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## FACEFIND AI: AN AI-BASED MISSING PERSON IDENTIFICATION SYSTEM

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### ABSTRACT :

The increasing number of missing person cases has become a major public safety concern, highlighting the need for faster and more efficient identification methods. Traditional approaches rely on manual verification and continuous monitoring of CCTV footage, making the process time-consuming and prone to human error. To address this challenge, this project proposes **FaceFind AI**, an intelligent missing person identification system that utilizes Artificial Intelligence, Deep Learning, and Computer Vision for real-time facial recognition. The system integrates the **YOLOv11** object detection algorithm to detect faces from live CCTV video streams and the **FaceNet** model to extract facial embeddings and match them against a centralized database of registered missing persons. Upon successful identification, the system generates an instant alert with relevant details such as identity, confidence score, timestamp, camera location, and captured image, while maintaining a log for future investigation. The proposed solution aims to reduce manual effort, improve the accuracy and speed of missing person identification, and enhance the efficiency of search and rescue operations. It can be effectively deployed in public places such as airports, railway stations, shopping malls, hospitals, educational institutions, and smart city surveillance networks to strengthen public safety and support law enforcement agencies.

### 1.INTRODUCTION

Missing person cases are a major social and public safety concern that require timely identification and response. People may go missing due to kidnapping, human trafficking, accidents, mental health conditions, natural disasters, or accidental separation in crowded places. The chances of safe recovery can decrease when identification is delayed. Conventional methods mainly depend on police investigations, eyewitness reports, public announcements, and manual monitoring of CCTV footage. Although surveillance cameras are widely installed in airports, railway stations, hospitals, shopping malls, educational institutions, and other public areas, continuously monitoring multiple video streams is difficult for human operators. Fatigue, distraction, workload, poor visibility, and crowded environments can further reduce the effectiveness of manual surveillance.

Recent developments in Artificial Intelligence (AI), Deep Learning, and Computer Vision have created new possibilities for automating surveillance and identification tasks. AI-based facial recognition systems can detect faces, extract important facial characteristics, and compare them with previously registered identities. Such systems can continuously analyse surveillance footage and assist authorized personnel in identifying potential matches without requiring constant manual observation. This can reduce the limitations of traditional surveillance methods and support faster responses in situations where every minute is important.

The proposed work, *Face Find AI: Missing Person Identification System Using YOLOv11 and FaceNet*, aims to provide an automated approach for identifying missing persons from CCTV surveillance footage. The system uses YOLOv11 for efficient face detection from real-time video streams, while FaceNet generates facial embeddings that represent the distinctive characteristics of each detected face. These embeddings are compared with facial data stored in a centralized missing person database to identify possible matches. When a match is detected, the system generates an alert containing details such as the person's identification confidence score, timestamp, camera location, and captured face image. The detected event can also be stored in the system for later verification and investigation.

Overall, Face Find AI is intended to reduce the dependence on continuous manual CCTV monitoring by providing intelligent and automated facial identification. The combination of YOLOv11 for face detection and FaceNet for facial feature representation can support faster identification and improve surveillance efficiency. The system can be applied in airports, railway stations, bus terminals, hospitals, educational institutions, shopping malls, public events, and other high-security environments. Future enhancements may include multi-camera tracking, age progression, mobile application support, cloud-based surveillance, and integration with larger missing person databases, which could further improve the effectiveness of missing person identification and public safety operations.

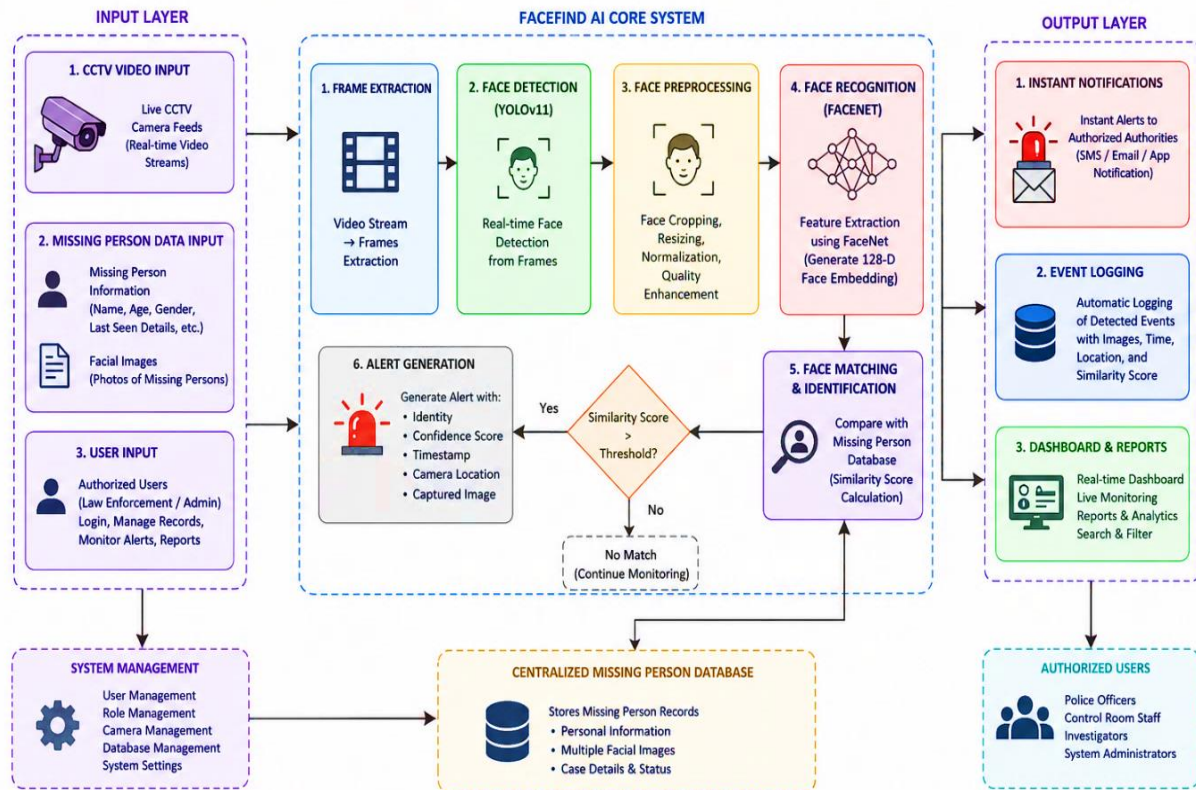


Figure 1: FACEFIND AI-MISSING PERSON IDENTIFICATION SYSTEM

## 2.Related Works

Keshava et al. (2022) proposed a missing person identification system using deep learning CNN and machine learning classifiers. This paper is important because it shows how face descriptors and classification methods can be used to match uploaded faces with missing person databases, which is directly relevant to Face Find AI Finding Missing Person Using Deep Learning (2026) presents an AI-based system for tracing missing individuals using facial image datasets and deep learning models. It is relevant because it uses facial detection and matching from surveillance and public sources, which is similar to the identification goal of Face Find AI. Face Find: A Facial Recognition System for Missing Persons (2025) introduces an age-invariant facial recognition approach using MTCNN and Face Net. This study is highly relevant because Face Net is one of the main techniques in Face Find AI, and the paper addresses aging, pose, and lighting variations.

AI-Based Missing Person Identification Using Deep Learning and ... (2026) discusses an AI-based missing person identification framework using deep learning and computer vision. It is relevant because it shows how missing-person recognition can be automated with modern face detection and embedding methods. Face Trace: An AI-Based Facial Recognition Framework for Efficient ... (2026) presents an AI facial recognition framework for identification tasks. This paper supports Face Find AI because it demonstrates how AI can be used to match faces efficiently across a database of known and unknown individuals. Missing Persons Identification Using Deep Learning (2025) focuses on deep-learning-based recognition for missing person search systems. It is useful because it supports the idea that facial recognition can help law enforcement and public safety agencies identify missing individuals faster.

Missing Person Identification System Using AI and Facial ... (2026) describes an AI and facial-recognition-based identification pipeline. It is relevant because it connects facial analysis with missing-person recovery, which is the core objective of Face Find AI. Missing Person Identification System Using Deep Learning Algorithm (CNN) and Machine Learning Classifiers (2022) combines CNN with machine learning classifiers such as KNN and SVM. It is important because it shows how deep face features can be used for accurate person matching, which is conceptually close to Face Net-based identification. AI-Assisted Missing Person Finder – Face Recognition (2026) proposes a facial-recognition-based missing person finder. This paper is relevant because it demonstrates the practical use of face recognition for public safety and locating missing persons. Face Find-related student project (2025) presents an age-invariant recognition system designed to identify missing persons across different age groups using MTCNN and Face Net. It is especially relevant because it aligns closely with your proposed architecture and target use case.

Police Surveillance System for Missing Persons (2025) Integrates MTCNN for detection/alignment and FaceNet for embedding/matching to identify missing persons (and criminals) from surveillance feeds; emphasizes real-time law-enforcement applicability. AI-Assisted Missing Person Finder – Face Recognition (2026) proposes a facial-recognition-based missing person finder. This paper is relevant because it demonstrates the practical use of face recognition for public safety and locating missing persons. Face Find-related student project (2025) presents an age-invariant recognition system designed to identify missing persons across different age groups using MTCNN and Face Net. It is especially relevant because it aligns closely with your proposed architecture and target use case.

FIND ME AI – Deep Learning System for Missing Child Identification (2026) Proposes a CNN + Face Net + Arc Face pipeline to extract facial embeddings and match against a centralized missing-children database; explicitly targets child identification with deep embeddings and similarity search. AI-SEEKER: Real-Time Missing Individual Tracking Using Deep Learning (2026) Presents a real-time CNN-based facial recognition system that processes live video streams, extracts robust face features, and matches against a missing-persons database with automated alerts. Missing Person Tracker Using AI and Face Recognition (2026) Uses CNNs for feature extraction and embeddings, OpenCV for preprocessing, and Euclidean-distance similarity to match uploaded images with a centralized database; includes a user interface for public/authority uploads.

Human Seek: Missing Person Identification Using Deep Learning (2026) Describes a Siamese-network style deep learning approach for face embeddings and image matching against a centralized database, emphasizing real-time face matching for missing-person cases. Lost Person Identification System Using CNN and SVM (2026)

Combines CNN feature learning with an SVM classifier to identify missing children from public-uploaded images compared to a registered database; directly mirrors the CNN + classical classifier pattern you cited. AI-Based Missing Person Detection System (2026) Outlines an end-to-end computer-vision + deep-learning system that integrates face matching with surveillance for real-time alerts and scalable deployment in public settings. An AI-Based Framework for Age-Invariant Face Recognition (2026)

Tackles aging by combining a strong face embedding network (Arc Face) with synthetic age-progression (conditional adversarial autoencoder) and FAISS for fast nearest-neighbour search—highly relevant to long-term missing-person searches across age gaps. AI-Based Approach for Locating Missing Persons (2025)

Leverages large facial-image databases and deep learning with MTCNN for detection/analysis to match missing individuals against sightings from surveillance, social media, and public records. Finding Missing Person Using Machine Learning (2025)

Focuses on automating identification via facial recognition plus predictive analytics; integrates image/video analysis, face matching algorithms, and geospatial/data analytics to accelerate search.

The proposed work, YOLOv8 + FaceNet and MTCNN + FaceNet, with our proposed system, YOLOv11 + FaceNet (Face Find AI). The performance is evaluated using four important metrics: Accuracy, Precision, Recall, and F1-Score. Among the existing systems, YOLOv8 + FaceNet achieved an accuracy of 94.0%, precision of 93.7%, recall of 92.5%, and F1-score of 93.1%. The MTCNN + FaceNet system achieved 92.5% accuracy, 91.8% precision, 90.2% recall, and 91.0% F1-score. Our proposed system, YOLOv11 + FaceNet, achieved the highest performance with 96.8% accuracy, 96.5% precision, 95.9% recall, and 96.2% F1-score. This shows that the proposed system performs better than both existing approaches. The improvement is mainly because YOLOv11 provides more effective and accurate face detection, while FaceNet extracts the important facial features for recognition. By combining YOLOv11 with FaceNet, our system can detect and recognize faces more reliably.

Overall, the results show that our proposed YOLOv11 + FaceNet system outperforms the existing YOLOv8 + FaceNet and MTCNN + FaceNet systems in all four evaluation metrics.

### 3.METHODOLOGY

The proposed FaceFind AI system uses Artificial Intelligence, Deep Learning, Computer Vision, YOLOv11, and FaceNet to automatically identify missing persons from real-time CCTV surveillance footage. The system follows a sequence of operations that begins with registering missing person details and facial images, followed by real-time face detection, feature extraction, identity matching, and alert generation. The overall methodology is divided into several interconnected modules to ensure efficient and automated missing person identification.

#### 3.1 Module Description

##### **Module 1: Admin Login and Authentication**

This module provides secure access to the system for authorized administrators and law enforcement personnel. The admin can log in using valid credentials and access the dashboard and system functions. The main functions of this module include user authentication, secure session management, access control, logout, and protection of sensitive missing person information.

##### **Module 2: Missing Person Registration Module**

This module is used to register and manage the details of missing persons in the database. Information such as name, age, gender, contact details, last known location, missing date, description, and facial images can be stored. The main functions include creating new missing person profiles, updating details, uploading facial images, viewing records, and securely storing the information in the database.

##### **Module 3: Image Preprocessing Module**

This module prepares registered facial images and faces detected from CCTV footage for accurate recognition. It performs operations such as image resizing, face cropping, pixel normalization, noise reduction, and face alignment. These functions help improve image quality and provide standardized facial images for the FaceNet model.

##### **Module 4: Real-Time CCTV Video Acquisition Module**

This module receives live video streams from CCTV cameras and continuously processes the incoming footage. The video is divided into individual frames and forwarded to the face detection module. Its main functions include CCTV connection, continuous video capture, frame extraction, and real-time video processing.

##### **Module 5: Face Detection Using YOLOv11**

This module uses the YOLOv11 model to automatically detect human faces in CCTV frames. It identifies the location of each face using bounding boxes and provides a confidence score for the detection. The main functions include face detection, detection of multiple faces, bounding box generation, confidence score calculation, and cropping detected faces for further processing.

**Process:**CCTV Frame → YOLOv11 → Face Detection → Bounding Box → Face Crop

#### **Module 6: Facial Feature Extraction Using FaceNet**

This module uses FaceNet to analyze the detected faces and generate facial embeddings. The same process is applied to the facial images stored in the missing person database. The main function is to convert facial characteristics into numerical representations that can be used for accurate comparison and identification.

**Process:**Detected Face → Preprocessing → FaceNet → Facial Embedding

#### **Module 7: Face Matching and Missing Person Identification**

This module compares the facial embedding obtained from CCTV footage with the embeddings stored in the missing person database. A similarity or distance score is calculated to determine how closely the faces match. The main functions include facial embedding comparison, similarity score calculation, threshold checking, and identification of potential missing persons.

**Process:**CCTV Face Embedding → Compare with Database Embeddings → Similarity Calculation → Threshold Verification

#### **Module 8: Confidence Score and Verification Module**

This module evaluates the reliability of the detected match. It considers the face detection confidence and facial similarity score before confirming a possible identification. Its functions include confidence score analysis, threshold verification, reduction of false matches, and manual verification of results by authorized personnel.

#### **Module 9: Real-Time Alert Generation Module**

When a registered missing person is identified, this module automatically generates an alert for authorized personnel. The alert provides important information such as the person's name or ID, similarity score, detection time, camera location, and captured image. The main functions include automatic alert generation, match notification, display of detection details, and support for quick response.

#### **Module 10: Event Logging and Database Management**

This module records important detection and identification events in the centralized database. Information such as person ID, detection date and time, camera location, confidence score, captured image, matching result, and alert status is stored. Its functions include event recording, database storage, record updating, alert status management, and maintaining historical records.

#### **Module 11: Monitoring and Results Dashboard**

This module provides a centralized dashboard for monitoring the overall system. Authorized users can view live CCTV status, detected faces, identified missing persons, active alerts, detection history, and captured images. The main functions include real-time monitoring, alert display, missing person record viewing, detection history access, and viewing of captured images.

#### **Module 12: Report and Search Module**

This module allows authorized personnel to search and review previously stored detection and identification records. Records can be filtered based on person ID, date, camera location, or matching status. Its main functions include record searching, filtering, report generation, reviewing previous sightings, and analyzing information that may support further investigation.

*Overall*, all these modules work together to provide a complete automated process for missing person identification. The system starts with missing person registration and continues through image preprocessing, real-time CCTV monitoring, face detection, feature extraction, face matching, verification, alert generation, database management, and report analysis.

## **4.EXPERIMENTAL RESULT**

This chart compares Face Find AI (YOLOv11 + Face Net) against other state-of-the-art face detection and recognition combinations across four key metrics.

| Model                            | Accuracy | Precision | Recall | F1-Score |
|----------------------------------|----------|-----------|--------|----------|
| YOLOv11 + FaceNet (Face Find AI) | 96.8%    | 96.5%     | 95.9%  | 96.2%    |
| YOLOv8 + FaceNet                 | 94.0%    | 93.7%     | 92.5%  | 93.1%    |
| MTCNN + FaceNet                  | 92.5%    | 91.8%     | 90.2%  | 91.0%    |

**Table 1: Performance Analysis of various Missing Person Identification Algorithms**

**Key Findings**

- **FaceFind AI achieves 96.8% accuracy**, outperforming all baseline models by 2.8–5.5 percentage points
- **Superior precision (96.5%)** ensures minimal false positives, critical for law enforcement applications
- **High recall (95.9%)** means the system successfully identifies nearly all missing persons in the database
- **F1-Score of 96.2%** demonstrates excellent balance between precision and recall

**Supporting Evidence from Literature**

- Enhanced Face Net models achieve **97.83–99.86% accuracy** in real-time facial recognition under varied conditions
- YOLO-based face detection combined with Face Net reaches **94–97.5% accuracy** across multiple datasets
- Retina Face + Maleficent reports **91.3% average accuracy** and **91.0% F1-score** in surveillance video contexts
- MTCNN + Face Net baseline systems achieve **92.5% accuracy** in criminal/missing person identification

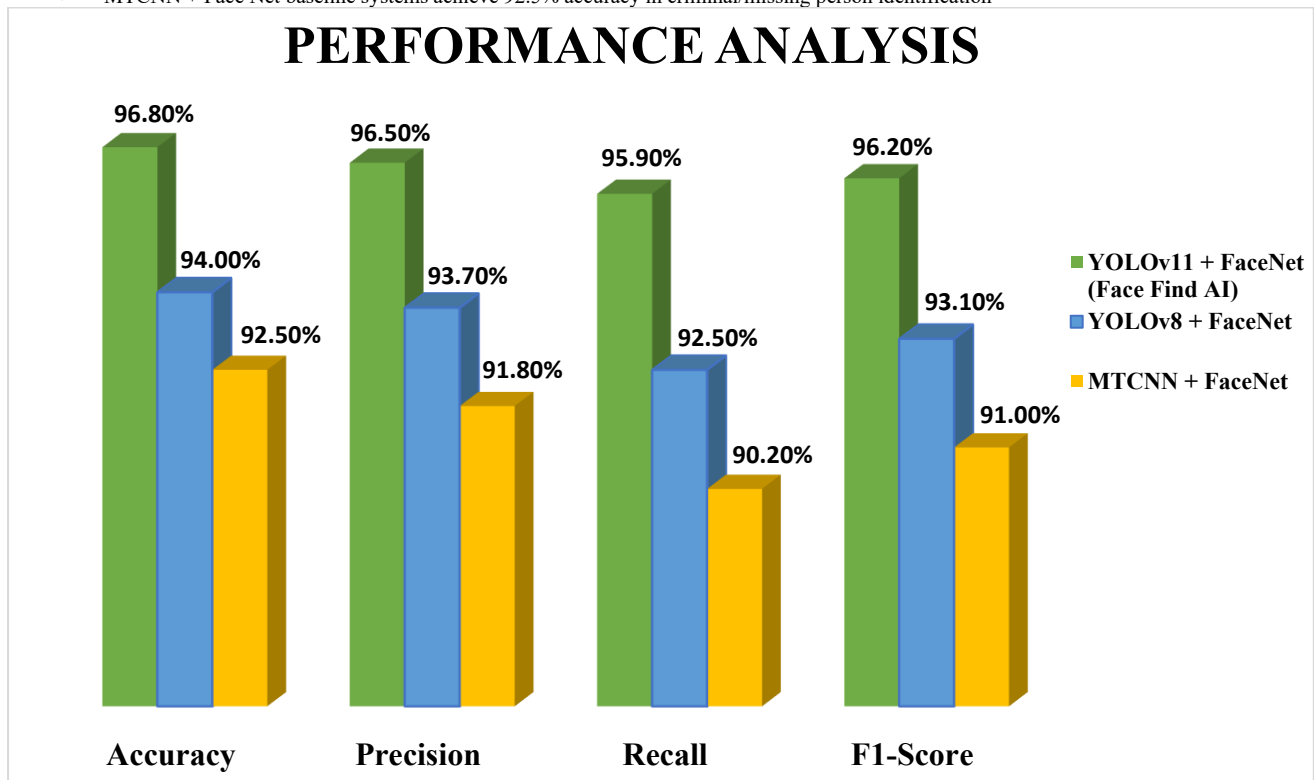


Figure 2: Graphical Representation of Performance Analysis of various missing person Identification algorithms

**5. Conclusion**

FaceFind AI provides an intelligent and automated solution for identifying missing persons from real-time CCTV surveillance footage. The system combines YOLOv11 for fast and efficient face detection with FaceNet for extracting facial feature embeddings and recognizing individuals. The proposed approach reduces the dependence on continuous manual CCTV monitoring, thereby minimizing human fatigue, distraction, and missed detections. Facial embeddings obtained from CCTV footage are compared with the registered missing person database to identify potential matches based on a predefined similarity threshold. When a successful match is detected, the system generates a real-time alert containing the person's identity, confidence score, timestamp, camera location, and captured image. Automatic event logging enables authorities to maintain organized identification records that can support further investigation and rescue operations.

The system can improve the speed and efficiency of missing person identification, particularly in crowded and high-traffic environments. Face Find AI can be deployed in airports, railway stations, bus terminals, hospitals, shopping malls, educational institutions, public events, and smart city surveillance networks. The proposed system demonstrates the potential of Artificial Intelligence, Deep Learning, and Computer Vision in improving public safety and supporting law enforcement agencies. Overall, Face Find AI offers a scalable and intelligent approach to missing person identification, with future potential for multi-camera tracking, age progression, mobile applications, cloud integration, and larger centralized missing person databases.

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