

Next-Generation Attendance Management

M. Uma Maheswararao¹, V. Anusha², L. Tarak Sri Chandrahas³, K. Vamsi Krishna⁴,
K. Lakshmi Harika⁵, Mrs. M. N. V. Surekha⁶

¹⁻²Department of CSE, Sri Vasavi Engineering College(A), Pedatadepalli, Tadepalligudem – 534101.

⁶Assistant Professor Department of CSE, Sri Vasavi Engineering College(A), Pedatadepalli, Tadepalligudem-534101.

Abstract - Next-Generation Attendance Management system is helpful for students as well as school management. In schooling system everything should be done manually which is time consuming and costly and another important task in school management is providing attendance to the students. Attendance marking in a classroom during lecture is onerous task. We have come up with our website to provide a solution to the school authorities. In our website we can register a student for attendance. Faculty has the power to modify, add, view and delete the data whereas student can view the details of themselves. Faculty can take the attendance of students with the help of face recognition which prevents the student to manipulate the attendance records. In this our system identifies and verifies student faces during attendance session. It captures student facial features, matches them against the stored data and records the attendance automatically.

Key Words: face recognition attendance system, face_recognition library, dlib library, opencv

1.INTRODUCTION

Face recognition is a technology that involves identifying and verifying individuals based on their facial features. It belongs to the group of biometric authentication that has earned substantial recognition for its wide range of applications and capabilities. In the realm of attendance automation management, innovative solutions have emerged to streamline the process. Trivedi et al. have introduced a Face Recognition Based Automated Attendance Management System that leverages the power of facial recognition technology [6]. Their research explores the practical Employing face recognition across diverse contexts, offering insights into the advantages and efficiency of such systems. In school management Marking attendance for students takes place crucial role. The problem arises when we think about the traditional methodology to record attendance in classroom calling out the names of students and taking the attendance is difficult task. Many problems may arise while taking the attendance like students manipulating the attendance records, Teacher may miss out or add some students while entering the attendance.

To deal with this obstacle numerous solutions were explored like id scan, biometric, face recognition.

In the realm of student attendance management, various techniques and technologies have been explored. One such approach, as discussed by Lukas et al. (2016) [11], involves the utilization of face recognition techniques for automating the attendance process in classroom settings. Their paper presents a student attendance system that relies on the domain of facial identification, that has gained significance in recent years. This approach aims to streamline the attendance tracking process, reduce manual effort, and enhance the accuracy of attendance records. Facial feature identification involves extracting distinct attributes or markers from an image of the individual's face. These attributes may encompass the relative positioning, dimensions, and contours of the eyes, nasal features, cheek structure, and jawline. Subsequently, these distinctive characteristics are employed to seek out comparable attributes in other images. [8] The 8th International Conference on Biometrics Theory, Applications, and Systems, hosted by IEEE in 2016 introduces innovative methods for face validation and formation of groups, which have proven to be highly effective in our system. The strategies outlined within this document have greatly contributed to the precision and dependability of our facial authentication system.

As a part of this project first we have to register the students by taking a snapshot of the student and placing them in the folder of student Graphics. In the actual time face recognition, opencv is utilized to capture video frames and preprocessing of images for more efficient face recognition. Face_recognition library is utilized for the identification of faces in the video frames with the help the pre-trained deep learning models, encoding of faces which represents unique features and characteristics in a vector of numbers. If the encoding of face recognised matches with an individual's facial encodings in the database the student attendance will be recorded as present. In our project Teacher and student can login in their respective login dashboards with username and password authentication. Teacher can take the attendance, view student details, view attendance percentage of students and Students are able

to access their personal details like biodata, attendance percentage.

2. LITERATURE SURVEY

A Literature survey is an assessment of existing relevant research and resources in the project's area to gather insights and information.

S. K. Sarangi, A. Paul, H. Kishor, K. Pandey focuses on Attendance in an educational institution for students is the most challenging part of the virtual platform. It works on an employing attendance tracking via face detection algorithm in real-time using the frontal face recognition concept. This paper introduces the concept of utilizing facial feature detection and identification algorithms for real-time attendance management. Existing literature on biometric-based attendance systems can be referred to, including research on application of facial recognition technology in educational settings [1].

Z. Erkin, M. Franz, J. Guajardo, S. Katzenbeisser, at the 9th International Symposium proposes about the paramount concern in the realm of biometric technologies, where privacy and security converge. With the growing utilization of face recognition as an unobtrusive means to verify identity, preserving privacy becomes increasingly critical, especially when the matching process takes place on central or untrusted servers. This paper introduces a pioneering approach, where Privacy-Enhancing Technologies are harnessed to create a robust privacy-enhanced face recognition system. The system's key innovation lies in its ability to efficiently protect both biometric data and the matching results from unauthorized access by any party involved, demonstrating a commitment to the principles of data protection and privacy. The proposed protocol envisions a collaborative scenario wherein one party contributes a facial image, and another party maintains access to a database of facial templates. Within this framework, the protocol ensures that the first party learns only minimal parameters of the database, while the second party remains unaware of the base image and the outcome of the recognition process. At the heart of this innovative protocol is an efficient method for securely comparing Pailler-encrypted numbers. The paper substantiates the feasibility of this approach through extensive experiments, affirming its practicality on standard hardware [2].

Shashank Reddy Boyapally says about the realm of computer vision algorithms concentrating mainly on their practical application in facial recognition. This work seeks to explore an algorithm crafted for easy assimilation into biometric attendance systems. Notably, the paper rigorously employs a range of fundamental techniques, including the judicious use of histogram-

oriented gradients for precise face detection, the assessment of facial landmarks, support vector machines to achieve robust facial recognition, and Sophisticated deep learning networks for accurate face comparison. The paper meticulously elucidates the scientific underpinnings of facial recognition procedures, ensuring a clear understanding of the methodologies employed. What makes this work unique is its commitment to practicality. The authors have thoughtfully developed an application that records timestamps as faces are detected, thereby enabling the marking of attendance in a structured .csv format. This ingenious approach bolsters the paper's relevance and utility in real-world scenarios. Importantly, the successful integration of machine learning, face landmark estimation, and computer vision principles underscores the paper's significance, positioning it as a valuable contribution to the realm of attendance systems. By harnessing the capabilities of the dlib and face_recognition libraries, the authors optimize their methodology, showcasing the potential of established tools for innovative applications [3].

Harsh Nagoriya navigates the intriguing landscape of face recognition technology, with a particular focus on its pragmatic utilization in the perspective of attendance management. It tackles the practical challenge of efficiently and accurately recording attendance, a task demanding a creative and innovative solution. The proposed system harnesses the power of face recognition to streamline this process, reducing the time and effort traditionally associated with attendance tracking. In this system, the unique facial characteristics obtained from images are integral in identifying students or employees and marking their attendance. Operated on a Raspberry Pi-based platform, the system demonstrates remarkable efficiency in swiftly detecting and recognizing human faces from images or videos captured through a camera. Subsequently, it performs a rigorous comparison between the recognized faces and the database of registered individuals. When a match is found, the student's presence is recorded; otherwise, their absence is duly noted. Of particular note is the system's independence from hardware or software constraints, attributed to its reliance on the OpenCV image processing library. This feature underscores its adaptability and versatility across various setups. The paper also touches regarding the application of the Eigen matrix concept (Eigen Faces) as a critical element of the system. This technique transforms images into matrices based on inherent features, simplifying face recognition and ensuring the seamless management and updating of attendance records [4].

Prateek Singhal along with Prabhat Kumar Srivastava, Arvind Kumar Tiwari, and Ratnesh Kumar Shukla focuses on landscape of biometrics,

specifically focusing on the multifaceted realm of facial recognition and authentication. In this extensive review, the authors delve deep into the world of machine learning techniques, shedding light on their pivotal role in addressing the complexities of facial identification. The exploration encompasses an array of databases and a diverse range of methodologies aimed at surmounting the challenges inherent to facial recognition. The paper not only offers an all-encompassing overview but also pays homage to the significant contributions of an array of researchers who have undertaken the realm of facial recognition and identity verification. Throughout, the authors offer a vivid exploration of facial datasets, real-time image processing techniques, and video analysis methods, providing a panorama of sophisticated strategies for facial identification and recognition. Notably, the paper highlights the incorporation of machine learning practices combined with multiple image datasets, an endeavour that amplifies the classifier's efficiency in predicting face detection and recognition-related content [5].

3. EXISTING SYSTEM

The existing system of attendance system mainly uses regular methods which were lacking efficiency and effectiveness compared to electronic attendance management. Traditional methods of taking attendance have been widely used and are still in place in many educational institutions and organizations.

Paper-Based Attendance: paper-based processes for tracking and recording attendance. In educational institutions instructors or teachers taking roll call and manually marking the attendance of students by writing their names or roll numbers on paper attendance sheets is not effective process. This manual process are time consuming which results in causing errors, and have limitations in terms of data analysis and security.

ID scanning systems: In this system people have to Scan cards or badges at a terminal to record their attendance. Carrying ID cards at all times can be seen as an inconvenience, and some individuals may forget or misplace their cards, leading to attendance errors. While ID cards and badges can enhance security, they are not foolproof. In some cases, individuals may lend their cards to others or may be duplicate the cards, allowing proxy attendance or unauthorized entry.

Paper sign-in sheets: Paper sign-in sheets are physical document used to record the attendance of individuals at various meeting, workshops or other gatherings. These are typically printed documents with space or fields for individuals to provide their name and signature these might include other data of individuals Necessary for verification process. Paper sign-in sheets are a straight forward method of tracking attendance which are very

simple less cost but This process is labour intensive requiring someone to manually organise and store sheets.

4. PROPOSED SYSTEM

The main goal of our next-generation Attendance management is to rectify the challenges of current system by providing a website where teacher can take the attendance of students with the help of face recognition attendance system. The paper 'Student Attendance using Face Recognition Technology' [9], presented at the 2020 2nd International Conference on Cybernetics and Intelligent System (ICORIS), offers valuable insights into the integration of face recognition for attendance recording. The research conducted by Rusdi, Kodong, Indrajit, Sofyan, Abdurrohman, and Marco provides a comprehensive understanding of the potential and feasibility of this technology. This reduces the burden of teacher to manually enter the data into a system which calculates attendance percentage. Here the dataset was trained to match the features of student and take attendance. The designed system calculates the attendance percentage also.

The designed system includes the following steps:

Step 1: Enrolling a new student

The enrolling process in an attendance tracking system based on facial identification is the initial step where individuals register their facial features into the system's database. During this process, the system captures facial images of individuals and creates unique facial encodings that represent their facial features in a vector format. The generated encodings, coupled with further particulars about the individual, is stored securely in the system's database. Once facial encodings were recorded in the database, the enrolling process is complete.

Step 2: Attendance tracking

Attendance tracking is the process of monitoring and recording the occurrence or non-occurrence of individuals in a class. The captured images are analyzed to identify the existence of faces in database. The system compares the detected facial features with referenced data stored in its database. These referenced data represent the facial encodings that are previously encoded.

Step 3: Identification

Identification in a facial identification attendance system involves the process of confirming an individual's identity based on their facial features. The system identifies and extracts key facial features, such as the distance between the eyes, nose shape, and other unique

attributes. If the detected features closely match a referenced data, the system verifies the individual's identity. Several studies in this realm of face recognition have contributed to the ongoing debate about highly successful methods for precise identification. Notably, Brunelli and Poggio conducted groundbreaking research in this area with their paper Face recognition: features versus templates [10], which was published in IEEE periodical dedicated to Pattern Analysis and Machine Intelligence in October 1993. In their work, the authors extensively examined the merits of using geometric features compared to template-based approaches for facial recognition. After successful identification, the system marks their attendance.

Step 4: Database update

Database update involves adding or modifying attendance related information in the system's database. The attendance data, including the individual's identity and any additional relevant information is stored into the system's database. The system securely stores this attendance data of who attended the lecture. The database update process ensures the accurate and reliable Attendance record management, enabling teachers to monitor attendance records. In this the attendance data is recorded into the database.

Step 5: Attendance Management

Attendance management in a facial recognition attendance system denotes the overall process of monitoring, recording, and organizing attendance data efficiently. Efficient attendance management is crucial in educational institutes, and various approaches have been examined to improve this process. In a study by Shailendra et al. [7], a novel approach to attendance management using a small, cost-effective, and energy-efficient system was presented. This approach aligns with the goals of our research to enhance attendance systems in educational institutions. The system collects attendance data by capturing facial images of individuals using a camera with the ability to recognize faces and verify the identity of individuals based on their facial features. When an individual is successfully identified, their attendance is recorded and recorded in the database.

Advantages of proposed system

Efficiency and Accuracy: The system efficiently harnesses cutting-edge face recognition technology, leading to a more streamlined attendance tracking process. Through this automation, it significantly reduces the time and manual effort traditionally associated with attendance management while elevating the overall accuracy and precision of the process to new levels.

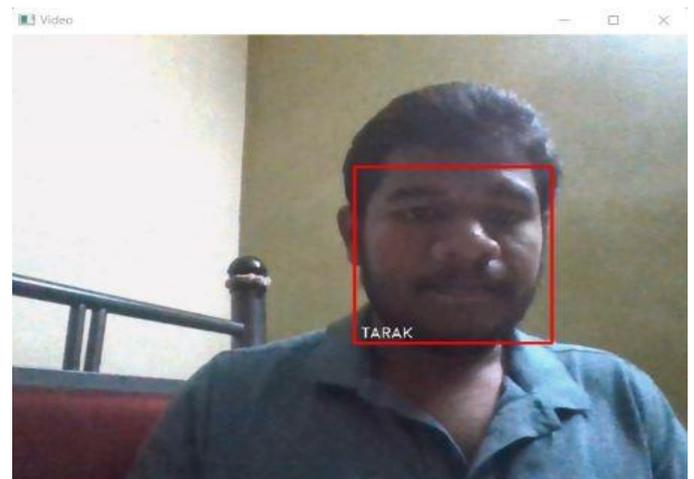
Transparency: Our system's design facilitates students convenient access to their attendance records, fostering transparency and empowering students to take an active role in tracking their attendance. This approach contributes transparency and personal responsibility for attendance.

Reduced Administrative Workload: For teachers the system simplifies student data management and attendance tracking, teachers do not have to worry about entering the data manually the system automatically manage the attendance management, significantly reducing administrative efforts related to identity checks, visitor processing, and security procedures. It simplifies data entry and registration processes, allowing administrative staff to focus on more critical tasks.

Enhanced Integrity: Face recognition technology makes it difficult for students to manipulate attendance records by minimizing the potential for manipulation and ensuring accurate identity verification. It minimize the potential to manipulate the data, ensuring the integrity of attendance data.

5. EXPERIMENTAL RESULTS

In a dynamic face recognition system, as students enter a classroom or designated area, their facial images are captured instantly using cameras or webcams. These captured images undergo preprocessing steps, including resizing, alignment, and normalization, to enhance accuracy during comparison. The system then extracts facial features from the images.

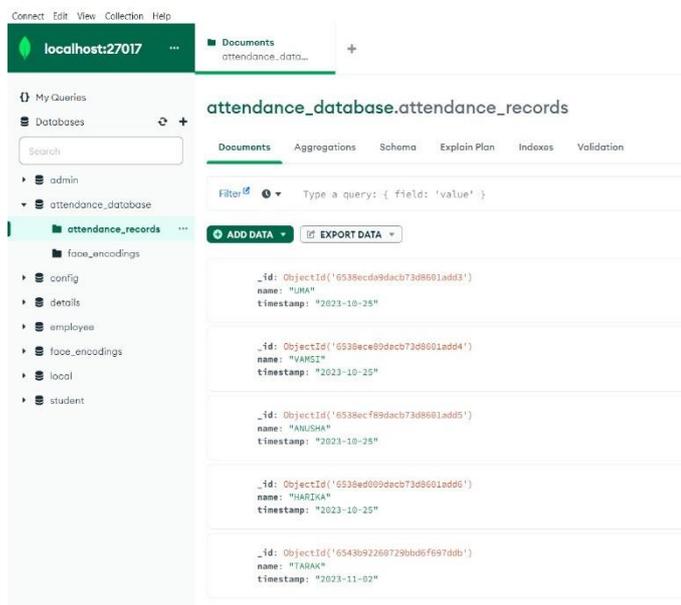


During comparison, the obtained face embedding is matched against enrolled face templates stored in the database. Utilizing sophisticated algorithms, the system compares numerical vectors to identify a match. If a match is found within a specified tolerance level, accounting for variations in lighting and facial

expressions, the student is marked as present for the specific class or session.

#	_id	ObjectID	name	String	encoding	Array
1	ObjectID('653766c9aff9463992')		"HARAK"		[]	128 elements
2	ObjectID('653766c9aff9463992')		"HARAK"		[]	128 elements
3	ObjectID('653766c9aff9463992')		"HARAK"		[]	128 elements
4	ObjectID('653766c9aff9463992')		"HARAK"		[]	128 elements
5	ObjectID('653766c9aff9463992')		"HARAK"		[]	128 elements
6	ObjectID('65386cc89f942b6cf')		"NETRIN"		[]	128 elements
7	ObjectID('65386cc89f942b6cf')		"NETRIN"		[]	128 elements
8	ObjectID('65386cc89f942b6cf')		"NETRIN"		[]	128 elements
9	ObjectID('65386cc89f942b6cf')		"HARAK"		[]	128 elements
10	ObjectID('65386cc89f942b6cf')		"HARAK"		[]	128 elements
11	ObjectID('65386cc89f942b6cf')		"HARAK"		[]	128 elements
12	ObjectID('65386cc89f942b6cf')		"HARAK"		[]	128 elements
13	ObjectID('65386cc89f942b6cf')		"HARAK"		[]	128 elements
14	ObjectID('65386cc89f942b6cf')		"ANUSHA"		[]	128 elements
15	ObjectID('65386cc89f942b6cf')		"ANUSHA"		[]	128 elements
16	ObjectID('65386cc89f942b6cf')		"ANUSHA"		[]	128 elements
17	ObjectID('65386cc89f942b6cf')		"ANUSHA"		[]	128 elements

The system provides real-time feedback by displaying the student's name or ID on a screen, confirming the successful attendance capture. Simultaneously, attendance data, including the date, time, and student details, is securely logged and stored. Authorized personnel can access and manage this attendance record for administrative purposes, ensuring efficient and accurate attendance management.



6.CONCLUSION

In order to matches the advanced technology. The next generation Attendance management was used in school management to decrease the burden of teachers by simplifying the workload and it is also beneficial to the students to monitor their attendance records. This paper proposes the automatic attendance tracking system

employing facial recognition techniques that are opencv, dlib, Face_recognition library. In future our system is capable in real time applications where the camera stores the detailed information of an individual attending an event which include timings of arrival and departure.

In conclusion, Next-Generation Attendance Management is a forward-thinking project that brings efficiency, accuracy, transparency, and security to the attendance tracking process in educational institutions. It has the potential to reduce administrative burdens, improve data integrity, and provide valuable insights into attendance trends. As technology continues to play an increasingly critical role in education, this system represents a step forward in embracing innovative solutions.

7.ACKNOWLEDGEMENT

We would like to take a moment to express our sincere gratitude for the unwavering support and guidance we've received throughout the development of our project. First and foremost, we extend our heartfelt thanks to SRI VASAVI ENGINEERING COLLEGE for providing us with the opportunity to pursue our engineering ambitions.

Our project guide, Mrs. M. N. V. Surekha, has been instrumental in offering invaluable guidance and support at every step of this project.

We also extend our appreciation to Dr. D. Jaya Kumari and Dr. G. V. N. S. R. Ratnakara Rao for their cooperation and encouragement.

Lastly, we acknowledge the unwavering support of our staff of the Department of Computer Science and Engineering played a crucial role in facilitating our project work, and we thank them for their contributions.

8.REFERENCES

S. K. Sarangi, A. Paul, H. Kishor, K. Pandey, "Automatic Attendance System using Face Recognition," in 2021 International Conference in Advances in Power, Signal, and Information Technology (APSIT), 08-10 October 2021. <https://ieeexplore.ieee.org/document/9641486/citations?tabFilter=papers>

Z. Erkin, M. Franz, J. Guajardo, S. Katzenbeisser, at the 9th International Symposium on Privacy Enhancing Technologies (PETS 2009) held in Seattle, Washington, USA in August. https://www.researchgate.net/publication/221655685_Privacy-Preserving_Face_Recognition

- Shashank Reddy Boyapally, "Facial Recognition and Attendance System Using Dlib and Face Recognition Libraries," March 14, 2021.
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3804334
- [1] Harsh Nagoriya, "Attendance System using Face Recognition utilizing OpenCV Image Processing Library," June 2020.
https://www.researchgate.net/publication/342566474_Attendance_System_using_Face_Recognition_utilizing_OpenCV_Image_Processing_Library
- [2] Prateek Singhal along with Prabhat Kumar Srivastava, Arvind Kumar Tiwari, and Ratnesh Kumar Shukla, Exploring Methods for Detecting and Recognizing Faces Using Machine Learning Techniques: a Conference Paper Published Online on September 20, 2021, in the Advances in Intelligent Systems and Computing, Volume 1374.
https://link.springer.com/chapter/10.1007/978-981-16-3346-1_9
- [3] Aparna Trivedi, Chandan Mani Tripathi, Dr. Yusuf Perwej, Ashish Kumar Srivastava, Neha Kulshrestha, "Automated Attendance Management Based on Recognition," *International Journal focusing on Scientific Research in Science and Technology*, Volume 9, Issue 1, Pages 261-268, January-February 2022.
<https://doi.org/10.32628/IJSRST229147>
- [4] Shailendra, Manjot S., Md. Alam K., Vikram S., Avinash P., and Sushma Wadar, "Attendance management system," in 2015 international Conference Sequel: The Second Edition on Electronics and Communication Systems (ICECS), IEEE, 26-27 February 2015.
<https://doi.org/10.1109/ECS.2015.7124938>
- [5] Swami Sankaranarayanan, along with Azadeh Alavi and Carlos D. Castillo, Rama Chellappa, "Probabilistic triplet embedding for facial verification and cluster analysis" published in the 2016 at 8th International Conference on Biometrics Theory, Applications, and Systems (BTAS) organized by IEEE held on 06-09 September 2016.
<https://doi.org/10.1109/BTAS.2016.7791205>
- [6] Jack Febrian Rusdi, Frans Richard Kodong, Richardus Eko Indrajit, Herry Sofyan, Abdurrohman, Robert Marco, "Student Attendance using Face Recognition Technology," published in the 2020 2nd International Conference on Cybernetics and Intelligent System (ICORIS), held on 27-28 October 2020.
<https://doi.org/10.1109/ICORIS50180.2020.9320819>
- [7] R. Brunelli, T. Poggio, "Face recognition: features versus templates," published in IEEE Transactions on Pattern Analysis and Machine Intelligence, Volume 15, Issue 10, in the month of October 1993, pages1042-1052.
<https://doi.org/10.1109/34.254061>
- [8] Samuel Lukas and his colleagues, Aditya Rama Mitra and Ririn Ikana Desanti, Dion Krisnadi, "face recognition technique for Student attendance system in the classroom," published in the 2016 International Conference on Information and Communication Technology Convergence (ICTC), held on 19-21 October 2016.
<https://doi.org/10.1109/ICTC.2016.7763360>