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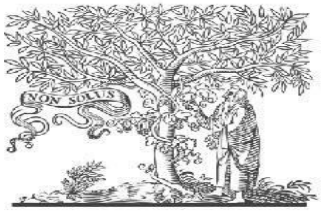

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FACE RECOGNITION BASED ATTENDANCE SYSTEM USING CNN ARCHITECTURE

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ABSTRACT:

Marking attendance in a classroom during lectures can be tedious and time-consuming, especially when dealing with many students. The traditional methods of attendance marking are vulnerable to proxy attendance, making it challenging to maintain accurate records. Our proposed project aims to create a more reliable automated attendance marking and management system by utilizing facial recognition technology. While biometric techniques such as fingerprint and Radio Frequency Identification tags have been utilized in the past, they have proven to be less reliable than desired. Therefore, we believe that facial recognition technology can be a more accurate and efficient means of recording attendance. The system aims to simplify the attendance marking process and save time by using face detection and recognition algorithms. The system comprises four phases: Image Capturing, Segmentation of group image and Face Detection, Face comparison and Recognition, Updating of Attendance in the database. The system records attendance by processing images of students' faces, comparing them against stored records, and updating the attendance database accordingly. By using facial recognition technology, the proposed system aims to overcome the challenges of traditional attendance marking methods and provide an efficient and reliable solution.

INTRODUCTION

Human involvement and inaccuracy will be reduced by the technology-based attendance system. Numerous different types of attendance systems are used in various industries, including biometric attendance systems, RFID (Radio Frequency Identification) attendance systems, which are typically used in large organisations, and NFC (Near Field Communication) attendance systems, which have extremely short transmission distances. If a user uses two devices that are used in an area that is larger than a few centimetres, communication between the devices will be cut off. NFC uses wireless communication technology, a high frequency operating at 13.56 MHz, and a maximum data transmission speed of 424 Kbit/s.

Computer-based vision algorithms leverage various facial features for various applications, including emotion detection, multiple camera surveillance, and face recognition. Of these applications, the face recognition system has garnered considerable interest from researchers. For face recognition, a number of techniques have been considered, including Support Vector Machine (SVM), Multi-Layer Perceptron (MLP), and Convolutional Neural Network (CNN). Face identification is accomplished using Deep Neural Networks (DNN), while SVM and MLP techniques use Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) for feature extraction. In the CNN method, photos are provided as a feature straight into the CNN module. The CNN approach has shown the highest accuracy in face detection, achieving a test accuracy of 98% on self-generated databases, while SVM and MLP approaches achieved test accuracy of 87% and 86.5%, respectively. These results suggest that CNN-based approaches are more accurate and reliable for face recognition applications.

WORK RELATED

Convolutional Neural Networks, or ConvNets/CNNs, are a class of Deep Learning algorithms used for image processing tasks. These networks can take input images and learn to assign importance to various aspects or objects in the image, enabling them to differentiate between unique features. The overarching goal of this field is to develop algorithms that enable machines to view and understand the world in a comparable manner to humans, allowing for a wide range of applications like image and video recognition, categorization and analysis of images, media recreation, recommendation systems, and natural language processing. Deep Learning has significantly advanced the field of computer vision, primarily through the use of ConvNets. Over time, these algorithms have been refined and perfected, leading to a wide range of exciting possibilities for AI (Artificial Intelligence) and machine learning.

Facial Key Point detection is a technique used to mark specific areas of the face, such as the eyes, nose, and mouth, which are relevant for various computer vision tasks like face filters, emotion recognition, and pose recognition. This process is achieved using Convolutional Neural Networks (CNN) and computer vision techniques. The key aim is to predict the coordinates of specific facial key points, such as the nose tip, center of eyes, etc., for a given face. To accomplish this, a CNN-based model that uses autoencoders is employed. CNNs are well-suited for this task due to their deep structure, which allows them to extract high-level information and deliver greater accuracy when identifying each critical point. The architecture of the convolutional network is designed to predict all facial key points simultaneously, enabling a comprehensive and efficient analysis of the face. This technique has immense potential for various real-world applications that require the accurate and precise detection of facial features.

Convolutional Neural Networks, or CNNs for short, are a specific type of neural network that incorporates convolutional layers to conduct computations on input data. These networks are typically employed for image processing tasks. These convolutional layers perform a

mathematical operation known as convolution, which is applied to the input data using filters or kernels to extract relevant features from the input data.

Convolutional output can be categorised into three modes: Full, Same, and Valid. The Valid mode is typically used for forward propagation to make it easier to extract features from images, while the Full mode is frequently used for backpropagation to get the best weights.

Pooling layers are typically placed after convolutional layers in the neural network, and their purpose is to reduce the output feature data from the convolutional layers. Pooling operations can compress the information in the output data without losing valuable information, reducing the risk of overfitting in the neural network. Additionally, pooling can help to extract features from the image data, contributing to the neural network's ability to classify the input data accurately.

PROPOSED SYSTEM

The proposed system for automatic attendance management using face recognition has several advantages over traditional manual methods. It is more efficient and saves time as it does not require the manual labor of taking attendance, which can be time-consuming and prone to errors. Additionally, face recognition is a reliable biometric process, which is difficult to forge, making it a secure method for attendance management.

The use of computer vision and deep learning techniques in this system enables accurate face detection and recognition, even in situations with varying factors such as skin color tone, hair, glasses, and picture quality. The system uses image capture to identify faces and mark attendance, which is a non-intrusive and convenient method for both students and teachers.

The GUI application created using Flask provides an easy-to-use interface for the users, making it accessible and user-friendly. Attendance management could undergo a substantial revolution thanks to the proposed technology that uses face recognition for automatic attendance tracking practices in educational institutions and workplaces. By introducing a more efficient and accurate method of attendance marking, this system could revolutionize attendance management as we know it.

AWS provides a wide range of machine learning services, including Amazon Recognition, which can be used for image and video analysis. Recognition makes it easy to add facial recognition capabilities to your application, enabling you to recognise and assess faces for a variety of use cases, including user identification, population census, and public safety. By using AWS, the project can leverage highly efficient deep learning technology and managed databases to create a secure and scalable solution for attendance management.

The camera-based attendance system can help schools and colleges save time by automating the attendance process. By using the camera to capture multiple faces of students in the classroom, the system can quickly identify and mark the attendance of each student. AWS recognition service can help improve the accuracy and efficiency of the facial recognition process. Overall, the project can provide a reliable and efficient

solution for attendance management in educational institutions.

Three tasks are performed by this AWS recognition service:

- ➢ Face and object Detection
- ➢ Face recognition
- ➢ Face comparision

Face Detection:

HOG (Histogram of Oriented Gradients) is a popular technique used for object detection, particularly for detecting human faces in images. It works by calculating the gradient orientation and magnitude for each pixel in an image and then grouping these gradients into cells. The cells are then normalized to reduce the effect of changes in lighting and contrast. The resulting histogram of oriented gradients is used as a feature descriptor for the object being detected, in this case, human faces.

The HOG method is particularly useful for face detection because it is invariant to changes in lighting, pose, and scale. This means that it can detect faces even if the lighting is poor or the faces are in different orientations or sizes. The HOG method is effective for face detection, achieving high accuracy rates on benchmark datasets such as the FDDB (Face Detection Data Set and Benchmark).

Face Recognition:

Facial recognition is a biometric technology that uses computer algorithms to extract unique features of an individual's face from an image or video and then matches those features against a database of known faces to identify or verify the person's identity. This technology has gained popularity in recent years due to its potential use in security systems, surveillance, and access control, as well as its convenience in applications such as unlocking smartphones or making payments.

Deep learning algorithms are used by facial recognition systems to examine and extract features from a person's face, such as the space between their eyes, their nose and mouth's shapes, and the angles of their jawline. To discover a match, these features are then run against a database of recognised faces. Several pictures or videos of the same person shot at various angles or with various lighting conditions may be used by facial recognition software to increase accuracy.

While facial recognition technology has many potential benefits, there are also concerns about privacy and potential misuse. Some worry that facial recognition could be used to track individuals without their knowledge or consent, and that it could be used for discriminatory or unethical purposes. Therefore, it is important to carefully consider the ethical implications and potential risks before implementing facial recognition systems.

Face Comparision:

The faces and the facial features kept in the AWS collection object will be compared. External Image ID and face ID will be returned if the image matches one in the collection. The roll in the local database is mapped with this external image ID (i.e., Microsoft SQL Server). Such an Excel sheet can be used to keep track of this data. The Excel sheet can be used to track students' attendance every week or

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every month. To keep track of the student's progress, this attendance can be forwarded to the student's parents or legal guardians.

Flow chart of our proposed system is given below:

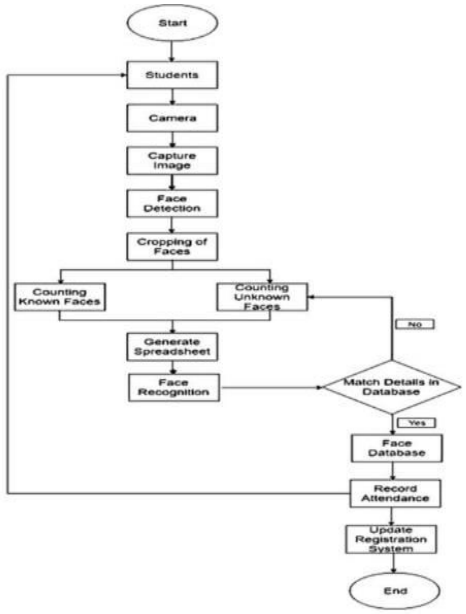

Fig 1: Flow Chart

Testing and considering the attendance

Whenever a student made a click on the button provided, a web cam will get opened.

The web cam has ability to capture the image of the students face and then the image is converted into greyscale, and it undergoes for scaling

The scaled image is converted into the form of vectors with the help of LBPHFaceRecognizer_create

Now the converted data will be helpful to predict the outcomes.

There are 4 conditions to collect the attendance

1: Before 10AM – Early come 2. After 10AM – Late

3. Before 4PM – Early out 4. After 4PM- Normal out

After checking the conditions data will be stored into MySQL database

RESULTS:

Welcome Page:

The welcome page describes the theme of the project.

Fig 2: Welcome Page

Take Attendance Page:

As soon as we click the take attendance option in our html page, we are redirected to camera module and then the camera of our device opens it captures our face and matches with the database images we have already stored by student name and roll number and It is the responsibility of the student's parents or guardians to keep an eye on their child's progress if the taken image matches any of the

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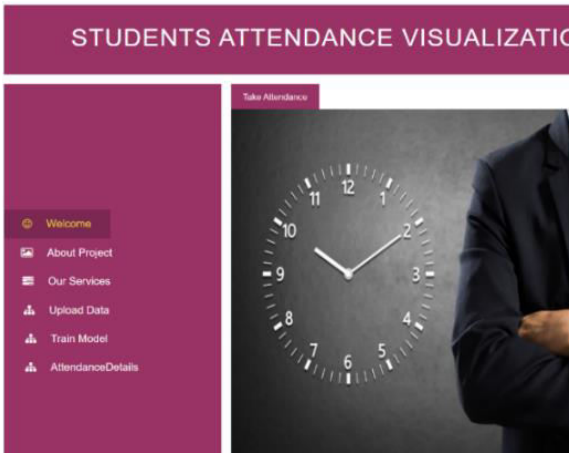

Fig 3: Take Attendance Page

Data Training page:

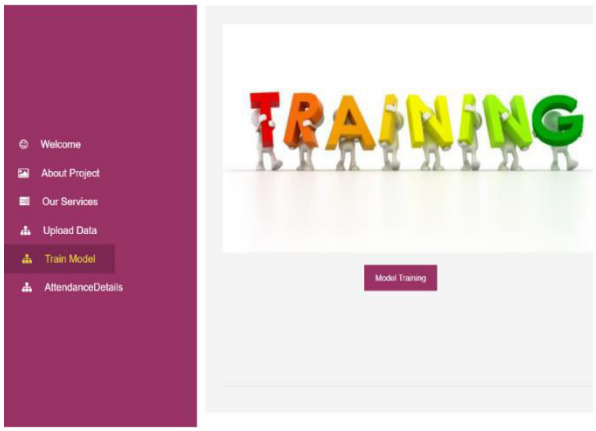

Fig 4: Data Training Page

View Attendance page:

The students can view the attendance whether it has taken or not for the day and for the previous days too with time and date. As soon as we click on the attendance details option in our HTML page, the page is directed into another page called view attendance page in there the student must give the roll number to check the attendance.

After providing the roll number, we must click submit option below the roll number column and the attendance is viewed.

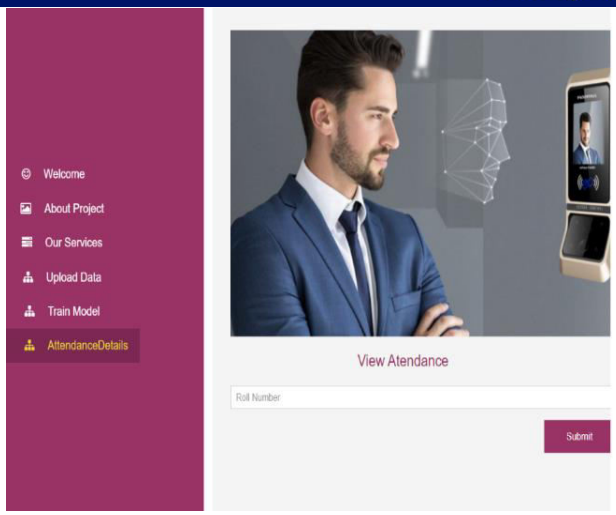

Fig 5: View Attendance Page

CONCLUSION

In our suggested work, we have developed a model that may take student attendance at designated periods using facial recognition; if student is not identified within designated times for attendance taken, they will be given attendance as being late. We have utilised the Flask Framework, where the student's data is kept, a model is trained, and then the student's picture is taken, tested, and attendance is transferred to the student by the photographed face.

FUTURE SCOPE

The concept can be developed in the future and applied to a variety of settings, including educational institutions, business offices, and other workplaces. The attendance of someone with less time may be taken into serious consideration.

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