

Review of “Automating Attendance with Image & Video Recognition - A Facial Recognition Based System”: A Comprehensive Study

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Abstract – The proposed project, ProScanX, is an advanced attendance management system that utilizes facial recognition from both video and images to enhance accuracy, security, and efficiency. Designed for educational and corporate environments, the system eliminates issues like proxy attendance and manual errors by ensuring only authenticated individuals can mark their presence. Developed using Flutter, it processes facial data from video streams and images with OpenCV for identity verification. Attendance records, including timestamps and captured images, are securely stored on Firebase or a local server for easy access and analysis. By automating attendance tracking, the system reduces administrative workload and ensures reliable data management. Additionally, it is scalable and can integrate further biometric authentication methods such as iris or fingerprint recognition to enhance security in the future.

Keywords – Attendance Management, Facial Recognition, Video-Based Authentication, Image Processing, Automated Attendance, Biometric Authentication

1. INTRODUCTION

Efficient attendance tracking is essential in educational institutions and corporate organizations to ensure participation, monitor performance, and maintain accountability. Traditional methods, such as manual roll calls and physical registers, are time-consuming, prone to errors, and susceptible to fraudulent practices like proxy attendance. These challenges highlight the need for a more secure and automated approach to attendance management.

This project introduces an **Attendance Management System using Face Recognition**, which leverages advanced facial recognition technology to authenticate individuals and accurately record attendance. The system captures facial data from both images and video streams, verifying identity through OpenCV-based recognition algorithms. Built using Flutter, the

system provides a seamless and user-friendly mobile application for attendance marking. All attendance records, including timestamps and facial data, are securely stored on Firebase or a local server, ensuring easy access and real-time monitoring. By eliminating manual errors and unauthorized attendance marking, this system enhances security, accuracy, and operational efficiency, making it a scalable solution for various educational and corporate environments.

1. LITERATURE REVIEW

The evolution of biometric attendance systems has significantly transformed how organizations track attendance. Traditional methods, such as manual registers and RFID-based systems, often suffer from inefficiencies, human errors, and security vulnerabilities. With advancements in biometrics, artificial intelligence (AI), machine learning (ML), and computer vision, attendance tracking has become more accurate, secure, and automated.

This review explores various studies on facial recognition and iris scanning for attendance management. It discusses their implementation, accuracy, security measures, and limitations while identifying potential improvements. The integration of AI and ML in biometric attendance systems enhances reliability by reducing spoofing risks and increasing authentication precision. However, challenges such as lighting conditions, facial

occlusions, and computational complexity remain areas for further research and development.

This book explores advanced techniques for Face De-Identification and privacy protection, addressing key challenges in safeguarding personal data. It introduces three innovative approaches to image privacy protection: differential private k-anonymity, identity differential privacy guarantee,

and personalized, invertible Face De-Identification. Additionally, it presents a novel reversible Face Video De-Identification framework that leverages deep motion flow, ensuring smooth and consistent privacy protection across video frames. [1].

This open-access book explores the evolving field of biometric identification using brainwave patterns and fingerprint recognition. It highlights recent advancements in electroencephalography (EEG)-based biometric systems, which analyze unique neural patterns for secure authentication. Additionally, it examines fingerprint recognition as a widely adopted biometric method, showcasing its reliability and efficiency in identity verification.[2].

Manufacturing companies struggle with increasing process complexity while ensuring timely deliveries, especially during assembly. Early detection of missing parts is crucial for meeting deadlines. This book explores machine learning-based predictive models to address this issue, identifying gaps in current methods, such as limited use of material data and late-stage predictions. Case studies confirm the impact of material data on predicting in-house shortages and supplier delays, providing valuable insights for production planning and procurement. [3].

This collection includes 532 research papers chosen from 1,420 submissions, covering key areas of computer vision and machine learning. Topics include action recognition, 3D reconstruction, biometric and face recognition, neural networks, deep learning, object detection, medical image analysis, and autonomous driving. Other areas explored are pattern classification, feature extraction, video processing, and optimization techniques.[4].

This book explores AI applications in cybersecurity, forensics, and biometric

systems, covering topics such as AI-driven intrusion detection, intelligent authentication for IoMT, electronic medical record security, and multi-face recognition with anti-spoofing. It also examines face morphing attack detection, AI-assisted forensics, terrorist activity prediction, security violations in IDS, image encryption, and ransomware mitigation. The book highlights emerging research areas where AI enhances security and intelligence. [5].

Human and activity recognition from video is a growing research field with applications in video surveillance, entertainment, multimedia, and medical diagnosis. This lecture explores face and gait recognition for identification and activity

detection. Traditional face recognition methods are discussed, along with advancements using video sequences, 3D models, and illumination variation techniques. Challenges include pose, disguise, and aging. Gait recognition, though studied in kinesiology, is now used for automated movement analysis, facing challenges like viewpoint variations. The lecture also reviews human activity recognition techniques across AI, image processing, and computer vision, emphasizing 2D/3D shape modeling. Future research focuses on multimodal fusion, pose variations, and 3D model accuracy. [6].

This book explores deep learning applications in computer vision, covering object classification, detection, segmentation, captioning, image generation, and face analysis. It provides practical examples using TensorFlow and Keras, helping readers master advanced deep learning techniques for robotics, automation, and AI-driven vision systems.[7].

This book explores OpenCV and computer vision, providing insights into facial recognition, object tracking, and augmented reality with Python. It also covers machine learning techniques, real-time data analysis, and AI implementation using TensorFlow and Keras, helping in building efficient applications.[8].

II. METHODOLOGY

A. Requirement Analysis

1. Student Registration (Admin/Teacher Role)

- Capturing Student Information:
 - The Admin/Teacher collects high- quality images of students using a webcam or an integrated camera.
 - Alongside the photos, the following details are entered:
 - Student Name
 - Student ID
 - Mobile Number
 - Email ID
- Storing Data in the Database:
 - The student details and images are securely stored in a centralized database.
 - Each student's facial image is processed using deep learning models such as FaceNet or VGGFace to generate a unique facial embedding.
 - This embedding, along with the student's details, is stored for

future identity verification during attendance marking.

2. Real-Time Attendance Marking (Admin/Teacher Role)

- Capturing Video or Images for Attendance:
 - The Admin/Teacher sets up a camera in the classroom or designated attendance area to capture real-time images or video.
 - The system processes the video feed to detect and recognize faces in real-time.
- Automatic Face Recognition and Attendance Marking:
 - The facial recognition algorithm compares detected faces with stored embeddings in the database.
 - If a match is found, the system logs the student's attendance with a timestamp and date.
- Real-Time Attendance Logging:
 - Students whose faces are successfully recognized are marked as Present in the system.
 - The system ensures attendance integrity by preventing unauthorized individuals from marking attendance on behalf of others.

3. Attendance Recording and Report Generation (Admin/Teacher Role)

- Attendance Data Storage:
 - Attendance records are stored

securely in a centralized database.

- The system maintains logs containing:
 - Student Name
 - Student ID
 - Attendance Status (Present/Absent)
 - Date and Time of Attendance
 - Generating Reports:
 - The Admin/Teacher can generate attendance reports for specific sessions, days, or time periods.
 - Reports are available in PDF or Excel format, making them easy to download, share, or print.
- #### 4. System Features, Security, and Maintenance (Admin/Teacher Role)
- Proxy Attendance Prevention:
 - The system ensures that only registered students can mark their

attendance, eliminating fraudulent practices.

- Security Measures:
 - Data is protected using encryption and secure storage mechanisms to prevent unauthorized access.
 - The system can include Role- Based Access Control (RBAC), but typically, the Admin/Teacher has full access to manage attendance.
- Scalability and Maintenance:
 - The system is designed to handle new students, additional sessions, and multiple locations efficiently.
 - Routine updates enhance facial recognition accuracy, system performance, and security over time .

B. Implementation

A. User Authentication (Teacher)

1. Start
2. Login Screen Displayed
3. If User Selects Registration:
 - Enter personal details
 - Validate input data
 - Store user credentials in Firebase Authentication
 - Send a verification email
 - Complete registration process
4. User Authentication Process:
 - If authentication is successful Redirect to the dashboard
 - If authentication fails → Display an error message
5. End

B. Student Attendance Management

1. Start
2. Login to ProScanX Admin Panel
3. Student Registration Process:
 - Capture high-quality images or video of students
 - Extract facial features using deep learning models
 - Store facial embeddings along with student details in the database
4. Real-Time Attendance Capture:
 - Live camera feed processes student faces

- Facial recognition algorithm matches detected faces with stored data
 - If a match is found → Attendance is marked as "Present"
 - If no match is found → Student is redirected to the registration process
5. Attendance Logging:
- Store attendance records in the database with timestamps

C. Attendance Report Generation

1. Start
2. Attendance Storage:
 - Every attendance entry is recorded with student details and timestamp
3. Attendance Calculation:
 - Calculate total attendance percentage for each student
4. Generate Report:
 - Export attendance data in PDF or Excel format
 - Allow teachers to download and review attendance reports
5. End

III. EXPECTED OUTCOMES

1. Automated and Precise Attendance Management

- Eliminates traditional roll-calling by using AI-powered facial recognition.
- Minimizes errors while ensuring accurate student identification.

2. Efficient Attendance Tracking & Data Storage

- Automatically records attendance, reducing manual efforts.
- Stores attendance data securely, making retrieval quick and hassle-free.
- Generates customized reports in PDF and Excel formats.

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