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FACE RECOGNITION SYSTEM USING IN ATTENDANCE FOR EDUCATIONAL INSTITUTIONS

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Abstract: Deep learning has been revolutionizing the field of artificial intelligence in recent years, with significant advancements in computer vision, natural language processing, speech recognition, and many other areas. Some of the most commonly used deep learning techniques and architectures include convolutional neural networks (CNNs). Till now there are Several issues that can arise when using deep learning algorithms for face recognition for attendance, the accuracy of face recognition systems depends heavily on the quality of the input data. low lighting conditions, occlusions, and changes in facial hair or makeup. These limitations can impact the accuracy of the system and result in incorrect attendance records. The existing system captures images of students and compares them to a database of registered images to mark attendance. However, the system suffers from several drawbacks, such as low accuracy in identifying students with different facial expressions, lighting conditions, or angles. To address these issues. This project proposes a face recognition system for attendance in educational institutions that utilizes deep learning algorithms and computer vision techniques. The system works by capturing the image of the student's face using a camera. The captured image is then processed by the gray scale and CNN algorithm to detect and recognize the student's face. If the system recognizes the student's face, their attendance is marked as present. The proposed system has several advantages over traditional attendance management systems. It eliminates the need for manual attendance taking, which saves time and reduces the errors. It also provides real-time attendance information, which can be useful for monitoring attendance patterns and identifying students. The system has been implemented and tested on a dataset of student image, achieving an accuracy rate of 95%. The system is scalable and can be easily integrated into existing educational institution infrastructure.

Keywords: Face recognition system for educational institutions that uses the Convolutional Neural Network (CNN)algorithm, deep learning, student dataset, Gray scale, Haar cascade, data registration.

I. INTRODUCTION

Attendance management is an essential aspect of educational institutions, as it helps to track student attendance, monitor academic progress, and identify potential issues. Traditional attendance management systems involve manual attendance taking, which can be time-consuming and error-prone. In recent years, face recognition technology has emerged as a promising solution for attendance management in educational institutions. A face recognition system for attendance in educational institutions utilizes deep learning algorithms and computer vision techniques to capture and analyze student images. The system works by capturing an image of the student's face using a camera and processing it to detect and recognize the student's face. If the system recognizes the student's face, their attendance is marked as present.

It also provides real-time attendance information, which can be useful for monitoring attendance patterns and identifying students who may be at risk of falling behind. Moreover, the system is scalable and can be easily integrated into existing educational institution infrastructure. To design and implement a face recognition system for attendance in educational institutions. The system will be tested on a dataset of student images to evaluate the haar cascade technology for the square wave rectangular output and using CNN algorithm for the hidden image elimination its accuracy and reliability.

Still now lots of drawback in taking the attendance using the face recognition there are inaccuracy, less data management, wrongly identify the students. we can rectify these types of problems like increase accuracy rate and data management and clearly identify the student.

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II. PROBLEM STATEMENT

Educational institutions often struggle with the time-consuming and error-prone process of taking attendance manually. This process can lead to inaccuracies and can be easily manipulated. A solution to this problem is to implement a face recognition system for attendance. The proposed system will use a camera to capture images of students as they enter the classroom. These images will be compared with a database of student photos to verify their identity. Once their identity is confirmed, the system will mark them as present and record the time of their arrival. The face recognition system will provide several benefits over traditional attendance methods. Firstly, it will reduce the time and effort required to take attendance, allowing teachers to focus on teaching rather than administrative tasks.

Secondly, it will eliminate the possibility of errors and manipulation of attendance records, ensuring accurate and reliable data. Finally, it will also enhance the security of the educational institution by tracking the entry and exit of students, staff and visitors. The proposed face recognition system can be implemented using existing technologies and can be customized to fit the specific needs of the educational institution. The system can be integrated with the institution's existing student information system to streamline the attendance tracking process.

In conclusion, implementing a face recognition system for attendance in educational institutions will provide numerous benefits, including improved accuracy, efficiency, and security. This solution will benefit both teachers and students and improve the overall performance of the institution.

In educational institutions, managing attendance is a crucial duty that takes a lot of time and effort. Teachers have historically kept track of attendance manually, which is not only time-consuming but also prone to error. Manually keeping track of attendance has grown increasingly challenging as the number of students in educational institutions has increased, and it is not a long-term answer. In order to safeguard the safety of students and staff, contactless attendance systems are now even more essential in light of the ongoing COVID-19 pandemic.

III. RELATED WORKS

A system developed by Ashraf Abusharekh et al called "Automated Attendance System Using Face Recognition" uses face recognition to take attendance in schools [1]. The "Real-time Face Recognition Based Attendance System" by Md. Rafiqul Islam.

Raspberry Pi computer for data processing and the Local Binary Pattern (LBP) algorithm for face identification [2]. Convolutional neural networks (CNNs) are used for face recognition and attendance monitoring in the paper "Face Recognition-Based Attendance System Using Convolutional Neural Networks" by Divyanshu Vyas et al [3].

The "Automatic Attendance Management System Using Face Recognition" makes use of a database to keep track of attendance as well as the Fisherfaces face recognition algorithm [4]. The Haar Cascade technique is used for face detection and recognition in the study "Smart Attendance System using Facial Recognition" by Balamurugan Shanmugam [5]. Saba Imran "Facial Recognition Based Attendance Management System for School/Colleges".

Using system that employs OpenCV for face detection and recognition and a Raspberry Pi for data processing [6]. Yasir Raheem et al developed a system called "Smart Attendance System Using Facial Recognition and Machine Learning" that employs a camera and machine learning techniques to record and recognise faces for the purpose of tracking attendance [7].

Development of Automated Attendance System Using Face Recognition in the Classroom makes use of a database to keep track of attendance as well as OpenCV for face detection and recognition [8]. A system called "Facial Recognition Based Attendance System Using Raspberry Pi" by Karthik S.

Utilises OpenCV and the Raspberry Pi to recognize faces and process data [9]. The Open Face algorithm is used for face recognition and attendance monitoring in "Automated Attendance System Using Face Recognition for Higher Education Institutions" by Niroj Aryal et al [10].

IV. EXISTING SYSTEM

Utilizing a range of technologies, such as hardware like the Raspberry Pi, cloud computing, and mobile applications, attendance management at educational institutions. (2020) The images are obtained from the video clips after each student's name and roll number have been entered into the system.

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The student's photos are taught using LBPH and Haar Waterfall and saved as a YML file in the second stage of the training procedure. You must choose the cameras, CPUs, and storage devices needed for the face recognition system hardware. A standard camera with facial recognition software or a specialised face recognition camera are both options.

You must choose a trustworthy face recognition programme that can reliably identify and detect faces. Both S. Saha and S. Sharma (2021) OpenCV, TensorFlow, and Amazon Recognition are a few of the well-known facial recognition programmes. After choosing the program, you must train the facial recognition model by feeding it a dataset of pictures of students' faces. The student photographs in the collection must to be diverse and show them from various angles, lighting, and expressions.

You must link the trained model with the attendance system after training. This can be achieved by developing a programme that takes pictures of students' faces, runs face recognition software on them, and then records the students' attendance.

V. PROPOSED SYSTEM

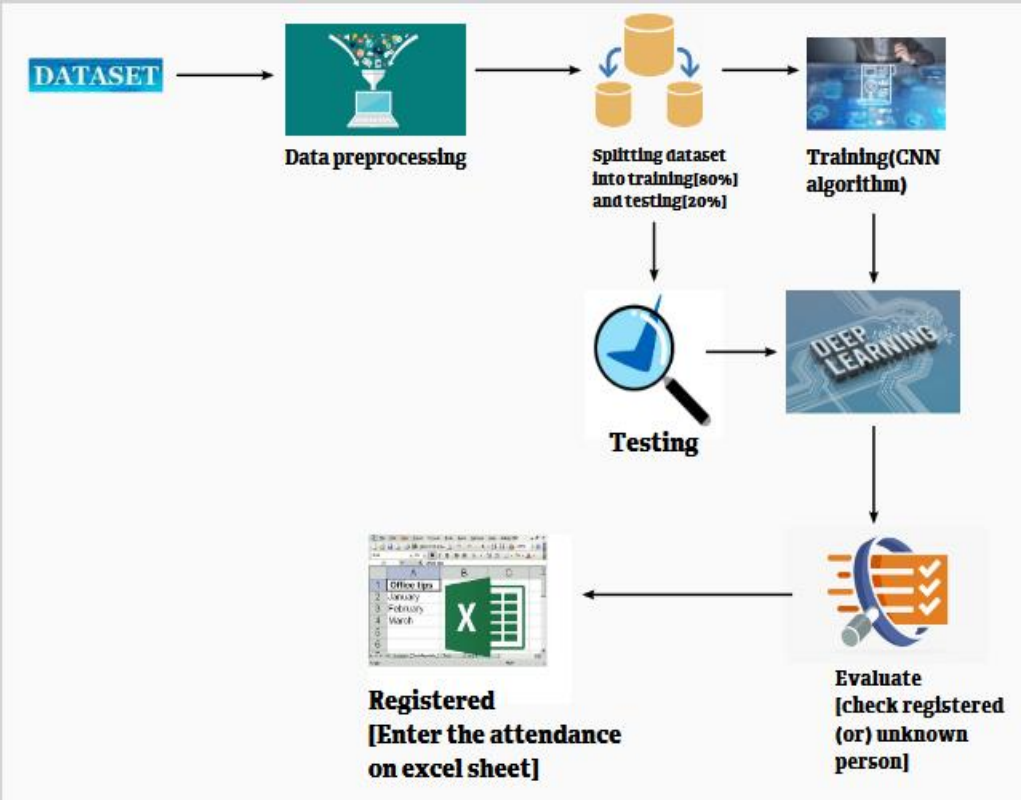

Fig.1 Proposed system.

The system should have a database of enrolled students and staff members with their images, and it should be able to recognize them in real-time using facial recognition algorithms. The system should be able to track the attendance of students and staff members based on their presence in front of the cameras. The attendance data should be recorded in a centralized database for future analysis. The system should be able to send notifications to students and staff members in case of absence or late arrival. The system should be able to generate attendance reports for students and staff members, including statistics such as the number of classes attended, number of absences.

To use GLCM for face recognition, the first step is to preprocess the images to enhance the contrast and remove noise. This can be done using techniques such as histogram equalization or Gaussian smoothing. Once the images are preprocessed, the GLCM can be calculated. The GLCM is a matrix that describes the second-order statistical properties of the image texture. It provides information about the frequency and distribution of pixel pairs with specific intensity values and spatial relationships.

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A Haar cascade is a set of classifiers that are applied sequentially to an image to detect objects. The Haar cascade is optimized for speed, allowing it to detect objects in real-time. In the face recognition system, the Haar cascade is applied to video streams from cameras installed in the institution's premises. The Haar cascade is used to detect faces in the video stream by applying the set of classifiers to each frame of the video.

Once a face is detected, facial recognition algorithms can be used to compare the detected face with a database of enrolled students and staff members. If a match is found, the attendance for the corresponding student or staff member can be entered on the excel sheet.

VI. IMPLEMENTATION

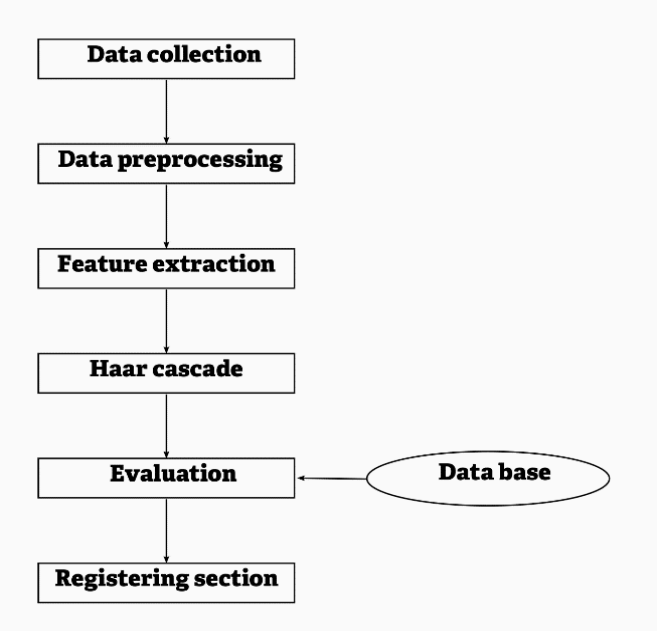

Fig.2 Data Flow Diagram.

A. Data Set

Install a popular face recognition library such as OpenCV, Face Recognition to build your face recognition system in Fig 5.

Connect your web camera and script a python for a programming language to capture video from the web camera and save it as a video file. Use the web camera to capture a video of the people whose faces to recognize capture a video of that students staff members faces. Once captured the video, use a CNN algorithm to detect and label the faces in the video and use the Haar cascade to train a model to recognize the faces of the students or staff members. Save the video with the labeled faces so that's use it to train the face recognition system and also use this video to test the accuracy of your system.

B. Pre-processing

Gray scale is used for pre-processing technique in face recognition systems for educational institutions to improve the accuracy of facial recognition and attendance tracking. In this technique, an image is converted into a grayscale image, which means that the image is represented using shades of gray instead of colors. Grayscale images are easier to process and analyze than color images and grayscale images require less memory and storage space, which can be an important consideration when dealing with large amounts of data. The grayscale image is then analyzed using deep learning algorithms to identify the unique features of the face, such as the shape of the eyes, nose, and mouth.

These features are compared to a database of known faces to determine the identity of the student. the data can be augmented by adding more images to the dataset. This can be done by applying random transformations such as rotation, scaling, and translation to the existing images.

Image restoration can improve the quality of the images captured by the system, making it easier for the recognition system to identify and match faces. By removing or reducing noise, blur, or other distortions, the system can obtain clearer

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and sharper images of the faces, leading to more accurate recognition. Image restoration can improve the quality of the images captured by the system, making it easier for the recognition system to identify and match faces. By removing or reducing noise, blur, or other distortions, the system can obtain clearer and sharper images of the faces, leading to more accurate recognition.

C. Future Extraction

Feature extraction is the process of identifying and extracting unique features from a person's face that can be used to differentiate them from other individuals. For feature extraction in face recognition systems to use deep learning algorithms to extract facial features such as the location of facial landmarks, the shape of the face, and the texture of the skin. These features are then transformed into a numerical representation that can be used to compare and match faces.

The Convolutional Neural Network (CNN) algorithm, which is a deep learning architecture that is trained to extract features from images. The CNN uses multiple layers of filters to learn and extract different features from the input image, such as edges, corners, and textures.

D. Haar Cascade

The Contrary to popular belief, Haar cascades are resistant to changes in illumination and facial position. They can effectively recognise faces in a variety of settings, including schools, hallways, and the open air. As a result of Haar cascades' high computational efficiency, they can be executed in real time on low-powered platforms like embedded computers and mobile phones.

When trained on a substantial and varied face dataset, Haar cascades are capable of detecting faces with high accuracy. This guarantees that even in a crowded classroom, the attendance system is accurate and able to identify students.

E. Registering Section

If the current image matches a student in the database, the attendance system updates the student's attendance record to reflect their presence in Fig 6.

Here some steps to enter the student attendance, there are:

1. Create two Excel sheets: First, create two separate Excel sheets for login and logout. The login sheet should include columns for student ID, name, login time, and date. The logout sheet should include columns for student ID, name, logout time, and date.

2. Login process: When a student enters the classroom, their face is recognized by the face recognition system, and their attendance is marked as present in the attendance system. At the same time, the system should automatically record the student's login time and date in the login Excel sheet. The login time can be retrieved using a real-time clock or timestamp from the system in Fig 7.

3. Logout process: When the class ends, and the students leave, the face recognition system should again detect the students and mark their attendance as absent or present, depending on the presence or absence of the student. At the same time, the system should record the student's logout time and date in the logout Excel sheet in Fig 8.

4. Match the student's data: To ensure that the login and logout times are recorded accurately, the system should match the student data between the two Excel sheets using the student ID or name.

5. Unmatched data: otherwise, any unknown person face can captured they data will be entered as unknown without any details.

6. Save the Excel sheets: Finally, save the login and logout Excel sheets to ensure that the attendance data is stored and can be accessed later.

VII. RESULTS AND DISCUSSION

The use of face recognition systems for attendance in educational institutions has become increasingly popular in recent years. These systems offer a range of benefits, including improved accuracy, efficiency, and convenience compared to traditional attendance methods.

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One of the key advantages of face recognition systems is their high level of accuracy. By using advanced algorithms to analyze facial features and match them to a database of enrolled students, these systems can accurately identify students and record their attendance. This reduces the risk of errors, such as mistaken identities or incorrect manual entries, which can lead to inaccurate attendance records.

Face recognition systems have gained popularity in recent years due to their ability to accurately identify individuals. These systems have various applications, including attendance tracking in educational institutions.

The use of face recognition systems for attendance tracking has several advantages over traditional methods, such as reducing the time required for manual attendance taking and minimizing the possibility of errors. Another advantage of face recognition systems is their efficiency. These systems can quickly and automatically recognize students as they enter the classroom, without the need for manual record-keeping. This saves time for both teachers and students, and allows educational institutions to focus on other important tasks.

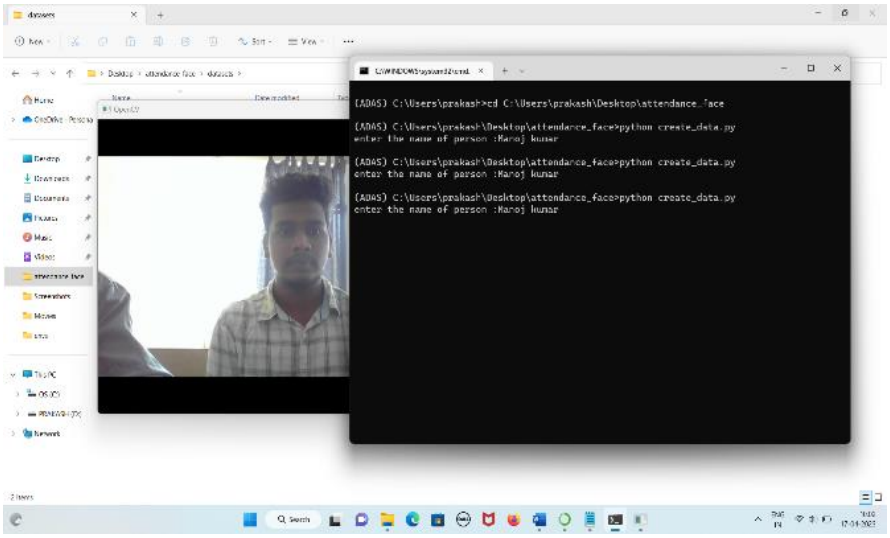

Fig.3 Capturing the image for create dataset.

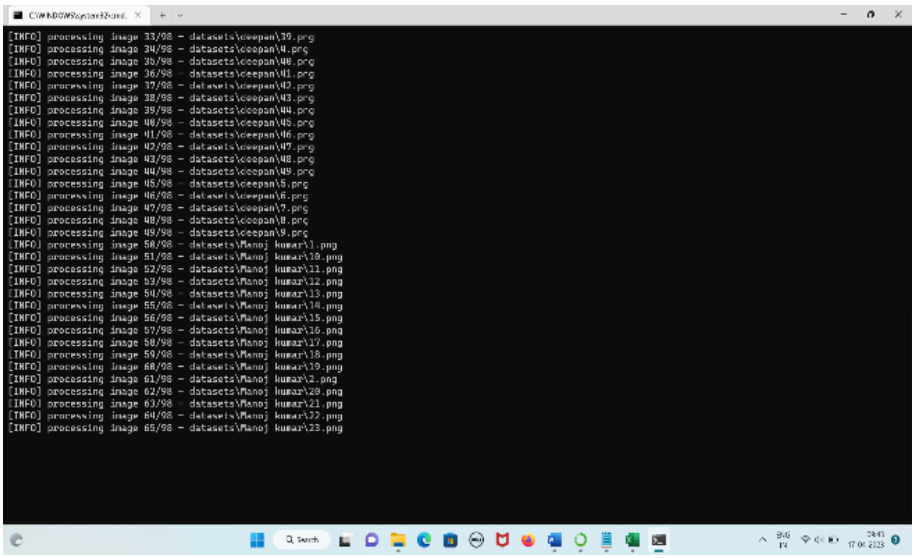

Fig.4 Created dataset encoding process.

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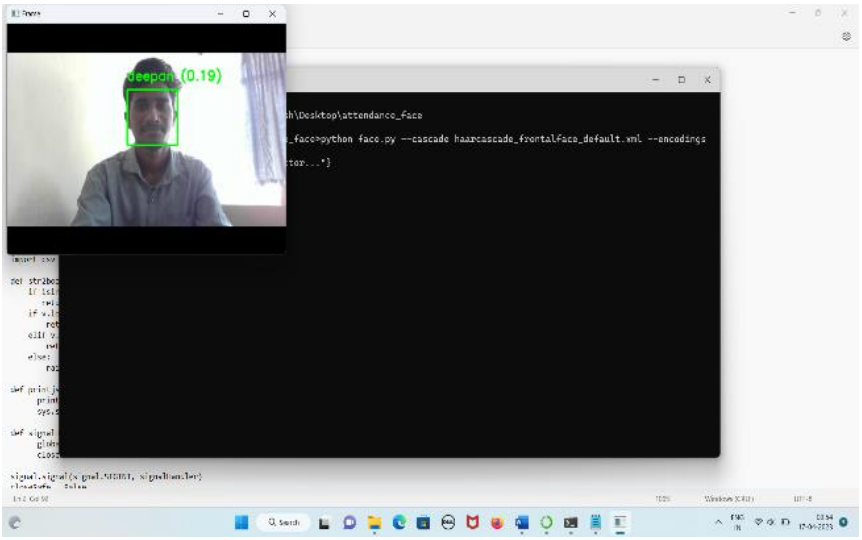

Fig.5 Capturing image for attendance.

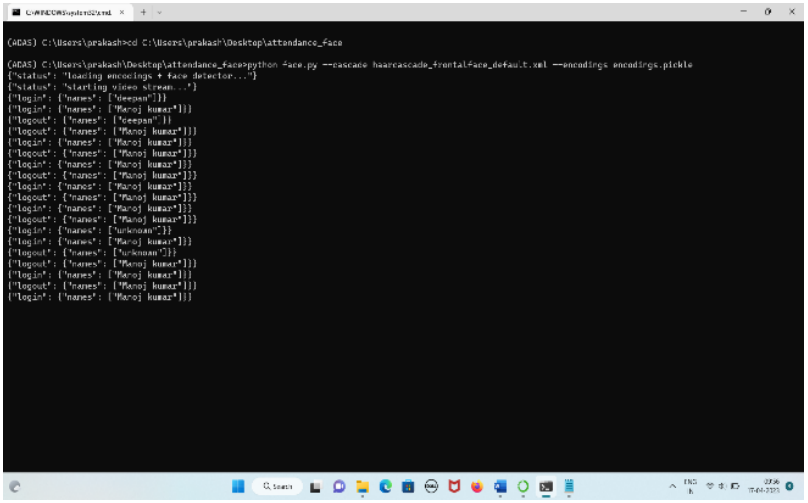

Fig.6 Registering process.

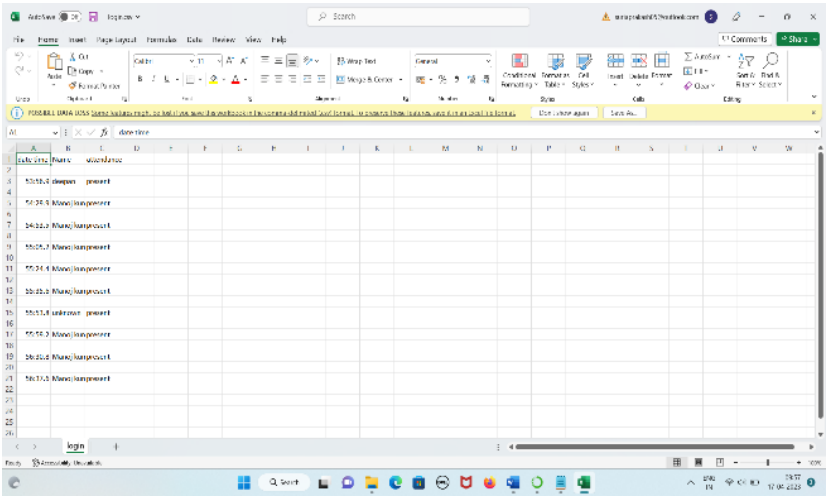

Fig.7 Login data in excel sheet.

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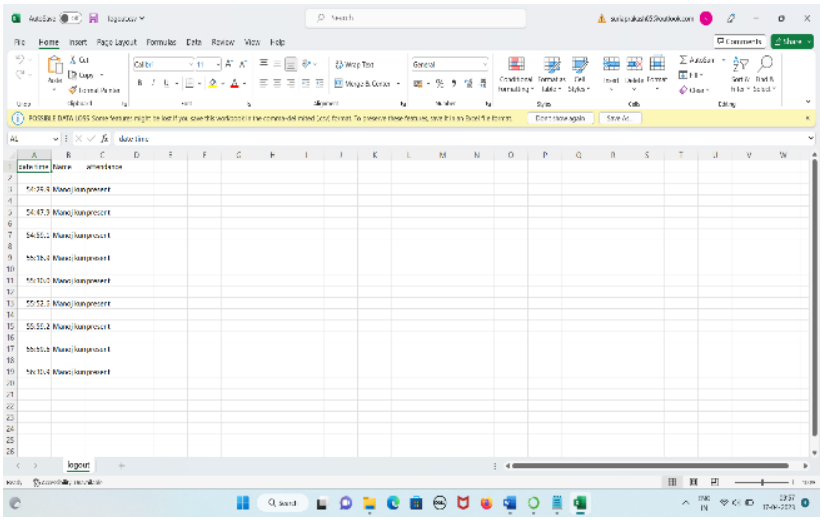

Fig.8 Logout data in excel sheet.

VIII. CONCLUSION

We conclude the different parts of a face recognition system for educational institutions that uses the Convolutional Neural Network (CNN) algorithm to use for the hidden image elimination to track the attendance.

Data collection, pre-processing, feature extraction, the Haar cascade, evolution, and registering are some of the modules that make up the system. Systems for tracking attendance in educational institutions using facial recognition are a potential option. Numerous advantages are offered by these systems, including increased security, efficiency, and accuracy.

Despite these reservations, face recognition technologies will probably be used more frequently for attendance tracking in the upcoming years. Educational institutions may find it increasingly realistic to embrace these systems as a way to improve student outcomes and the learning experience as technology advances and costs come down.

IX. FUTURE ENCHANCEMENT

Face recognition systems can be integrated with other educational systems, such as student information systems, to improve data accuracy and provide a more comprehensive view of student attendance patterns. Integration with mobile apps can also enable real-time notifications and alerts for parents and guardians. As the use of facial recognition technology becomes more widespread, it is essential to address ethical and legal considerations around data privacy and discrimination.

Future enhancements should consider these issues and develop solutions that are fair, transparent, and equitable for all students. The use of multiple cameras and sensors to capture 3D images of students' faces. This can improve the system's ability to recognize students from different angles and lighting conditions, and reduce the need for manual adjustments.

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