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Smart Attendance System An ML-Based Facial Recognition project

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Abstract - Traditional classroom Attendance Marking is a crucial and also a long-term process. To resolve this problem, we will use Machine Learning based facial recognition technique to detect and recognize the faces of the students in the classroom and mark the attendance based on identification of the student. An input image is taken in every hour of the class and given to the system as input and match it with the known images of the students. We will be using convolutional neural network-based method. With the help of these specification and algorithm we need to mark the presence or absence of the students in the classroom which would avoid complications in existing methods like calling out names and biometric systems.

Key words: Attendance Marking, Features Extraction, Face Detection Method, Face Recognition Method

I. INTRODUCTION

[1] The contents of this paper mainly focus on attendance marking using Machine Learning based facial recognition techniques. Human face plays an important role in our day to day life mostly for identification of a person. The attendance is marked based on the detection and recognition of the faces of the students in the class. Face recognition is a part of biometric identification that extracts the facial features, and then stores it as a face print to uniquely recognize a person. Biometric face recognition technology has gained the attention of many researchers because of its wide application. Face recognition technology is better than other biometric based recognition techniques like finger print, palm-print, iris because of its non-contact process. [2] Recognition techniques using face recognition can also recognize a person from a distance, without any contact or interaction with person. The face recognition techniques are currently implemented in social media websites like Facebook, at the airports, railway stations. [3] At crime investigations, Face recognition technique can also be used where, the captured photo can be stored in a database, and can be used to identify a person. Facebook uses the facial recognition technique for automating the process of tagging people. Recent researches show there is a betterment in facial recognition systems. In the last ten years there is huge development in recognition techniques. Currently, Currently, most of the facial recognition systems perform well with limited faces in the frame. Moreover, these methodologies have been tested under controlled lighting conditions, proper face poses and non- blurry images. The system that is proposed for face recognition in this paper for attendance system is able to recognize multiple faces in a frame without any control on illumination, position of face. One of the big challenges faced during the teaching activities is classroom attendance. It is an indispensable and vital part of classroom tasks done by the faculties which consume lot of time in proctoring and precious timings of them. Further it needs more effort to manually checking for corrections. The proposed system takes in charge of avoiding the enormous time consumption of the facilities in attendance marking and paves the way for faculties to concentrate on the improvement of the students. The system takes in the information and images of the students in the class which is given to the system for training and then the image taken in every hour of the class is passed to identify the student. The image taken overcomes limited light environment, distance factors and human faces differ by having spectacles etc. We can split the working into two divisions which starts with the detection and identification of the input image where the data is converted into the matrix form and the second division takes care of recognition the image and matching it with the students known image matrix, on comparing both the matrix of known and unknown images, the minimum difference matching is the face of the student. Once the processing is completed it will show the list of students absent for that particular class and waits for the faculty's confirmation. This is the phase where the system will cross verify the result provided. Here the faculties submit is taken as final attendance of that particular hour. The final data is stored in the database which can be used anytime for further references. It helps the faculties to monitor the performance of the students and will be easy to get the past records also. The accuracy of the system deals with identifying the images crossing all the parameters like student in long distance and even in limited lightings.

II. LITERATURE SURVEY

[1] Automated Attendance System Using Face Recognition:

Automated Attendance System using Face Recognition proposes that the system is based on face detection and recognition algorithms, which is used to automatically detects the student face when he/she enters the class and the system is capable to marks the attendance by recognizing him. Viola-Jones Algorithm has been used for face detection which detect human face using cascade classifier and PCA algorithm for feature selection and SVM for classification. When it is compared to traditional attendance marking this system saves the time and also helps to monitor the students.

[2] Automated Attendance Management System Based on Face Recognition Algorithms. [3] On this paper they propose an automated attendance management system. This system is basically based on face detection and recognition algorithms, automatically detect the student when he enters the classroom and marks the attendance by recognizing him. Because of LBPH outperforms other algorithms with better

recognition rate and low false positive rate the system is based on this algorithm. . The system uses SVM and Bayesian as a classifier because they are better when compared to distance classifiers. A face region is then extracted and pre-processed for further processing. As not more than two persons can enter the classroom at a time face detection algorithm has less work. The future work they are saying on this paper is to improve the recognition rate of algorithms when there are unconscious changes in a person like tonsuring head, using a scarf, facial hair. The limitation of the system is it only recognizes faceup to 30 degrees angle variations which have to be improved further. Gait recognition should be combined with face recognition systems in order to achieve better performance of the system. Student Attendance System Using Iris Detection [6] In this proposed system the student is requested to stand in front of the camera to detect and recognize the iris, for the system to mark attendance for the student. Some algorithms like Gray Scale Conversion, Six Segment Rectangular Filter, Skin Pixel Detection is being used to detect the iris. It helps in preventing the proxy issues and it maintains the attendance of the student in an effective manner, but in one of the time-consuming process for a student or a staff to wait until the completion of the previous members.

In [13] the author 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.

Xiang-Yu Li [5] the author proposed that recognition face using hog features and pca algorithms. By applying 0recognition algorithm to cropped faces images from that we get similarity b/w taken image and database image.
In this paper PAC algorithm used for face detection and recognition. Arun Katara [8] the author shows that face recognition of facial of different person or student from recognition attendances is upload to database using face detection and recognition of student or workers. From this manual work is decrease by human and automatically attendance system based on faces process done.

III. OBJECTIVE

A. Less Time consuming:

The key detachment of this project is, it is less time consuming. When going along with the traditional method of calling names it shows cons by affecting the factor called time, because it will be more tedious when we call out large number of people in the class one by one. To overcome this, we can think of biometric system which uses finger print of students as a unique id to identify them. But it is not advisable that large crowd of people have to make their presence in each and every hour of a day in a class. Thus, we can conclude it is a time saving system when comparing it with the complications of the existing methods.

B. No human intervention needed & less paper works:

In traditional attendance system, the faculty has to wait until each student respond during attendance. The faculties need to maintain the paper records as well. In this proposed system faculties do not have any kind of intervention, they can procced with their classes and the attendance will be stored in the database for future references for monitoring the student performance.

C. An ease to use product:

Through this project, our goal is to reduce the work and burden of the faculty members. It is an ease to use platform which requires only the image of the classroom and produces results within minutes.

IV. PROPOSED SYSTEM

The system is developed for deploying an easy and a secure way of taking down attendance. The software stores the faces that are detected and automatically marks attendance. It saves time and efforts. It involves two process. At first the input image is taken by covering the whole classroom of all students in a standard quality. From the group image taken, by using python's OPENCV module it detects the human faces and by using facial recognition module it recognizes the face and get the encodings from it.The next step of process is done by using the training images, the images of all the students in a class must be given to the code. Here these images are again detected and faces are recognized and encodings are produced. These encodings are compared with the encoding of the test input image given and results are obtained. Based on the results of comparison, whether the student is identified or not he/she is marked as present/absent respectively. This system uses convolutional neural network method for recognizing the faces of the student in the image provided.

The system is effective in identifying the faces even in low lightning makes it stand out. It also identifies the side images of the student in precise. Later, after getting confirmation from the respective faculty the result is stored in the database for further references and can be viewed and downloaded any time if needed. The result is stored in the database for every hour attendance.
The respective report of attendance will be sent to the respective faculty at the end of each hour of class through mail.

Faculty have all the previous record stored in the database rather than writing names in registers and maintaining paper works. This system allows the faculty to have view and download the records stored in the database.

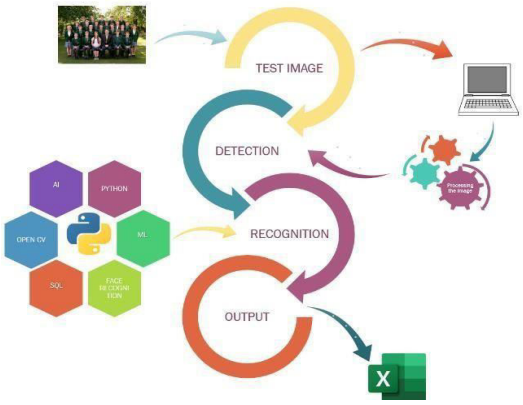

Fig -1: Flow of the proposed system

V. WORK FLOW & RESULTS

The main working principle of the project is that, the image captured is detected and converted into matrix recognize it. Further the recognized image of the student is provided with attendance, else the system marks the student as absent if not present. Capture Image: The mobiles phone is used to capture the image of entire classroom which acts as the input for the project.

Fig -2: Image of students in a classroom

Face Detection:

Face detection can be regarded as a specific case of object-class detection. In object-class detection, the task is to find the locations and sizes of all objects in an image that belong to a given class. Examples include upper torsos, pedestrians, and cars.

Face-detection algorithms focus on the detection of frontal human faces.

It is analogous to image detection in which the image of a person is matched bit by bit. Image matcheswith the image stores in database.

Any facial feature changes in the database will invalidate the matching process.

A reliable face-detection approach based on the genetic algorithm and the eigen-face technique.

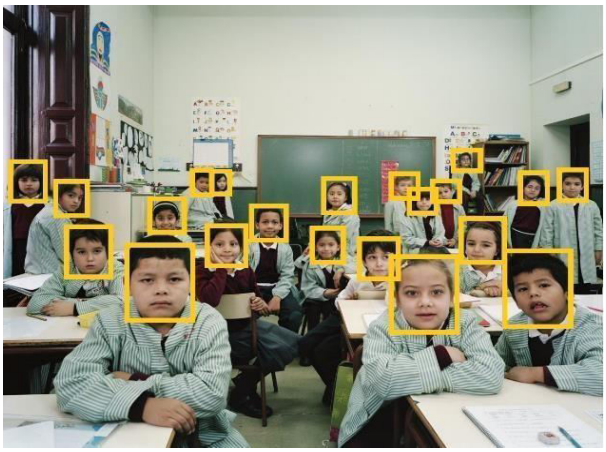

Fig -3: Detecting Images of students.

Face Recognition:

After the completion of detecting and processing the face, it is compared to the faces present in the student's database to update the attendance of the students. Face recognition is achieved using Deep Learning's sub-field that is Convolutional Neural Network (CNN). It is a multi-layer network trained to perform a specific task using classification.

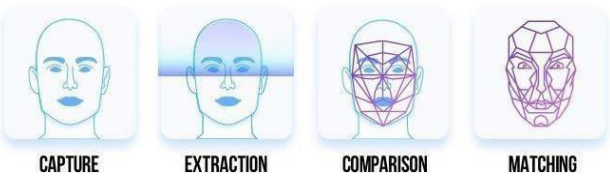

Fig -4: Detecting Images of stud

Result-Processing:

The Result-processing mechanism involves the process of updating the result in the database. This record can be viewed and downloaded by the faculty members anywhere anytime. This attendance record can be sent to respective faculty within the class hour.

CNN (Convolution Neural Network):

CNN (Convolution Neural Network) uses a system like a multilayer perceptron that has been designed to process the requirements faster. The CNN layer consists of an input layer, an output layer and a hidden layer that includes multiple convolution layers, pooling layers, fully connected layers, and normalization layers. The removal of limitations and increase in efficiency for image processing results in a system that is far more effective, simpler to trains limited for image processing and natural language processing.

VI. TECHNOLOGY USED

Anaconda

Anaconda distribution could be a free and open source distribution of the R and Python programming languages for computing such as data science, machine

learning applications, large-scale data processing, predictive analytics, etc. that aims to change package management and preparation.

Anaconda has many packages further as conda packages and virtual atmosphere. It conjointly includes a user interface referred to as Anaconda Navigator. It is graphically different to the statement interface.

Anaconda Navigator

Anaconda Navigator can be a graphical desktop interface included in Anaconda Navigator Distribution that allows users to launch applications and control conda packages, environment, and networks. Navigator can rummage around for packages on the Anaconda Navigator Cloud or in a very native Anaconda Navigator Repository, install them in an environment, run and upgrade the packages. It is on the Windows, macOS, and UNIX market. The applications are JupyterLab, Jupyter Notebook, Spyder, Orange, RStudio, Visual Studio Code.

Spyder

Spyder (Scientific Python Development Environment) is an integrated software environment (IDE) with open source cross-platform for scientific programming in the Python language. Spyder also incorporates NumPy, SciPy, Matplotlib, Pandas, IPython, SymPy and Cython as an alternative open source program with a range of excellent packages within the scientific Python stack. It is cross platform on the market Anaconda.

Python

Python is a general programming language, which is high level. The language constructs and object-oriented methodology are aimed at helping programmers write simple, logical code that comes in for small and large scale. This embraces many programming paradigms, as well as programming that is procedural, object-oriented and sensible.

Mongo DB

MongoDB is a general purpose, document-based, distributed database built for modern application developers and for the cloud era. MongoDB supports a rich and expressive object model. Objects can have properties and objects can be nested in one another (for multiple levels). This model is very "object-oriented" and can easily represent any object structure in any domain. Indexes speed up the queries significantly, but they also slow down writes. Secondary indexes are a first-class construct in MongoDB. This makes it easy to index any property of an object stored in MongoDB even if it is nested. This makes it really easy to query from the database based on these secondary indexes. MongoDB supports a "single master" model. This means it have a master node and a number of slave nodes. In case the master goes down, one of the slaves is elected as master. The trade-off for multi-master is that the reads are slower and scale less effectively because the client must read from multiple nodes to ensure consistency. During the time of new leader election, replica set is down and cannot take writes. MongoDB, allows not to enforce any schema on the documents. While this was the default in prior versions, in the newer version it has the option to enforce a schema for the documents. Each document in MongoDB can have a different structure and it is up to the application to interpret the data. While this is not relevant to most applications, in some cases the extra flexibility is important. Schema-less models mean that documents in the same collection do not need to have the same set of fields or structure, and common fields in a collection's documents may hold different types of data. These are the viewable advantages which won over the Relational database model.

VII. FUTURE ENHANCEMENTS

• As a part of future scope of application, we can get the images of the classroom from live streaming video and from the frames we can get the faces detected.

• We would also like to explore better algorithms for face detection and face recognition to increase the number of students to be detected and recognize.

• Also, it can be implemented more in other places where there is need to mark presence of every individual in large crowded area like seminar hall, conferences, meetings etc.

VIII. CONCLUSION

The proposed system, helps in making the tedious attendance process easier by using face IDs of the students. It eliminates the necessity of keeping the previous records in larger files instead it extends it advantage in keeping all the files in a database and can be accessed by respective faculties everywhere. It keeps all the past records readily available which can further be used in analyzing the performance of the students. It helps the faculties more in concentrating the performance of the student than wasting their precious time in reviewing records.

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