



CLASS ATTENDANCE MONITORING SYSTEM USING FACE RECOGNITION

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ABSTRACT

Marking attendance in a classroom during a session is not only a tedious task but also a time consuming one. The presence of abnormally large number of students during the session leads to high chances of proxy attendance. Marking presence with conventional methods has been a complicated task. The increased demand in efficient and automatic techniques of marking attendance is a problematic aspect in the area of face recognition. Earlier, the issue of automatic attendance marking has been managed through standard biometrics like fingerprint, RFID, Iris Biometric, etc. Anyway, these techniques lack reliability. This paper endeavours to design an automated system that records the attendance with the usage of facial recognition. The system allows the user to post name, Id and images while adding a new student data and stores the images based on the coordinates of the face location in the database. A facial recognition model is trained based on the dataset of images. It initializes a K-Nearest Neighbors classifier with a specified number of neighbors and fits the model on the known faces and names. After training the model, attendance can be marked along with the time of registered students in an excel sheet which can be viewed and downloaded.

Keywords: Face Recognition, Attendance marking, OpenCV, Flask, K-Nearest Neighbors.

1. INTRODUCTION

The technology around us continues to advance at an unprecedented rate and will transform the world corresponding to human needs. People are used to technology even in minute and easy tasks. The problem arises in traditional ways of marking attendance by professors which consumes lots of effort and time. The problem arises when seeing the professors struggle with managing the attendance. The conventional approaches include calling out names of students, passing sheets to enter details with signature, etc. These approaches involve disturbance in class time as well as affect in concentration of students and professors. These methods of marking attendance also led to manipulation of attendance data. In order to prevent malpractices such as proxy attendance, this system is proposed to manage and record attendance effectively and efficiently. Firstly, the system records the name and Id of unregistered student through add new student function. When the data is submitted, camera is opened and images are stored based on face locations into the database. Secondly, the images are trained by initializing a K-Nearest Neighbors classifier with specific number of neighbors. It saves the encodings and labels to files using NumPy. Lastly, attendance is marked along with time of authorized students in an excel sheet which can be downloaded.

2. LITERATURE SURVEY

In many colleges attendance marking is done through manually calling out names of students or by passing attendance sheets to students. From the past few years standard biometrics such as RFID, Fingerprint based, iris based and facial based (HOG, Haarcascade) systems are in use for attendance marking.

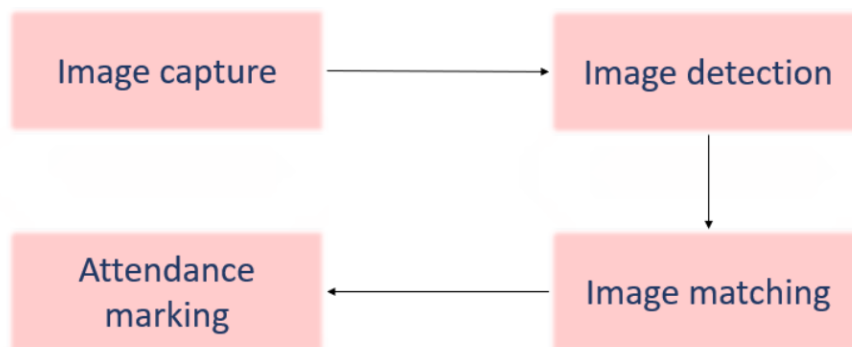
Authors in [1] proposed an automated attendance system which focuses face recognition using RFID. The model counts and detects the registered students as they come and leave the classroom. Here the drawback is if the card is in place and the person leaves the attendance is still recorded.

In [2], the authors proposed a model where the attendance is monitored automatically from a live video. Here, they used Haar Cascade and LBPH algorithms for face detection and face recognition respectively.

In the paper [3], authors designed a model which converts a captured video into frames which are used as the student images. It uses Viola-Jones algorithm for face detection and recognises the face using LBPH algorithm. Once the face is matched, the attendance is recorded in the CSV file.

3. METHODOLOGY

The implementation uses Flask, a micro web framework written in Python, to create a web-based user interface to interact with the system. It has dependencies on several python libraries such as OpenCV, Scikit-Learn, face_recognition, os, numpy, joblib. The modules into which the system is divided and an elaborative description of each module is shown below.

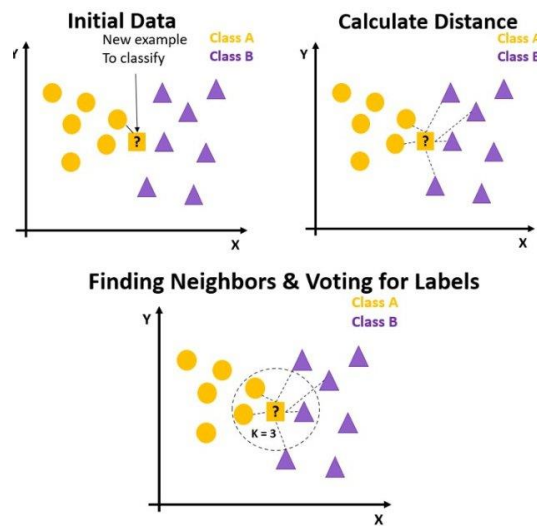


A. DATASET CREATION

The system first prompts the user to add student information by collecting their name and a unique Id number. It extracts the Id and username from the submitted form data. Creates a new folder in the dataset directory with the name as username. It then starts the video camera and captures images from the video camera, detects the face in each image, and shows the image with a rectangle around the detected face. If the user presses the 's' key, the current image is saved in the folder created in a unique file name. The function stops capturing images when it has saved the images. Stops the video camera, closes all windows, and returns a message that the dataset has been created for the given username.

B. TRAINING THE DATASET

The route starts by loading the images and encoding the faces, then it trains the K-Nearest Neighbors classifier model on the known faces and names. After that, it saves the model to a file named 'face_recognition_model.clf'. Then, it generates the encodings and labels of the known faces and saves them to files named encodings.npy and labels.npy, respectively. Finally, returns a message to the console indicating that the dataset is trained and redirects the user to the index page.



C. TAKE ATTENDANCE

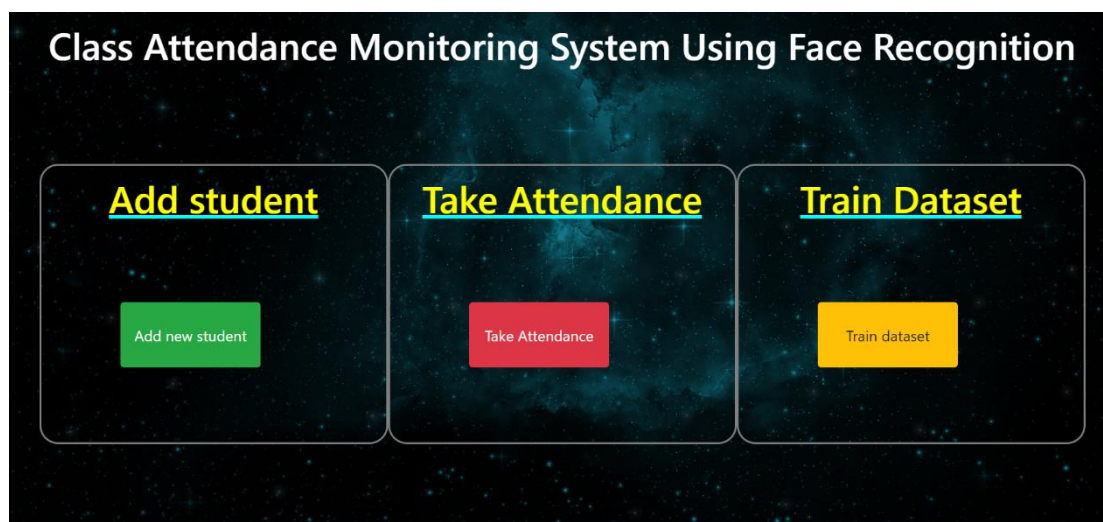
The user can then take attendance by launching the camera and capturing the video stream or even by uploading a video file. It loops through each face in the frame, computes the distance between the face encoding and the known face encodings using `face_distance` function of `face_recognition` library. If the distance is less than a threshold value of 0.6, it determines the label of the recognized face by finding the index of the minimum distance in the labels array. If the distance is greater than the threshold value, it assigns the label as "Unknown".

It then draws a rectangle around the face and writes the label below the face. If the recognized label is not "Unknown", it calls the `mark_attendance` function to mark the attendance of the recognized person. Finally, it displays the video stream with the recognized faces and waits for the user to hit 'q' to quit. When the user hits 'q', it releases the camera and closes the video window. It returns a string "Attendance has been taken successfully!" to indicate that attendance has been marked.

D. MARK ATTENDANCE

The `mark_attendance` function gets executed immediately after the `take_attendance` function without being called. The `mark_attendance` function takes a name parameter and marks the attendance of the person with that name in a CSV file named 'attendance.csv'. If the name is already present, the function returns without writing anything to the file. If the name is not present, the function gets the current date and time and formats it as a string. It then writes the name and time to the file and the excel file can also be downloaded.

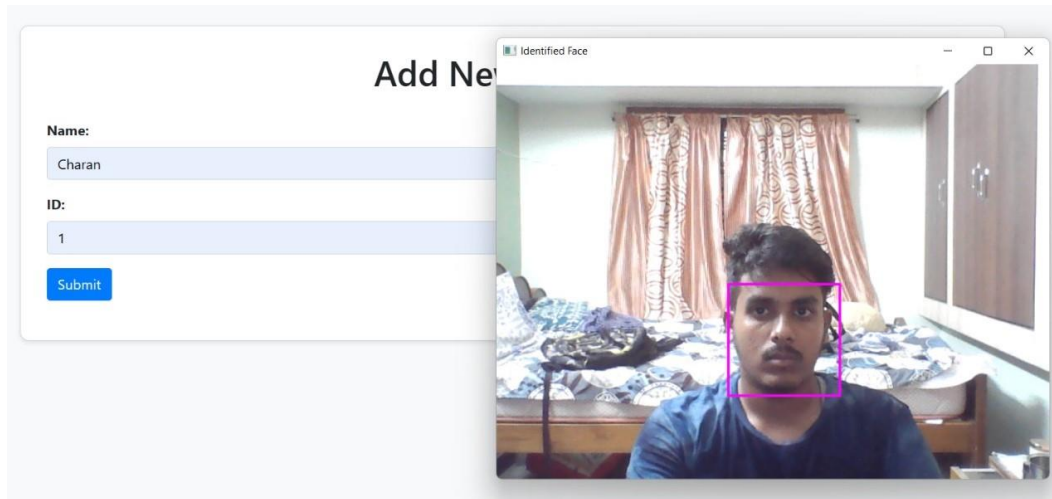
4. RESULTS AND DISCUSSION



The proposed system is developed to mark attendance automatically and efficiently. The developed project is supposed to show three buttons in user interface namely, add new student, take attendance and train dataset.

A. ADD NEW STUDENT

When there is need to update an unregistered student, they can click on add new student. This redirects them to a new page where student Id and name are given as input and submitted. After submitting the camera is opened which allows the unregistered student to captures images of him/her. When the camera is opened a rectangular box is displayed on the camera which represents face locations. Thereby, registering the student details into the dataset.



B. TRAIN DATASET

Whenever, there is update in the dataset, it has to be trained to update the model. The model trains using K-Nearest Neighbors classifier on known faces and names. It generates encodings and labels and saves them to files. The below images is the file which consists of the encodings.

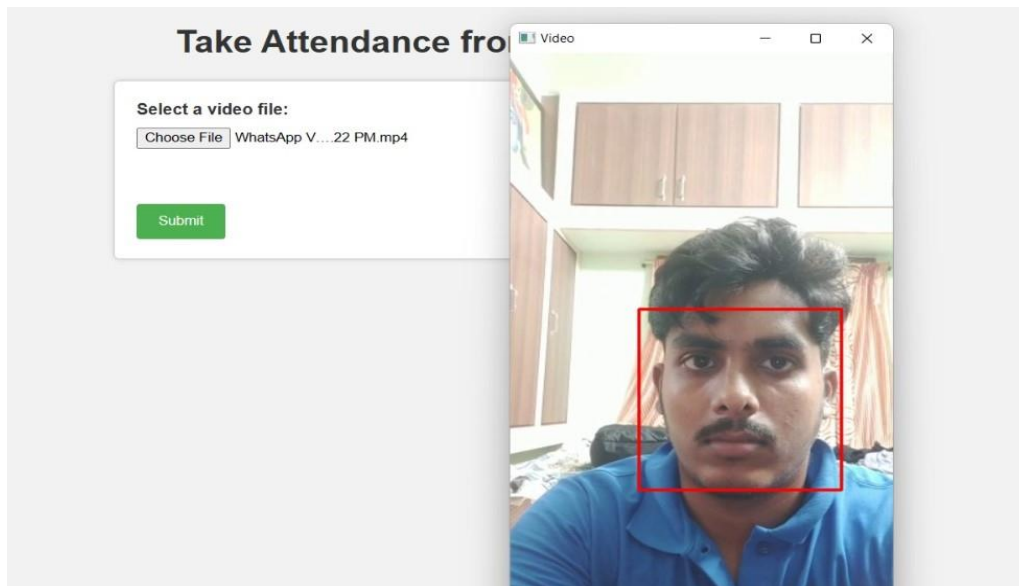
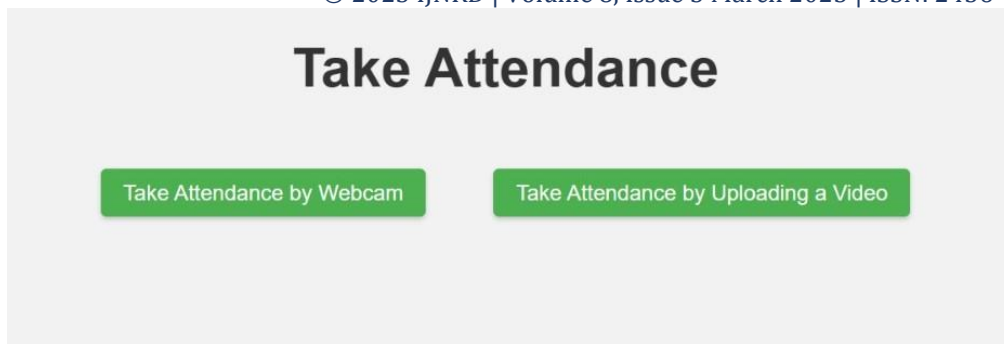
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1  NUMPY.ndarray{'descr': '<f8', 'fortran_order': False, 'shape': (120, 128), }
2  NUMPY.ndarray[0]
3  NUMPY.ndarray[1]
4  NUMPY.ndarray[2]
5  NUMPY.ndarray[3]
6  NUMPY.ndarray[4]
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24 NUMPY.ndarray[22]

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C. TAKING ATTENDANCE

When we hit the take attendance button in the index page, it redirects us to take attendance page. Here, we have two options. One, to take attendance by webcam and second to take attendance by webcam. In take attendance by webcam, camera is opened and attendance is recorded live. In take attendance by uploading a video, video file is uploaded and attendance is recorded.



D. RECORDING ATTENDANCE



When recording attendance using webcam, it is shown on the screen. If the student name is present in the attendance sheet, then do nothing. If not, the student name along with the date and time are saved in the excel sheet. The below image shows the recognized faces of students and the recorded attendance in the excel sheet.

	A	B
1	Name	Time
2	Thanmayi	21-03-2023 13:52
3	Mouli	21-03-2023 13:52
4	Charan	21-03-2023 13:52
5	Yash	21-03-2023 13:52

5. CONCLUSION

This Class Attendance Monitoring System recognizes the faces of registered students very easily. Those people who want to access this model need not know how to develop the system. It is sufficient to know how to use it and can be accessed by everyone easily. The main steps of this project are: To generate dataset of authorized students, use that dataset to train our model, use that model to predict the faces and finally record the attendance. All the steps are accomplished successfully. It met our aims and objectives and we are working to deal with the limitations.

6. FUTURE SCOPE

1. An updated version of the model can be developed where the system can be used not only for students attendance marking but also in private and public organizations for security and attendance purposes.
2. There are few faces that are really tough to distinguish like twin siblings. Building a more precise system for look-alikes can be a challenge.

7. REFERENCES

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