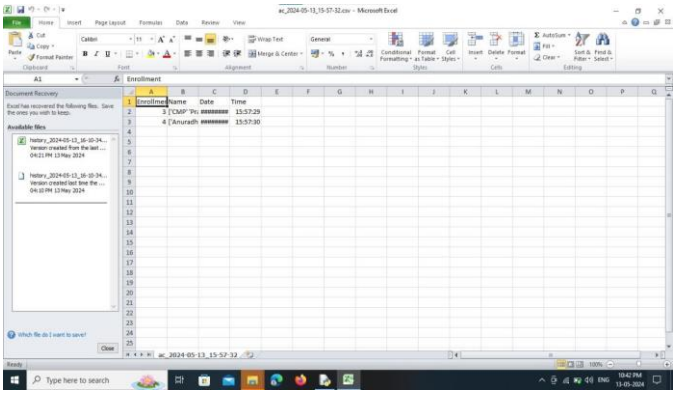


Figure 5.5 – Final Attendance sheet

6. APPLICATIONS

- Using a face recognition attendance system during exams could help ensure that the right students are present and prevent unauthorized individuals from entering. It adds an extra layer of security and accountability to the exam process. However, it's essential to consider privacy concerns and ensure that the system is implemented ethically and transparently.
- Large application in Institute attendance system where multiple attendance is are carried out for different classes the attendance will be short time and reduce the manual error.
- Large application of computer vision in field of communication biomedical automatic product inspection.
- Schools: Face recognition attendance systems can be used to track student attendance in class. This can be helpful for teachers who need to track which students are present and for administrators who need to track overall attendance patterns.

7. CONCLUSION & FUTURE SCOPE

7.1 Conclusion :

We have studied the different algorithms used in face recognition systems and, successfully implemented Attendance Management System using Face Recognition. This system will capture the image of the whole class at one time. The face of a student should be at a minimum distance of 2.5 feet. This is done to avoid accidental face recognition. Our system requires good lighting conditions to accurately classify the images of students.

Our system is first trained and then while testing it detects the face and labels the face with his/her name. By implementing the algorithm and technique used to develop a face recognition system, we analyzed the performance of the developed algorithm. And deploying a system that will generate attendance reports of students. Our does not require any human interference. This is the most beneficial advantage. Also, the time for teachers for taking attendance is used properly so that they can interact with students effectively having more time. Our system will accurately predict the student's faces and accordingly marks the attendance in an excel sheet. In our system we have compared SVM, CNN and LBPH algorithms for accuracy.

We can conclude that LBPH (Local Binary Patterns Histogram) algorithm, is the most efficient algorithm for face recognition from images because it gives high accuracy during the training and testing phase.

.

7.2 Future Scope :

The future scope of face recognition attendance systems is quite promising, with advancements in technology and increasing demand for efficient and secure attendance management solutions. Here are some potential directions in which this technology could evolve.

- Using a face recognition attendance system during exams could ensure that the right students are present and prevent unauthorized individuals from entering. It adds an extra layer of security and accountability to the exam process. However, it's essential to consider privacy concerns and ensure that the system is implemented ethically and transparently.

- It adds an extra layer of security and accountability to the exam process. However, it's essential to consider privacy concerns and ensure that the system is implemented ethically and transparently.

8. REFERENCES

1. S. Sharmila, G. K. Nagasai, M. Sowmya, A. S. Prasanna, S. N. Sri and N. Meghana, "Automatic Attendance System based on Face Recognition using Machine Learning," *2023 7th International Conference on Computing Methodologies and Communication (ICCMC)*, Erode, India, 2023, pp. 170-174
2. Y. Jayasimha, M. Venkatesha and R. V. S. Reddy, "Face Detection and its Features Extraction using Convolution Neural Network Model," *2022 3rd International Conference for Emerging Technology (INCET)*, Belgaum, India, 2022, pp. 1-6.
3. V. A, R. R. Krishna and R. V. U, "Facial Recognition System for Automatic Attendance Tracking Using an Ensemble of Deep-Learning Techniques," *2021 12th International Conference on Computing Communication and Networking Technologies (ICCCNT)*, Kharagpur, India, 2021, pp. 1-6
4. G. Singh and A. K. Goel, "Face Detection and Recognition System using Digital Image Processing," *2020 2nd International Conference on Innovative Mechanisms for Industry Applications (ICIMIA)*, Bangalore, India, 2020, pp. 348-352.
5. S. Lukas, A. R. Mitra, R. I. Desanti and D. Krisnadi, "Student attendance system in classroom using face recognition technique," *2016 International Conference on Information and Communication Technology Convergence (ICTC)*, Jeju, Korea (South), 2016, pp. 1032- 1035.