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Smart Attendance System Based on Facial Recognition

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ABSTRACT—Face recognition systems play a critical role in practically every area in today's digital economy. One of the most widely utilized biometrics is face recognition. It can be used for security, authentication, and identity, among other things. Despite having lower accuracy than iris and fingerprint recognition, it is commonly utilized due to its contactless and non-invasive nature. Face recognition systems can also be used to track attendance in places like schools, colleges, and companies. Because the existing manual attendance system is time consuming and difficult to maintain, this system intends to create a class attendance system that employs the concept of face recognition. And there may be prospects of proxy attendance. As a result, the demand for this system grows. Database development, face detection, face recognition, and attendance updating are the four steps of this system. The photos of the kids in class are used to generate the database. The Haar-Cascade classifier and the Local Binary Pattern Histogram technique are used to detect and recognize faces, respectively. Faces are discovered and recognized from the classroom's live streaming footage

I. INTRODUCTION

Face recognition Technique is becoming increasingly important in today's digitized world as their practical applications in various days-to –day activities are rapidly increasing. In many schools and universities, the traditional system of attendance marking is a time-consuming task. It is also a strain on the professors, who must physically call the names of students to mark attendance, which could take up to 5 minutes of the entire session. This takes a long time. There is a probability that a proxy will be present. As a result, several institutions have begun to employ different methods for documenting attendance, such as Radio Frequency Identification, iris recognition, fingerprint recognition, and so on. These methods, on the other hand, are queue-based, which might take longer and be obtrusive.

Face recognition has established itself as an important biometric characteristic that is both simple to acquire and non-intrusive. Face recognition systems are indifferent to a wide range of face expressions. There are two types of face recognition systems: verification and face identification. Facial verification is a complete matching method of facial nodes that compares a person's face image to previously saved face photographs.

The goal of this system is to create an attendance system that uses face recognition technology. In this case, an individual's face will be used to determine attendance. Face recognition is becoming increasingly popular and is now frequently employed. In this research, we propose a system that recognizes students' faces from live footage of a classroom and marks attendance if the faces are found.

II. LITERATURE REVIEW

Authors in paper [1] have explained Face recognition, as one of the most successful applications of image analysis that has recently gained significant attention. It is due to availability of feasible technologies, including mobile solutions. Research in automatic face recognition has been conducted since the 1960s, but the problem is still largely unsolved. Last decade has provided significant progress in this area owing to advances in face modeling and analysis techniques. Although systems have been developed for face detection and tracking, reliable face recognition still offers a great challenge to computer vision and pattern recognition researchers. There are several reasons for recent increased interest in face recognition, including rising public concern for security, the need for identity verification in the digital world, face analysis and modeling

techniques in multimedia data management and computer entertainment.

In this paper they have discussed face recognition processing, including major components such as face detection, tracking, alignment and feature extraction, and it points out the technical challenges of building a face recognition system. They focused on the importance of the most successful solutions available so far. The final part of the chapter describes chosen face recognition methods and applications and their potential use in areas not related to face recognition.

Authors in [2], explain why Python is a suitable language for both learning and real world programming. Python is a powerful high level, object-oriented programming language created by Guido van Rossum. In this paper we first introduce you to the python programming characteristics and features. This paper also discusses about the reasons behind python being credited as the fastest growing programming language in the recent times supported by research done over the articles procured from various magazines and popular websites. This paper features about the characteristics and most important features of python language, the types of programming supported by python and its users and its applications.

Paper [3] is all about why Artificial Intelligence is becoming increasingly relevant in the modern world where everything is driven by technology and data. It is used extensively across many fields such as search engines, image recognition, robotics, finance, and so on. We explored various real-world scenarios in this book and we learnt about some keywords that can play an important role in building Artificial Intelligence applications.

During the course of this paper, we will find out how to make informed decisions about what algorithms to use in a given context. Starting from the basics of Artificial Intelligence, you will learn how to develop various building blocks using different data mining techniques. You will see how to implement different algorithms to get the best possible results, and will understand how to apply them to real-world scenarios. If you want to add an intelligence layer to any application that's based on images, text, stock market, or some other form of data, this exciting book on Artificial Intelligence will definitely be your guide!

Paper [4,] explains the motivation of using python as GUI and introduction of Tkinter toolkit and its features. Tkinter, or "Tk interface", is a module of python that provides an interface to Tk GUI toolkit, developed in TCL (Tool Command Language) and multiplatform, with support for Linux, MAC OS and MS Windows. Tkinter is natively present in Linux and MAC OS, and can be easily installed on MS Windows; it is not part of Python. Tkinter is part of Python, being called "Tkinter" in versions prior to 3, and "Tkinter" on version. Widgets, geometry management and event handling are the three main concepts of Tk, which also apply for Tkinter. Widgets Often referred to as controls, or window elements, widgets are all visible components on a graphical inter-face. Some examples are frames, labels, buttons, text entries, checkboxes, tree views, scrollbars, and text areas.

In paper [5], they have explained Face recognition, as one of the most successful applications of image analysis that has recently gained significant attention. It is due to availability of feasible technologies, including mobile solutions. Research in automatic face recognition has been conducted since the 1960s, but the problem is still largely unsolved. Last decade has provided significant progress in this area owing to advances in face modeling and analysis techniques. Although systems have been developed for face detection and tracking, reliable face recognition still offers a great challenge to computer vision and pattern recognition researchers. There are several reasons for recent increased interest in face recognition, including rising public concern for security, the need for identity verification in the digital world, face analysis and modeling techniques in multimedia data management and computer entertainment.

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Recent advances in automated face analysis, pattern recognition and machine learning have made it possible to develop automatic face recognition systems to address these applications. On the one hand, recognizing face is natural process, because people usually do it effortlessly without much conscious. On the other hand, application of this process in area of computer vision remains a difficult problem. They are based on the important advantage—non-invasiveness.

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Behavioral patterns are more sensitive to human overall condition, such as stress, illness or fatigue. The brief analysis of the face detection techniques using effective statistical learning methods seems to be crucial as practical and robust solutions.

III. PROPOSED SYSTEM

All students in the class must first register by filling out the appropriate information, after which their photographs will be uploaded. Faces will be detected from live streaming video of the classroom during each session. Faces will be identified and matched to photographs in the dataset. If a match is found, the student's attendance will be recorded. A list of absentees will be mailed to the faculty member in charge of the session at the end of each session. The suggested system's architecture is shown in the figure1.

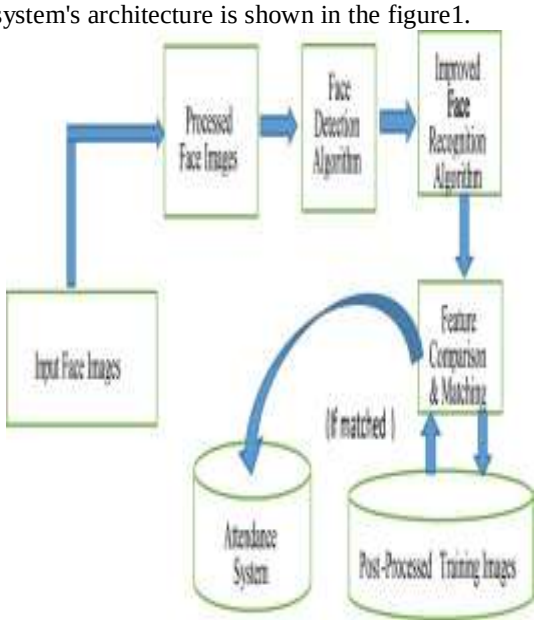
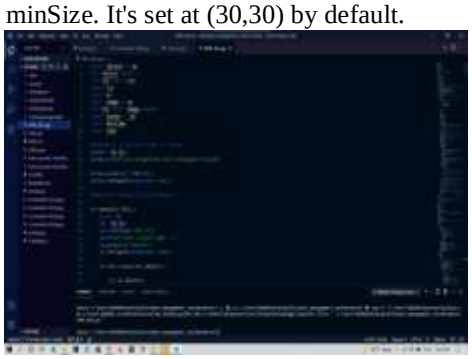


Figure-1

Basic representation of system architecture

This procedure is usually broken down into following stages:

1. Creation of dataset: A web cam is used to collect images of students. Multiple photographs of a single student will be taken from various angles and gestures. Pre-processing is applied to these photos. Cropping the photos yields the Region of Interest, which will be used in the recognition procedure. The cropped photos are then resized to a specific pixel point. After that, these photos will be transformed from RGB to grayscale. The photographs will subsequently be saved in a folder with the names of the students.
2. Face Detection: The Haar-Cascade Classifier with OpenCV is used to detect faces in this example. Before it can be utilized for face detection, the Haar Cascade algorithm must be taught to detect human faces. Feature extraction is the term for this process. The training data for the haar cascade is an xml file called haarcascade frontalface default. For feature extraction, the haar features will be employed. The detect Multiscale module from OpenCV is being used here. To construct a rectangle around the faces in an image, this is required. It takes into account three parameters: scale Factor, minNeighbors, and minSize. The Scale Factor is a metric that indicates how much an image must be scaled down in each picture scale. The minimum number of neighbors that each candidate rectangle must have is specified by minNeighbors. Higher values frequently detect fewer faces but detect higher image quality. The minimal object size is specified by minSize. It's set at (30,30) by default.



All the necessary libraries need to be imported first.

3. Face Recognition: Preparing training data, training the face recognizer, and making predictions are the three processes in the face recognition process. The photos in the dataset will be used as training data. They will be given the integer label of the student to whom they belong. Face recognition is then performed on these photos. Local Binary Pattern Histogram is the face recognizer employed in this system. The list of local binary patterns for the entire face is first compiled. These LBPs are then transformed to decimal numbers, and histograms of all of the decimal values are created. At the end, each image in the training data will have its own histogram.

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4. Attendance Updating: The recognized faces will be marked as present on the excel sheet, while the remainder will be tagged as absent, and the list of absentees will be mailed to the respective faculties. At the conclusion of each month, faculties will be updated with a monthly attendance sheet.

IV. RESULTS AND DISCUSSION

Users will be given four options here: student details, take image, train image, test image, and automatic attendance. Students must fill out all relevant information, such as their enrolment number, and save their work", as shown in the figure-2.

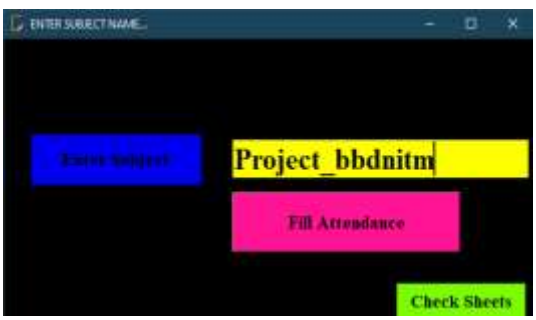
Figure-2

Entry fields

The web cam starts automatically after clicking the Take Image button, and a window appears "Get in Frame", as shown in the figure-3, that begins detecting the faces in the frame. The camera then begins taking images automatically until the image has been trained according to the instructions.

Face Capture

After that, the photographs will be pre-processed and saved in the training images folder.
Faculty members are expected to register with the appropriate subject name.



The below figure-5 shows the attendance sheet is updated after clicking the "Automatic Attendance" button. All the students who have been registered and trained earlier using the train button are successfully marked with their respective details.

recognition process. Recognized students are marked as '1' and absent students are marked as '0'. The list of absentees

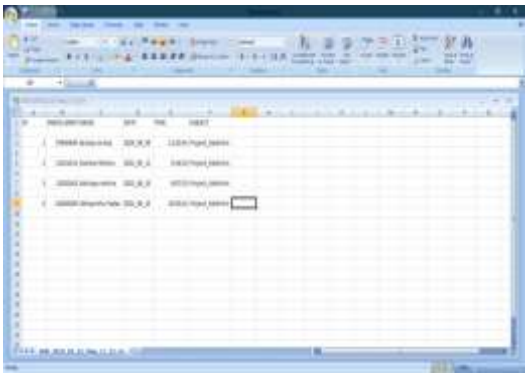


Figure-5
Attendance Updated Successfully

V. CONCLUSION

In the case of the COVID-19 outbreak, contact tracing via biometric identification has become a commonly used strategy for limiting virus dissemination. Various countries are incorporating facial recognition into their systems and replacing it with contact biometric technologies for everything from monitoring temperatures to identifying people without masks. It operates on a massive algorithmic scale, with the software storing or accessing a vast amount of data. According to the report, approximately half of all adults in the other countries have their photographs kept in one or more face recognition databases utilized by various government agencies for public safety.

The computational models, which were implemented in this project, were chosen after extensive research, and the successful testing results confirm that the choices made by the researcher were reliable.The system with manual face detection and automatic face recognition did not have a recognition accuracy over 90%, due to the limited number of Eigen faces that were used for the PCA transform. This system was tested under very robust conditions in this experimental study and it is envisaged that real-world performance will be far more accurate. The fully automated frontal view face detection system displayed virtually perfect accuracy and in the researcher's opinion further work need not be conducted in this area.

Using face recognition algorithms, this system tries to provide an effective class attendance

system. The suggested technology will be able to track attendance using facial recognition. It will use the webcam to detect and recognize faces. It will mark the honored student's attendance and update the attendance record after recognition.

VI. FUTURE SCOPE

Now a day's face recognition multi-management system is used in many fields like security, law enforcement, disease analysis, research etc., this technique is inspired by architecture of human brain. After concluding all literature review we can say that the face recognition multi-management system still needs to be addressed for successful implementations.

In Future we can improve more efficiency for face recognition techniques, because the data generation is increasing very fast, and also we should focus on the commodity hardware.

Also conclude from this paper we can say the different implementations of face recognition multi-management system are the respective applications and there is lack of standard benchmark or workload for comparing other implementations and extensions.

VII. ACKNOWLEDGMENT

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