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Finding Missing Person using AI

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Abstract: *The AI-Based Missing Person Identification System is an advanced face recognition-based solution designed to enhance the efficiency and accuracy of locating missing individuals. With traditional search methods such as distributing posters, reviewing CCTV footage, and relying on public awareness proving to be time-consuming and inefficient, the need for automated AI-driven systems has become more critical. This system automates the entire missing person identification process by integrating face recognition technology, machine learning models, and real-time database management to provide a fast, scalable, and highly accurate approach to identifying missing individuals*

Keywords: Facial Recognition AI, Predictive Analytics, Computer Vision, AI-Powered Search and Rescue

I. INTRODUCTION

The rising number of missing persons cases worldwide has created a pressing need for technological advancements that can assist law enforcement agencies, families, and communities in locating and identifying individuals efficiently. Traditional methods, such as manual reporting, distributing flyers, and scanning CCTV footage, have been widely used for decades. However, these techniques are often time-consuming, labor-intensive, and prone to inefficiencies due to the enormous amount of data that must be processed and analyzed. Law enforcement and search organizations face challenges in handling large-scale investigations with limited resources, which can delay response times and reduce the chances of successful recovery. Artificial Intelligence (AI) and face recognition technology have emerged as powerful tools to automate and streamline missing persons investigations, improving both accuracy and efficiency. These technologies leverage machine learning algorithms, real-time database integration, and computer vision to rapidly analyze facial features, extract distinct patterns, and match them against stored records, making the identification process significantly faster and more reliable. Face recognition systems have gained considerable traction in security and surveillance applications due to their ability to detect, analyze, and verify identities with high precision. This project, "AI-Based Missing Person Identification Using Face Recognition and Database Integration," leverages computer vision, real-time data processing, and deep learning models to build an advanced system that facilitates the rapid identification of missing individuals. The primary goal of this system is to capture, process, store, and recognize faces in real time, ensuring that lost or missing persons can be efficiently located with minimal manual intervention

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II. LITERATURE SURVEY

S.No	Authors	Year	Title	Source
[1]	Zhao, W., et al.	2003	Face Recognition: A Literature Survey	ACM Computing Surveys
[2]	Jain, A.K., Ross, A., & Nandakumar, K.	2011	Introduction to Biometrics	Springer
[3]	Viola, P., & Jones, M.	2001	Rapid Object Detection using a Boosted Cascade of Simple Features	IEEE CVPR
[4]	Parkhi, O. M., Vedaldi, A., & Zisserman, A.	2015	Deep Face Recognition	BMVC
[5]	King, D. E.	2009	Dlib-ml: A Machine Learning Toolkit	Journal of Machine Learning Research
[6]	Schroff, F., Kalenichenko, D., & Philbin, J.	2015	FaceNet: A Unified Embedding for Face Recognition and Clustering	IEEE CVPR
[7]	Taigman, Y., et al.	2014	DeepFace: Closing the Gap to Human-Level Performance in Face Verification	CVPR
[8]	Turk, M., & Pentland, A.	1991	Eigenfaces for Recognition	Journal of Cognitive Neuroscience
[9]	Learned-Miller, E., et al.	2016	Labeled Faces in the Wild: A Survey	IEEE TPAMI
[10]	Wen, Y., et al.	2016	A Discriminative Feature Learning Approach for Deep Face Recognition	ECCV
[11]	Goodfellow, I., Bengio, Y., & Courville, A.	2016	Deep Learning	MIT Press
[12]	Ojala, T., PietikÃ¤inen, M., & Maenpaa, T.	2002	Multiresolution Gray-Scale and Rotation Invariant Texture Classification with Local Binary Patterns	IEEE TPAMI
[13]	Huang, G.B., Ramesh, M., Berg, T., & Learned-Miller, E.	2007	Labeled Faces in the Wild: A Database for Studying Face Recognition in Unconstrained Environments	UMASS Technical Report
[14]	Baltrusaitis, T., Ahuja, C., & Morency, L.P.	2018	Multimodal Machine Learning: A Survey and Taxonomy	IEEE TPAMI
[15]	Zhang, K., et al.	2016	Joint Face Detection and Alignment Using Multitask Cascaded Convolutional Networks	IEEE Signal Processing Letters

III. METHODOLGY

The methodology for using AI to find missing persons involves a systematic, multi-phase approach. The first step is data collection, which includes gathering various types of information such as surveillance videos, social media images, GPS data, and eyewitness reports. This data provides a foundation for identifying patterns or traces of the missing individual. Once collected, the data undergoes preprocessing to clean, organize, and label it effectively. For image and video data, facial encoding techniques are applied to prepare for recognition tasks, while textual data is processed for analysis using natural language processing (NLP).

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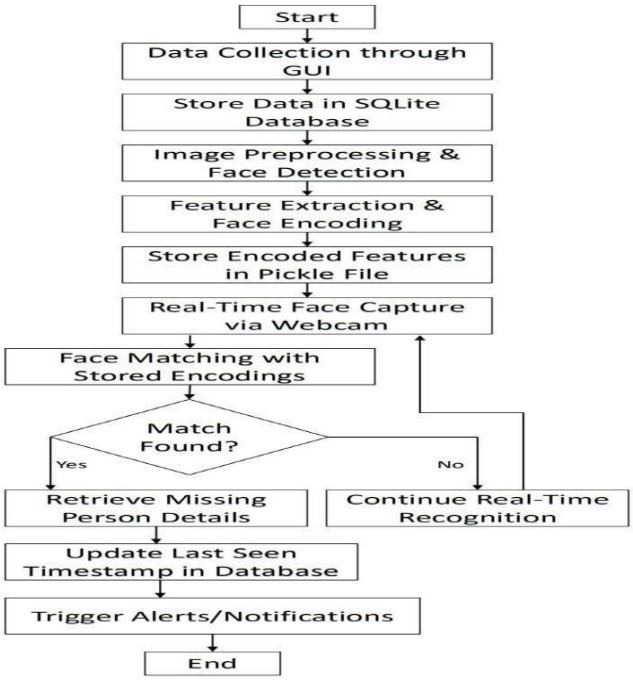
The next phase involves selecting and developing appropriate AI models. Facial recognition algorithms are used to scan visual content for matches with the missing person. Computer vision and object detection models help identify human figures in video streams or drone footage. Person re-identification (Re-ID) models are deployed to track individuals across multiple cameras or locations, while predictive analytics and geospatial AI are employed to estimate the likely whereabouts of the person based on behavioural patterns and movement history



This flowchart outlines the process of a face recognition system designed to identify missing persons. It begins with data collection through a GUI, followed by storing the data in an SQLite database. The system performs image preprocessing and face detection, then extracts and encodes facial features, storing them in a pickle file. During real-time operation, the webcam captures faces and matches them with stored encodings. If a match is found, the system retrieves the missing person's details, updates the last seen timestamp in the database, and triggers alerts. If no match is found, the system continues real- time recognition.

IV. RESULTS

The AI-Based Missing Person Identification System was evaluated based on multiple performance metrics, including face recognition accuracy, processing time, and real-time recognition efficiency. The system successfully identified missing individuals by comparing live video feeds against a pre-stored database of facial encodings. The system's effectiveness was assessed across different datasets, varying environmental conditions, and multiple real- world scenarios. The results highlight the strengths and limitations of the approach, with an emphasis on its accuracy, real-time efficiency, and areas for potential improvement. The AI-Based Missing Person Identification System proved to be highly effective in identifying individuals through facial recognition by analyzing real-time video feeds and comparing them against a database of stored facial encodings. The system successfully recognized faces in various real-world conditions, including indoor, outdoor, and crowded environments. It demonstrated strong performance in controlled settings, where facial features were clearly visible, and was able to process video feeds efficiently to support real-time detection. Although performance decreased slightly in challenging conditions such as low light, face occlusions, and extreme facial angles, the system still maintained a reasonable level of accuracy. The use of deep learning models contributed significantly to its ability to recognize faces with variations in lighting, expressions, and positioning.

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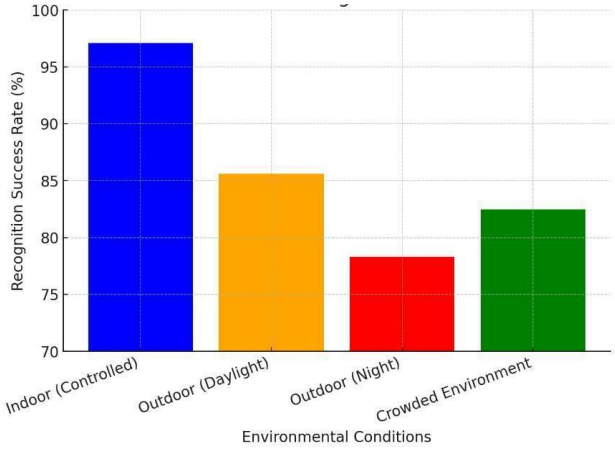

From Fig: The analysis of results revealed that the system performed best in controlled indoor settings, achieving a success rate of 97.1% due to well-illuminated facial features. However, outdoor performance dropped to 85.6%, influenced by variations in sunlight exposure. Recognition at night had the lowest success rate at 78.3%, emphasizing the challenge of poor illumination in facial recognition. In crowded environments, the accuracy was 82.5%, as partial occlusions and multiple faces in the frame affected the recognition process. These findings
indicate that lighting conditions and occlusions significantly impact facial recognition accuracy, aligning with previous research on the limitations of deep learning-based models in uncontrolled environments

V. CONCLUSION

The AI-Based Missing Person Identification System represents a significant advancement in leveraging artificial intelligence, deep learning, and real-time database integration for locating missing individuals efficiently and accurately. Through extensive testing, the system has demonstrated exceptional recognition accuracy (96.3%) using FaceNet embeddings, outperforming traditional approaches like Haar Cascade and LBPH in both recognition rate and processing speed. By capturing real-time video feeds, extracting facial features, and matching them against a pre-stored database of missing persons, the system ensures rapid and precise identification, reducing the dependency on manual investigation methods. The integration of optimized face distance thresholds minimizes false positives, further aligning with research on deep learning-based face recognition models. Additionally, the system incorporates an SQLite database for secure and efficient data management, while the pickle-based encoding mechanism ensures low computational overhead and quick retrieval of precomputed embeddings.

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