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FACE RECOGNITION ATTENDANCE SYSTEM

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Abstract : These days, face detection and recognition technologies are crucial, and we've seen that they have a wide range of applications, including in high-risk information offices, cell phones, and the military. As an alternative to the conventional paper and fingerprint attendance systems, we chose to create a device that can detect and recognize faces as a student attendance system. The creation and deployment of an automated attendance system utilizing facial recognition technology is investigated in this mini project. Utilizing Python and its robust libraries, including face_recognition, dlib, and OpenCV. The system seeks to offer a smooth and effective way to monitor attendance in corporate or educational environments. Through comparison with a pre-registered database of facial image data, faces are detected and recognized as part of the project. This method saves time and reduces errors by doing away with the need for conventional manual 4 attendance methods. Key features of the system include facial recognition, feature extraction, accuracy assurance, and robustness.

I. INTRODUCTION

Traditional attendance tracking techniques like roll calls and sign-in sheets are becoming less effective and more prone to human error in today's hectic corporate and educational settings. Automating and improving these procedures is becoming more and more possible with the introduction of cutting-edge technologies, especially in the domains of computer vision and artificial intelligence. Face recognition software has become a viable option, using machine learning to precisely identify people in real time. This project's main goal is to create a reliable Face Recognition Attendance System that uses Python and a number of libraries to automate the attendance marking process. This system combines OpenCV for image processing, dlib for machine learning features, and face recognition for detection and recognition**.**

II. LITERATURE SURVEY

Globally, face recognition technologies are improving security and attendance monitoring, which has resulted in notable advancements in identity verification. For access control strategies to be effective, people must be identified precisely and on time. Using deep learning models, specifically Convolutional Neural Networks (CNNs), for face recognition tasks has yielded encouraging results in recent studies, allowing for precise and effective identity verification.

1. G. M. A. R. Hussain, A. M. B. T. Rehman, and M. K. Khan, "Automated Attendance System Using Face Recognition," 2020 International Conference on Artificial Intelligence (ICAI), Dubai, UAE, 2020, pp. 1–5, 5 doi: 10.1109/ICAI49722.2020.9235706.

2."Real-Time Face Recognition for Smart Attendance System," presented by J. Zhao, J. Wang, and Y. Liu at the IEEE 14th International Conference on Image Processing, Image Quality, and Image Capture Systems (IPIQ) in 2019

3. H. M. N. Abdalraouf, "Face Recognition-Based Real-Time Attendance Management System," 9th International Conference on Information Technology (ICIT), Amman, Jordan, 2018, pp. 123–128 doi: 10.1109/ICIT.2018.00036.

III. METHODOLOGY

The suggested face recognition attendance system guarantees accuracy, speed, and robustness by means of a methodical multi-phase pipeline.

1. Image Acquisition

The system uses a live video feed from a webcam or IP camera installed at the classroom or office entrance.

Individual frames are extracted in real time at a fixed interval (e.g., every second) to identify faces.

2. Face Detection

Face detection is performed on the captured frames using the Multi-task Cascaded Convolutional Neural Network (MTCNN) or Haar Cascade Classifier. These methods locate face bounding boxes and identify facial landmarks (eyes, nose, mouth) necessary for alignment.

3. Preprocessing

To enhance recognition performance:

Face Alignment: Faces are aligned based on eye and nose positions to reduce the effects of tilt and rotation.

Resizing: Cropped face photos are resized to the input dimensions required by the FaceNet model.

Normalization: Pixel counts are scaled to the range [0,1] or standardized (mean subtraction and division by standard deviation) to match the training conditions of the neural network.

4. Feature Extraction with FaceNet

FaceNet converts each face into a unique 128-dimensional embedding vector using a deep convolutional neural network trained on a large-scale face dataset (e.g., VGGFace2). These embeddings are designed to be:

Close together for the same person (low intra-class distance)

Far apart for different people (high inter-class distance)Feature Extraction

5. Face Matching

The embeddings of detected faces are compared against a database of known embeddings using:

Cosine Similarity or Euclidean Distance

A threshold (e.g., 0.5 for cosine similarity) is used to determine if a face matches a registered user.

6. Attendance Logging and Management

The attendance records are stored in a database (e.g., SQLite, MySQL, or Firebase).

7. System Optimization

To ensure smooth operation:

Frame Skipping: Not every frame is processed to reduce computation.

Multi-threading: Separate threads handle video capture, recognition, and logging

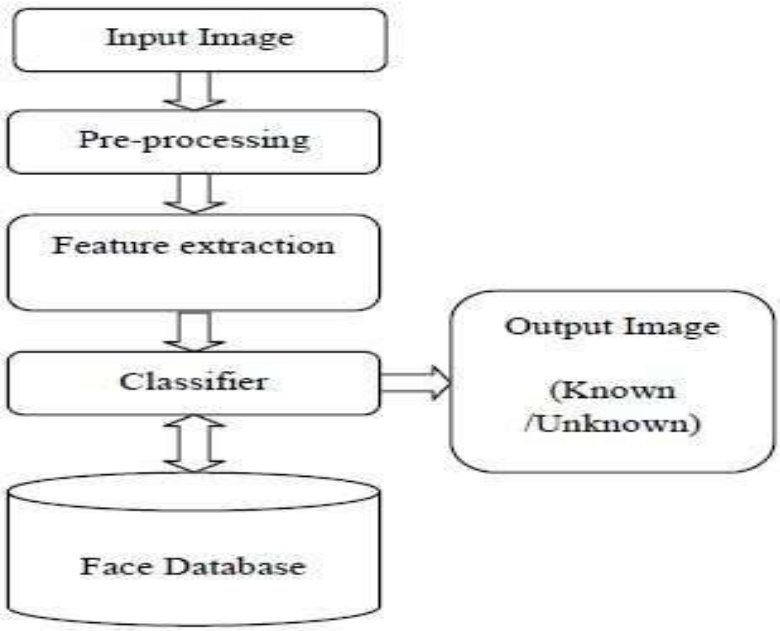


Fig : *Implementation Diagram*

IV. DESIGN AND ARCHITECTURE OF THE SYSTEM

1. Input Layer: Captures image frames from camera feeds

This module captures video from webcams or IP cameras and extracts frames at regular intervals (e.g., 1 frame per second). Frames are resized and filtered to improve quality before face detection begins.

2. CNN Backbone: Uses FaceNet to convert faces into vector representations

Detected faces are aligned and passed through the FaceNet model, which transforms them into 128-dimensional embeddings. These vectors capture unique facial features for each individual, enabling accurate recognition.

3. Database Matching: Pre-saved embeddings allow quick matching and identification

Generated embeddings are compared with a database of stored user embeddings using cosine similarity or Euclidean distance. If a match exceeds a set threshold, the person is identified; otherwise, they are marked as unknown.

4. Output: Attendance logs are updated in real-time and stored securely

Matched individuals are marked present with a timestamp. Records are stored in a secure database and accessible via a dashboard. Duplicate entries are prevented within defined time windows, and logs can be exported or integrated into external systems.

V. FUTURE WORK OF THE SYSTEM

- Integrating with cloud-based systems for scalability.
- Enhancing accuracy using deep learning (CNN, FaceNet) for real-time recognition.
- Mobile app integration for real-time alerts and attendance tracking.
- Adding liveness detection to prevent spoofing using photos/videos.
- Adapting the system to work in low-light or multi-angle environments.

VI. IMPACT ON SOCIETY

By improving efficiency, accuracy, and responsibility in institutions and businesses, the introduction of a face recognition-based attendance system greatly affects society. It guarantees that only present people are marked by eliminating manual errors and preventing proxy attendance ..The system promotes transparency through real-time digital records and reduces administrative workload. Additionally, its contactless nature is especially valuable in maintaining hygiene and safety in post-pandemic environments. By encouraging the use of AI and computer vision, it also fosters technological awareness and digital transformation. Furthermore, moving away from paper-based methods supports environmental sustainability by reducing waste.

VII. RESULT OF THE SYSTEM

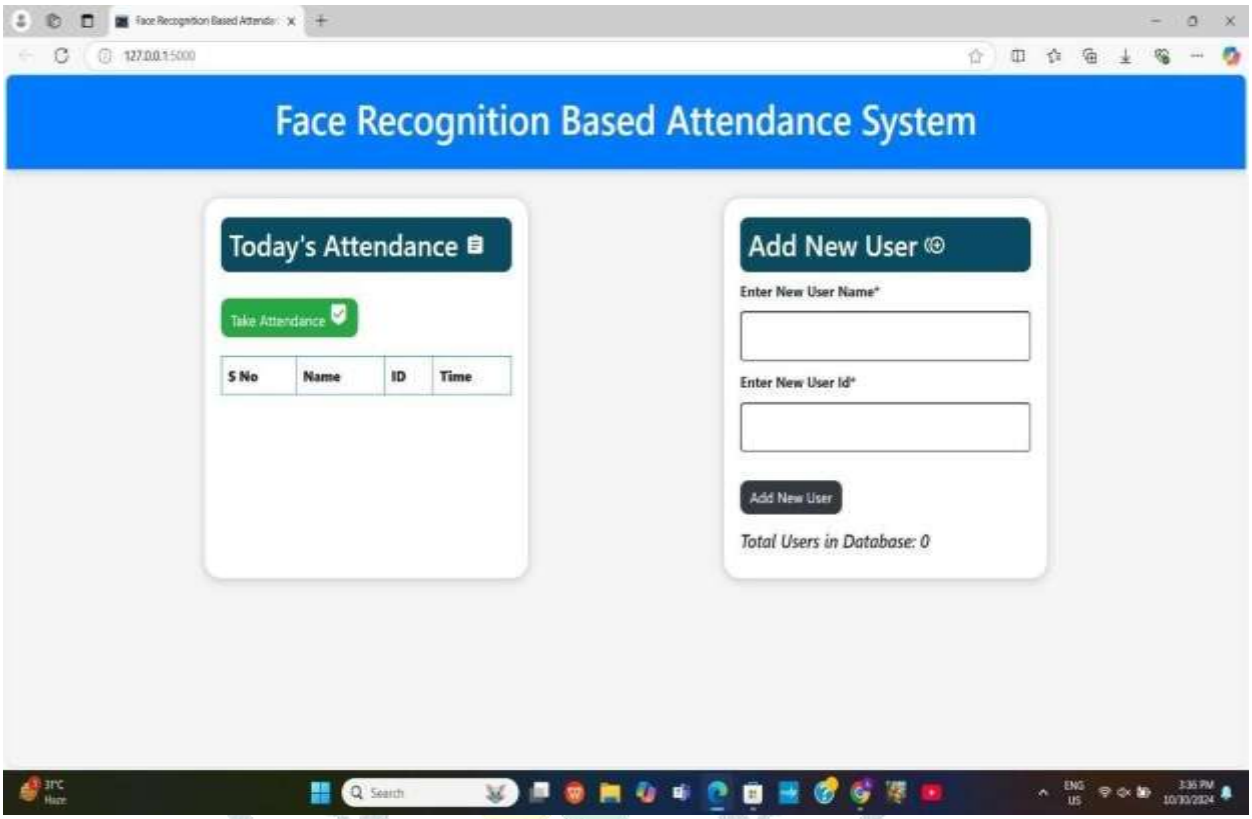
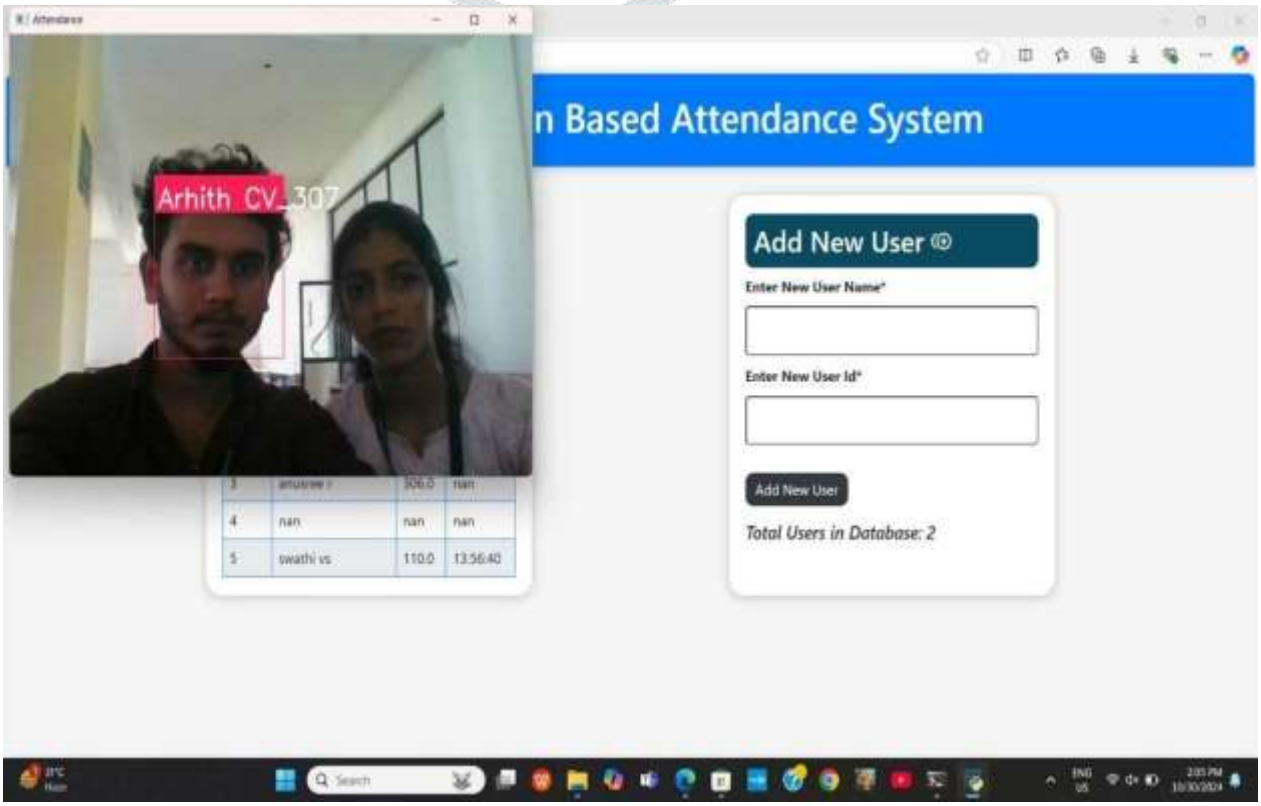


Fig:Output



VIII. CONCLUSION:-

The Face Recognition Attendance System automates attendance tracking effectively by means of manual intervention reduction, so enhancing accuracy and efficiency. Integrated advanced facial recognition technology enables real-time identification, therefore simplifying the process for both users and administrators. Built to be scalable, the system can handle many users simultaneously and promises good performance even in hectic settings. Future work enhancements could be the use of liveness detection to stop spoofing attacks, the development of a mobile app for user convenience, and the inclusion of IoT elements to control physical access depending on attendance records.

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