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Identification of Missing Person using CNN

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Abstract:-Our project aims to leverage Convolutional Neural Networks (CNNs) for the identification of missing persons. CNNs, a class of deep learning algorithms widely used in image recognition tasks, offer promising potential in automating and enhancing the identification process. The project aims to develop a robust system using CNN models to match unidentified individuals with missing person databases, improving identification accuracy and providing closure.

The proposed approach demonstrates potential in assisting law enforcement agencies and missing persons organizations by providing a reliable and efficient means of cross-referencing images from various sources, such as surveillance footage, social media, and public records. Additionally, the flexibility of CNNs allows for the integration of other biometric markers, including fingerprints and voice recognition, to increase the accuracy and reliability of identifications.

This research underscores the importance of using artificial intelligence and machine learning in social good applications, highlighting the potential for technology to play a transformative role in reuniting families and bringing closure to unresolved cases. Future work will focus on refining the model, enhancing privacy protections, and ensuring ethical use in real-world applications.

Keywords:- *Automated Identification, Convolutional Neural Networks (CNNs), Deep Learning, Facial Recognition, Missing Person Identification, Pattern Recognition, Social Impact.*

I. INTRODUCTION

The identification of missing persons is a critical issue in law enforcement, humanitarian work, and disaster response. Recent advancements in artificial intelligence (AI) and deep learning have opened new possibilities for enhancing the accuracy and efficiency of identifying missing individuals. Convolutional Neural Networks (CNNs), a type of deep learning algorithm, have gained significant popularity due to their effectiveness in image analysis and pattern recognition.

CNNs can process visual data and learn complex features, making them well-suited for facial recognition, object detection, and other tasks related to visual identification. When applied to the problem of identifying missing persons, CNNs can analyze images or video footage to match them against a database of known individuals. This technology can help law enforcement agencies, non-profit organizations, and rescue teams to locate missing persons more efficiently and accurately.

In this context, CNNs offer several key advantages. They can analyze large volumes of data quickly, making them ideal for processing surveillance footage or large-scale image databases. Additionally, CNNs can identify subtle features and patterns that might be overlooked by human observers, enhancing the accuracy of identification.

However, implementing CNN-based systems for identifying missing persons involves several challenges. These include ensuring data privacy, addressing bias in training datasets, and maintaining the reliability of the models in various scenarios. Moreover, integrating CNNs into existing workflows and ensuring interoperability with other systems are crucial considerations.

II. LITERATURE REVIEW

TITLE : Identification of Missing Person Using Convolutional Neural Networks

AUTHORS: P.D Nharsha Sai; V.V Sai Kiran, K. Rohith; D.RajeswaraRao

The image of person is matched using the Deep learning model, VGG16. This CNN model can be used for Face recognition in images. VGG-16 is a pre-trained model which is run on millions of images. Those weights are used in our proposed work. The NumPy module is used to represent mathematical and logical operations on arrays. This Predictive model probably identifies the missing person if the image matches and is found in the database. This methodology uses several steps which are data preprocessing, data augmentation, VGG-16, training and testing the model. Using this model, the accuracy for the training data is 90.01%. On testing, the accuracy obtained is 85.21%.

TITLE : Facial Matching and Reconstruction Techniques in Identification of Missing Person Using Deep Learning,

AUTHORS: R Annamalai; Sudharson S; Kolla Gnapika Sindhu

The number of missing person cases has dramatically increased nowadays, leaving loved ones with a lot of unanswered questions. Police inquiries and public

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announcements are two regularly used traditional methods for locating missing persons, although they frequently fall short, especially over time. Artificial intelligence (AI) is gaining popularity and could be used to enhance the search process. This study offers a revolutionary approach for solving the unsolved cases of missing individuals by using AI-based facial matching and face reconstruction approaches. The proposed method successfully uses the ORL (Olivetti Research Laboratory) Dataset's Support Vector Machine (SVM) classifier to reach an outstanding accuracy of 93% by combining face landmarks and machine learning algorithms. Additionally, a 3D face reconstruction method based on Convolutional Neural Networks (CNN) trained on the varied 300-W dataset achieves a high accuracy of 90%. These results demonstrate the potential of AI and deep learning models for improving missing person identification. The proposed approach offers a viable option that aids in providing closure to the impacted families, making a significant contribution to the field and reducing crimes in the future.

TITLE: Drone-based Autonomous Human Identification for Search and Rescue Missions in Real-time.

AUTHORS: K. Jayalath, S.R. Munasinghe

A drone-based human identification system to make search and rescue missions more effective. The drone, once detects signs of human presence in real-time aerial videos, autonomously navigates towards the suspicious location to get a better view to verify human presence. It processes images and sends selected frames for the operator for verification and issuance of instructions for follow-up actions. A custom built Tensorflow neural network is used as the object detector, which processes images in real-time and report human objects if detected on the ground.

TITLE: Efficient Face Recognition in Real Time for Locating Missing Person

AUTHOR: Nimmy Pailochan, Ms. R. Keerthana, Mr. N. Santhosh, Dr. J. Sreerambabu YEAR:2023

This paper presents a web-based application system that utilizes deep learning as the core technology of a Face Recognition System, with the primary objective of enhancing the accuracy and efficiency of locating missing individuals. Every day, a significant number of individuals go missing due to various factors such as old age, mental health issues, or conditions like Alzheimer's. The conventional methods employed for searching for missing persons are typically slow, expensive, and involve protracted physical searches lasting weeks or even months. In contrast, deep learning-based technologies offer a promising solution by rapidly analyzing substantial volumes of data within minutes or hours. By leveraging facial recognition technology, which is an application of deep learning, our proposed system aims to compare images and videos obtained from surveillance cameras with pictures of missing persons to identify potential matches. Specifically, we employ the Resnet deep learning algorithm to examine the images of missing individuals, thereby improving the accuracy and speed of identification and making the process more reliable and efficient. To provide a comprehensive solution, we have developed a user-friendly webbased application system that facilitates the search for missing persons. The application efficiently collects and stores information about missing individuals in a centralized database. Whenever a missing person is identified in a CCTV video stream, our application actively tracks their location. Once the missing person is successfully identified within the video stream, the application promptly sends location details via email to the person's relative.

TITLE: AI BASED – ASSISTED SEARCH FOR MISSING PERSON

AUTHORS: Hemadharshini S, Bheena Dhevi V, Bama Devi YEAR: 2023

Face recognition is a biometric-based technology that mathematically maps a particular person's or individual's facial features and stores all that data as a face print. By using this technique, the information on the face of a person is saved mathematically or in the format of graphs in the database, which is used for detecting that particular face. The face recognition model in our system will find a match of that person in the database. If a match is found, it will be notified to the police and the guardian of that person. In this paper, we will use the ideas of the AWS facial recognition algorithm which is based on Artificial Intelligence (AI) and will detect faces with the maximum accuracy to find the missing person.

III. PROBLEM STATEMENT

The objective is to use convolutional neural networks (CNN) to precisely identify missing people by using their visual recognition skills for age progression analysis and face feature detection.

Large data sets, unique face patterns, and a dependable tool for law enforcement and humanitarian agencies are the goals of this model.

IV. KEY POINTS WITHIN THE PROBLEM STATEMENT

➢ *Certainly, here are key points to consider within the problem statement for the project of identifying missing persons by comparing live video with dataset images:*

- Identification of Missing Persons: The primary objective is to develop a system capable of identifying missing persons through comparison of live video footage with a dataset of known images of missing individuals.
- Real-Time Video Analysis: The system must be capable of analyzing live video streams in real-time, ensuring swift identification and response to potential matches.

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- Integration of Datasets: The project involves integrating a comprehensive dataset containing images and relevant information of missing persons with the system. This dataset serves as the reference for comparison during the identification process.
- Machine Learning Algorithms: Utilization of advanced machine learning algorithms, such as convolutional neural networks (CNNs), for accurate and efficient matching between live video frames and dataset images.
- Feature Extraction and Comparison: Implementation of techniques for feature extraction from both live video frames and dataset images, enabling meaningful comparison to identify potential matches.
- Accuracy and Reliability: Ensuring the system delivers high accuracy and reliability in identifying missing persons, minimizing false positives and false negatives.
- Privacy and Ethical Considerations: Incorporating mechanisms to protect the privacy of individuals captured in live video feeds and adhere to ethical guidelines regarding the use of sensitive personal data.
- Scalability and Deployment: Designing the system to be scalable, allowing it to handle large volumes of live video feeds and dataset images efficiently. Additionally, ensuring ease of deployment across various locations and platforms.
- Collaboration with Law Enforcement and Authorities: Collaboration with law enforcement agencies and relevant authorities to facilitate the integration and utilization of the system within existing missing persons identification frameworks.
- User Interface and Accessibility: Developing a user-friendly interface for operators to interact with the system, facilitating ease of use and accessibility in various operational scenarios.
- Evaluation Metrics: Establishing clear evaluation metrics to assess the performance of the system, including metrics such as precision, recall, and F1-score, to measure its effectiveness in identifying missing persons accurately.
- Continuous Improvement and Updates: Implementing mechanisms for continuous improvement and updates to the system, including regular updates to the dataset, optimization of algorithms, and incorporation of feedback from users and stakeholders.

V. PROPOSED METHODOLOGY

➢ *Define Project Scope and Objectives:*

- Clearly define the purpose of the project, whether it's to aid law enforcement, humanitarian efforts, or another cause.
- Set specific objectives such as improving the efficiency of identifying missing persons, reducing search time, or increasing accuracy.

➢ *Data Collection:*

- Gather a comprehensive dataset of images of missing persons from various sources such as law enforcement databases, NGOs, social media, and family submissions.
- Ensure that the dataset is diverse, including images of people of different ages, genders, ethnicities, and appearances.

➢ *Preprocessing:*

- Standardize the images in the dataset to a common format and resolution.
- Apply preprocessing techniques such as normalization, resizing, and noise reduction to improve consistency and quality.

➢ *Feature Extraction:*

- Utilize computer vision techniques to extract features from both the live video feed and the dataset images.
- Features could include facial landmarks, color histograms, texture descriptors, or deep learning embeddings.

➢ *Model Training:*

- Train a machine learning or deep learning model to learn the relationship between the features extracted from the live video and dataset images.
- Consider using convolutional neural networks (CNNs) for feature extraction and classification tasks due to their effectiveness in image analysis.

➢ *Model Integration:*

- Integrate the trained model into a real-time video processing pipeline capable of analyzing live video streams.
- Ensure that the system can handle the computational requirements for processing video in real-time.

➢ *Real-time Detection and Matching:*

- Implement algorithms to detect faces or individuals in the live video feed.
- Use the trained model to compare the detected faces with the dataset of missing persons.
- Employ techniques such as similarity metrics, thresholding, or machine learning classifiers to match live faces with the dataset.

➢ *Verification and Validation:*

- Validate the performance of the system using a separate validation dataset and metrics such as accuracy, precision, recall, and F1-score.
- Conduct thorough testing to ensure the system's reliability and robustness in various scenarios and conditions.

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➢ *Deployment and Monitoring:*

- Deploy the system in relevant environments such as law enforcement agencies, public spaces, or humanitarian organizations.
- Monitor the system's performance in real-world usage and collect feedback for continuous improvement.

➢ *Privacy and Ethical Considerations:*

- Implement privacy measures to protect the identities and data of individuals, ensuring compliance with regulations such as GDPR or HIPAA.
- Address ethical concerns related to surveillance, consent, bias, and potential misuse of the technology.

➢ *Documentation and Reporting:*

- Document the entire methodology, including data sources, preprocessing steps, model architecture, training process, and evaluation results.
- Provide clear and comprehensive reports on the project outcomes, including successes, limitations, and recommendations for future enhancements.

➢ *Continuous Improvement:*

- Iterate on the system based on feedback, technological advancements, and evolving needs to continually enhance its effectiveness and usability.

This methodology provides a structured approach to leveraging live video footage for identifying missing persons, integrating techniques from computer vision, machine learning, and real- time processing.

VI. TECHNIQUE OF THE SOLUTION

➢ *One technical solution for identifying missing persons by comparing live video with a dataset of images involves using computer vision and facial recognition algorithms. Here's a high-level overview of the process:*

- Face Detection: Use a face detection algorithm to locate and extract faces from the live video stream in real-time. This step ensures that only the relevant portions of the video containing faces are processed further.
- Feature Extraction: Extract facial features from the detected faces in the live video. These features could include the relative positions of key facial landmarks, such as eyes, nose, and mouth, as well as more complex features derived from the face's texture and structure.
- Database Query: Compare the extracted features from the live video with the dataset of images containing faces of missing persons. This comparison could involve a similarity measure, such as cosine similarity or Euclidean distance, to determine how closely the features match.
- Matching Algorithm: Implement a matching algorithm to identify potential matches between the live video and images in the dataset. This algorithm should consider factors such as the similarity threshold for considering a match and any additional constraints, such as age, gender, **or ethnicity, to** improve the accuracy of the identification.
- Verification and Notification: Once a potential match is identified, the system should verify the match through additional checks, such as human review or additional biometric verification methods. If the match is confirmed, notify the relevant authorities or individuals responsible for locating the missing person.
- Feedback Loop: Incorporate a feedback loop to continuously improve the accuracy of the system. This could involve updating the dataset with new images of missing persons, fine-tuning the matching algorithm based on performance feedback, and incorporating advances in computer vision and facial recognition technology.

VII. RESULTS & DISCUSSIONS

➢ *Dataset*

This dataset contains different images of persons. The image size is width=640, height=480 Each person of the image will be stored with their name in a separate folder. Each image in jpeg file or jpg file format

➢ *Training And Testing*

Training:Images of known faces are loaded using the load_encoding_images method of the SimpleFacerec class. Each image is converted into a face encoding using the face_recognition.face_encodings function. The resulting face encodings and their corresponding names are stored in lists (known_face_encodings and known_face_names) for recognition.

Testing: The ‘start_video’method initializes the webcam and continuously reads frames. Faces are detected using the ‘detect_known_faces’ method, which compares the detected face encodings with known faces. If a match is found, the recognized person's name is displayed on the frame. The ‘capture_imag’e method allows capturing an image when the "Capture" button is clicked, saving it with the detected faces and showing a success message.

➢ *Library Used*

A Python library built on top of dlib and OpenCV Provides easy-to-use interfaces for face detection, face encoding, and face comparison. Offers pre-trained deep learning models for accurate face recognition tasks. Enables developers to integrate face recognition capabilities into their applications efficiently. Convolutional Neural Network : CNN is a type of deep learning architecture commonly used for image classification and recognition tasks. Also used to extract features from human images to identify different humans.

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➢ *Integration*

The face recognition module is seamlessly integrated into the larger application, enabling real-time face detection, identification, and image capture functionalities It leverages the capabilities of the face recognition library to provide accurate and reliable face recognition services within the graphical user interface.

VIII. CONCLUSION

The project aiming to identify missing persons by comparing live video with a dataset of images represents a significant advancement in leveraging technology for humanitarian purposes.

By harnessing the power of computer vision and machine learning algorithms, this project offers a promising solution to expedite the process of locating and reuniting missing individuals with their families and loved ones.

Through rigorous testing and refinement, it has the potential to become an invaluable tool for law enforcement agencies, humanitarian organizations, and communities worldwide, offering hope and closure to those affected by the tragedy of disappearance.

As we continue to refine and develop this technology, we move closer to a future where no one is left behind, and every missing person is given the opportunity to be found.

FUTURE SCOPE

In the realm of future work for identifying missing persons, advancements in computer vision and artificial intelligence hold significant promise. One avenue of exploration could involve enhancing the accuracy and efficiency of matching live video footage with a comprehensive dataset of images. This could be achieved through the refinement of deep learning algorithms capable of recognizing facial features, gauging age progression, and accounting for variations in lighting, angles, and resolution.

Additionally, integrating real-time monitoring capabilities could bolster the system's responsiveness, enabling swift identification and location tracking. Collaborations with law enforcement agencies, forensic experts, and technologists could facilitate the development of a robust framework that respects privacy concerns while maximizing the potential for reuniting missing individuals with their loved ones.

Furthermore, exploring the integration of biometric data beyond facial recognition, such as gait analysis or voice recognition, could provide further layers of identification, enhancing the system's overall effectiveness and reliability.

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