e-ISSN: 2582-5208
International Research Journal of Modernization in Engineering Technology and Science
(Peer-Reviewed, Open Access, Fully Refereed International Journal)
Volume:06/Issue:05/May-2024 Impact Factor- 7.868 www.irjmets.com

SMART ATTENDANCE MONITORING USING FACE RECOGNITION

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DOI : https://www.doi.org/10.56726/IRJMETS55208

ABSTRACT

Manual attendance tracking is a time-consuming, error-prone, and frequently inefficient procedure used in organizations and educational institutions. As a result of its ability to improve accuracy, strengthen security, and expedite the process, automatic attendance systems have become more popular. In order to automate the administration of attendance, this study presents a creative Automatic Attendance System that makes use of face recognition and convolutional neural networks (CNN). The suggested solution starts by using a network of security cameras or webcams to take pictures of people as they go into a school or place of employment. During preprocessing, CNN-powered deep learning techniques are used to identify and extract facial features from these photos. For identification, the derived face traits are then compared to a previously created database of registered people's facial data. This identification method ensures high accuracy in tracking attendance since it is impervious to changes in illumination, face expressions, and small position alterations.

Keywords: Convolution Neural Network, Deep Learning, Face – Recognition, Open CV, Automatic Attendance System.

I. INTRODUCTION

Attendance Management records the data of your present and absent students. This system is used to track students those who are present. Face recognition systems are essential in practically every industry in our digital age. Face recognition is a widely utilized biometric technology. It may be applied to identity, authentication and security. This attendance management system uses facial recognition technology and deep learning mechanisms. This deep learning based software solution's primary goal is to use computer vision to update attendance using students faces. In addition to that it generates a customized report based on the attendance marked and the absentees list is mailed to the respective staffs. The system also has a separate admin login for the staffs to add new students to the database and it also allows them to edit their details accordingly. The purpose of this research study is to investigate the idea, creation, and use of an Attendance Management System (FRAMS) based on facial recognition. This study's main goals are to describe the technology underlying facial recognition, go over the benefits and drawbacks of FRAMS, assess how it affects attendance control in different situations, and provide best practices for its implementation. To sum up, this research study offers a thorough investigation of the application of facial recognition technology in attendance control.

II. LITERATURE SURVEY

The IEEE paper titled "SwinFace:A Multi-task Transfomer for face Recognition , Expression recognition , Age Estimation and attribute estimation" is proposed by Lixiong Qin,1 Wang, Chao Deng, Ke Wang, Xi Chen ,Jiani Hu ,Weihong Deng. In this work, a single Swin Transformer is used to provide a unified method for face identification, age estimate, facial emotion recognition, and face attribute (gender) estimation. In contrast to previous approaches that use different models for every job, SwinFace makes use of a common backbone with task-specific subnets to promote task synergy.

The IEEE paper titled "Multibranch Convolutional Neural Network For Gender And Age Identification Using Multiclass Classification And FaceNet Model" is proposed by Haris Setiawan,Mudrik Alaydrus, Abdi Wahab. This work aims to optimize accuracy and mean absolute error (MAE) in age and gender identification through multiclass classification and FaceNet integration within a multibranch convolutional neural network (CNN), addressing dynamic factors influencing gender and age recognition.

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The IEEE paper titled "Face Detection and its Features Extraction using Convolution Neural Network Model" is proposed by Yenumaladoddi Jayasimha , Venkatesha M, R. Venkata Siva Reddy . This thesis presents a CNN-based prototype for age prediction, gender classification, and facial emotion recognition. It employs hybrid feature extraction and optimization algorithms, achieving 98.79% accuracy in emotion recognition. Suitable for diverse human-computer interaction applications leveraging AI and ML.

The IEEE paper titled "Facial expression and attributes recognition based on multi-task learning of lightweight neural networks" Is proposed by Andrey V. Savchenko . This paper explores multi-task learning of lightweight CNNs for face identification and facial attribute classification (age, gender, ethnicity). Models based on MobileNet, EfficientNet, and RexNet architectures achieve near state-of-the-art results on UTKFace and AffectNet datasets. Additionally, using these models as feature extractors improves accuracy on EmotiW challenge datasets. Source code and models are publicly available.

The IEEE paper titled "A Review on Unconstrained Real-Time Rotation-Invariant Face Detection" is proposed by Shubh Lakshmi Agrwal , Sudheer Kumar Sharma , Vibhor Kant . An overview of pose and rotation invariant face detection approaches and applications.

III. PROPOSED SYSTEM

In order to precisely identify and record student attendance, the suggested approach calls for the installation of an AI-based smart face attendance system that makes use of Convolutional Neural Network (CNN) technology. This technology eliminates the need for human attendance taking by using face recognition algorithms to verify students upon admission into classrooms or designated attendance zones. High precision and dependability in attendance monitoring are ensured by the system's capacity to detect and match face characteristics with the integration of CNN algorithms.

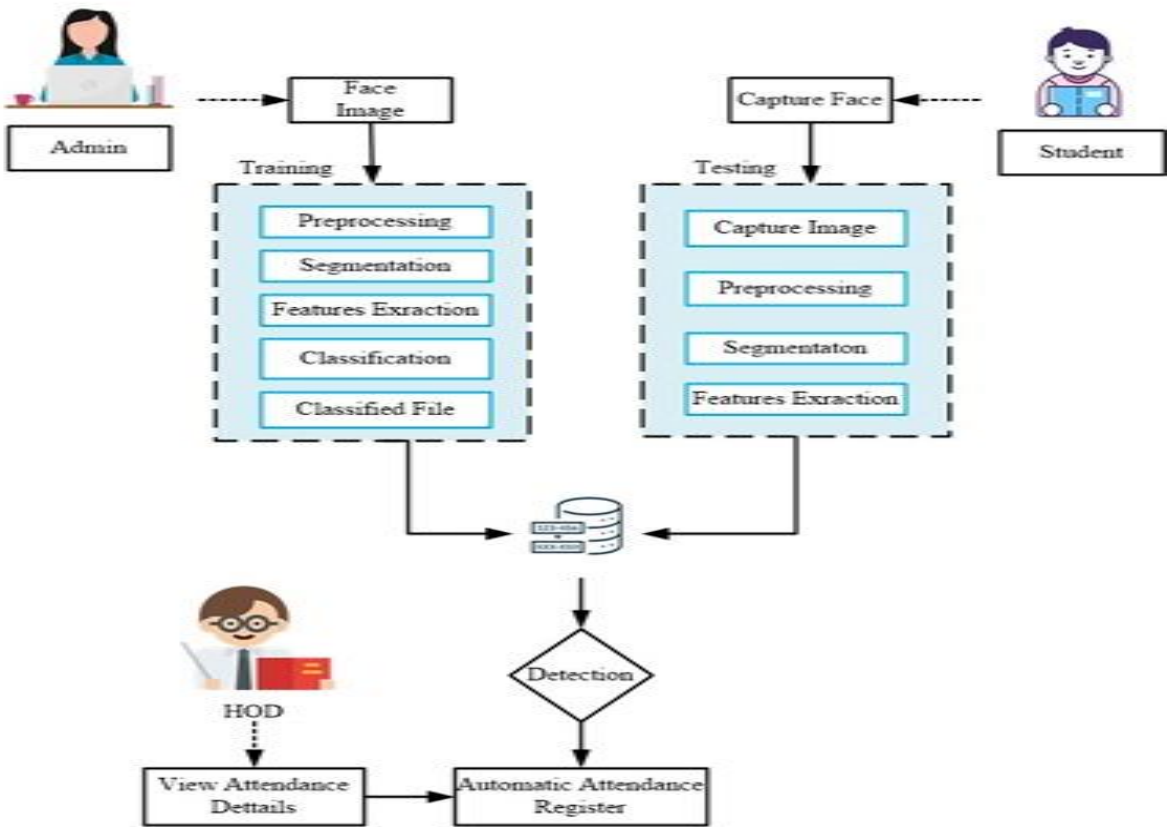

Fig.1 System Architecture

In addition, the system creates attendance reports automatically and transmits them in real time to college departments and heads of departments (HoDs). The automation of administrative procedures results in a reduction of paperwork, improved efficiency and accountability within the educational institution, and prompt access to attendance data for monitoring and decision-making.

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IV. METHODOLOGIES

A webcam or camera is used to collect student photographs in various settings, ensuring a varied range of facial expressions and viewpoints.

Preprocessing is applied to these photos, which includes downsizing to uniform proportions and cropping to isolate the Region of Interest (ROI) that contains the face.Additionally, to ease processing and lighten computational burden, photos are transformed from color (RGB) to grayscale.Subsequently, the photos undergo processing and are arranged into an extensive dataset. Every image is identified for supervised learning by labeling the matching student.Using the OpenCV package, the machine learning-based Haar-Cascade Classifier is used to accurately distinguish faces.This classifier can identify faces inside an image by learning patterns of facial characteristics from a large number of positive and negative pictures. Preparing training data, teaching the face recognizer, and generating predictions are the three main phases in the face recognition process. The captured images are used as the training data in the first stage. These pictures are all tagged with integer labels that identify the student they belong to. Then, facial recognition is applied to these annotated images. The Local Binary Pattern Histogram is the face recognizer employed in this system. First, a list of all the local binary patterns (LBPs) for the entire face is obtained by the system. After converting these LBPs into decimal values, histograms are made using the decimal values. Each image in the training data set therefore generates a histogram.

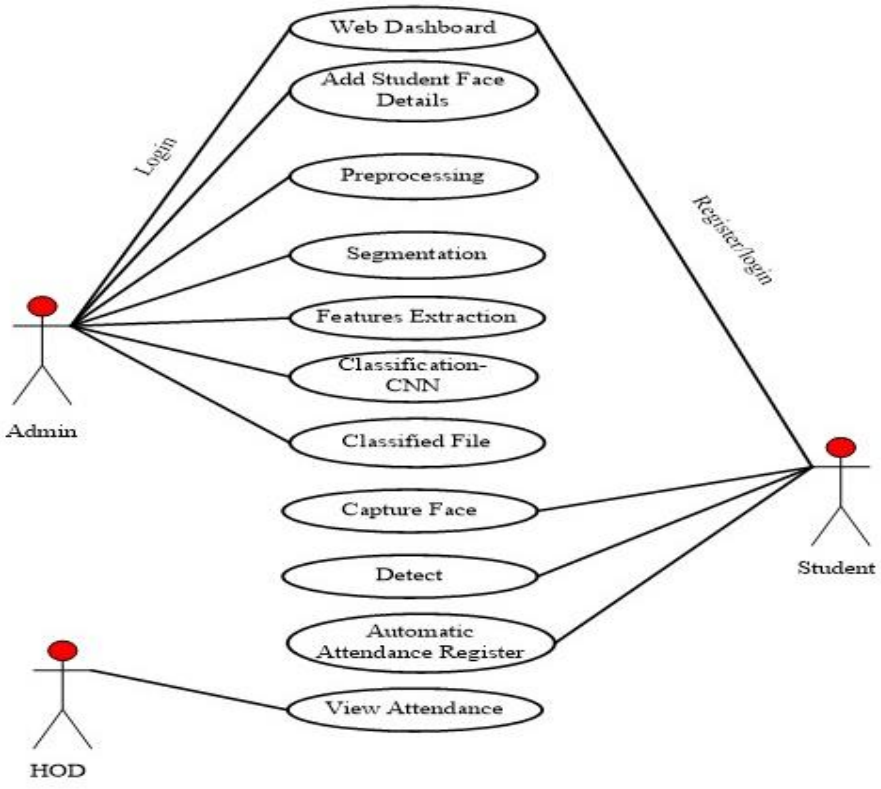

Fig.2 Use Case Diagram

Face detection, face alignment, feature extraction, and identification are the many phases of the system's operation. In order to improve feature extraction, the system aligns faces it detects in the video stream with conventional poses. The CNN model then takes face traits and compares them with student profiles that have already been registered in order to identify specific individuals. The system keeps a database of all enrolled students and their attendance records in order to monitor attendance. When a recognition attempt is successful, the system modifies the attendance records appropriately.

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Fig 3. Admin Login page

It also uses a threshold technique to reduce false positives and manage recognition uncertainty. In addition, the system has a reporting feature that lets administrators know when pupils are missing.

Fig 4. Adding Student details

A comparison between enrolled students and those identified during the current session is used to provide a detailed report that includes a list of absentee names. Administrators may monitor attendance patterns and quickly address any concerns with rapid action thanks to this reporting capability.

V. RESULT

Our suggested system's main goal is to create a sophisticated class attendance system that makes use of facial recognition technology. By using face recognition technology to record attendance in a seamless manner, this system seeks to transform attendance monitoring. Through the use of a webcam, the system effectively recognizes faces in a classroom setting and goes on to correctly identify each person. The system ensures accuracy and dependability in attendance management by rapidly recording the recognized student's, teacher's, or staff member's attendance upon successful recognition. This creative method provides a practical and effective way to track attendance for several stakeholders, which has major benefits for educational institutions like schools and universities. Because it can meet the demands of staff members, instructors, and students in terms of attendance.

VI. FUTURE WORK

Future improvements to the attendance system can involve linking it with the current student information systems (SIS) to guarantee smooth data synchronization and expedite administrative operations. Real-time alerts for tardiness and absences might enhance teacher-student communication, allowing for prompt interventions and encouraging responsibility. The face recognition system's dependability and integrity would be improved by including extra security features like anti-spoofing techniques, which would protect against unauthorized access attempts. In addition, the examination of attendance data may yield significant understandings of attendance trends and patterns, allowing academic institutions to make well-informed choices about the distribution of resources and student engagement programs. Last but not least, creating mobile applications for attendance monitoring will improve user accessibility and convenience by enabling them to mark attendance from their tablets or smartphones and access extra features while on the road.

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VII. CONCLUSION

Face recognition technology ensures accurate and error-free recording while revolutionizing attendance management. By using this automated approach, educational institutions may save a significant amount of time and money that would otherwise be required for human attendance tracking. Its versatility allows for effective attendance tracking for staff, instructors, and students in a variety of educational environments. Additionally, the method fosters a culture of timeliness and active engagement by encouraging accountability among stakeholders.

ACKNOWLEDGEMENT

I would like to thank Mrs. N. Porchelvi (Ph.D) Assistant professor of department of ECE for her guidance during work on the implementation of these techniques and while writing this paper.

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