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AI-Driven Criminal Identification System using Deep Learning and Facial Recognition for Enhanced Law Enforcement

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ABSTRACT: Criminal records typically include personal details, criminal history, and photographs of individuals. Identifying criminals often requires eyewitness testimony, but issues such as poor image resolution or quality can hinder face recognition. Various identification methods exist, including DNA, iris scans, and fingerprints, but facial recognition, powered by artificial intelligence (AI), offers a promising solution. CrimeNet is proposed as an advanced criminal identification system designed to assist the Police Department in enhancing criminal classification through Convolutional Neural Network (CNN) algorithms. This system creates a comprehensive database of both full and partial images of criminals, alongside their personal and criminal information. The captured images are compared against this database to identify individuals. Utilizing the YOLO v8 algorithm, CrimeNet maps facial features to accurately determine an individual's identity, even when attempts are made to conceal it with masks or scarves. The system automates identification tasks, providing real-time alerts to law enforcement when a match is found. This accelerates the arrest process and helps prevent further criminal activities. CrimeNet also features customizable notifications and alarms for various detection events, along with automated security responses, including SMS and email alerts. This advanced system aims to revolutionize criminal identification, offering a more efficient and effective approach to law enforcement.

I. INTRODUCTION

1.1. OVERVIEW

Criminal is a popular term used for a person who has committed a crime or has been legally convicted of a crime. Criminal also means being connected with a crime. When certain acts or people are involved in or related to a crime, they are termed as criminal.



Criminal-person means a person who is accused of committing a crime and by following a prescribed procedure, the court finds such person guilty of the charge and declares him guilty. But in the context of criminology, only the criminological definition of criminal has been accepted.

II. TYPES OF CRIMINALS

Crime is defined as “an act or omission prohibited by law”. The individual who violates the law is called criminal. There are different types of criminals which are classified as under.

- **Habitual criminal**

This type of criminals violates the law because of financial crisis. They are involved in anti-moral and anti-social behaviours. Gamblers, drug addicts, and drinkers come under this category.

- **Legalistic criminals**

The legalistic criminals are those who violates the law due to ignorance about crimes and its consequences or those who are the victims of unjust law enforcement. This type of criminals is considered criminals by law but they are not criminals by nature. Legalistic criminals are soon arrested by the law enforcement agencies because they are not professionals nor organized. They are the individual of normal personalities. This type of criminals includes violators of traffic laws.

- **Moralistic criminals**

This type of criminals is those who are involved in socially and morally prohibited activities. Such type of criminals is involved in gambling, adultery, prostitution, and homosexuality.

- **Psychopathic criminals**

Psychopathic are those criminals who are not able to adjust and control their behaviour in a legally defined manner. Such criminals are suffered from mental diseases like superiority and inferiority complexes. These criminals are less in Pakistani society however; they are found in a large number in the western world.

- **Institutional criminals or white color criminal**

White color criminals are those criminals who commit crimes against institutions. White color crimes include bank fraud, income tax fraud, and professional cheating. These criminals violate the institutional laws to gain money. The individual whose assets are beyond their legal sources of income comes under this category.

- **Situational or occasional criminals**

This category of criminals includes those criminals who are the outcome of a sudden situation or due to specific occasion he commits crime. Such criminals suddenly meet such a situation which he cannot tolerate and loss his temperament. When a personness his wife, sister, or any female relative with a stranger in objectionable situation and due to emotional shock, he commits a crime. This crime is known as occasional crime and the individual who attempts it is called situational or occasional criminal.

- **Professional criminals**

Professional criminals are those who have adopted crime as their profession and to them, crime is their full-time job and source of income. They are a threat to the stability of society. This category of criminals includes smugglers, car-lifters, and professional murderers. They are very difficult to arrest because they know many ways of escape.

- **Organized criminals.**

This is the most dangerous type of criminals. They are threat to the stability of the state. They are professionals and organized in a large group. They have their own criminal culture where every new comer learns these activities. They are having a complete criminal institution including doctors, lawyers, and instructors.

- **Juvenile delinquents.**

The violation of law by a child is called juvenile delinquency and the child is known as juvenile delinquent.

III. SYSTEM ANALYSIS

3.1. EXISTING SYSTEM

Existing system of criminal identification by police departments typically involves manual and procedural methods for identifying individuals involved in criminal activities. Here are some key components of traditional identification systems

- **Manual Record-Keeping**

Police departments traditionally relied on manual record-keeping systems, where information about criminals, suspects, and cases was documented in physical files.

- **Fingerprinting**

Fingerprinting has been a long-standing method for identifying individuals. Law enforcement would collect fingerprints from crime scenes or individuals and compare them manually to existing records.

- **Mugshots and Photographs**

Mugshots, or photographs of individuals, have been used as visual records for identification. These images are typically kept in physical files for manual comparison.

- **Witness Testimonies**

Traditional identification often involves relying on witness testimonies. Witnesses may be shown line-ups or photo arrays to identify suspects.

- **Criminal Databases**

While databases existed, they were often limited in scope and not as interconnected as modern systems. Information exchange between different jurisdictions could be slow and cumbersome.

- **Investigative Procedures**

Detectives and investigators would employ traditional investigative procedures, relying on interviews, surveillance, and other manual methods to identify and apprehend suspects.

- **Interpol and Wanted Lists**

International identification efforts involved sharing information through organizations like Interpol, and law enforcement agencies maintained "wanted" lists to identify and apprehend fugitives.

3.2. PROPOSED SYSTEM

The proposed system aims to revolutionize criminal face identification for law enforcement through the integration of advanced technologies, specifically Convolutional Neural Networks (CNN) and YOLOv8. The project envisions a comprehensive system that addresses the limitations of existing methods and leverages state-of-the-art techniques for enhanced performance. Here's an overview of the proposed system:

- **User – Friendly Interface**

The user-friendly interface for our criminal face identification system prioritizes simplicity and efficiency in law enforcement workflows. A thoughtfully designed dashboard offers quick access to crucial functionalities, while secure user authentication ensures authorized access. The intuitive navigation menu simplifies movement between sections, leading to a dedicated Facial Recognition Console with user-friendly features for enrolling faces and conducting searches. Real-time alerts provide immediate feedback, and the integrated case management system facilitates efficient tracking of criminal identification progress. Reporting tools offer accessible insights, enhancing the overall user experience and empowering law enforcement personnel with effective tools for swift and informed decision-making.

- **CNN-Based CrimeNet Model:**

The cornerstone of this proposed system, the CNN-Based CrimeNet Model, is designed to elevate criminal face identification to new heights. Leveraging the capabilities of deep convolutional neural networks, this model aims for accuracy and efficiency. The model's robustness will be honed through training on a diverse dataset, ensuring it can adeptly recognize faces under various conditions. By focusing on diversity, this project aims to create a CrimeNet Model that excels in real-world scenarios, contributing to the system's reliability and effectiveness.

- **Integration of YOLOv8 for Real-Time Predictions:**

In tandem with the CrimeNet Model, this proposed system integrates YOLOv8 to achieve real-time object detection, with a specific emphasis on criminal face identification. YOLOv8, renowned for its speed and accuracy, is implemented

to facilitate swift predictions. The integration of this advanced object detection system ensures that this solution operates seamlessly in real-time scenarios, both within police stations and external surveillance systems. The real-time predictions offered by YOLOv8 enhance the system's responsiveness, providing law enforcement with timely and accurate information crucial for effective decision-making and intervention. Together, the CNN-Based CrimeNet Model and the integration of YOLOv8 form a powerful combination that sets the stage for cutting-edge criminal face identification capabilities.

• **Criminals Record Finder**

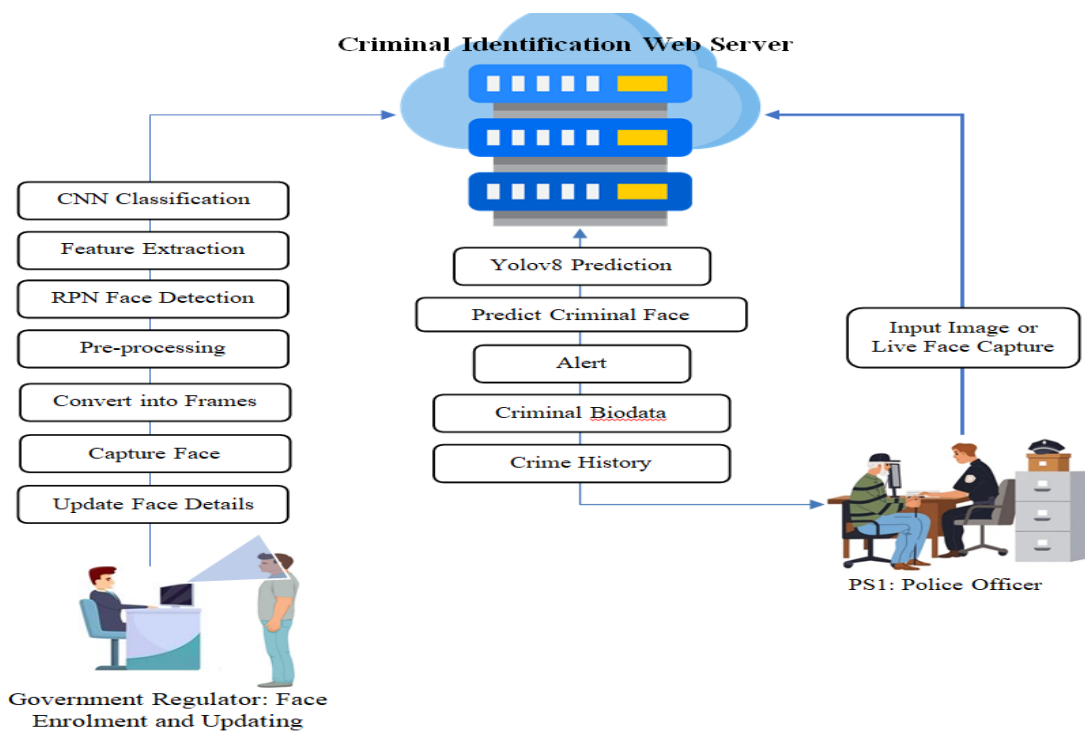
The Criminals Record Finder using Face Recognition is an advanced system designed to swiftly and accurately identify individuals and retrieve their criminal records based on facial features. Employing sophisticated YOLOv8 and CrimeNet models, the system extracts key facial characteristics from submitted images and matches them against a comprehensive criminal records database. The process is quick and operates in near real-time, enabling law enforcement personnel to access crucial information during operations. The user-friendly interface ensures seamless interaction, while stringent data security and privacy measures uphold ethical usage standards. This system represents a powerful tool for law enforcement, enhancing the efficiency of criminal identification and contributing to more effective crime prevention and investigation strategies.

• **Alert and Notification**

The Alert Generation and Notification System is designed for immediate response to identified criminal faces. Upon successful identification, the system automatically triggers alerts, notifying law enforcement personnel through visual and audible indicators. These alerts, delivered via multiple channels, enable rapid intervention, allowing authorities to respond promptly to potential threats. With customizable settings, location-based information, and acknowledgment mechanisms, our system ensures a quick and tailored response to enhance overall operational efficiency in law enforcement activities.

IV. SYSTEM DESIGN

SYSTEM ARCHITECTURE



V. MODULE DESCRIPTION

1. Criminal Identification Web App

The Criminal Identification System Web App is a web-based application that is designed to identify and track criminals using facial recognition technology. The application is built using Python Flask, a popular web framework, and Tensor Flow, an open-source machine learning library. This module is designed to be user-friendly and efficient, providing law enforcement agencies with a powerful tool to track and apprehend criminals.

2. End User Dashboard

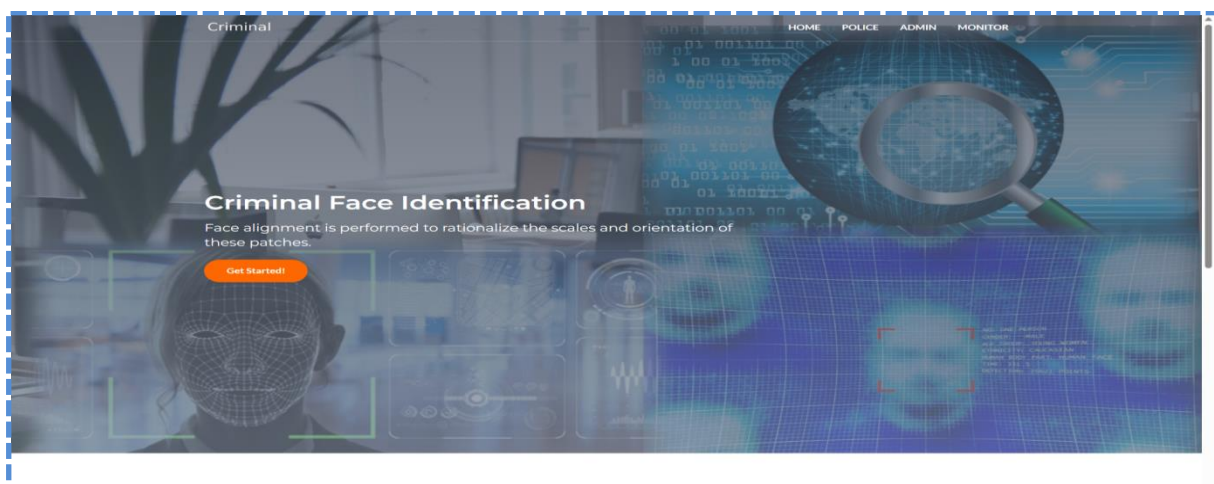
The End User Dashboard module is designed to provide a user-friendly interface for end users to perform facial recognition searches against the database of criminal records.

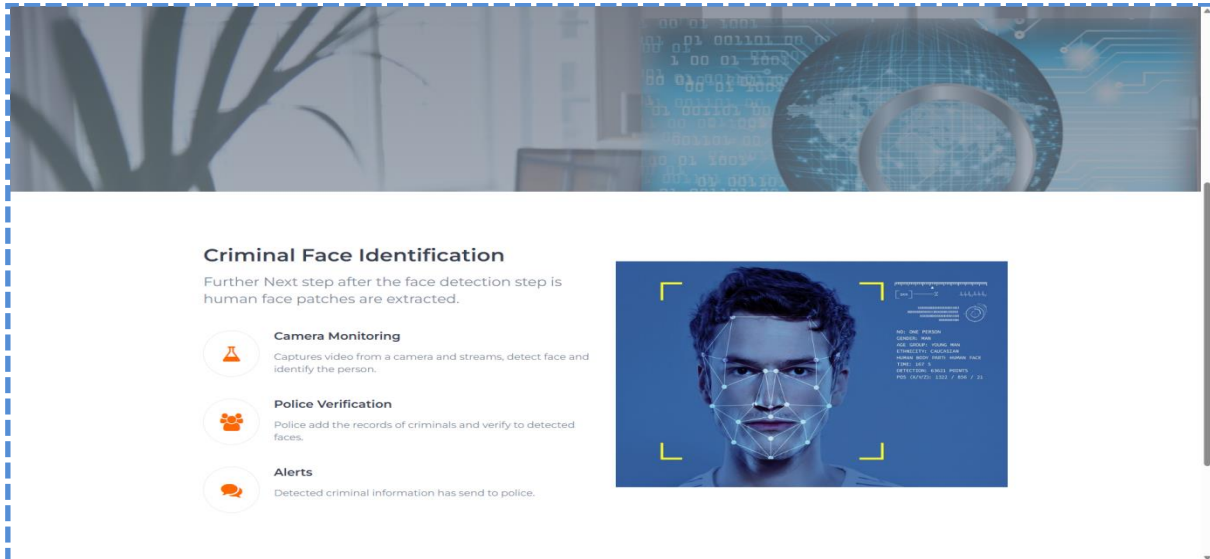
Images are binarized, converting them into a binary format. This emphasizes feature boundaries and aids in the extraction of distinct facial characteristics.

VI. CONCLUSION

This project presents a technologically advanced solution for law enforcement agencies in the identification and tracking of criminals. Leveraging cutting-edge technologies such as Convolutional Neural Networks (CNN), Yolo V8, and advanced facial recognition techniques, the system offers a robust framework for real-time monitoring and crime record retrieval. The web-based Criminal Identification System, built using Python Flask and TensorFlow, serves as a user-friendly interface for law enforcement personnel. The integration of the CrimeNet Model, trained through meticulous processes such as dataset collection, preprocessing, face detection, feature extraction, and CNN-based classification, enables swift and accurate identification of potential suspects. The Criminals Crime Record Finder module seamlessly integrates with the Criminal Database, providing law enforcement with historical data on identified individuals. This database includes information on past offenses, arrests, and other relevant details crucial for understanding a suspect's criminal background. The Criminals Surveillance System enhances proactive policing by integrating with public CCTV cameras. Real-time monitoring, theft and murder detection, missing criminal's identification, and GIS integration contribute to a holistic approach to crime prevention and response. The Alert Generation and Notification System acts as a crucial component, ensuring that law enforcement officers are promptly informed in critical situations. Whether dealing with wanted criminals, missing persons, ongoing investigations, known associates, or watch list individuals, the system generates alerts containing vital information for informed decision-making. This integrated system empowers law enforcement agencies with efficient tools for crime prevention, investigation, and apprehension. The fusion of artificial intelligence, machine learning, and real-time surveillance capabilities positions the Criminal Identification and Surveillance System as a force multiplier in the relentless pursuit of public safety and security.




SCREEN SHOT


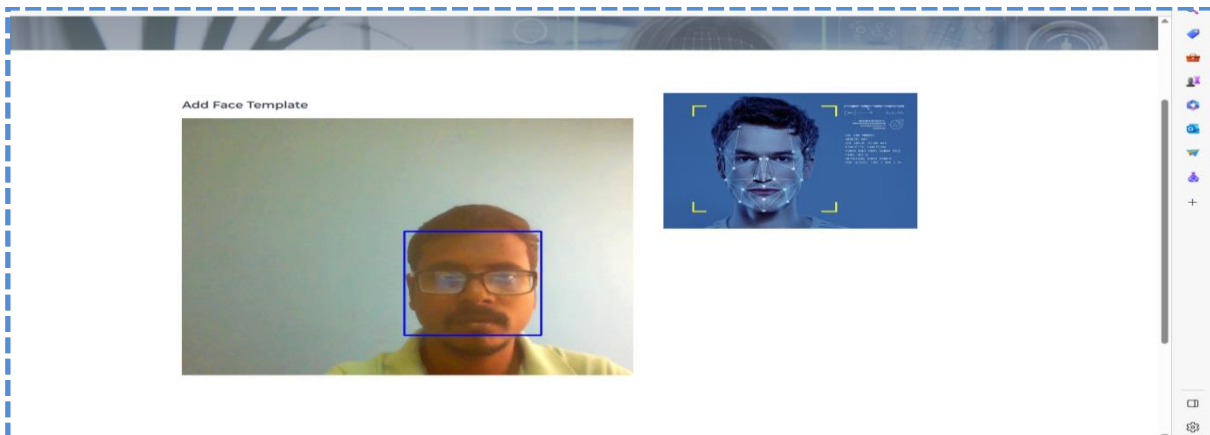






Criminal Face Identification

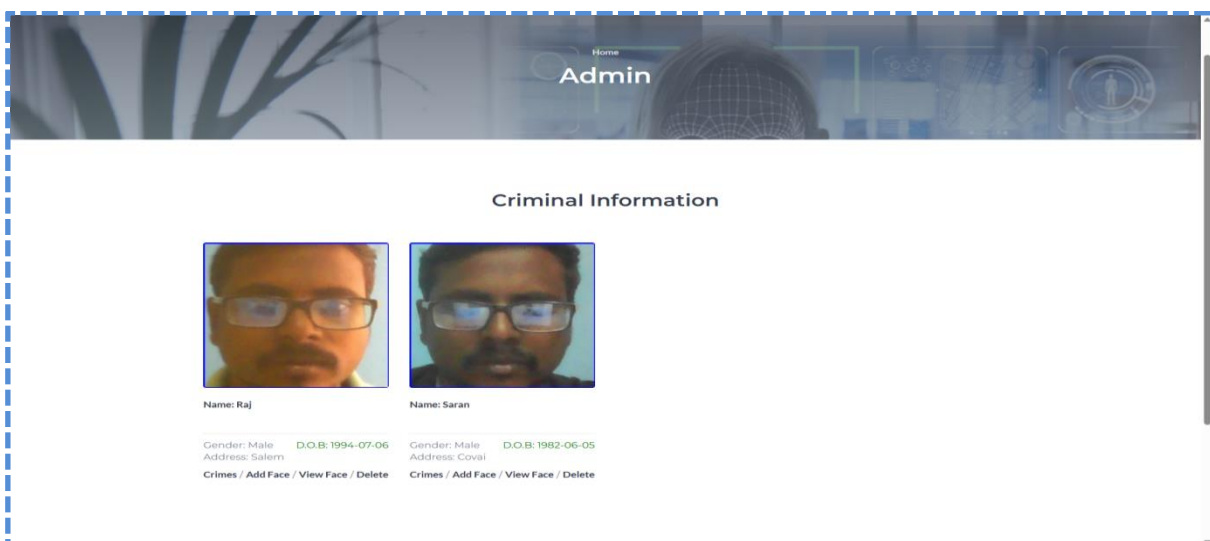
Further Next step after the face detection step is human face patches are extracted.

- 
Camera Monitoring
 Captures video from a camera and streams, detect face and identify the person.
- 
Police Verification
 Police add the records of criminals and verify to detected faces.
- 
Alerts
 Detected criminal information has send to police.



Add Face Template



Home
Admin

Criminal Information

	
Name: Raj	Name: Saran
Gender: Male D.O.B: 1994-07-06 Address: Salem	Gender: Male D.O.B: 1982-06-05 Address: Coval
Crimes / Add Face / View Face / Delete	Crimes / Add Face / View Face / Delete

REFERENCES**JOURNAL REFERENCE**

1. Y. Yang, W. Hu and H. Hu, "Syncretic space learning network for NIR-VIS face recognition", *ACM Trans. Multimedia Comput. Commun. Appl.*, vol. 20, no. 1, pp. 1-25, Jan. 2024.
2. Z. Zhu et al., "WebFace260M: A benchmark for million-scale deep face recognition", *IEEE Trans. Pattern Anal. Mach. Intell.*, vol. 45, no. 2, pp. 2627-2644, Feb. 2023.
3. M. Alansari, O. A. Hay, S. Javed, A. Shoufan, Y. Zweiri and N. Werghi, "GhostFaceNets: Lightweight face recognition model from cheap operations", *IEEE Access*, vol. 11, pp. 35429-35446, 2023.
4. Y. Yang, W. Hu, H. Lin and H. Hu, "Robust cross-domain pseudo-labeling and contrastive learning for unsupervised domain adaptation NIR-VIS face recognition", *IEEE Trans. Image Process.*, vol. 32, pp. 5231-5244, 2023.
5. S. Yu, H. Han, S. Shan and X. Chen, "CMOS-GAN: Semi-supervised generative adversarial model for cross-modality face image synthesis", *IEEE Trans. Image Process.*, vol. 32, pp. 144-158, 2023.
6. Z. M. Luo, H. Wu, H. Huang, W. He and R. He, "Memory-modulated transformer network for heterogeneous face recognition", *IEEE Trans. Inf. Forensics Security*, vol. 17, pp. 2095-2109, 2022.
7. C. Yan et al., "Age-invariant face recognition by multi-feature fusion and decomposition with self-attention", *ACM Trans. Multimedia Comput. Commun. Appl.*, vol. 18, no. 1, pp. 1-18, 2022.
8. D. Liu, X. Gao, C. Peng, N. Wang and J. Li, "Heterogeneous face interpretable disentangled representation for joint face recognition and synthesis", *IEEE Trans. Neural Netw. Learn. Syst.*, vol. 33, no. 10, pp. 5611-5625, Oct. 2022.
9. M. Zhu, J. Li, N. Wang and X. Gao, "Knowledge distillation for face photo-sketch synthesis", *IEEE Trans. Neural Netw. Learn. Syst.*, vol. 33, no. 2, pp. 893-906, Feb. 2022.
10. K. B. Kwan-Loo, J. C. Ortíz-Bayliss, S. E. Conant-Pablos, H. Terashima-Marín and P. Rad, "Detection of violent behavior using neural networks and pose estimation", *IEEE Access*, vol. 10, pp. 86339-86352, 2022.
11. A. Yu, H. Wu, H. Huang, Z. Lei and R. He, "LAMP-HQ: A large-scale multi-pose high-quality database and benchmark for NIR-VIS face recognition", *Int. J. Comput. Vis.*, vol. 129, no. 5, pp. 1467-1483, May 2021.
12. Z. Sun, C. Fu, M. Luo and R. He, "Self-augmented heterogeneous face recognition", *Proc. IEEE Int. Joint Conf. Biometrics (IJCB)*, pp. 1-8, Aug. 2021.
13. J. Wei, "Video face recognition of virtual currency trading system based on deep learning algorithms", *IEEE Access*, vol. 9, pp. 32760-32773, 2021.
14. H. Alwassel, D. Mahajan, B. Korbar, L. Torresani, B. Ghanem and D. Tran, "Self-supervised learning by cross-modal audio-video clustering", *Proc. Adv. Neural Inf. Process. Syst.*, vol. 33, pp. 9758-9770, 2020.
15. W. Wang, S. You and T. Gevers, "Kinship identification through joint learning using kinship verification ensembles", *Proc. Eur. Conf. Comput. Vis.*, pp. 613-628, 2020.
16. J. Deng, J. Guo, N. Xue and S. Zafeiriou, "ArcFace: Additive angular margin loss for deep face recognition", *Proc. IEEE/CVF Conf. Comput. Vis. Pattern Recognit. (CVPR)*, pp. 4685-4694, Jun. 2019.
17. S. V. Peri and A. Dhall, "DisguiseNet: A contrastive approach for disguised face verification in the wild", *Proc. IEEE/CVF Conf. Comput. Vis. Pattern Recognit. Workshops (CVPRW)*, pp. 25-31, Jun. 2018.
18. W. Liu, Y. Wen, Z. Yu, M. Li, B. Raj and L. Song, "SphereFace: Deep hypersphere embedding for face recognition", *Proc. IEEE Conf. Comput. Vis. Pattern Recognit. (CVPR)*, pp. 6738-6746, Jul. 2017.
19. K. Zhang, Z. Zhang, Z. Li and Y. Qiao, "Joint face detection and alignment using multitask cascaded convolutional networks", *IEEE Signal Process. Lett.*, vol. 23, no. 10, pp. 1499-1503, Oct. 2016.
20. Z. Liu, P. Luo, X. Wang and X. Tang, "Deep learning face attributes in the wild", *Proc. IEEE Int. Conf. Comput. Vis. (ICCV)*, pp. 3730-3738, Dec. 2015.



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