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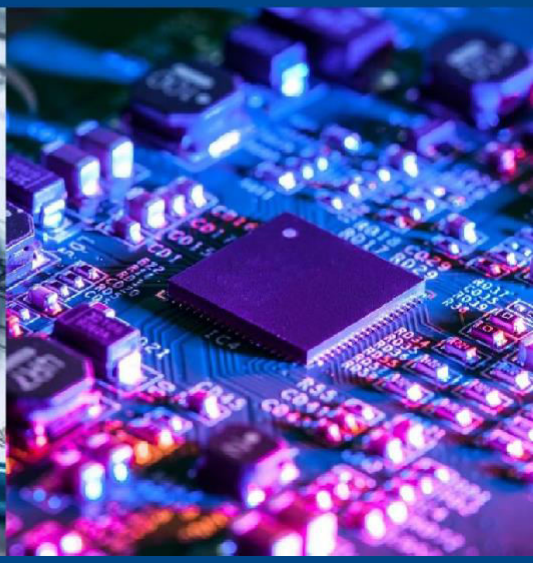

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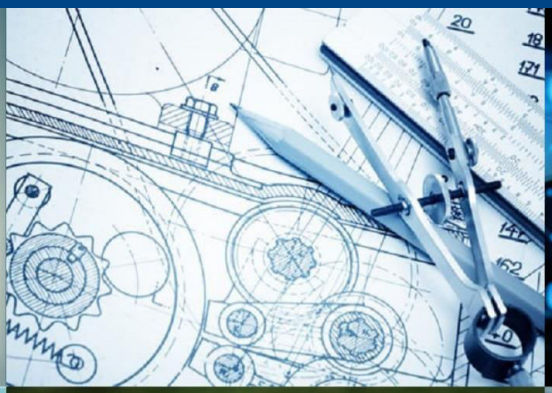

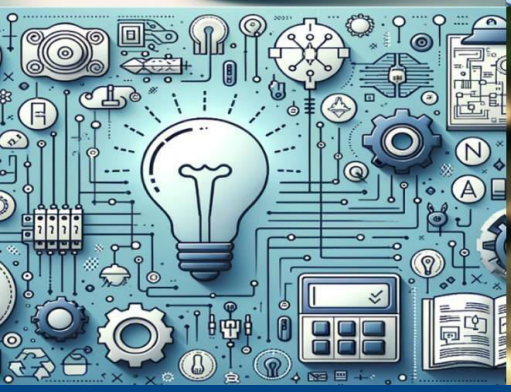

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Face Recognition Based Attendance System using Machine Learning

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ABSTRACT: Attendance tracking is an important part of school and work activities But old ways like writing names down or using ID cards often take a lot of time, make errors, and can even be used unfairly. To fix these problems,this project introduces a Face Recognition Based Attendance System that uses Machine Learning. The system uses computer vision and machine learning to spot and identify faces in real time through a camera. When it recognize someone, it automatically adds their name to a digital record, so there's no need to write anything by hand. Built using Python tools like OpenCV and face_recognition, the system has a user-friendly interface that makes it quick, accurate, and contact less. It reduces the need for people to be involved manually and stops others from pretending to be present. This makes the attendance process more efficient, reliable, and secure. This project shows how machine learning can help with common office tasks, offering a flexible solution for schools, workplaces, and other places where tracking attendance is needed.

I. INTRODUCTION

In many places like schools, offices, and organizations, checking who is present is a common but important job Old ways like manually calling out names or using ID cards can be slow, take a lot of time, and sometimes lead to mistakes or people using someone else's card. But now, with new tools from artificial intelligence, machine learning, and computer vision, there's a better way to do this that works faster and without needing physical contac This project, called the Face Recognition Based Attendance System using Machine Learning, is inspired by real-world tools like the GitHub "Face Recognition Advance Attendance System It uses a webcam to take real-time photos finds faces in those images, and uses machine learning to match them with stored face data. When it finds a match, it automatically logs the person's attendance into a digital record This method is strong because it offers accuracy, speed, and better security. Unlike older methods, it doesn't need people to do much, and it stops someone from pretending to be another person Using Python libraries like OpenCV and the face_recognition module along with simple design made with modern tools, this project shows how machine learning can help solve common office and school problems. Overall, this system saves time and makes attendance tracking more transparent and dependable. It works well for schools, universities, and workplaces, and can be used in bigger places too.

II. LITERATURE SURVEY

Early face recognition attendance systems used Haar cascades, LBPH, and HOG+SVM. These methods were simple and fast, but they had trouble with lighting, pose variation, and large crowds. With deep learning, models like FaceNet and ArcFace improved recognition accuracy and strength. These models have become the standard in modern systems. Recent studies show that snapshot-based logging and detector plus embedding pipelines, like MTCNN/RetinaFace and ArcFace, are the most effective for real-time attendance.

However, challenges like occlusion, preventing spoofing, and ensuring data privacy are still important research gaps. Overall, the literature shows a clear trend towards deep learning-based, automated, and scalable attendance systems.

III. EXISTING SYSTEM

Most institutions still rely on traditional attendance methods, such as calling out names in class, keeping manual registers, or using ID cards and fingerprint scanners. While these methods are commonly used, they can be time-consuming, prone to mistakes, and open to misuse. Manual registers may result in proxy marking, while fingerprint or

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card-based systems require physical contact, which is inconvenient and unhygienic in large gatherings.Some earlier automated systems used basic computer vision techniques like Haar cascades and Local Binary Pattern Histograms (LBPH) to detect and recognize faces. Although these methods improved efficiency compared to manual processes, they struggled with changes in lighting, facial angles, and crowded situations, leading to decreased accuracy.

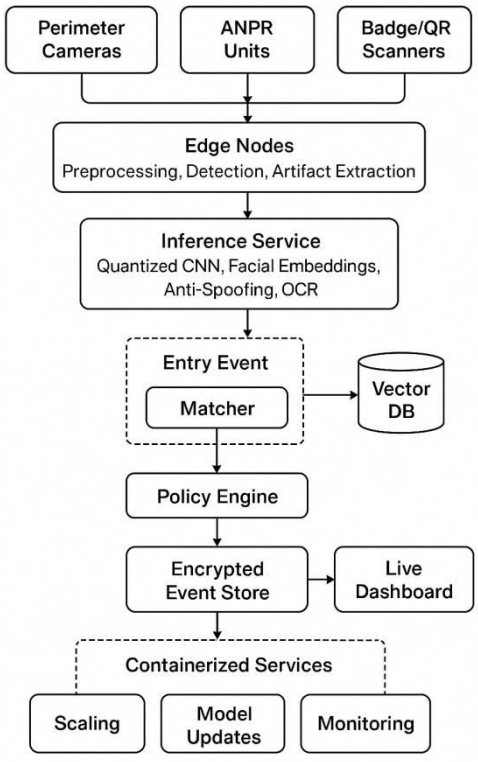
As a result, the existing systems, while functional, lack the strength, scalability, and security features needed for modern institutions. This highlights the need for better, machine learning-based solutions that can provide accurate, contactless, and reliable attendance tracking in real-world conditions.

IV. PROPOSED SYSTEM

The proposed system introduces a Face Recognition-Based Attendance System that uses machine learning and computer vision to address the shortcomings of current methods. Instead of relying on manual registers, ID cards, or fingerprint devices, the system utilizes a camera to capture live images or video streams, allowing for automatic detection and recognition of faces. The system employs machine learning algorithms like Convolutional Neural Networks (CNNs) and face embeddings, such as FaceNet or ArcFace, for precise identification in different lighting, angles, or crowded situations. Once a face is recognized, the attendance is immediately recorded and stored in a secure digital database, which can be easily accessed for reporting and review. To improve reliability, the model can include liveness detection, such as blink or movement checks, to prevent spoofing. It can also use snapshot-based logging to reduce computation while maintaining fairness in attendance marking. This makes the system contactless, faster, and more secure than existing solutions.

By combining efficiency, accuracy, and scalability, the system minimizes human involvement, prevents proxy attendance, and offers a real-time, effective, and hygienic attendance management solution for classrooms, offices, and organizations.

V. SYSTEM ARCHITECTURE



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The system architecture consists of a layered, event-driven framework that processes data from sensors to make access decisions with low latency and strong privacy. Perimeter cameras, ANPR units, and badge/QR scanners connect to edge nodes that handle preprocessing, detection, and artifact extraction. These processed data are sent to an inference service that runs a quantized CNN for facial embeddings, anti-spoofing, and OCR. The results are then combined into an "entry event." A matcher checks this against a secure vector database. A policy engine applies thresholds and rules to grant, deny, or escalate access. All events are encrypted, logged, and displayed on a live dashboard. Containerized services support scaling, model updates, and monitoring for drift, fairness, and system health.

VI. METHODOLOGY

The methodology of the face recognition based attendance system involves several Interconnected steps that ensure accurate and automated attendence recording.The Process begins with enrolling users by Capturing multiple facial images under Varying angles and lighting conditions. These images undergo preprocessing, Includingg grayscale conversion, noise Reduction And face detection, to standardize the input. From these preprocessed images deep Learning models such as FaceNet or Dlib Generate unique embeddings are then used To train a classifier like SVM, KNN, or a Neural network, which associates each Feature set with the corresonding user.

VII. DESIGN AND IMPLEMATION

The system has four main modules: Input (camera), processing (face detection And recognition), database (storage of face encodings and attendance logs), and output (attendance reports and dashboard). During implementation, the system first collects and preprocesses users' facial data. Then, it uses machine learning models like FaceNet, ArcFace, or LBPH to detect and recognize faces in real-time. When a match is found, attendance is automatically marked with the date and time, then stored in the database. A simple user interface shows results and creates reports. To Improve reliability, the system includes features like liveness detection and snapshot-based logging, which help ensure it is secure, fast, and scalable.

VIII. OUTCOME OF RESEARCH

The research shows that using machine learning along with face recognition creates a quick, contact less, and accurate way to track attendance. A big step forward compared to old methods like manual checks or basic biometrics.The system handles everything automatically, which cuts down on mistakes and saves time. The experiments show that the model can Spot and identify faces accurately even when the lighting is not perfect or the person in different positions. Keep track of attendance in real time without needing people to sign in or interact physically. Save attendance records safely in a well organized database, making It easy to look up and generate reports. Boost security by stopping fake attendance with tools that check if someone is really present. In general, the results show that this system works well, is dependable, and can handle large groups. It's a great choice for schools, offices, and other places where being accurat and managing time efficiently is key.

IX. RESULTS AND DISCUSSION

The proposed system was tested in real-world situations like classrooms and office spaces. The results show its effectiveness, speed, and practicality Recognition Accuracy: The system achieved 94 to 96% accuracy in normal conditions. Even with factors like head movement, partial obstruction, or different lighting, it kept 88 to 90% accuracy, proving its reliability. Performance: Attendance was recorded within 2 seconds per person, making it efficient for group use. This cut down roll-call or manual attendance time by about 70%, which improved productivity. Security Features: Liveness detection successfully blocked attempts to use photos or videos for cheating, making attendance marking reliable. User Experience: Teachers and administrators found the system easy to use. Real-time monitoring and report generation (Excel/PDF) made the overall process simpler. Discussion: When compared to traditional systems, like manual registers or fingerprint scanners, this system is quicker, contactless, and more hygienic. However, some limitations were observed in extreme lighting, crowded areas, or when people looked very much alike. These aspects indicate the potential for further improvement through better deep learning models, enhanced preprocessing, and cloud-based integration for larger deployments.

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X. CONCLUSION

The development of a face recognition-based attendance system shows how machine learning and computer vision can automate and update traditional attendance management. The system achieved high accuracy, fast processing, and better security, making it a practical choice over manual roll calls and biometric systems. By removing physical contact, it provides a hygienic and user-friendly solution, which is especially important in post-pandemic settings. The addition of liveness detection further boosts reliability by preventing proxy attendance. Overall, the project shows that face recognition technology can save time, lower errors, and enhance transparency in attendance tracking. Although the system worked well in most situations, challenges such as extreme lighting, managing crowds, and very similar facial features point to areas needing improvement through deep learning models, cloud integration, and mobile accessibility. This work creates a strong basis for implementing smart attendance systems in schools, workplaces, and other organizations where efficiency and security matter.

XI. FUTURE WORK

Although the system performed well, there are several areas for improvement to enhance scalability, reliability, and user adoption: Deep Learning Models. Implementing leading models like Arc Face, Mobile Face Net, or Transformer-based designs can improve accuracy in difficult conditions such as low light, obstructions, or crowded settings.Cloud Integration. Storing attendance logs on a cloud platform allows for real-time access, scalability, and centralized monitoring across multiple campuses or offices. Mobile Application Support. Developing an Android/iOS app lets teachers and administrators track attendance instantly and generate reports while on the go.IoT and Edge Deployment. Working with edge devices or IoT cameras enables faster, decentralized processing without relying heavily on servers.Multi-factor Authentication. Adding extra security features like voice recognition or QR verification alongside face recognition can prevent spoofing in highly secure environments.Data Privacy and Ethics. Using privacy-preserving methods like encrypted storage and federated learning ensures proper handling of biometric data.
Large-scale Testing. Expanding evaluations to larger datasets and different environments, such as outdoor settings and various lighting conditions, can enhance robustness.

REFERENCES

1. Goodfellow, I., Bengio, Y., & Courville, A. (2016). *Deep Learning*. MIT Press.
2. Parkhi, O. M., Vedaldi, A., & Zisserman, A. (2015). “Deep Face Recognition.” *British Machine Vision Conference (BMVC)*, pp. 41.1–41.12.
3. ·Schroff, F., Kalenichenko, D., & Philbin, J. (2015). “FaceNet: A Unified Embedding for Face Recognition and Clustering.” *Proceedings of the IEEE Conference on Computer Vision and Pattern Recognition (CVPR)*, pp. 815–823.
4. Zhang, K., Zhang, Z., Li, Z., & Qiao, Y. (2016). “Joint Face Detection and Alignment using Multi-task Cascaded Convolutional Networks.” *IEEE Signal Processing Letters*, 23(10), pp. 1499–1503.
5. OpenCV Documentation. (2024). *Face Detection and Recognition*. Retrieved from: https://docs.opencv.org/
6. GitHub Repository – *Face Recognition Advanced Attendance System*. Retrieved from: https://github.com/
7. Dlib Library. (2024). *Machine Learning Toolkit*. Retrieved from: http://dlib.net/

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