Facial Recognition based Attendance Management System

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Abstract - *Monitoring attendance daily is an important but difficult process especially in schools and colleges for a large group of students as well as employees. Manual attendance marking for teachers is very tedious and tiring, also the process may vary from Universities to States. Attendance is marked either using Roll Calls or an Attendance Sheet is passed among the students onto which they sign and mark their presence. These methods could give rise to chances of duplicate signatures or false roll calls, hence to overcome these drawbacks we have planned to design an Attendance System based on Facial Recognition. In our proposed system, attendance of students will be registered using camera captured photos, compared with the faces present in the database for which we apply various system algorithms including histogram classification, noise removal, face detection & recognition etc. and later marked according to the system-generated output.*

***Key Words*: Attendance; face; recognition; detection; crop; machine learning; deep learning; automated; smart; marking system; database; dataset; training.**

1. INTRODUCTION

Consolidating attendance manually in schools as well as colleges is leading to waste in efforts for professors / teachers as well as the students [1]. Today biometric systems are more widely as their accuracy has since improved to such an extent that nowadays biometric recognition systems are often favoured over other modalities like Fingerprint Recognition, Iris Recognition, Facial Recognition, Voice Recognition and Signature Recognition etc. Face Recognition refers to the technology which can recognize or verify subject identity through image or video sources which also resembles some important applications of Image Processing owing to its use in many fields [8]. First Facial Recognition System algorithms were created in the early 1970s to computerize the traditional methods of attendance marking using Euclidean Distance and K-nearest Neighbour Algorithms to attain better accuracy in results. Face Recognition can be classified into two types:

1.) Appearance-based Techniques that use texture features applied to face or other unique regions.

2.) Feature-based Techniques that use geometric features like mouth, nose, head, etc. and their relationships.

Face Detection detects the presence of face as well as facial features from the photos or even different facial poses from the images using different techniques like: LBP, SMQT features, SNOW Classifier Method [6]. After applying Face Detection Techniques this paper focuses on successfully detecting the faces or objects in the images. Further system trains datasets where the images taken are then checked with the images already present in the database. In case if the image is not present in the database system itself updates the following image as a new identity so that the next time it is considered for student's respective attendance using Face Recognition Techniques like: Haar Cascade Features, Machine Learning, Deep Learning and some Classification Techniques.

2. LITERATURE REVIEW

Literature survey performed for face recognition is a two-step process: Face Detection and Face Recognition. In face detection, the subject field is divided into regions such as "face" and "non face" when the subject is captured [3]. There are different approaches for detecting faces such as Holistic Approach and Feature based approach.

In the proposed system we are using the feature based approach. The feature based approach directs towards detecting faces using the features of the faces such as the placement of eyes, nose and mouth relatively as well as independently [7]. Aside from these, the system faced an issue of illumination where light intensity played a role in detection and recognition of faces. Hence to deal with this variation we convert images into grayscales first and then process them. The key reason for using gray-scale images to derive descriptors instead of explicitly working on color images is that gray-scale optimizes the algorithm and eliminates computational constraints [3]. Also, a Keras machine learning model is used for detecting faces which seem to appear near as well as far away in the picture.

3. METHODOLOGY

In the earlier schemes the student's presence was reported at once for the entire day. Hence if a student is present only for one lecture and then leaves the college; attendance will be marked for the entire day as 'PRESENT'. This paper proposes a framework for the student's automatic attendance which will mark the attendance through face recognition for each lecture in the classroom. In the system proposed here, the database of a student will consist of their name, identity numbers, class numbers, divisions and everything else that will be necessary to identify a particular student. Also, importantly the database will consist of student images which will be used to train model which will further be useful to classify test images. Now, when the faculty uploads an image onto the system, the system detects faces out of that image and looks for matches in the earlier created database. If a particular face is matched into the database then the attendance for the corresponding student is marked.

The proposed system can be considered to be comprising of the following two systems:

A. Facial Recognition System
B. Attendance Marking System

The Facial Recognition System is the one which takes care of detecting, extracting, storing, processing, matching and recognizing faces. There are two types of inputs to this system: First when a new student is added to the database, images are taken to train the model. Second type of input is when the image of the classroom is provided by a faculty from which faces are detected then recognized. But there is only one output of this sub - system, the identity of the students who were recognized into the database.
Now, the function of the Attendance marking sub - system is to take the identities of the students from the facial recognition sub - system as an input and mark their attendances in the database. Also, this system provides various functionalities to retrieve attendance under different kinds of constraints as required by the colleges or organizations as per regulations set by the respective University or Higher Authority.

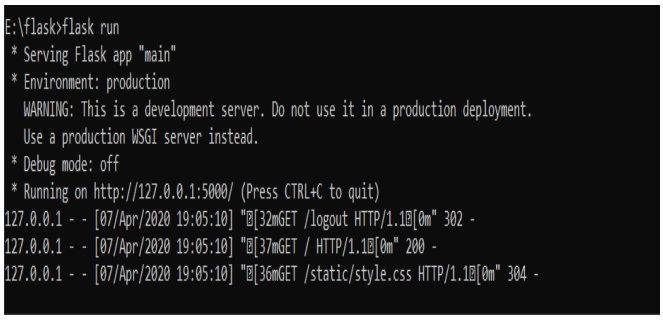

Fig -1: Setting up Flask for UI

3.1 Block Diagram

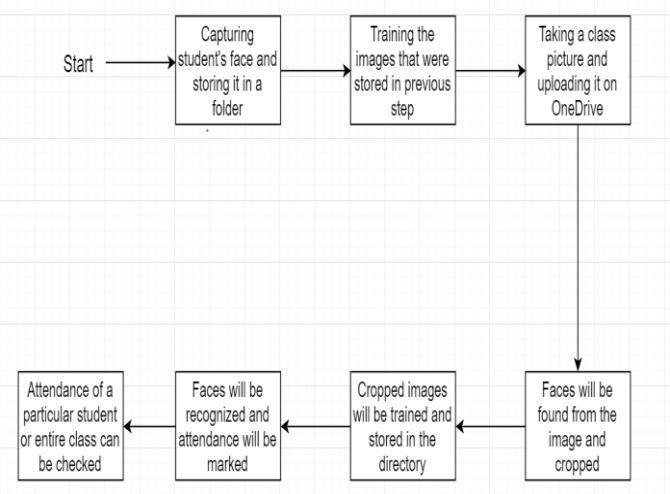

Fig -2: Flow of Project

3.2 Stepwise Procedure

After visiting the link through flask, user will be taken to the portal as shown below where users need to Login to continue. He can either be an admin or a non-admin user; hence there are separate Login options provided respectively.

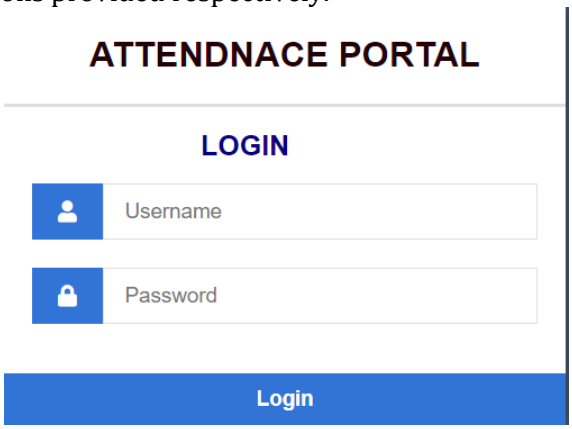

Fig -3: Login to Attendance Portal

The Admin-user has the privileges to perform the following functions as shown in the given figure.

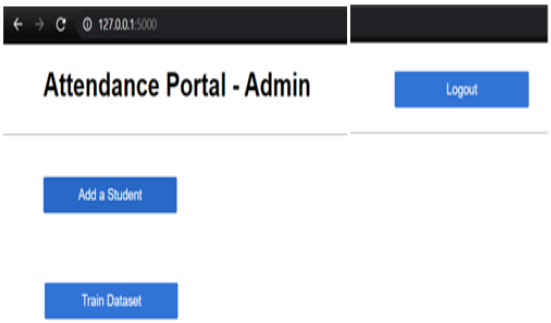

Fig -4: UI for user Logged In as an Admin

1. Create dataset: Faces of students will be captured using Mobile Phones or Webcams and stored in a directory. The image quality of the photos may result in varying accuracy percentage, hence recommended that photos captured must be of high resolution as well as stable.

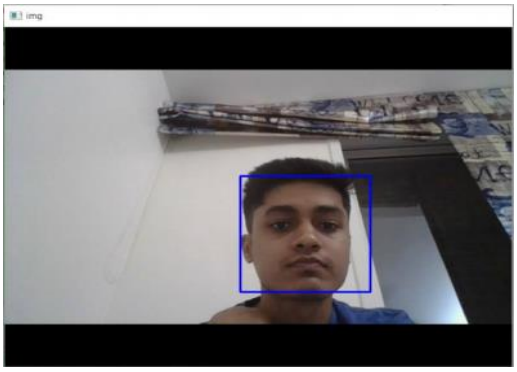

Fig -5: Capturing Photos using Webcam

2. Train dataset: The faces captured in the above step will be trained and an .npz file will be created in the same directory. We need to capture multiple images for each student thereby increasing the percentage of accuracy.

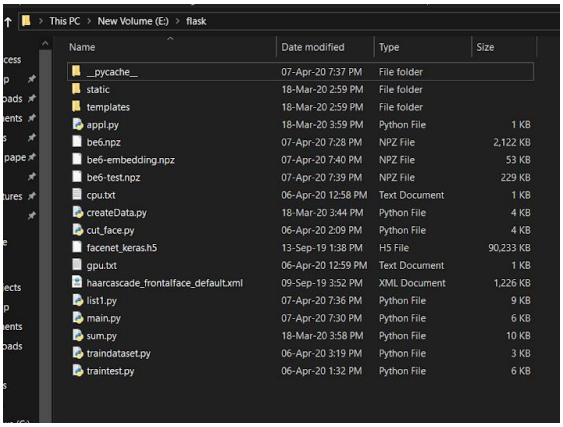

Fig -6: test.npz file is created

3. Test dataset: Pictures of the classroom will be taken and uploaded on OneDrive (preferred) or any other cloud storage platforms. This can be done by the faculty members whenever they get time.

Fig -7: Photos Uploaded to OneDrive

4. Crop face: In this step we will crop human faces from the picture which was uploaded in the above step and save them in the current directory.

Fig -8: Saving Cropped Faces from Photo

5. Training cropped images: This step is similar to Train dataset but in this step the cropped images will be trained and an .npz file will be created.

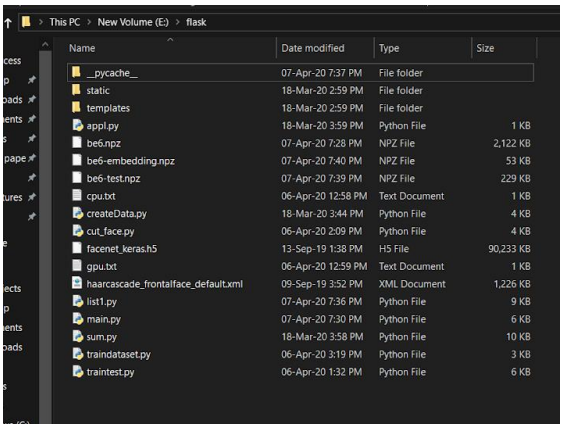

Fig -9: embedding.npz file is created

6. Recognition: Cropped faces will be recognized in this step. Images will be recognized if it passes the given threshold and attendance of those students will be marked in the database.

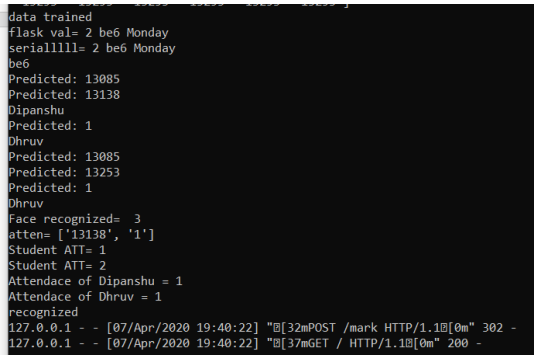

Fig -10: Recognized Students from Photo

7. Checking attendance: Attendance of the entire class or a particular student can be checked by primary fields that can be set in database while feeding data. Multiple queries are implied so that desired output can be achieved.

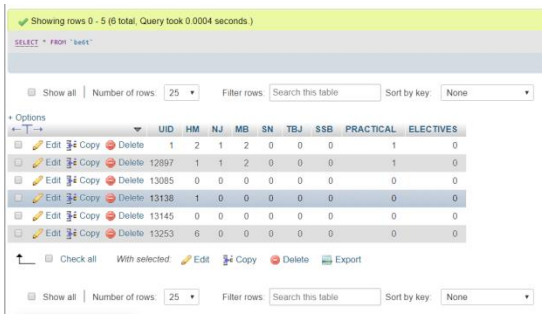

Fig -11: Attendance Record in Database

3.3 Advantages of Approach

- A user friendly system with minimal human interaction.
- This system will help in achieving efficient result in minimum time.
- Paperless way of marking attendance which reduces wastage of paper.
- Prevents marking of proxy and reduces human error.
- Easy retrieval of attendance anytime and anywhere from database.
- Does not need any extra external hardware component.
- Highly secure as only the staff or required members have access.
- Does not require much storage space

4. CONCLUSION

The proposed system will be a novel development step towards the Attendance Management System in various Educational as well as Commercial Organizations. Face recognition systems are now cost effective, reliable and accurate. Our system will help the staff of the organizations to easily & automatically mark attendance of the students, and will also help in different kinds of computational tasks/ operations related to attendance of students. Our system will prevent proxy and reduce the wastage of time. Therefore, the 'Face Recognition based Attendance Management System' will help save Time, Energy, Efforts of a person due to minimum human intervention, and will also reduce human errors and other errors in computation and various tasks [8].

REFERENCES

[1] E. Vardharajan, R. Dharani, S. Jeevitha, B. Kavinmathi, S. Hemalatha, 2016. "Automatic Attendance Management System using Face Detection", (Online International Conference on Green Engineering and Technologies).

[2] Priyanka Wagh, Jagruti Chaudhari, ,Roshni Thakare, Shweta Patil, "Attendance System based on Face Recognition using Eigen Face and PCA Algorithm", Nashik, India.

[3] Sumit Kewalramani, 2018. "Automatic Attendance System by Face Recognition using Machine Learning", (International Journal of Engineering Sciences & Research Technologies), Indore, India.

[4] Manop Phankokkruad, Phichaya Jaturawat, "Influence of Facial Expression and Viewpoint Variations on Face Recognition Accuracy by Face Recognition Algorithms", Bangkok, Thailand.

[5] Khaled Mohammed, A S Tolba, Mohammed Elmogy, 2018. "Multimodal Student Attendance Management System", (Ain Shams Engineering Journal), Egypt.

[6] Refik Samet, Muhammed Tanrivedi, "Face Recognition based Mobile Automatic Classroom Attendance Management System", (2017 International Conference on Cyber Worlds), Ankara, Turkey.

[7] B Prabhavati, V Tanuja, V Madhu, M Babu, "A Smart Technique for Attendance System to Recognize Faces through Parellelism", (14th ICSET IOP Publishing 2017), Tamil Nadu, India.

[8] Anusaya Tantak, Archana Kale, Rujuta Mehtre, Prof S S Pophale, 2017. "Face Recognition for E-Attendance for Students and Staff", (IOSR Journal of Computer Engineering), Maharashtra, India.

[9] Rekha E, Dr. Ramaprasad P, "An Efficient Automated Attendance Management System based on Eigen Face Recognition", Dubai, UAE.