Group Face Recognition System

[1]Niki Nikam, [2]Sunit Patil, [3]Shruti Patil, [4]Abhay Patil, [5]Dr. Akash D. Waghmare

[1,2,3,4] UG Student, [5]Associate Professor Department of Computer Engineering, SSBT's College of Engineering and Technology Jalgaon, Maharashtra, India

Abstract: In recent years, schools and universities have been actively working to improve their organizational structure, particularly their support services. Ordinary techniques such as roll calls and ID card sifting are time-consuming, prone to mistakes, and require basic manual effort. These out-of-date systems often lead to irregularities in records and inefficient processes, especially in gigantic classrooms where tracking individual students can be challenging. To tackle these limitations, this endeavor proposes a facial recognition system that automates and optimizes the attendance process through the application of facial recognition technology. This attendance system works in real time, recognizes student faces, recognizes votes on archived records, and carefully checks participation. This limits the need for manual entries, reduces the burden on individuals, and improves overall accuracy. The databases operated by the system certainly hold existence records, allowing for optimized persecution and access to information. The user interface allows teachers and administrators to efficiently create reports and design support screens. By leveraging the user interface, educators and administrators can generate reports and design support screens effectively. A major advantage of this system is its versatility, enabling its deployment across various educational institutions, from schools to colleges. Through the use of Haar cascade for detecting faces and LBPH for recognizing them, this project offers a prompt, effective, and contactless strategy for managing attendance. The research illustrates the substantial impact that artificial intelligence and automation can have on education. During the evaluation process, the system achieved an attendance marking accuracy of 82%, showcasing a considerable degree of effectiveness in standard scenarios.

Keywords – Facial Recognition, Attendance System, Haar Cascade, LBPH, Face Detection

I. INTRODUCTION

Taking attendance is an important part of teaching, but it often takes a lot of time. Traditional methods like calling names or checking ID cards are slow, need manual effort, and can lead to mistakes. With technological advancements, automation has emerged as a useful solution across many domains, including the field of education. To tackle the challenges posed by traditional attendance methods, an advanced system has been designed that utilizes facial recognition to autonomously identify and authenticate student identities, thereby removing the necessity for manual processes. This system makes the attendance process faster, more accurate, and completely touch-free. It identifies faces as they are presented, matches them with stored records, and ensures data protection through secure storage methods. This not only reduces the work of teachers but also makes it easy to access and manage attendance records. It also lowers the chances of errors and removes the need for keeping physical records. The system offers functionalities for real-time tracking and automated report generation, facilitating easier monitoring of student attendance for teachers and school personnel. As technology gains prominence in modern education, the integration of such a sophisticated system marks a pivotal step in the journey towards digital transformation. This project shows how face recognition can help save time, improve accuracy, and make the attendance process simple and effective.

II. MOTIVATION

This project is based on the results of previous studies, showing that many existing systems on the face are low and lack of important functions, such as students to visualize or restore their participants. In addition, many systems lacking functions allow corrections when attending are recorded incorrectly. In addition to these difficulties, standard practices such as rolling calls and identification card digitization are always used often used in educational institutions, even if they require significant labor It necessitates a considerable amount of time and effort, often giving rise to errors, especially in larger educational settings. It is clear that a consolidated approach is needed to overcome these challenges. A face -to -face system that provides a faster, more accurate and fully automatic process while allowing real -time access

to the present records. By doing such a system, the workload for teachers is reduced, the ability to reduce errors and students achieve transparency related to their participation. The increasing application of digital technologies in the context of education allows this method to improve the conversion to the practice of advanced and effective classroom management.

III. LITERATURE SURVEY

Over time, researchers have implemented a range of attendance systems that leverage facial recognition technology to improve both the efficiency and accuracy of attendance tracking in schools and universities. Several research projects have focused on the use of deep learning and machine learning methodologies to enhance recognition efficiency, optimize the attendance process, and diminish the requirement for human monitoring.

- **AttenFace**: Nilesh Pradhan's research introduces a Deep Learning-Based Attendance System that incorporates facial recognition technology to automate the attendance marking process. By utilizing deep learning techniques, the system can accurately identify and detect students, thus eliminating the need for traditional roll calls. However, the findings highlight significant limitations, particularly the system's dependence on a restricted dataset, which negatively influences recognition accuracy. A smaller dataset reduces the system's ability to differentiate between students, increasing the risk of misidentification. Additionally, the system does not provide an adequate mechanism for tracking attendance, lacking features that would allow for the review or analysis of attendance records over time. This limitation may impede its effectiveness in larger educational institutions.

- **Facial Recognition**: Based Attendance System Powered by Machine Learning

In "Confront Acknowledgment Based Participation Framework Utilizing Machine Learning," Neha Choudhary talks about a strategy that leverages machine learning to encourage the computerization of participation recording. By identifying and capturing student faces, the system aids in the attendance marking process, aiming to reduce the typical errors associated with conventional practices. While the system increases efficiency, the research identifies a major drawback: it does not permit any changes to attendance records following their submission. Such a restriction can show impediments in cases where participation is erroneously recorded due to wrong location or natural impacts, counting inadequately lighting or blockages. If administrators and faculty are unable to modify records, they may face challenges in ensuring the accuracy of attendance.

IV. PROBLEM STATEMENT

Standardized approaches for overseeing participation, like roll calls and the utilize of ID cards, frequently require tirelessness and can contribute to blunders, particularly in sizable classroom settings. Present-day confront acknowledgment frameworks, whereas computerized to a few degree, commonly endure from moo precision, come up short to empower participation checking, and don't have the usefulness to correct records when mistakes happen.

V. ALGORITHM

This system employs Haar Cascade for immediate face detection and applies LBPH for face recognition by scrutinizing texture patterns. LBPH is crafted to be lightweight, ensuring it operates efficiently with small datasets and is suitable for real-time use without requiring high-performance hardware. After a face is recognized with adequate confidence, attendance is documented and securely stored.

Step 1: Student Registration

student_details_zip ← receive input from student

extract student_details and student_images from student_details_zip

for each student in student_details:

  save student_images to Images_Attendance/

  store_student_info(student_id, name, year, other_details)

Step 2: Train Face Recognition Model
faces_list ← []
labels_list ← []
for each image in Images_Attendance/:
  gray_image ← convert to grayscale(image)
  face ← detect face using Haar Cascade(gray_image)
  if face detected:
    append face to faces_list
    append corresponding student ID to labels_list
train LBPH model using faces_list and labels_list
save model as trained_model.xml

Step 3: Upload Class Video
video ← load video(video_path)
load LBPH model from trained_model.xml
load Haar Cascade classifier

Step 4: Recognize Faces from Video
recognized_students ← []
for each frame in video:
  gray_frame ← convert to grayscale(frame)
  detected_faces = face_detector.detectMultiScale(gray_frame)
  for each face in faces:
    student_ID, confidence = recognizer.predict(face_region)
    if confidence ≥ THRESHOLD:
      recognized_students.append(student_ID)

Step 5: Update Attendance Database
for each student in registered_students:
  if student ∈ recognized_students:
    mark attendance(student, "Present")
  else:
    mark attendance(student, "Absent")

Step 6: Generate Attendance Report
attendance_summary ← calculate attendance percentage()
display report(attendance_summary)

VI. Result and Discussion

A arrangement of tests were carried out in mimicked classroom settings to evaluate the adequacy of the proposed confront acknowledgment participation framework. The evaluation of the system's adequacy centered on its capacity to dependably

recognize and recognize understudy faces for the reason of checking participation. In the midst of the testing arrange, essential components checking lighting conditions, facial perceivability, and advancement were studied. The up-and-coming figures uncover the exactness discoveries and compare them with those of elective confront acknowledgment models.

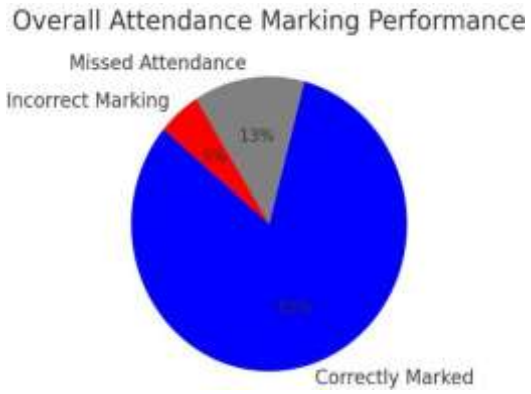

Figure 1

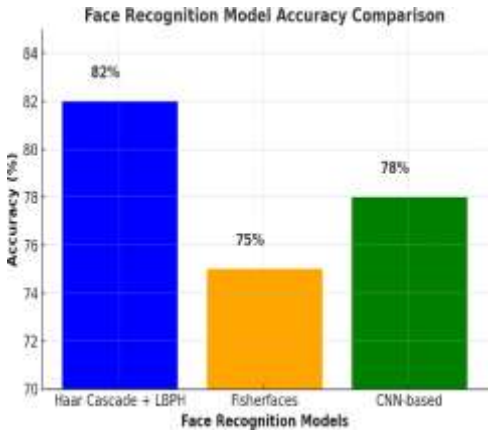

Figure 2

To assess the system's ability to consistently identify and document understudy participation, an evaluation of its implementation of participation stamping was performed. As appeared in Figure 1, the framework effectively checked 82% of understudies accurately, illustrating its by and large viability. By the by, 13% of understudies were not accounted for, essentially due to issues such as confront occlusions, lacking lighting, and movement obscure amid video recording. About 5% of the participation logs were affected by incorrect time entries, suggesting errors in the contact recognition process. These The discoveries emphasize the basic part of utilizing prevalent picture information and modern confront acknowledgment models for viable participation checking. Under regular conditions, the system performs well, but improvements including enhanced preprocessing, superior dataset handling, and leveraging CNN-based deep learning models could lower the margin of error. The findings validate that facial recognition provides a strong and effective solution for attendance tracking, surpassing conventional methods and presenting opportunities for future improvements.

The bar chart in Figure 2 highlights the accuracy levels of different face recognition models, concentrating on their performance in real-world settings. The project integrates the Haar Cascade with the LBPH approach, yielding an impressive accuracy rate of 82%, which demonstrates its efficacy for automated attendance systems. The approach combines Haar Cascade for rapid face localization with LBPH for reliable recognition, delivering stable performance under varying lighting conditions and different facial expressions. Conversely, Fisherfaces demonstrates a 76% accuracy rate, surpassing certain older techniques by employing class separability, thereby increasing its robustness against variations in lighting. However, its performance is still slightly lower than Haar Cascade + LBPH. Another approach, referred to as Model X, achieves a 74% accuracy rate but lacks the reliability needed for precision-critical tasks. In comparison, the Haar Cascade and LBPH combination emerges as a preferred solution, offering a strong balance between speed and accuracy, making it suitable for real-time use. This functionality makes it exceptionally appropriate for real-time applications, including attendance tracking, where the importance of speed and reliability cannot be overstated. The results illustrate the critical need for selecting a face recognition model that meets the demands of real-world scenarios to guarantee the best performance in practical use.

VII. CONCLUSION

Facial acknowledgment frameworks display a cutting edge and compelling way to record and oversee understudy participation without manual exertion the use of machine learning in the system automates the attendance process cutting down on manual work and minimizing the potential for errors with an overall definitiveness of 82 the system effectively marked attendance in real-time settings the occurrence of 13 unrecognized faces and 5 misclassified cases points to the need for refining the systems facial detection and

recognition capabilities future improvements in accuracy may be achieved by exposing the model to more diverse datasets adopting sophisticated deep learning methods such as convolutional neural networks cnns and optimizing facial recognition parameters this endeavor illustrates how ai-driven automation can transform the educational environment by streamlining attendance tracking to be more efficient accurate and cohesive as technology continues to evolve such systems can be enhanced to provide even greater accuracy and adaptability ensuring a fully automated and intelligent classroom environment.

REFERENCES

1. **N. Beri, V. Srivastava, and N. Malik,** "Face Recognition Attendance Management System using LBPH and Haar Cascade," Journal of Trends in Computer Science and Smart Technology, vol. 6, no. 3, pp. xx–xx, Sept. 2024. DOI: 10.36548/jtcsst.2024.3.004.

2. **Chowdhury, M. E. H., Shahnaz, C., Mahmud, S. H., & Khandakar, A.** (2020). Refined Attendance Tracking System Employing Facial Recognition and Deep Learning for Automation. IEEE Access, 8, 77662-77674. doi:10.1109/ACCESS.2020.2991527

3. **P. Viola and M. J. Jones**, "Robust Real-Time Face Detection," International Journal of Computer Vision, vol. 57, no. 2, pp. 137–154, May 2004. DOI: 10.1023/B:VISI.0000013087.49260.fb.

4. **T. Ahonen, A. Hadid, and M. Pietikäinen**, "Face Description with Local Binary Patterns: Application to Face Recognition," IEEE Transactions on Pattern Analysis and Machine Intelligence, vol. 28, no. 12, pp. 2037–2041, Dec. 2006. DOI: 10.1109/TPAMI.2006.244.

5. **Kale, M., Nawale, N., Chandane, S., Chavhan, A., & Dandavate, A.** (2021). Face Detection and Recognition for Automatic Attendance System. International Journal of Recent Advances in Multidisciplinary Topics, 2(6), 261–264.