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AUTOMATED FACIAL RECOGNITION FOR CLASS ATTENDANCE

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Abstract: Students' daily attendance may be tracked in real time with Face Recognition Class Attendance. In order to keep track of student attendance, high-definition facial biometrics are employed. Face recognition, a branch of machine learning that utilizes deep learning techniques, is one such application. The current methods of collecting attendance are time consuming. Manually entered attendance records are vulnerable to error. Proxy attacks can be used against both traditional methods of attendance tracking and biometric systems. This paper's major goal is to address these concerns. KNN, SVM, CNN, Haar Classifiers, and Gabor filters are all included in the suggested system. A picture set of students is used to train and test the algorithm. The attendance of pupils will be created and kept in an excel sheet after a successful face recognition. Attendance in a classroom may be taken more quickly and efficiently using the new method. The method we've created is simple to use, and it also saves you money.

Keywords: Face Recognition, Gabor Filters, HAAR classifiers.

I. INTRODUCTION

It's tough to keep track of one's attendance while going about one's regular business. Keeping track of students' attendance is a must for any organisation, and each one has a different method for doing so. Some utilise a paper sheet and a pen to manually record attendance, while others employ biometrics like fingerprints, RFID cards, and Iris recognition. It takes a long time to individually call each student's name. There is a danger of card loss or illegal use of the card for fraudulent attendance if the RFID technology is used by each student. They all have its limitations and are not 100% accurate, such as fingerprints or iris scans.

In order to construct an attendance management system, the usage of facial recognition is simple. Additionally, face-recognition technology reduces the likelihood of false attendance. Passive identification is possible with face recognition since the person being recognized doesn't have to do anything to be recognized.

A wide range of techniques for facial recognition and identification have recently been developed. To identify a person's facial characteristics, there are two methods: appearance-based (covering the entire face) and feature-based (geometric features such as eyes, nose and mouth).

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Using machine learning, face recognition is utilised to improve the current system's performance. A high-quality camera is needed to capture images of students, and the identification process is carried out using a histogram of oriented gradient. Recognition of performance may also be accomplished through the application of deep learning. Students' attendance is determined by comparing their input image to a set of reference photographs, which are stored in the system once the camera's images are uploaded.

II. LITERATURE SURVEY

A fingerprint-based attendance system was proposed by the author in [1]. Students might use a portable fingerprint gadget to put their finger on the sensor during class without the assistance of an instructor. Using this technique, you can be sure that your attendance will be accurately recorded. Distracting pupils by handing them a device during a lecture is an issue with this approach.

Radio Frequency Identification (RFID) systems have been studied extensively in the literature. In order to be recorded, pupils are required to wear an RFID tag-type badge that must be inserted into a card reader, as described in [2]. Recorded attendance may be saved to a database using the system's RS232 connection to the computer. It's possible that someone may get access to this system without permission. A legitimate ID can be used to gain entry into the organisation by persons who are not authorized.

Facial recognition and detection systems have been developed on a wide range of platforms, including Mat Lab and microprocessors, as well as in academic research. [3] Based on the raspberry pie face recognition system, they applied techniques such as hair cascades and other conventional facial detection and recognition methods. Using face recognition instead of passwords and RFID cards is the primary objective of these researchers.

According to Jalendu Dhamija et al. [8], in their study "An Advancement towards Efficient Face Identification utilising Live Video Feed," they advocated the use of three algorithms to increase face recognition rates: Fisherface, PCA, and SVD. The rate of recognition can be improved by omitting some methods and holding out on others.

Tanupriya Choudhury [9] worked with Aayush Mittal, Fatima Sartaj Khan, Praveen Kumar, and Tanupriya Kumar to automate the conventional technique of collecting attendance on registers and to interface the system with the cloud in order to make all the information immediately available and eliminate mistakes. Attendance may be recorded at a single time for a group of students using this method. As a result, the Viola-Jones, Eigen Vectors, and Adaboost algorithms used in this system prove to be more dependable and accurate than the alternatives for recording attendance.

III. SYSTEM DEVELOPMENT

A very durable, modular, scalable, and secure system was designed for the proposed system. Android Studio, JAVA (Android), SQLite Database, and XML were all used to make this happen. Android Studio is a tool for developing Android-optimized apps. Because of the extensive set of libraries available in JAVA, it was chosen as a

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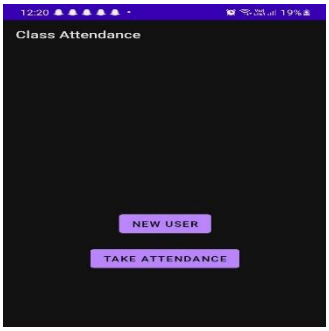
programming language. In order to design the app's user interface, Android development was employed. It was used to style the layout of the programme, as well as the various aspects of the layout, and to transfer data between the various Android system components. Because of its flexibility and accessibility, the relational database management system SQLite was included into the system.

There are two sections of the app: one for new users, and the other for those who need to take attendance.

(a) NEW USER: Splash screen, registration screen, and category details are all part of the user experience. The first time an Android app is launched, a splash screen will appear, which will blink for 30 seconds before the actual app is launched. The splash screen is an inherent function of the Android Studio tool, and when you pick it, the inbuilt design of the screen appears, which may be customized to meet your specific needs.

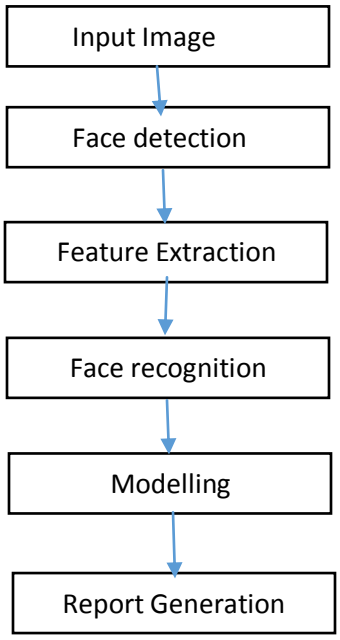


(b) REGISTRATION SCREEN: There will be a registration page after the splash screen. When registering, the user must provide his complete name, Roll number, and an image of themselves. After clicking the Register button. Afterwards, the student will be able to access their academic records.

(c) TAKE ATTENDANCE SCREEN: The following screen will be a Take Attendance screen after the splash screen. In order to proceed, the user will need to snap a photo of themselves. Afterwards, when you press the ″OK″ button. After the pupil has been effectively captured.

IV. METHODOLOGY

Flow chart



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A. DATABASE CREATION

In the first phase, the database will be established at the time of student enrollment. The database will contain basic information on each student, such as their name and class number. The student's photograph will be used to train the recommended system. All of the students' images are saved in one place for instructional reasons. Using all of the photos in the database, we were able to perform face recognition on the students in attendance at the lecture. This can be accomplished.

B. IMAGE AMELIORATION

A student's movement may cause a camera in a classroom to get a blurry image. Adversarial networks can be used to enhance the image. It is well−known that GANs are capable of maintaining picture texture information, generating solutions that appear plausible, and maintaining photo texture information.

C. FACE DETECTION

Face detection relies on facial landmarks. These landmarks aid in the recognition of faces. Detection of face features was accomplished using Haar classifiers. There are several photos used to train a cascade function in this ML technique. In order to identify additional images, this technique is used on them. Subtracting the total of pixels from the sum of pixels beneath the black zone is used to build these classifiers. It was found to be difficult to apply 6000 different attributes to every single window frame. Features were grouped into stages, known as classifier cascades, to facilitate classification. In order to remove unnecessary features, AdaBoost might be employed.

D. FEATURE EXTRACTION

A Gabor filter is used in feature extraction to capture skewed face traits. If you want to extract features that aren't susceptible to illumination, occlusion, position variation and context then this is a critical step. 2DGabor filters are used to rectify spatial distortions caused by location and illumination variation.

E. FACE RECOGNITION

We employed KNN, CNN, and SVM for facial recognition. Because of their accuracy, robustness, and complexity, these three methods are compared.

K−nearest neighbor algorithm：

In the process of learning, KNN maintains the analysis of training samples as a result of the process. KNN data points are typically located by using the Euclidean distance measure. Objects are classified according to the preferences of the majority of their immediate neighbours, and they are then placed in the most appropriate category.

$$d(x,y)=\sqrt{x_1 - y_1)2 \ldots \ldots (x_n - y_n)2}$$

d(x,y) is the euclidean distance.

Conventional Neural Networks：

Different aspects of photos may be inferred by using convolutional neural networks. Face recognition systems can benefit from this feature extraction approach. 68 facial characteristics are used by CNN to yield 128−dimensional encoding, which is an RGB−encoded face feature. These codes are used to identify the faces that are similar to the ones in the database. The severity of face

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comparisons can be influenced by one's level of tolerance.

Support Vector Machine:

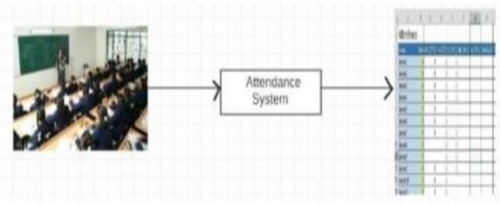
According to the SVM, the data is categorised according to the level that optimises the profit margins. There are no gaps in the SVM's decision bounds. SVM is a very effective image classification technique. SVMs outperform standard query refinement systems in terms of search accuracy after just three or four rounds of relevant feedback, according to experimental data. Additionally, this holds true for image segmentation systems that make use of privileged SVMs or customised SVM variants.

REMOVAL OF REDUNDANCY:

There's a good chance that some photographs may have an unmarked pupil face due to the device's several cameras. During a presentation, a student's attendance will be marked based on the number of unmarked faces he or she seems to have.

F. REPORT GENERATION

The following pupils are marked as present in an excel sheet that contains information about the verified students. Students' names, numbers on their rosters, and whether or not they were present over the course of a lecture are all included in this list. The database is then updated with this information.



RESULTS

When all of the below factors are taken into account, the algorithm's accuracy, precision, and time complexity are calculated.

Algorithm	CNN	KNN	SVM
Accuracy	99. 3	98. 6	88
Precision	0. 98	0. 98	0. 78
Time Complexity	124S	120S	480S

CONCLUSION

High accuracy and minimal time complexity are achieved by the developed system. Hands-on work is reduced because of the adoption of new technology. Gabor filters now have far higher accuracy. Facial recognition was performed using three different algorithms. Conventional neural networks and K-nearest neighbour algorithms. KNN was determined to have a 99. 3 % accuracy rate. The computational complexity of traditional neural networks was determined to be modest. It was discovered that SVM is not optimal compared to other methods.

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