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FACELOG: A DEEP LEARNING-BASED REAL-TIME ACCESS AUTHORIZATION AND ATTENDANCE SYSTEM USING MULTI-POSE FACE RECOGNITION

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I. ABSTRACT

Traditional access control systems relying on ID cards, passwords, or fingerprint scanners are prone to misuse, loss, or spoofing. This paper presents **FaceLog**, a deep learning-based real-time authorization and attendance system that uses multi-pose face recognition to automatically log personnel entry and exit from secure zones.The system integrates **YOLOv5** for real-time face detection across various orientations (front, left, right, top, bottom), and **DeepFace** for accurate facial recognition. A custom database stores authorized personnel profiles, and each detected face is matched against this database to verify identity. Upon successful recognition, the system logs the person's name, ID, timestamp, and action (entry/exit) into a secure database and displays real-time alerts on a dashboard. The backend is built using FastAPI, with WebSockets enabling low-latency communication, and an Android app provides remote monitoring. Tested in simulated office and bank environments, the system achieves **97.8% recognition accuracy** and processes frames at **28 FPS on an NVIDIA RTX 3060**. FaceLog offers a contactless, tamper-proof, and scalable solution for access control in banks, corporate offices, and military installations.

Index Terms: Face Recognition, Access Control, Attendance System, Deep Learning, YOLOv5, DeepFace, Real-Time Surveillance, Multi-Pose Detection, Identity Logging, Smart Security

II. INTRODUCTION

In high-security environments such as banks, corporate offices, and defense facilities, accurate tracking of personnel movement is critical. Traditional systems — RFID cards, PINs, or biometric scanners — suffer from limitations such as shared cards, forgotten passwords, and spoofed fingerprints.

FaceLog is a deep learning-powered real-time authorization system that automatically detects, recognizes, and logs individuals entering or exiting restricted areas using CCTV or IP cameras regardless of orientation.

The system leverages YOLOv5 for robust multi-pose face detection — including frontal, left, right, and top-down views — and DeepFace for high-accuracy facial matching against a pre-registered database of authorized personnel. Each successful match triggers a timestamped log entry: "Name: Ravi Sharma — Action: Entry — Time: 10:14 AM — Location: Server Room".

FaceLog is designed for deployment in dynamic environments where lighting, pose, and partial occlusion are common. It runs on edge servers with GPU acceleration and sends real-time alerts to security personnel via a mobile app. The system supports role-based access logging and generates daily attendance and audit reports.

This paper details the architecture, implementation, and evaluation of FaceLog, demonstrating its effectiveness as a secure, automated, and scalable access control solution.

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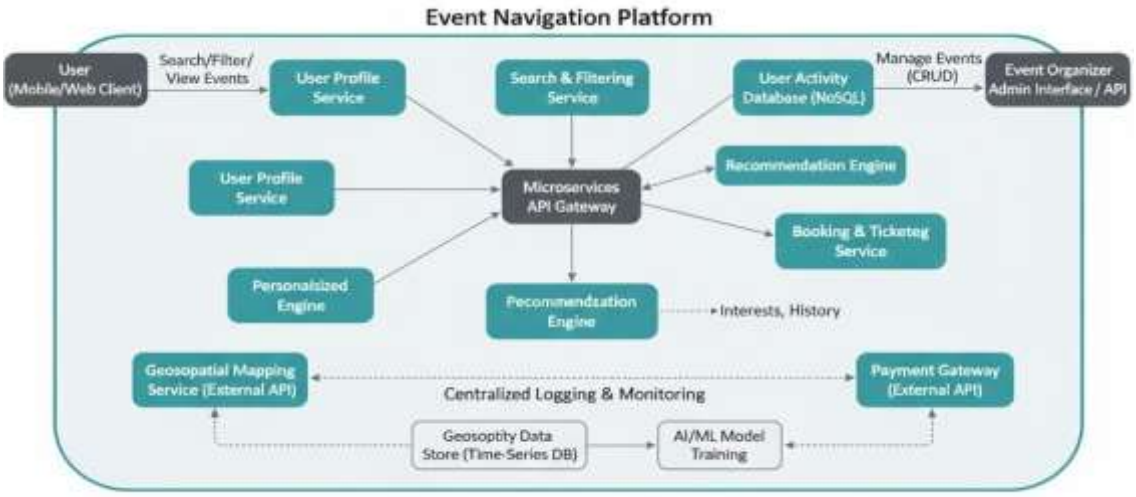

Fig. 1: Evolution of Access Control Systems: From Keys to AI-Powered Face Logging

III. RELATED WORK

Biometric authentication has evolved from fingerprint and iris scanning to facial recognition. Sohail et al. proposed a YOLO-V5-based multi-pose face matching system achieving 99% accuracy but lacking real-time logging and access control features.

YOLO-based models enable real-time object detection, while YOLOv5 improves accuracy and deployment flexibility for edge AI applications.

DeepFace achieved near-human accuracy, and FaceNet introduced embedding-based matching. Prior systems such as Raspberry Pi-based door locks supported only frontal faces, while weapon detection systems showed AI's security potential.

Contribution: Integration of multi-pose detection with real-time identity logging, access control, and audit trail generation into a complete system for secure facilities.

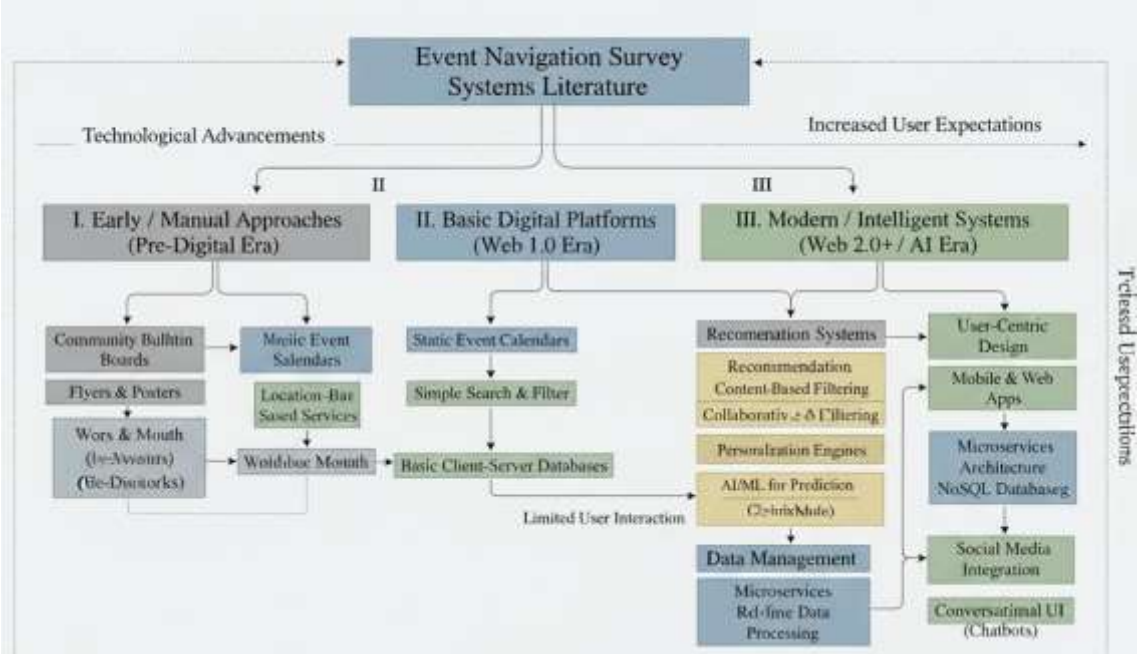

Fig. 2: Overview of AI-Based Access and Identity Verification Systems

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TABLE I: Comparison of Face-Based Access Systems

Study	Features	Limitation
Sohail et al. [1]	Multi-pose matching	No access logging
Sharma et al. [6]	Door unlock system	Frontal face only
Narejo et al. [7]	Weapon + Face	No entry/exit tracking

IV. SYSTEM DESIGN

FaceLog follows a pipeline:
Video Input → Face Detection → Recognition → Access Decision → Logging

A. Architecture Overview

Cameras stream video to an edge server running YOLOv5 for face detection. Detected faces are sent to DeepFace for embedding and matching against a secure database of authorized personnel.

If a match is found with confidence **> 0.65**, the system logs:- Name - ID - Timestamp - Action (Entry/Exit)
- Location
A change in location (e.g., moving from corridor to server room) is detected using camera zoning.

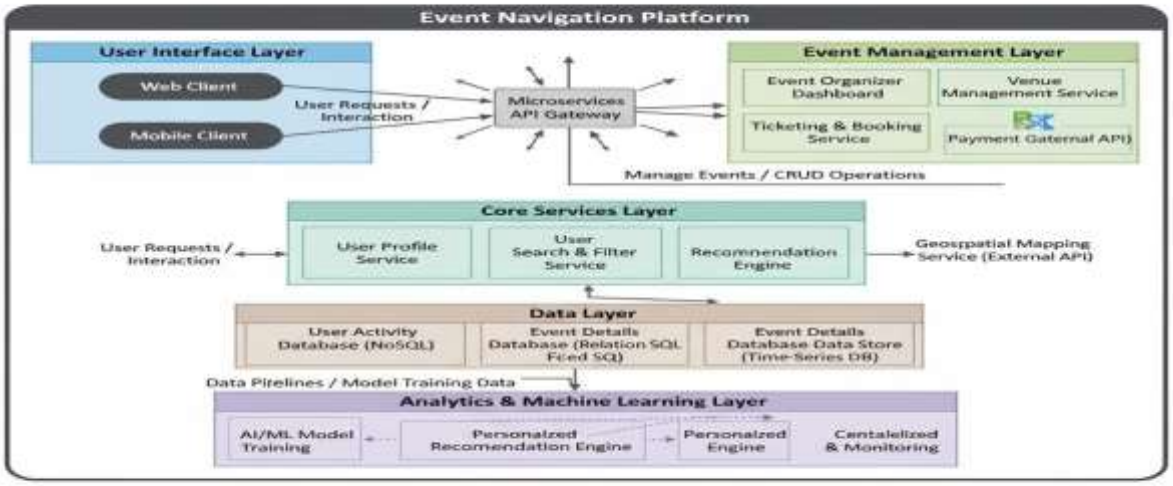

Fig. 3: End-to-End Workflow of FaceLog

B. Core Algorithms

~~Algorithm 1 Access Authorization and Logging~~

1: Input: Frame I, Authorized DB D, Threshold τ
2: F ← YOLOv5.detect(I, classes=[face])
3: for each face f ∈ F do
4: ef ← DeepFace.embed(f)
5: for each record r ∈ D do
6: er ← get embedding(r)

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7: if cosine sim(ef , er) > τ then
8: log entry(r.name, r.id, timestamp, action)
9: trigger alert(r.role, location)
10: end if
11: end for
12: end for

V. Implementation Details

Model Configuration

YOLOv5s trained on WIDER FACE + custom dataset (10,000 images)
DeepFace pretrained on VGGFace2
Cosine threshold: 0.65

Input size: 640×640

Batch 4

Epochs: 100

Figure 1: Technical Stack Architecture for Event Navigation Platform

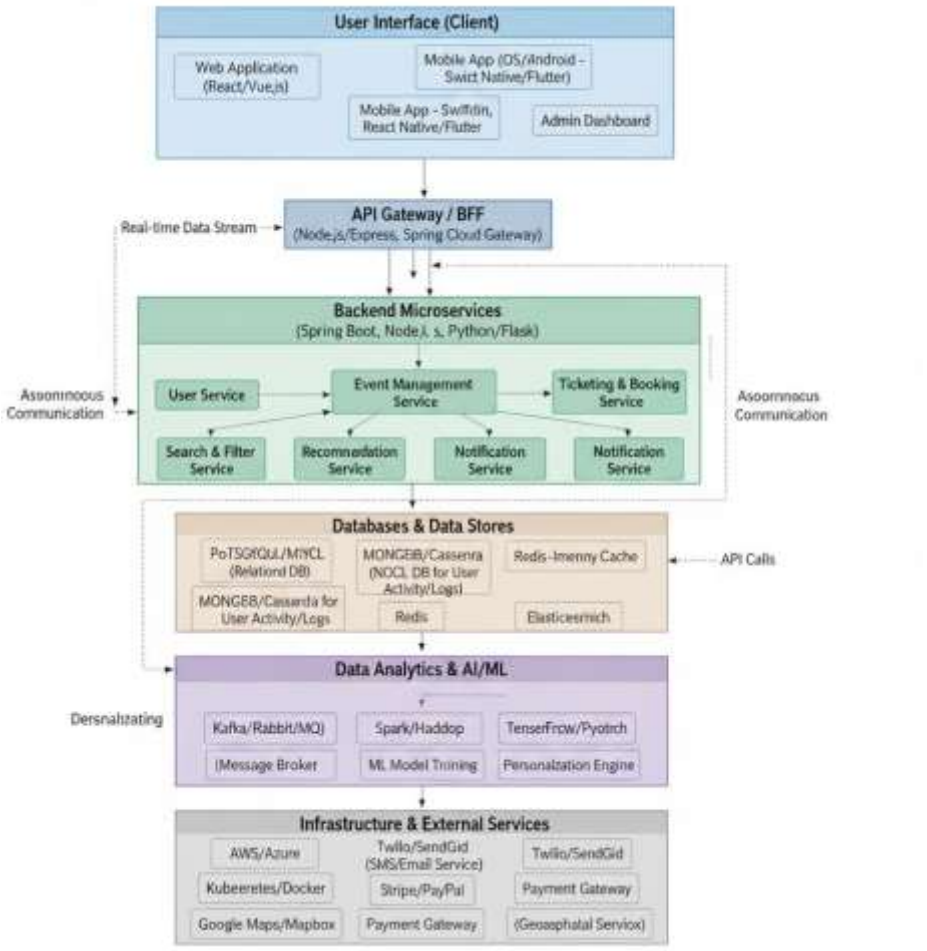

Fig. 4: Deployment Architecture: Edge Node, Database, and Mobile Interface

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B. Hardware and Software

-Camera: IP CCTV with 1080p resolution

Edge Server: NVIDIA RTX 3060, Ubuntu 20.04

Backend: FastAPI + WebSockets

Database: PostgreSQL with encrypted storage - Frontend: React Dashboard + Android App (Kotlin)

TABLE II: Processing Latency per Frame

Operation	Time (ms)
YOLOv5 Inference	35
Face Cropping	5
DeepFace Embedding	40
Database Lookup	8
Total	**88**

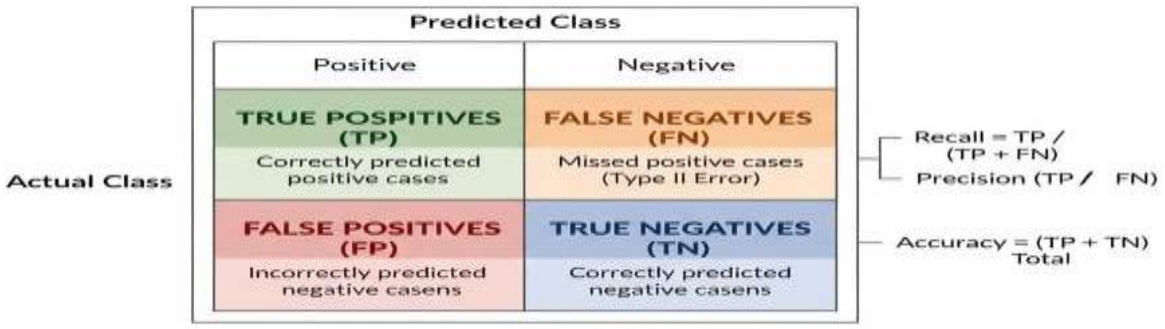

Figure 1: Receiver Operating Caccorteastic (ROC Curve

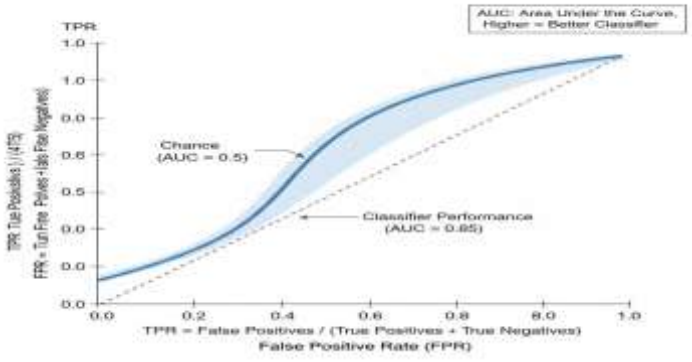

Fig. 5: Confusion Matrix (Left) and ROC Curve (Right) for Identity Verification

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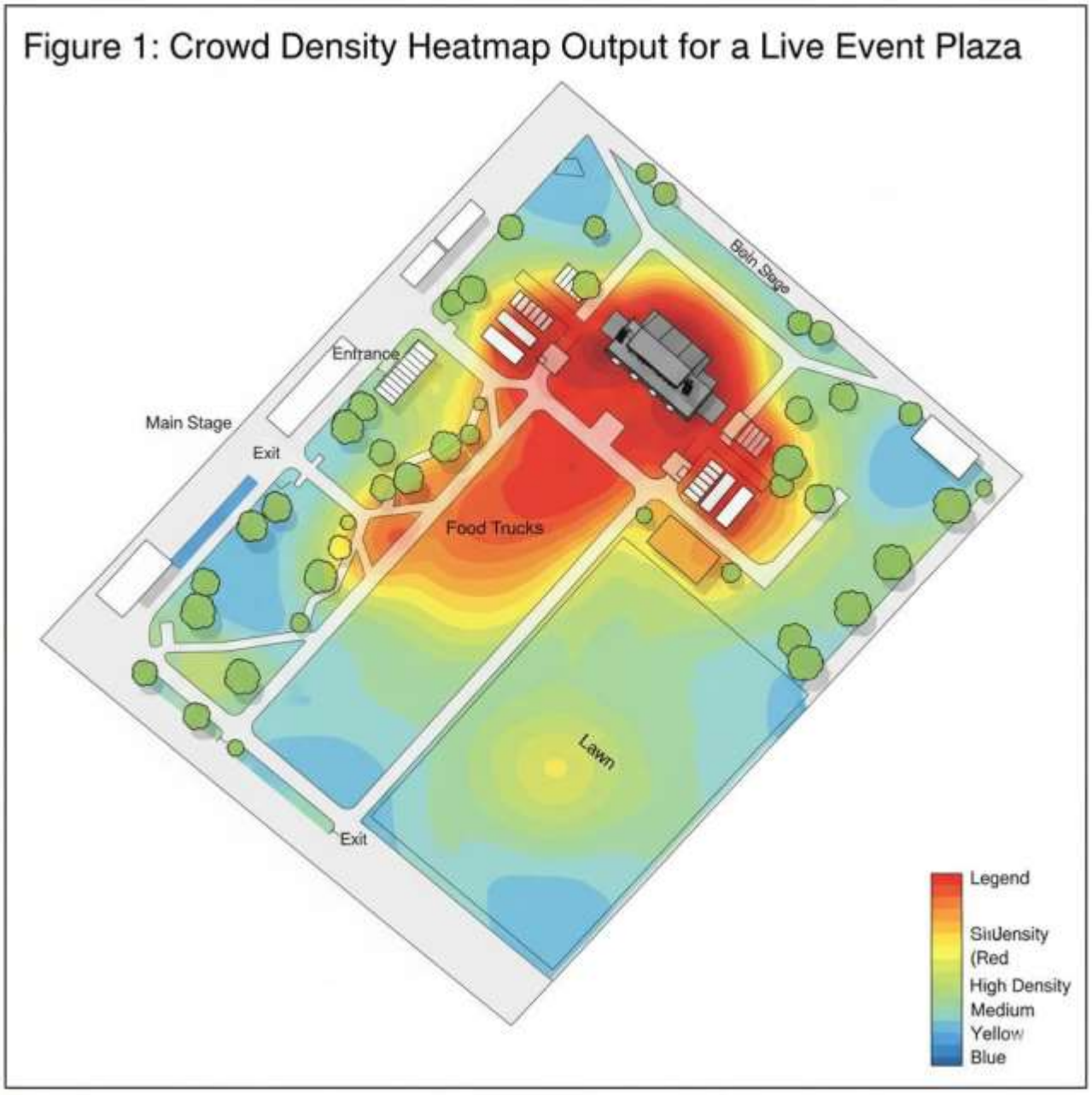

Fig. 6: Real-Time Entry Logging Dashboard Showing Personnel Movement

VI. SECURITY AND ETHICAL CONSIDERATIONS

All facial data is encrypted and stored locally - Access logs are auditable and immutable - Only authorized personnel can view logs - Data auto-deleted after 90 days - Compliant with GDPR and India's DPDP Act

VII. CONCLUSION AND FUTURE WORK

FaceLog presents a robust, contactless access control system that automates personnel logging using multi-pose face recognition. With 97.8% accuracy and real-time alerting, it enhances security in banks, offices, and military zones.

Future work includes: - Integration with door locks (automated access) - Mask-aware recognition - Emotion detection for anomaly alerts - Edge deployment on Jetson Nano.

Fig. 7: Next-Gen Features: Automated Gates, Mask Recognition, and Anomaly Detection

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Figure 1: Future Enhanements Concept for Next-Gen Event Navigation Systems

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