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FINDING MISSING PERSON USING AI AND ML

[1] Sarika B. Patil, [2]Ruchika Fegade, [3]Pranali Nanaware, [4]Shruti Kadu
[1]Assistant Professor, [2]Student, [3]Student, [4]Student
[*1,2,3,4]Electronics and telecommunication,
*[1,2,3,4]Nutan Maharashtra Institute of Engineering and Technology, Talegaon, Maharashtra, India

Abstract : The literature review of the previous publications is the topic of this paper. This study analyses a number of academic papers. Each paper's methodology, implementation strategies, advantages, disadvantages, future scope, and conclusion are examined. Finding missing people is also the foundation of the papers under study. By the end of this article, a better method for locating missing people will have been found, and the shortcomings of earlier research publications will have been solved. This work is essentially based on ongoing research. The literature review of the previous publications is the topic of this paper. This study analyses a number of academic papers. Each paper's methodology, implementation strategies, advantages, disadvantages, future scope, and conclusion are examined. Finding missing people is also the foundation of the papers under study. By the end of this article, a better method for locating missing people will have been found, and the shortcomings of earlier research publications will have been solved. This work is essentially based on ongoing research.

I. INTRODUCTION

The goal of the Finding Missing Person through Video Footage by Uploaded Photo project is to use artificial intelligence and face recognition technology to transform the way law enforcement organisations handle missing person cases. Conventional means of locating the missing frequently entail laborious procedures such as going through hours' worth of CCTV material by hand, speaking with witnesses, and depending on sporadic leads. When missing people are relocated across cities or nations, these approaches may prove to be both inefficient and time-consuming.

By creating a state-of-the-art system that allows authorities to upload a photo of the missing individual, our initiative aims to overcome those issues. Next, a plethora of video footage from various surveillance sources, such as traffic cameras, public safety cameras, and private CCTV systems, is scanned and analysed by the AI-driven platform. The technology compares the uploaded photograph with the faces found in the movie using sophisticated facial recognition algorithms. The technology produces real-time alerts as soon as a possible match is found, giving law enforcement quick leads that can drastically cut down on search time.

The project improves the accuracy of the inquiry while simultaneously speeding it up. By broadening the search across several places and automating the review of video footage, it lowers the probability of lost possibilities. This AI-powered system increases the likelihood that missing people will be found promptly and safely by enabling law enforcement to concentrate their resources on potential leads. It does this by processing enormous volumes of footage accurately and fast.

Through the integration of the AI solution into missing person investigations and the provision of a state-of-the-art, technologically sophisticated alternative to traditional investigative approaches, the research has the potential to significantly impact public safety.

II. NEED OF THE STUDY.

Physically, it takes a very long time because the process of looking for a missing person takes a long time, and filing a police station FIR takes longer. Additionally, there is not a lot of staff available to look for missing persons during the handy process, which leaves half of the cases unsolved. The average number of missing children in India is 296 every day, which is a concerning statistic. Additionally, half of the 9,019 individuals—a troubling total—remain untraceable each month. According to data from the National Crime Records Bureau, 1,08,234 children went missing nationwide during the Covid-

19 outbreak in 2020, which is shocking. There were reports of 33,456 missing girls and 15,410 missing boys, with 43,661 of them still unaccounted for.

The growing number of missing persons cases around the world is what inspired our effort. In 2020 alone, more than 89,000 people were reported missing in the United States, according to the National Crime Information Centre (NCIC). Some of these cases go unsolved for years, and many families are still looking for their loved ones, but most of these cases are settled swiftly. The importance of using technology to locate missing people has grown, particularly with the popularity of social media and security cameras.

But a lot of the current approaches to missing person searches, like putting up flyers or calling the police, can take a long time and don't always work. Consequently, applying machine learning algorithms can aid in speeding up the search and raising the chances of success. The suggested strategy will make use of pictures and videos of the missing person from a variety of sources, including friends, relatives, security cameras, and social media. The Haar Cascade algorithm will be trained using these pictures and videos in order to identify the face of the missing person. After training, the algorithm can be used to check for the presence of the missing person in fresh photos or videos.

III. RESEARCH METHODOLOGY

3.1 Data Collection

Data collection for a missing person case involves gathering and organizing relevant video data from many sources, such as traffic cams, public CCTV cameras, and other surveillance systems in the area of the last saw individual, using artificial intelligence and video footage.

Data collection using AI for a missing person investigation requires precise collaboration with both public and private surveillance networks in order to access and gather relevant footage from locations connected to the person's last known movements. This contains video from transit hubs, nearby regions, and places they are known to visit. By collecting from a range of camera angles, times, and dates, thorough coverage is guaranteed. The video data needs to be organized and securely kept after it has been gathered. Here, metadata tagging is essential because it makes it simple to retrieve particular videos by linking each clip to data such as position, perspective, and date. This speeds up the subsequent search and processing stages.

As new information, such recent sightings or updated last-known locations, becomes available, data collection operations in a missing person inquiry may continue over time. Finding hints can be improved by collecting more video from places like train stations, public gatherings, or other sites that are pertinent to the person's profile. This data collection process needs to be adaptable so that footage may be accessed quickly upon request. The overall quality and coverage of the data that feeds into the AI model are improved by streamlining cooperation with private organizations and municipal government to guarantee data collecting is quick and covers all potentially important places.

3.2 Data Preprocessing

Data preparation for a missing person investigation utilizing AI and video footage is the process of improving the quality and organizing the raw video data in order to prepare it for analysis. Important steps include de-noising and altering the resolution to improve video clarity, especially for low-quality content. The film is then divided into separate frames for processing by AI models. This stage also involves normalizing lighting and adjusting contrast to provide consistency and help the AI accurately detect and identify humans. Last but not least, in order to speed up further analysis and improve search accuracy, metadata such as location, time, and camera angle must be added to these frames.

Data preprocessing involves enhancing video quality through contrast adjustments, de-noising, and sharpening in order to increase visibility in low-quality movies. Key frames are then identified and normalized for consistency in lighting, color, and aspect ratio to guarantee consistency across all images. Each frame is labeled with detailed metadata, including position and timestamp, to aid with tracking and identification in later stages. This enhanced and well-structured dataset significantly boosts AI's efficiency and accuracy in finding missing individuals.

Subsequent phases of data preprocessing may entail fine-tuning elements such as frame extraction rates, normalization parameters, and noise reduction levels in response to feedback from preliminary testing and model performance. For example, when film comes from sources with very fluctuating illumination, it may be helpful to modify the contrast or brightness normalization. By exposing the model to a variety of sights, data augmentation techniques like cropping or rotating photographs can further increase the model's resilience. Maintaining an accurate, uniform dataset that is tailored for high-performance model output requires regular preprocessing that complies with the most recent model criteria and data inputs.

3. 3 Model Development

The primary objective of model development for missing person detection in video footage is to create and refine machine learning algorithms that can precisely identify and track persons. Using face recognition models trained on photos of the missing person—using several examples with varying lighting, perspectives, and even little changes in look (like new hairstyles or accessories)—is one common technique. Deep learning frameworks such as Convolutional Neural Networks (CNNs) or specialized models like YOLO (You Only Look Once) are used for real-time object detection and tracking, which is essential for recognizing the individual across different scenarios and footage sources.

To improve accuracy, these models are further trained using techniques like transfer learning, which modifies a previously learned model to quickly recognize certain traits of the missing person. Additional levels of AI processing, such behavioral pattern analysis, can identify specific movements or activities, like standing, walking, or strange behavior. This technique reduces the need for a comprehensive human examination by generating alerts when the individual is located within a scenario. The model can enhance its effectiveness in missing person identification by enhancing its accuracy in real-world scenarios, such congested settings or low-quality film, which is made possible by ongoing testing and validation on a range of datasets.

In order to support situations where the face might not be clearly visible, the model may also be extended with recognition capabilities outside facial recognition, such as gait analysis or identifying distinctive body movements. The model can be made more resilient to the variability of the real world by diversifying the training data to include different lighting and setting circumstances. Furthermore, for even more sophisticated identification, the model architecture may be modified over time to make use of more sophisticated methods like transformer networks. By making these adjustments, the AI's accuracy can be greatly increased, giving case handlers more trustworthy alerts and insights and eventually increasing the likelihood of recovery.

3.4 Model Deployment

The installation of cloud-based servers or edge devices is typically necessary to handle large video files and provide fast processing speeds. The model deployment process for a missing person tracking system involves integrating the trained AI model into a scalable, dependable infrastructure that can process video footage in real-time or nearly real-time. Incoming video feeds are continuously scanned by the deployed model, which uses its taught recognition skills to find and follow the missing individual across several camera sources. The system usually has automated pipelines and APIs that link it to video sources for efficient deployment, enabling real-time alerts and seamless data flow.

Large video files and quick processing speeds usually need the installation of cloud-based servers or edge devices. The trained AI model must be integrated into a scalable, reliable infrastructure that can analyze video data in real-time or almost real-time as part of the model deployment process for a missing person tracking system. The deployed model continuously scans incoming video feeds and employs its learned identification skills to track and locate the missing person across several camera sources. Real-time warnings and smooth data flow are made possible by the system's automated pipelines and APIs, which connect it to video sources for effective deployment.

After deployment, the model's real-time processing capabilities can be tailored for various sites, balancing network needs and computing capacity. In high-traffic areas, for example, edge deployment—running the AI locally on security cameras—could lower latency. Frequent tracking of performance indicators, such accuracy and response time, aids in identifying areas in need of optimization. By incorporating feedback mechanisms, law enforcement can directly validate detections, which gradually enhances model learning. Faster detection, less network stress, and the ability of the AI to adapt to changing operational requirements in various deployment contexts are all made possible by this dynamic deployment approach.

3.5 Matching and Identification

The primary objective of the matching and identification step is to compare the identified individuals in the camera footage with known images or characteristics of the missing person. In order to identify potential matches, the AI model analyzes unique facial characteristics and patterns in the preprocessed frames of the data using facial recognition algorithms. The model is often designed to work with several facial recognition techniques, such as feature matching, 3D facial modeling, and even multi-angle recognition, to guarantee accuracy across a range of camera angles and lighting conditions. Each identified match is given a confidence value, which helps rank the most likely candidates for further analysis.

Additionally, identification goes beyond facial recognition by incorporating other distinguishing traits like clothing, body posture, and behavioral patterns. This enhances the AI's ability to differentiate the individual from those who appear similar in crowded or complex environments. This multi-layered approach improves the reliability of the identification process by reducing false positives and increasing the probability of accurately identifying the missing person. The technology then forwards any high-confidence matches directly to investigators or case managers, allowing for quick action and allowing the team to focus on good leads. Regularly updating the model with new images or information from the family or authorities can guarantee accurate matching throughout time.

To facilitate visual matching across many settings, more identification elements, like the ability to identify particular clothing colors or accessories, can be added as the algorithm gains experience. Additionally, behavioral tracking models may be used to pinpoint particular behaviors or patterns of movement associated with the person, such as approaching transportation stations on a regular basis or seeming motionless in particular locations. The model's accuracy and dependability are increased in difficult situations, including congested areas, by combining facial and non-facial recognition capabilities. By prioritizing high-probability matches, the system's confidence score feature enables investigators to promptly concentrate on leads with the most promise.

3.6 Verification and Validation

The Verification and Validation phase is crucial to ensuring the accuracy and reliability of the AI system used to identify missing persons. The systematic process of verifying that the AI model has been applied correctly and operates as intended is known as verification. One method to assess the model's performance is to use a validation dataset that wasn't used for training. Metrics like precision, recall, and F1 score are used to assess the model's effectiveness in detecting and identifying individuals. These metrics confirm that the system can effectively differentiate between the missing individual and individuals that appear to be similar.

Validation incorporates real-world testing situations in addition to algorithmic performance to evaluate the system's efficacy in practical applications. Working with law enforcement agencies to do field testing may be necessary to assess the model's performance using actual surveillance footage in a range of conditions, such as changes in crowd sizes, lighting, and weather. Feedback from these tests is essential for iteratively improving the model and deployment strategies. Upholding strict verification and validation protocols boosts the general effectiveness of missing person recovery efforts and fosters greater confidence in the AI system's abilities among the public and law enforcement.

New validation data can be gathered and used to assess the model's performance in developing settings, including night scenes or crowded areas, as it is tested in a variety of real-world scenarios. In order to ensure that the model continually flags the right person and complies with privacy and accuracy criteria, verification also entails analyzing detection records. Working with law enforcement and facial recognition specialists, the system is continuously calibrated to minimize prejudice and preserve accuracy in a variety of contexts. This stringent procedure guarantees that the AI satisfies moral and legal requirements, offering dependable assistance with missing person inquiries.

3.7 Continuous Improvement

The goal of the Continuous Improvement phase is to continuously improve the AI system's performance and adjust to new difficulties in missing person identification. This entails methodically gathering input from users who engage with the system in practical situations, such as case managers and law enforcement officers. They offer insightful information about the efficacy, precision, and usability of the model, which helps determine what has to be improved. Developers can pinpoint specific areas that want development, including optimizing the model's algorithms or growing the training dataset, by examining misidentifications or false positives.

This stage also involves periodically retraining the model using fresh information, such as updated photos or videos of ongoing instances. Enhancing the model's capabilities also requires incorporating recent developments in machine learning technology and methodologies. For example, improving current algorithms or implementing newer architectures can result in increased processing speed and accuracy. System performance metrics are continuously monitored to make sure the AI continues to function well in a variety of scenarios. The ultimate objective of continuous improvement is to develop a system that is more dependable, effective, and flexible over time, greatly raising the likelihood of finding missing people.

In order to keep the model sensitive to the intricacies of the actual world, continuous improvement depends on routinely retraining it with updated data and actively examining performance logs. Model efficiency is increased and processing times are decreased by incorporating latest developments in machine learning, such as better model topologies or novel optimization strategies. By creating an automatic feedback loop, researchers can promptly disclose errors, facilitating quicker corrections and enhancing model dependability. This proactive approach to development ensures the AI model's long-term utility in helping law enforcement agencies locate missing people by keeping it flexible and efficient.

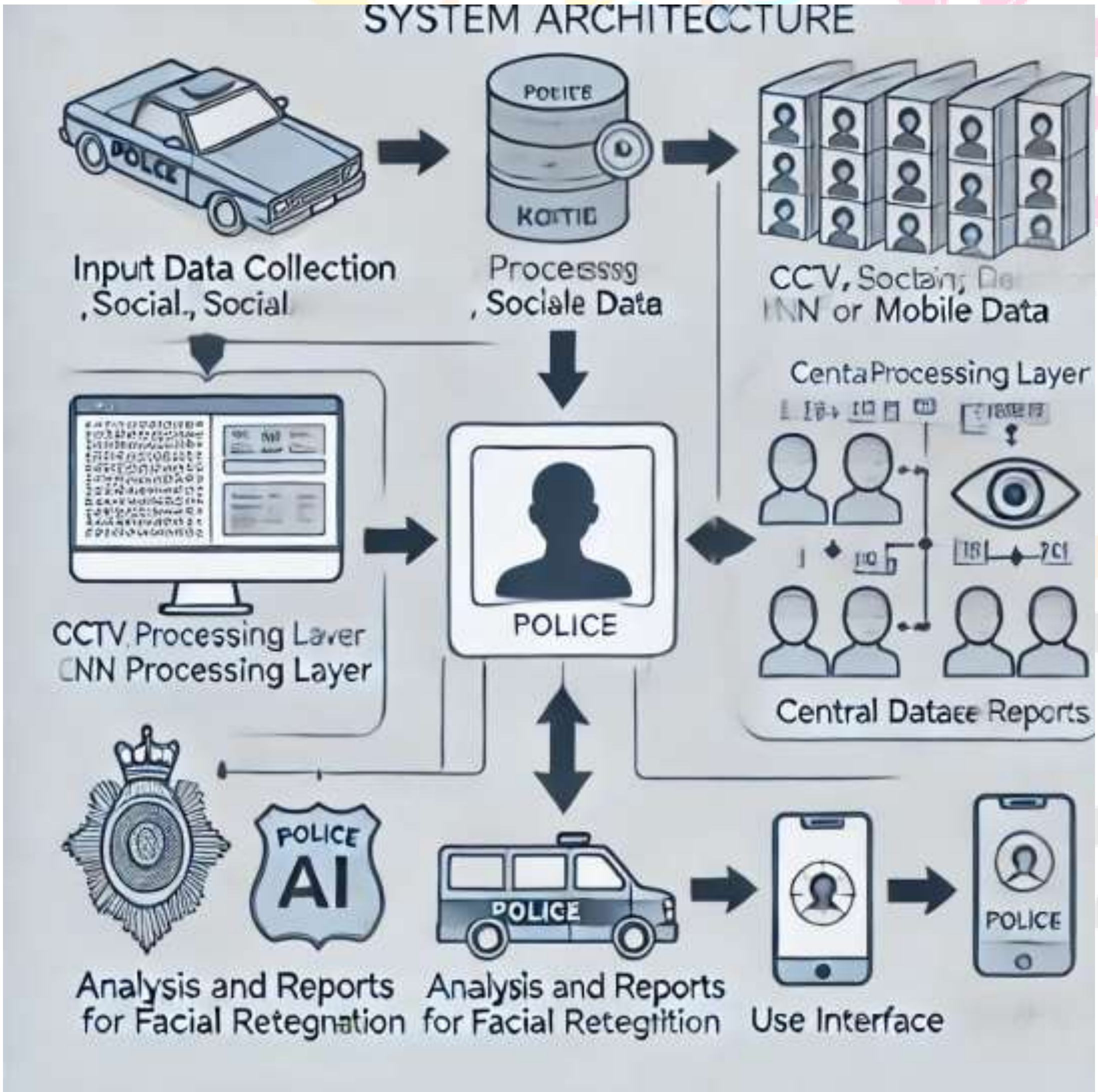
IV. RESULTS AND DISCUSSION

.4.1 Result

The implementation of an AI system for finding missing persons is expected to yield significant improvements in identification rates compared to traditional methods, facilitated by real-time matching through Convolutional Neural Networks (CNNs). Enhanced community engagement is anticipated through a user- friendly interface and mobile application, which will likely lead to an increase in public submissions of potential matches. The system aims to reduce false positives via a robust verification process and regular updates, ultimately fostering stronger collaboration between law enforcement and citizens in the search for missing individuals.

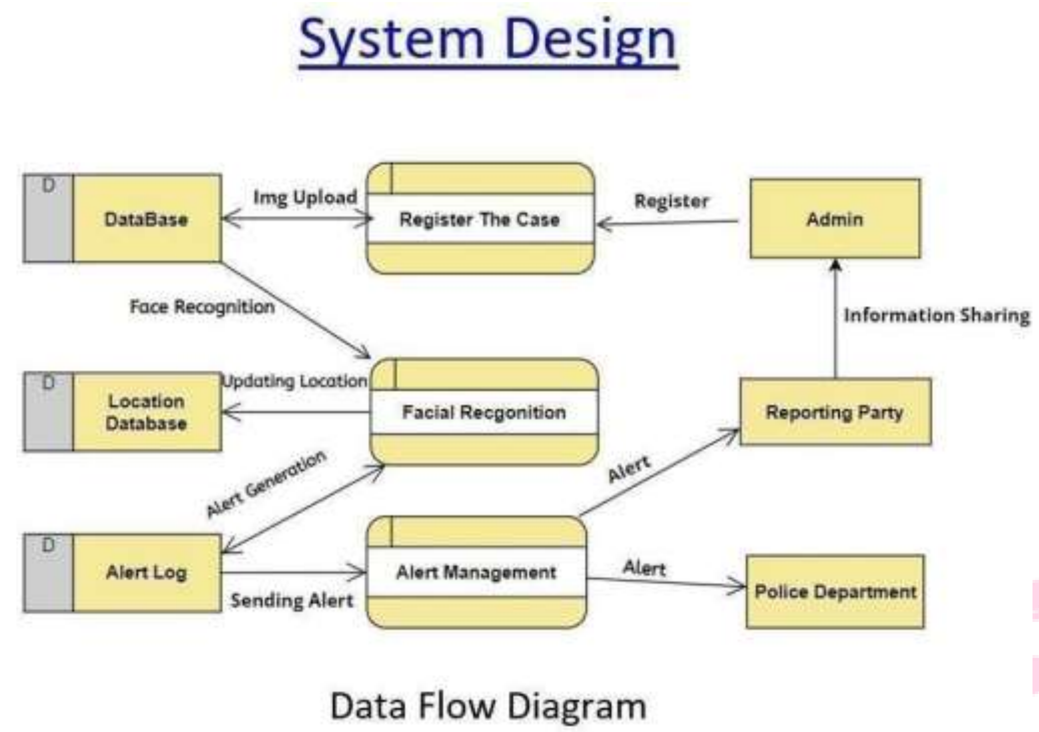
In terms of effectiveness, the strengths of this AI system include its efficiency in analyzing large volumes of data rapidly, scalability to incorporate additional data sources, and the ability to operate continuously without the limitations of human resources. However, challenges such as data privacy concerns and reliance on the quality of input data must be addressed. Opportunities for improvement exist through partnerships with NGOs and law enforcement agencies, as well as the integration of other AI technologies to enhance the system's capabilities. Nevertheless, threats such as technological obsolescence and public skepticism regarding surveillance technology could hinder its adoption.

4.2 Tentative System Architecture

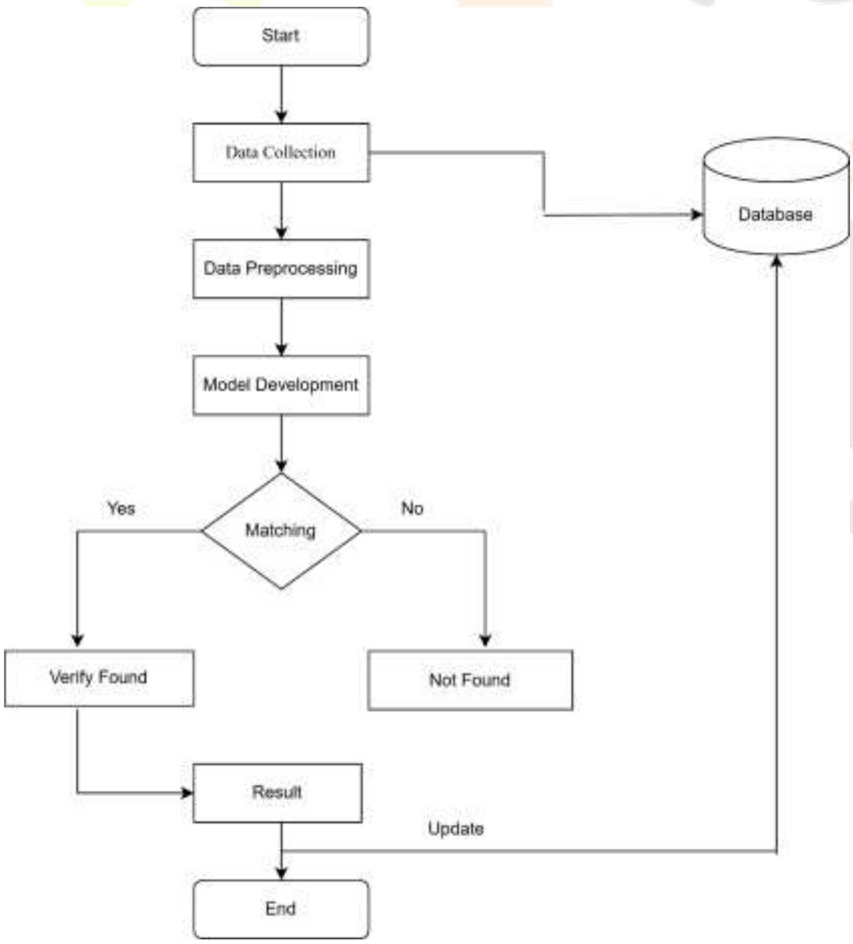


system architecture

4.3 System Design and Flow Chart



system design



flowchart

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