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AI Powered Thief Detection and Police Alert System

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ABSTRACT :

The growing demand for enhanced security solutions has led to the development of AI-powered theft detection systems that leverage real-time facial recognition, machine learning technologies, and advanced analytics. This review paper focuses on a system designed to automatically detect and identify criminals from live video feeds using facial recognition technology. By cross- referencing detected faces with a database of known offenders, the system pro- vides immediate alerts to law enforcement via email and SMS, facilitating fast- er response times and more effective resource allocation. This paper presents a detailed examination of the current technologies employed, including the integration of OpenCV for image processing, Flask for web deployment, and SQLite for storing records and detection logs. Additionally, it outlines the system objectives, methodology, and future potential in enhancing public safety and reducing false alarms. As AI and computer vision continue to evolve, this system demonstrates promising advancements in crime prevention and the automation of law enforcement processes.

Keywords: Facial Recognition, Machine Learning, OpenCV, Flask, SQLite, Public Safety, Crime Prevention

1. Introduction :

In recent years, advancements in artificial intelligence (AI) and computer vision have dramatically transformed security systems, particularly in the domain of automated theft detection and instant threat notification. Traditional surveillance systems, while effective to some degree, typically rely on manual monitoring by security personnel, which can lead to delayed responses, human error, and inefficient allocation of resources. In contrast, AI-powered theft detection systems overcome these limitations by introducing automated, real-time identification of suspicious activities and individuals through machine learning algorithms and facial recognition technologies.

These intelligent systems continuously analyze live video feeds from CCTV cameras, detecting faces and comparing them against a vast database of known offenders or individuals with criminal records. Upon detecting a match, the system promptly sends alerts to law enforcement agencies and security personnel via email and SMS, accompanied by video evidence for rapid verification. This automated process accelerates response times and minimizes the need for manual oversight, thereby enhancing overall security and improving the efficiency of resource deployment in critical situations. Through a comprehensive literature survey, detailed examination of system objectives, and analysis of various implementation methodologies, this review underscores the potential of AI technologies to significantly enhance public safety and crime prevention efforts. As AI continues to evolve, these systems are expected to become more accurate, reliable, and scalable, making them vital tools in modern security infrastructure. Additionally, ongoing advancements in AI-driven image processing and automation will likely contribute to a substantial reduction in false alarms, further improving their effectiveness in real-world applications.

2. Literature Survey :

The table below provides a comparative analysis of research papers focused on face detection, recognition, and crime detection systems. It highlights the authors, titles, publication years, along with the advantages (pros) and limitations (cons) of the proposed methods and technologies in each study. This comparison aims to offer insights into the advancements and challenges in the domain of criminal identification systems using artificial intelligence and related techniques.

Table 1 – Comparative Analysis of Research

Sr. No.	AUTHOR	TITLE	YEAR	PROS	CONS
[1]	Apurva Pongade, Shruti Karad, Divya Ingale, Shravani Mahabare	Face Detection and Recognition For Criminal Identification System	2024	Haar Cascade -classifier provides high-precision	Data Security, Scalability Challenges
[2]	Waqas Ali Manj , Zunaira Faraz, Hamza Farooq,	Automatic Face Recognition of	2023	CNN- High Accuracy 99.38%,	Lighting Sensitivity, Pose Limitation

	Muhammad Ali Fazal	Criminals in Investigation Using Artificial Intelligence		Wide Application	Less Security
[3]	Parth Virdhe, Anuj Nemanwar, Sairaj Shirole, Aditya Chouthankar	Theft Detection using Deep Learning	2023	Yolo Automated Crime Detection Accuracy: 82%	Only detects object and suspicious activity
[4]	Arjun Menon, Shivani Singh, Raushan Kumar, Ritvik Sethi, Abha Kiran Rajpoot	Leveraging Facial Recognition Technology in Criminal Identification	2023	MTCNN -Automation and Speed	Data Security

[1] This study focused on face detection and recognition for criminal identification systems using the Haar Cascade classifier, known for its high precision in facial detection tasks. Despite its accuracy, the system encounters significant challenges related to data security and scalability, which limit its effectiveness in large-scale deployments and raise concerns about protecting sensitive information.
[2] This study examined automatic face recognition of criminals during investigations using artificial intelligence, particularly employing CNNs. The system achieved impressive accuracy, reaching 99.38%, and demonstrated a wide range of applications. However, it was sensitive to changes in lighting and pose, which impacted performance. Additionally, the study highlighted security limitations, making the system vulnerable in certain scenarios.
[3] This study explored deep learning techniques, utilizing the Yolo algorithm for automated crime detection. With an accuracy of 82%, the system showed promise in identifying objects and suspicious activities. However, it was primarily limited to object detection, lacking the ability to identify individuals involved in the crimes, which restricted its utility in more comprehensive theft detection scenarios.
[4] This research effort leveraged facial recognition technology in criminal identification, using the MTCNN algorithm to provide speed and automation in facial recognition processes. While the system improved efficiency, it still faced data security challenges, which are critical when dealing with sensitive criminal records and identification data.

3. Problem Statement :

"Manual identification of individuals with past criminal records is indeed inefficient, time-consuming, and prone to human errors, making it unsuitable for situations where swift action is critical, such as in active criminal investigations or security-sensitive environments. The reliance on manual processes increases the likelihood of missed identifications or delays in responding to potential threats. Furthermore, the growing volume of data in criminal databases makes it increasingly difficult to accurately match suspects to records without the aid of automation. This challenge is particularly acute in high-traffic or high-risk areas where the ability to quickly identify and respond to known offenders could significantly improve security and public safety outcomes. Addressing these inefficiencies requires the development of an automated solution that can leverage advanced technologies such as facial recognition and AI to enhance accuracy, speed, and resource allocation in criminal identification processes. This project aims to provide such a solution by automating the detection and identification of individuals with criminal records in real-time, ensuring that law enforcement and security personnel receive timely, accurate alerts to act upon swiftly."

4. Objectives :

1. To automate the identification of individuals with past criminal records using facial recognition technology.
2. To ensure real-time detection and matching against a database of known criminals.
3. To implement immediate notification mechanisms to alert law enforcement authorities upon detection.
4. To enhance the efficiency and accuracy of criminal identification processes.
5. To improve public safety by enabling swift law enforcement responses.

5. Discussion :

To enhance criminal identification systems, a hybrid approach could be used, combining CNN with MTCNN or Haar Cascade for improved accuracy and robustness, making detection less sensitive to environmental factors like lighting and pose. Additionally, a secure, scalable cloud-based system with encrypted databases can address data security and scalability issues. Integrating object detection (e.g., YOLO) with face recognition would enable both individual identification and suspicious activity detection, enhancing crime prevention capabilities. Further, federated learning can improve security by allowing localized training without raw data sharing. Together, these improvements would yield a more accurate, secure, and adaptable real-time criminal detection system.

6. Conclusion :

To advance criminal identification systems, a hybrid approach that combines CNN with MTCNN or Haar Cascade could enhance accuracy and robustness, reducing the impact of environmental variables such as lighting and pose. Additionally, implementing a secure and scalable cloud-based infrastructure with encrypted databases can effectively tackle data security and scalability concerns. Integrating object detection with face recognition would enable comprehensive detection of both individuals and suspicious activities, amplifying crime prevention potential. Federated learning can further improve security by enabling localized training without sharing raw data, safeguarding privacy. Together, these enhancements would result in a criminal detection system that is more accurate, secure, and adaptable to real-time operational needs.

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