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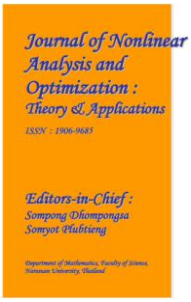

LOCATING MISSING PERSONS USING AI & ML

Dr. J. Aruna Devi, Associate Professor in Computer Science Department (CSE), Vignan's Institute of Information Technology, Vishakapatnam, India. jarunadevi2003@gmail.com
Sagineti Lasya Priya, Computer Science Department (CSE), Vignan's Institute of Information Technology, Vishakapatnam, India, saginetilasya29@gmail.com
Vangalapudi Jeshitha, Computer Science Department (CSE), Vignan's Institute of Information Technology, Vishakapatnam, India, jeshi070803@gmail.com
Sanjeevani Boddapati, Computer Science Department (CSE), Vignan's Institute of Information Technology, Vishakapatnam, India, sanjeevanisurya@gmail.com
Yendamuri Ganesh, Computer Science Department (CSE), Vignan's Institute of Information Technology, Vishakapatnam, India, gyendamuri142@gmail.com
Ratnala Mohan Krishna, Computer Science Department (CSE), Vignan's Institute of Information Technology, Vishakapatnam, India, mohankrishnaratnala@gmail.com

ABSTRACT: The "Locating Missing Persons Using AI & ML" project not only showcases the power of advanced technology but also highlights the potential in search and rescue missions. Our project aims to develop a system which streamlines the process of locating missing persons. The methodology involves the use of Django framework for structuring the project. A Face recognition module utilizing on deep learning integrated with OpenCV, is used which undergoes iterative training of the unique facial features. Separate user and admin profiles are maintained, where admins can have the overall control over the website, while users can register missing cases. This technology enables the system to automatically trigger email alerts to reporting person and admin upon detecting faces using surveillance or uploads. The system is also capable of tracking the locations and updating the database after acknowledgement. This innovative application significantly boosts the effectiveness and precision of search missions.

Keywords:
Missing Persons, AI (Artificial Intelligence), ML (Machine Learning), Django, Face recognition, OpenCV, Email alerts.

1. INTRODUCTION

In the realm of locating missing persons, advancements in technology have become increasingly instrumental, particularly with the fusion of Artificial Intelligence (AI), Machine Learning (ML), and sophisticated software frameworks like Django, along with specialized modules for face recognition and computer vision such as OpenCV. Traditional methods for finding missing individuals have often been limited by manual processes and reliance on outdated databases. However, with the integration of Django - a high- level Python web framework—alongside AI-driven face recognition modules and the capabilities of OpenCV for image processing, a new era of search and rescue operations has emerged. The combination of Django's robust web development capabilities with AI and ML-powered face recognition technologies offers a multifaceted approach to locating missing persons. By integrating these tools, law enforcement agencies and humanitarian organizations gain access to powerful solutions for analyzing vast datasets, including surveillance footage, social media posts, and publicly available images. Utilizing Django as the backbone for web development allows for the seamless integration of these technologies into user-friendly platforms accessible to investigators, volunteers, and the public. Through intuitive interfaces, users can upload images,

provide tips, or access real-time updates on search operations, fostering community engagement and collaboration in the effort to locate missing individuals. The incorporation of AI & ML algorithms within the Django framework enhances 2 the efficiency and accuracy of search efforts. These algorithms can analyze facial features, behavioral patterns, and geographical data to generate leads and prioritize search areas effectively. Moreover, by leveraging the power of OpenCV for facial recognition, authorities can match images of missing persons with potential sightings captured in surveillance footage or social media posts. Despite the promising capabilities offered by these technologies, ethical considerations regarding data privacy, algorithmic bias, and the responsible use of surveillance must be addressed. As such, developers and stakeholders need to uphold ethical standards and adhere to legal guidelines to ensure the ethical deployment of these tools in search and rescue operations.

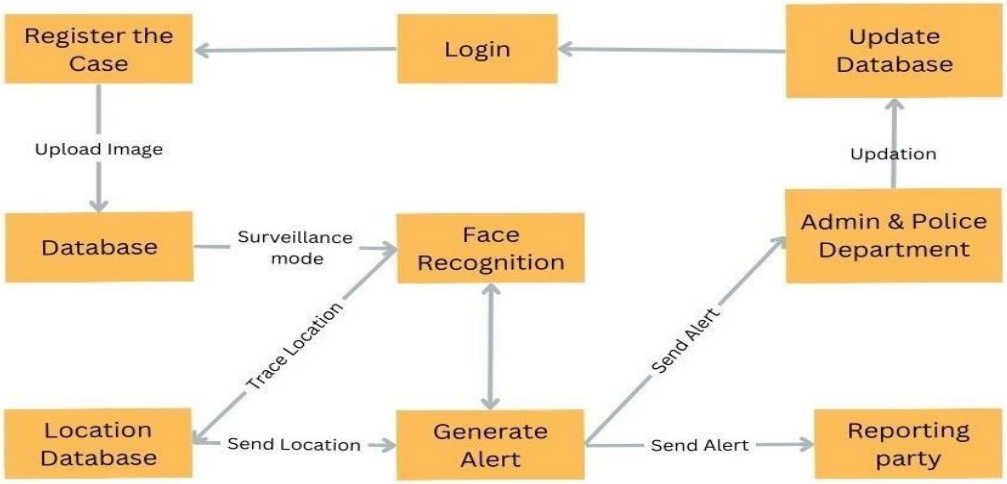

Fig 1: System Architecture of Locating Missing Persons using AI & ML

2. LITERATURE REVIEW

We have conducted several studies in the domain of employing AI & ML methodologies for locating & identifying missing persons. Chaukade [1] explored the utilization of AI and ML techniques for finding and matching lost individuals, publishing their work in 2022. Pawar et al. [2] focused on facial recognition algorithms based on AI to achieve the highest level of accuracy for finding missing persons, publishing their findings in 2021. Babbar et al. [3] delved into facial recognition across different age groups utilizing deep residual networks, presenting their work at the International Conference in 2019. Srikanth and colleagues [4] presented a machine learning approach using Python for identifying missing persons, publishing their work in 2022. Sarkar and Shenoy [5] explored face recognition employing artificial neural networks & feature extraction in 2020. Hetal et al. [6] described an Android-based application for finding missing persons, published in IRE Journals in an unspecified year. Patil et al. [7] presented an AI-based approach for finding missing persons, published their work in the International Journal in June 2021. Ayyappan and Matilda [8] discussed the identification of missing small children and criminals using web scraping and face recognition, presenting their findings at the IEEE ICSCAN in 2020. Balar et al. [9] developed an effective facial recognition system designed to identify missing individuals, published Journal in May 2019. Arnikar et al.
[10] described an RFID-based system for missing person identification, presented at IEEE International Conference in 2014.
In conclusion, the literature reviewed suggests that AI & ML holds great promise for the search and rescue efforts. Despite the progress made in this field, many more challenges and limitations remain. However, by integrating interdisciplinary approaches and innovative solutions we can create more effective and inclusive strategies for locating and identifying missing individuals ultimately enhancing public safety and well-being.

3. PROPOSED SYSTEM & METHODOLOGY

This system aims to leverage AI and ML to expedite and enhance missing person searches. Here's a breakdown of its key components:

A. Case Registration

Users would access a secure registration portal requiring credentials provided by their organizations. The registration form would likely collect user information like name, affiliation, contact details, and security clearance level. Image and video data will undergo preprocessing steps like noise reduction and facial landmark detection for improved analysis.

B. User Interface and Alert System

A user-friendly interface will allow law enforcement and authorized personnel to:

1) Input missing person details including facial images and descriptions.
2) Monitor real-time search results and lead generation.
3) Access location data and potential sightings on a map.

C. Sending Emails

If a missing person is found then an email is sent to the registered email with the case and police department along with the information of the location latitude & longitude of the missing individual.

This proposed system offers a framework for leveraging AI and ML to significantly enhance missing person searches. By integrating advanced AI techniques, data fusion, and a focus on security and privacy, we can bring hope and efficiency to this critical endeavor.

The proposed system works on the following methodology. The python library for Face Recognition uses both computer vision (CV) techniques and deep learning algorithms for face detection and recognition purposes. Histogram of Oriented Gradients (HOG) is used for detecting faces, it is commonly used for object detection (here face detection) where it identifies various regions of the image that contains faces based on gradient distributions. Then it incorporates the use of Convolutional Neural Network (CNN) a form of deep learning algorithm like the dlib library which is used for extracting features and recognition of faces. After this face- recognition generates various numerical representation (vectors) known as face encodings. These encoding capture the unique face characteristics to enhance the comparison and recognition. Further it performs distance metrics such as the Euclidean distance or cosine similarity to gauge similarity of face encodings. By comparing the distances between these encodings, the library identifies whether the face detected matches with any of known faces in the database.

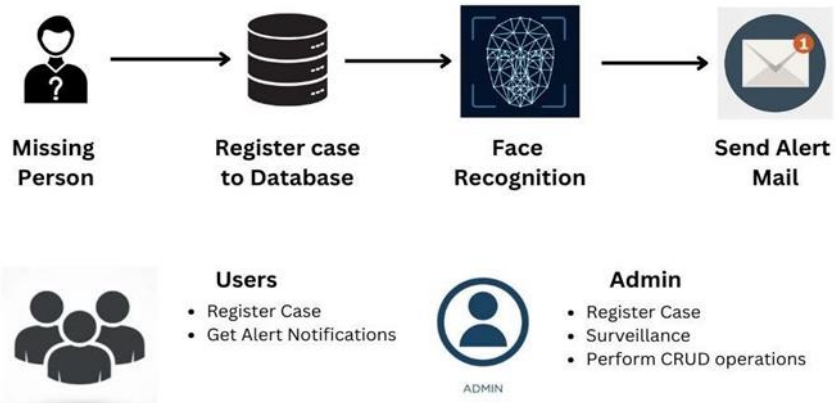

Fig 2: Project Model

The methodology involves following steps:

A. Input Image / Register Case

Users initiate the system by providing an input image or registering a case. This can be done through the system's user interface or an API endpoint.

B. Get Registered

The system processes the registration, storing relevant details in the database. This includes user information, case details, and a reference to the provided image.

C. Check for Face Detection

Utilizing OpenCV for facial recognition, the system checks if a face is detected in the registered image. This step involves preprocessing the image, extracting facial features, and utilizing the face recognition library to identify faces.

D. Send Mail and Alerts (On Face Detection)

If a face is successfully detected, the system triggers actions such as sending email notifications and alerts to notify relevant parties. This could include case investigators, administrators, or other designated

individuals.

E. Admin can perform CRUD Operations

Administrative users have the capability to perform CRUD operations and change information stored in the system. This functionality is accessible through a secure admin interface, ensuring control and management of the database records.

F. Admin Module

In the proposed AI and ML-powered missing person search engine, the admin functionalities would be crucial for system management and ensuring responsible use. Here's a breakdown of some key admin features:

1) System Configuration and Management

a) Data Source Management: Admins can define trusted sources for data acquisition, including authorized access to public and private surveillance feeds, social media platforms (with user consent agreements), and phone network data (with legal authorization).

b) User Management: Admins can create and manage user accounts for authorized law enforcement personnel and search teams. Assigning access levels and permissions ensures data security and restricts unauthorized use.

2) Data Security and Privacy Controls

a) Data Anonymization: Admins can configure the system to anonymize facial data whenever possible during analysis, minimizing privacy concerns.

b) Data Access Logs: Admins can review and access the data logs which enables to monitoring of user activity and ensure that the authorized personnel are using the system appropriately.

3) Legal and Ethical Compliance

a) Admins can be responsible for ensuring the system adheres to all relevant legal and ethical guidelines regarding data privacy, facial recognition usage, and user consent for data collection.

By implementing these functionalities, admins can ensure the system operates effectively, upholds data privacy, and delivers valuable tools for law enforcement in their critical mission of finding missing persons

G. CNN Algorithm

A Convolutional Neural Network (CNN) represents a type of Deep Learning neural network architecture extensively utilized in Computer Vision tasks. CNNs are composed of various layers that are designed to derive hierarchical representations of features from input images. Key components of CNN encompass convolutional layers, pooling layers, and fully connected layers. Convolutional layers execute convolution operations to the images given as input, capturing spatial features and patterns through learned filters. Pooling layers reduce the spatial dimensions of feature maps, thereby decreasing computational complexity while preserving important details. Finally, fully connected layers combine extracted features to make predictions, for instance categorizing images in image classification assignments.

H. Open CV

OpenCV, an abbreviation for Open-Source Computer Vision Library, serves as a fundamental component in the realm of computer vision (CV) and processing images. Developed initially by Intel in 1999, it has evolved into a versatile and comprehensive library, offering a wealth of functionalities for analyzing, manipulating, and understanding visual data. At its core, OpenCV is designed to facilitate the development of applications that require tasks such as object detection, facial recognition, motion tracking, and augmented reality. OpenCV's extensive functionality covers a wide spectrum of tasks within the field of computer vision. From basic image processing operations like filtering, thresholding, and morphological operations to more advanced techniques such as feature extraction, object recognition, and stereo vision, the library offers a rich set of tools to address diverse application requirements. The community surrounding OpenCV plays a pivotal role in both developing & adoption. With a vibrant ecosystem of developers, researchers, and enthusiasts, OpenCV benefits from continuous contributions, feedback, and support. The community-driven nature of the library fosters collaboration, knowledge sharing, and innovation, resulting in a robust and dynamic ecosystem.

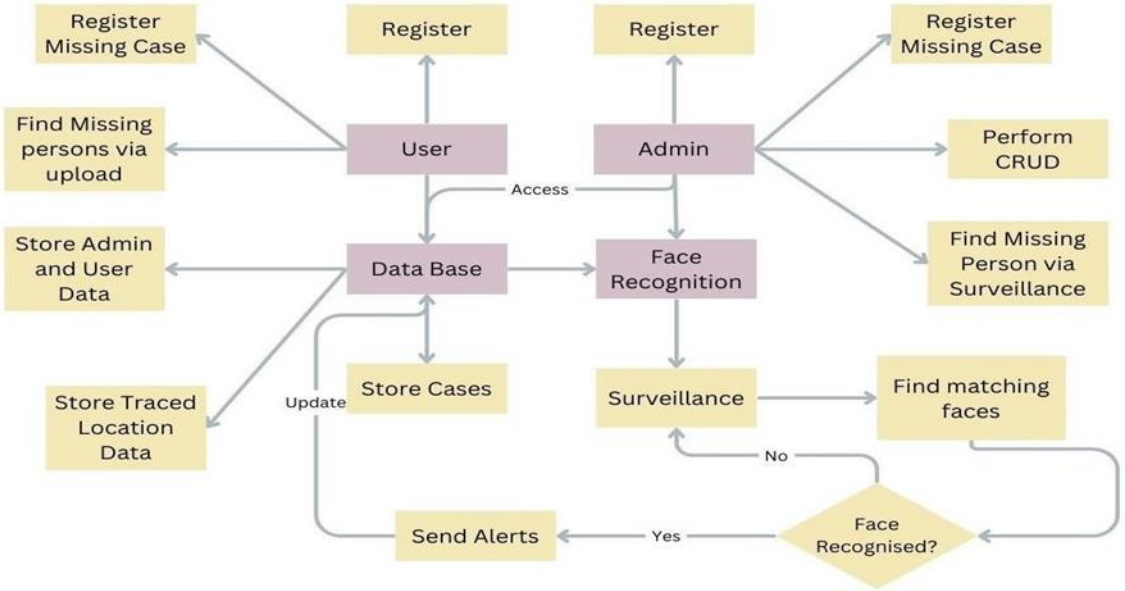

Fig 3: Data Flow Diagram

I. Face Recognition Module

OpenCV offers a robust face recognition module that allows developers to integrate facial recognition capabilities into their applications with ease. This module provides tools and algorithms for identifying faces in video streams or images, identifying facial landmarks, and recognizing individuals utilizing their facial characteristics. Here's an outline of some key aspects of the face recognition module in OpenCV:

1) Face Detection

The face recognition incorporates pre-trained cascades for detecting faces, such as the Haar cascade classifier, which can quickly identify regions of interest in images or video frames. This detection step is essential for subsequent facial recognition tasks.

2) Facial Landmark Detection

OpenCV's face recognition module also supports facial landmark detection, which involves locating keys features on a face, like the nose, eyes, mouth, & eyebrows. These landmarks act as anchor points for analyzing faces and can be used to align faces for improved accuracy in recognition.

3) Face Recognition Algorithms

OpenCV provides implementations of popular face recognition algorithms, such as Eigenfaces, Fisher faces, and Local Binary Patterns Histograms (LBPH), among others. The above algorithms extract features from facial images and use them to train models for recognizing individuals. Developers can choose the most suitable algorithm based on their application requirements and performance considerations.

4) Training and Recognition

With OpenCV's face recognition module, developers can train custom models using labeled datasets containing images of individuals' faces. Throughout the training, the algorithm familiarizes with distinct patterns & features specific to everyone. Once trained, the model can identify faces in real-time or batch- processing scenarios, identifying individuals based on their facial characteristics.

5) Integration with Machine Learning

OpenCV's face recognition module seamlessly integrates with other machine learning frameworks, such as scikit-learn or TensorFlow, allowing developers to incorporate advanced techniques for feature extraction, dimensionality reduction, and classification into their face recognition pipelines. This flexibility enables the development of more sophisticated and accurate recognition systems.

4. RESULTS & DISCUSSIONS

In our project "Locating Missing Persons Using AI and ML," we successfully implemented a system that utilizes AI and ML technologies to streamline the search and rescue process by using Face recognition. Upon detecting missing individuals through facial recognition, the system automatically generates email alerts containing precise location details to relevant authorities and case registrants. Concurrently, the system updates its database with the traced location information, ensuring real-time

data accuracy for ongoing search missions. Moreover, our system prioritizes data privacy and security by implementing robust encryption protocols to safeguard sensitive information collected during the search process. This ensures compliance with legal and ethical guidelines regarding the management of personal data, thereby fostering trust and cooperation among stakeholders involved in search and rescue operations. The below are the output screens of our project Locating Missing Persons using AI & ML.

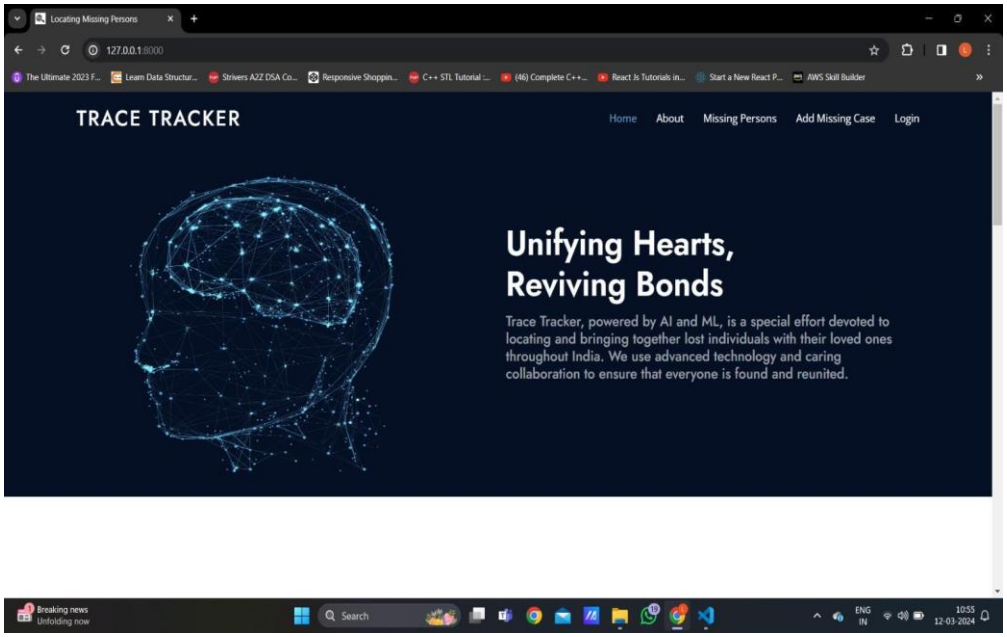

Fig 4: Home Page

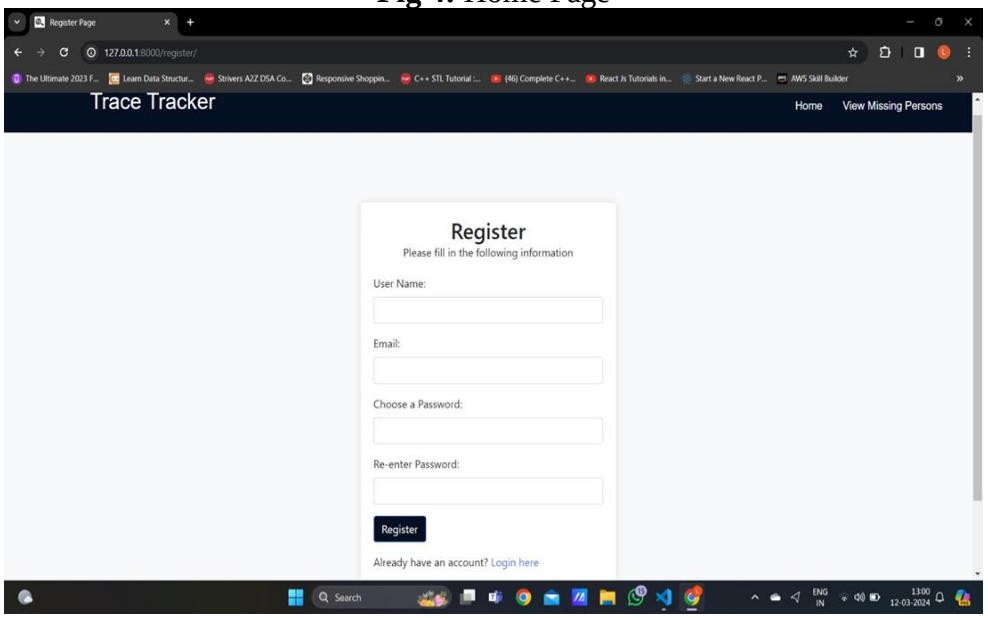

Fig 5: Registration Page

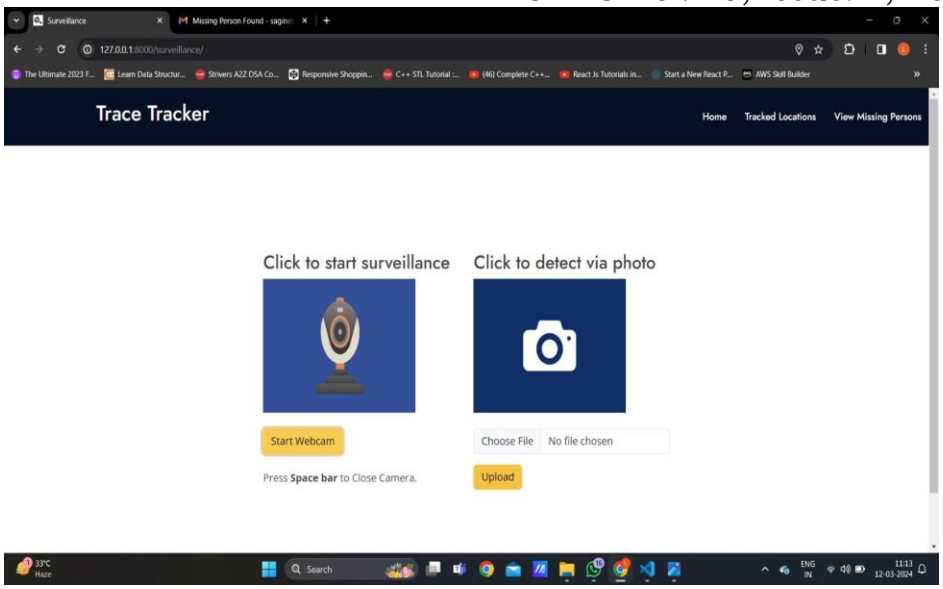

Fig 6: Upload and Surveillance page

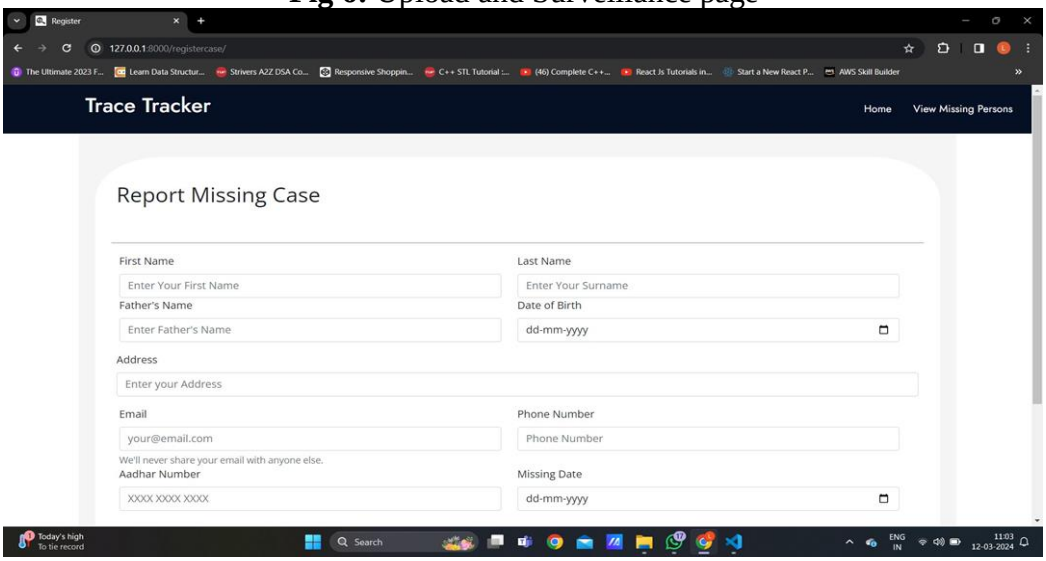

Fig 7: Reporting Missing Case Page

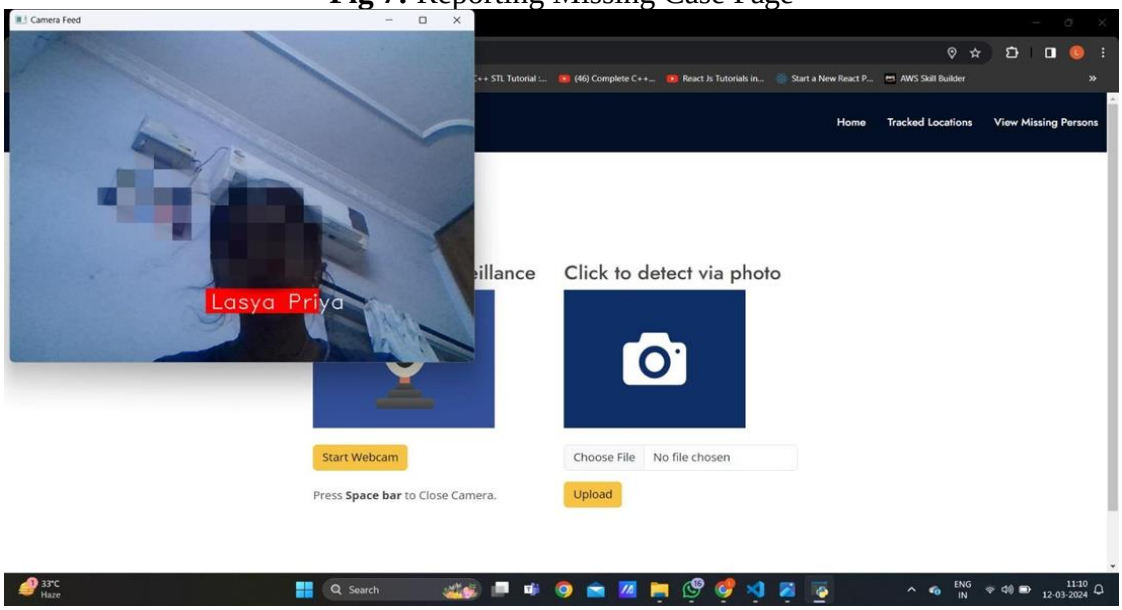

Fig 8: Found Missing Person

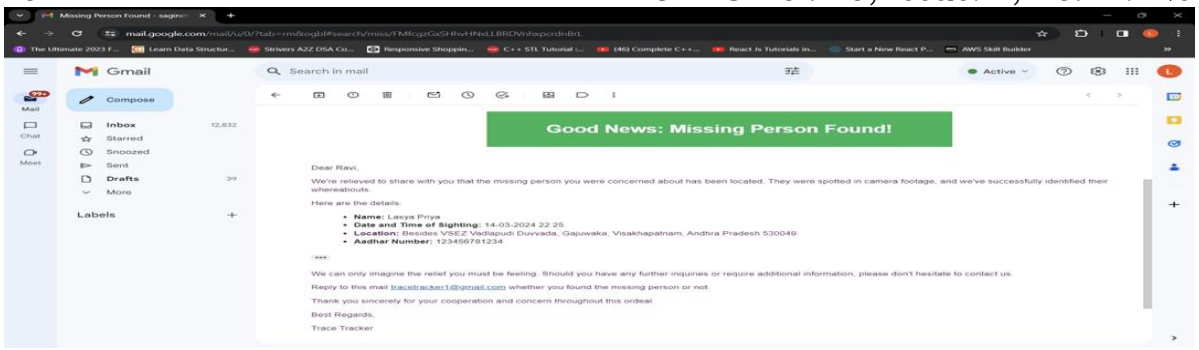

Fig 9: Receiving Acknowledgement through Mail

5. CONCLUSION

The project "Locating Missing Person Using AI & ML" represents a significant stride in leveraging cutting- edge technologies to address critical societal challenges. Through the integration of AI & ML algorithms, we've showcased the capability to revolutionize search and rescue operations, offering efficient and effective methods for locating missing individuals. Our research and development efforts have underscored the power of AI and ML in analyzing datasets, identifying patterns, and generating actionable insights to aid search missions. By harnessing innovative techniques such as image recognition, we have enhanced the capabilities of search teams and law enforcement agencies in their quest to reunite families and communities with their loved ones.

In the future, our system can be extended by connecting it to publicly available CCTV cameras and enable real-time face detection. We will consistently monitor the frames coming from these cameras, and our system monitors the faces within the footage. If a missing person is identified in any of the frames, and information will be promptly relayed to appropriate authorities, it would notify them immediately so that they can inform the missing person's family members.

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