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# Automated Detection and Identification of Missing Person Using AI

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***Abstract:*** ***Every year, millions of people, including children and adults, go missing due to a range of causes such as abduction, natural disasters, accidents, and voluntary disappearances. The issue of missing persons is a significant and growing problem that affects individuals, families, and entire communities around the world. The Missing Person Finder project depicts the idea of automating the process of locating missing individuals by combining web technologies, computer vision, and deep-learning. The web portal built using Python Flask, allows families and law enforcement to upload details and photos of missing persons. The system processes CCTV footage with OpenCV to extract frames, which are analyzed by a deep learning face recognition model to identify potential matches. Notifications are sent to relevant parties when a match is found, enabling prompt action. By automating video analysis, the system significantly reduces the time and effort required for manual reviews, improving search efficiency and accuracy. Public engagement is encouraged through the portal, where users can view missing person profiles and report sightings. Integration with national or regional databases broadens the search network, enhancing the chances of finding matches. This innovative tool offers a comprehensive approach to addressing the critical issue of missing persons, benefiting families, law enforcement, and the wider community.***
***Keywords: Deep Learning, Image & Video Processing, Web Portal, Facial Recognition.***

## I. INTRODUCTION

The growing issue of missing persons remains a pressing global concern, affecting millions of individuals annually, including children, adults, and the elderly. Whether due to abductions, natural disasters, accidents, or voluntary disappearances, the search for missing persons often places significant emotional and logistical strain on families, communities, and law enforcement agencies. Traditional search methods are frequently time-consuming and heavily reliant on human effort, which can delay critical responses and reduce the efficiency of searches.

In response to this growing problem, advancements in technology have enabled more efficient and effective solutions. The integration of computer vision, deep learning, and web technologies offers a promising avenue for automating and accelerating the process of locating missing individuals. The Missing Person Finder project seeks to leverage these cutting-edge technologies to streamline the search process and improve its accuracy. By combining a user-friendly web portal with powerful image and video analysis capabilities, the project aims to create an automated system that can quickly process surveillance footage, identify potential matches, and alert relevant parties. This innovative system not only enhances the speed of finding missing persons but also empowers the public to actively contribute to the search, creating a more collaborative and proactive approach.

The Missing Person Finder project represents a step toward transforming the way missing persons are located, making the search process more efficient, accurate, and responsive to the needs of affected families and law enforcement. Through this project, the hope is to reduce the emotional toll on those involved and increase the overall success rate of locating missing individuals.

## II. RELATED WORK

Hrutika et al. [1] (2024) proposed an innovative solution to the global issue of missing persons by leveraging artificial intelligence (AI) and deep learning techniques. Using Convolutional Neural Networks (CNNs) and ResNet architectures, the system enhances the accuracy and efficiency of image classification and helped addressing challenges like cross-age face recognition in surveillance footage. Motivated by alarming statistics, such as the daily average of 296 missing children in India and over 108,000 cases reported in 2020, the study underscores the urgency of effective interventions. Additionally, the paper emphasizes ethical considerations and societal impacts, advocating for the responsible deployment of AI in search and rescue operations. By integrating advanced AI algorithms, the system offers a promising approach to transforming missing person detection and improving search and rescue efforts globally.

Shriyash et al. (2024) introduced a system that integrates machine learning (ML) methodologies to improve the efficiency and accuracy of locating missing persons. The researchers suggested the implementation of TensorFlow, a prominent ML framework, to improve face detection accuracy, thereby aiding in the identification of missing persons. By integrating advanced ML algorithms, the system aims to streamline search efforts, offering a more effective and dependable approach for tracking and finding missing persons.

Devi et al. [3] (2024) proposed a system leveraging harnessing AI and ML technologies to boost accuracy and operational efficiency of identifying missing individuals. By utilizing advanced algorithms, the study addresses key challenges in facial recognition, enabling the detection of missing persons from large datasets and instant surveillance technologies. Incorporating AI and ML optimizes and simplifies search efforts, reduces manual intervention, and enhances reliability, presenting a viable and effective method to tackle the global concern of lost individuals.

Mayank et al. [4] (2022) examined how machine learning, particularly the KNN algorithm, can be utilized to enhance the accuracy of identifying and tracking missing individuals. The study put forward a system that utilizes facial recognition and pattern analysis to match individuals in surveillance footage with existing databases, aiming to optimize the accuracy and speed of missing person detection. By integrating ML algorithms, the system seeks to streamline search efforts, reduce manual intervention, and provide a more reliable method for locating missing persons.

Mohan et al. [5] (2023) proposed a mobile application aimed at improving the process of locating missing individuals. The app allows law enforcement officers to enter and update information about missing persons into a centralized database, which can be accessed by the public. Users can search for missing individuals using specific criteria such as name, age, gender, and physical features, making it easier for community members to contribute to the search. This mobile-based solution aims to enhance the efficiency and collaboration between law enforcement and the public, leveraging crowdsourced efforts to accelerate the search for missing persons. By enabling widespread participation and quick access to information, the app improves the speed and accuracy of missing person detection.

Ponmalar et al. [6] 2022 studied how AI-driven technologies can streamline the process of identifying and finding lost persons. The researchers developed an AI-powered framework that processes data from security cameras, social media platforms, and public databases to detect and locate missing individuals. The system uses advanced AI algorithms to detect patterns and matches in the available data, thereby boosting precision and workflow efficiency of the search process. By integrating AI technologies, the proposed solution aims to provide law enforcement and the public with a more effective tool to quickly locate missing individuals, potentially revolutionizing missing person investigations.

## III. SYSTEM IMPLEMENTATION

1. ***User-Friendly Portal for Missing Individuals:*** The system includes a web-based portal developed using Python Flask, providing an intuitive interface for users to submit detailed information about missing persons. The portal collects essential details such as names, ages, addresses, parents' details, and photographs. Acting as a centralized database, it facilitates seamless collaboration between families, law enforcement agencies, and other stakeholders. The structured data collection ensures easy retrieval and integration with the face recognition system for efficient identification.
2. ***CCTV Frame Extraction:*** To efficiently process large volumes of CCTV footage, the system extracts individual frames from videos. Using OpenCV, the videos are processed by extracting frames at a frequency of 72 frames per second and converted to RGB format for facial detection. The Haar Cascade Classifier initially detects faces, while dlib's 68-

point facial landmark detection refines the process by identifying key facial features such as eyes, nose, and jawline. This ensures that every critical moment is analysed, increasing the chances of locating the missing person.

3. ***Deep Learning-Based Face Recognition****:* The extracted frames are processed using a deep learning model. The model encodes facial features and compares them against stored images. If a match is found, the name of the missing person is displayed, and a red rectangle highlights the detected face. If no match is found, the system marks it as "Unknown" for further review. This advanced AI model significantly enhances the accuracy and speed of identifying missing individuals from CCTV footage.

4. ***Real-Time Notification System****:* When the face recognition model detects a match, the system automatically triggers a real-time alert to relevant authorities, guardians, or family members. The notification includes critical information such as the frame number where the match was detected, the similarity score indicating match confidence, and a visualization of the detected face within the CCTV footage. This real-time alert mechanism ensures timely intervention, improving the likelihood of a successful recovery of the missing person.

5. ***Automation for Efficiency****:* The system automates the traditionally labour-intensive process of analysing CCTV footage, significantly reducing manual effort and operational time. With automated monitoring, the system significantly decreases the likelihood of human oversight and inaccuracies. The automation ensures that the search process is faster, more efficient, and highly accurate, making it a valuable tool in missing person investigations.

6. ***Focus on Vulnerable Populations****:* While the system is designed for all missing person cases, it is particularly beneficial for vulnerable populations such as Alzheimer's patients, young children, or individuals with disabilities who may wander and become disoriented. By providing a reliable and timely identification mechanism, the system enhances safety measures and increases the chances of locating and assisting these high-risk individuals before they are exposed to potential harm.

7. ***Integration of AI and Web Technologies****:* The system effectively integrates AI-powered face recognition with a web-based platform, combining the accuracy of machine learning with the accessibility of modern web technologies. The Python Flask-based portal serves as the interface for data entry and retrieval, while OpenCV and dlib handle real-time facial analysis. This synergy ensures a scalable, user-friendly, and efficient solution for identifying missing individuals, improving the overall effectiveness of search efforts.

8. ***Enhanced Collaboration and Scalability***: Designed for scalability, the system allows multiple stakeholders, including law enforcement, families, and NGOs, to collaborate seamlessly. The centralized portal enables streamlined data sharing and ensures that critical information is accessible when needed. Additionally, the modular architecture allows for future enhancements such as predictive analytics, geographical tracking, and integration with government security databases. This ensures that the system remains effective and adaptable to evolving needs in missing person investigations.

## IV. METHODOLOGY

Figure 1 outlines a face recognition system designed for identifying missing persons, by leveraging user-submitted data and CCTV footage.

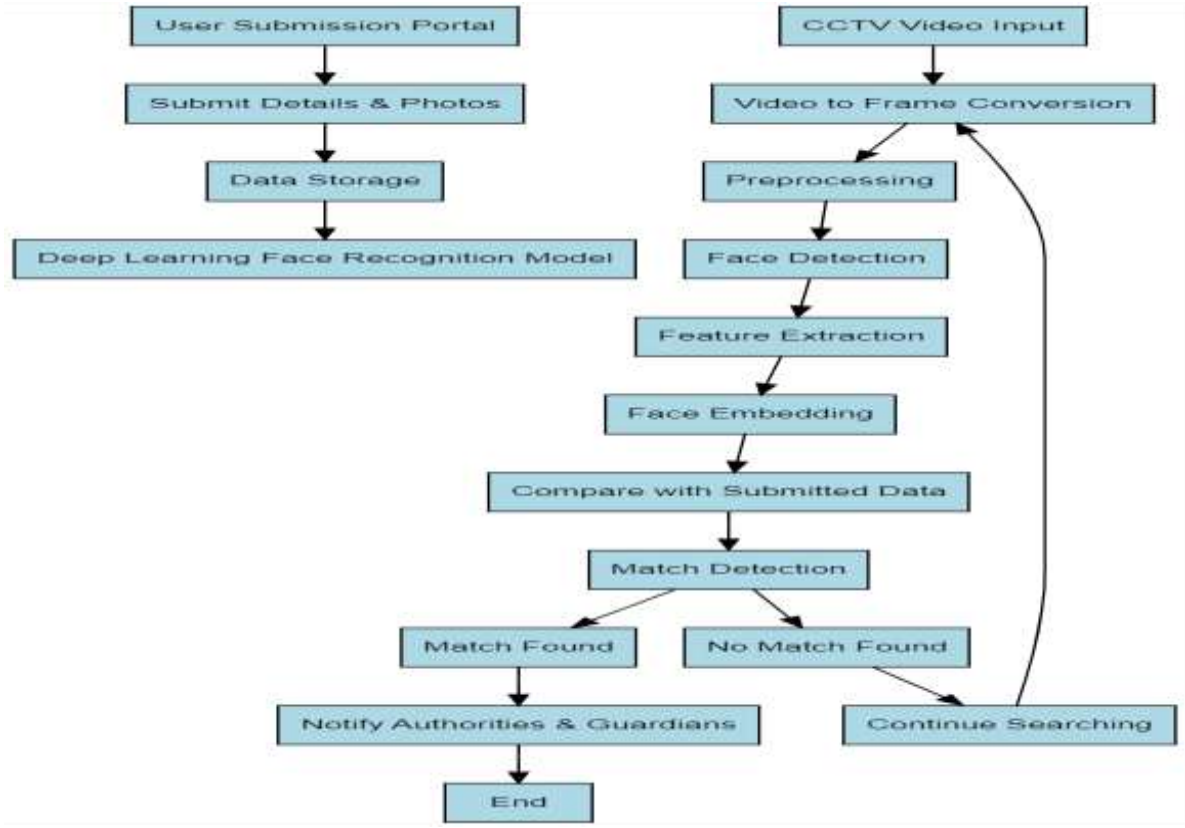


Fig 1: Block Diagram

On the user side, individuals submit details and photos through a portal, which are stored in a database. A deep learning face recognition model processes this data to extract facial features and generate a unique face embedding (numerical representation). Simultaneously, CCTV footage is input into the system, converted into individual frames, and pre-processed to enhance image quality. Faces detected in the frames undergo feature extraction and embedding. The generated embeddings are subsequently matched against the database records. Upon identifying a match, Law enforcement and guardians receive notifications, concluding the process. If no match is detected, the system continues analyzing additional frames. The goal is to identify individuals by matching CCTV footage with submitted data and notify the appropriate parties when a match is found.

## V. HAAR CASCADE CLASSIFIER AND DLIB IN FACIAL RECOGNITION

The Haar Cascade Classifier, an object detection algorithm powered by machine learning, is utilized in computer vision tasks, particularly for face detection. This algorithm plays a pivotal role in detecting faces within video frames. It employs a pre-trained classifier, trained on thousands of positive and negative images, to recognize facial patterns such as the eyes, nose, and mouth. It utilizes an integral image representation to compute rectangular feature sums efficiently, enabling rapid feature extraction. Haar-like features, which represent contrasts in pixel intensity, are slid across the frame to identify potential face regions. The cascade structure of classifiers ensures efficient processing by quickly rejecting non-face regions and focusing computational power on promising areas. Once potential faces are detected, bounding boxes are created, and the detected regions are passed to the dlib library for refinement [10].

Dlib is a powerful, modern C++ toolkit that provides an extensive suite of machine learning and computer vision capabilities, with robust support for Python bindings. This is utilized for advanced facial detection and landmark identification. After initial face detection, dlib's advanced model for detecting facial landmarks, trained on extensive datasets refines the process by identifying 68 key landmarks on a face. Fig 2 illustrates the identification of facial landmarks using Dlib [18]. These landmarks include facial features like the eyes, brows, nose, lips, and jaw contour,

providing a detailed representation of the facial structure. This precision ensures that the detected faces are accurately analyzed and marked, creating a dataset of frames with labeled facial features for further processing. Dlib's robust model enhances the overall accuracy and reliability of the system, making it an integral component for analyzing facial features in real-time and pre-recorded video streams [18].

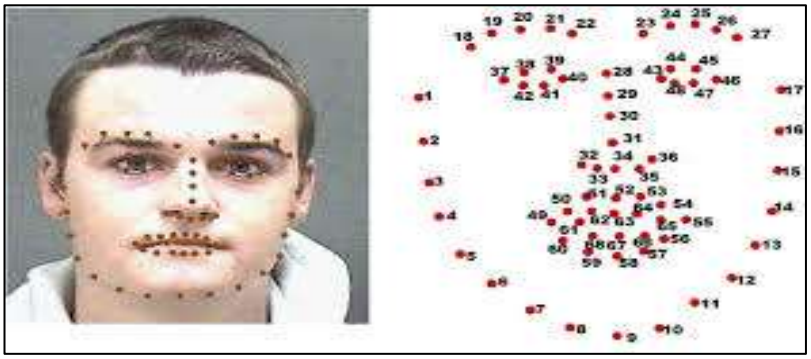

Fig 2 Facial landmark detection utilizing Dlib

## VI. INFERENCE

The missing person finder using AI is an innovative system designed to automate the process of locating missing individuals with speed and a high accuracy of 80%. This solution leverages a deep learning-based face recognition model to analyse and compare faces from video frames or images against a database of missing persons. By converting video footage into individual frames and processing them in real time, the system efficiently identifies potential matches, reducing the need for exhaustive manual review. This AI-driven approach not only enhances search efficiency but also improves accuracy, making it a valuable tool for law enforcement and humanitarian efforts in reuniting families with their loved ones. The system can be accessed through a web portal, allowing users to upload images and search for potential matches seamlessly.

## VII. CONCLUSION

The Missing Person Finder project marks a major breakthrough in the search for missing individuals, combining technology with social responsibility. The system's automated facial recognition enhances identification accuracy, offering a transformative solution for law enforcement and families dealing with missing persons. Through the integration of user-friendly interfaces and advanced deep learning algorithms, the project addresses critical gaps in existing search methodologies, offering hope for families impacted by this issue.

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