

Face Recognition for Law Enforcement Agencies

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Abstract—The goal of this research article is to discuss the creation of a crime prevention system that uses facial recognition technology to detect suspects. The system will be built with JavaScript's Face API and will function in real-time. Using machine learning approaches, the system will be trained to recognize faces and compare them to a database of known suspects. The scalability and flexibility of the system to various law enforcement settings will be evaluated by evaluating its accuracy, speed, and usability with a database of known suspects and real-time video feeds. Privacy issues will be addressed in the system's design, and safeguards will be put in place to protect the privacy of innocent people. In addition, the system will adhere to current rules and guidelines for the use of facial recognition technology in law enforcement. The ultimate purpose of this research is to contribute to the creation of reliable and effective crime prevention systems that use face recognition technology, therefore assisting in crime prevention and the progress of facial recognition technology in law enforcement.

Index Terms—Crime, Prevention, Face, recognition, Detection, Safety

I. INTRODUCTION

Criminal behavior is ubiquitous in practically every civilization today. Criminals employ modern technology to perpetrate crimes, making it more difficult for law enforcement to identify and capture suspects. The Republic of India is no exception, with the police department serving as the primary organization in charge of crime prevention. However, the criminal area unit's and criminal investigation system's present paper-based technique makes it difficult to identify offenders and conduct investigations effectively.

While CCTV cameras are frequently utilized by the public to monitor their surroundings, the data is typically not centralized, making it difficult for law enforcement to follow offenders. The initial purpose of this research is to automate the police department's present manual system. This not only cuts down on the time it takes to match criminal records, identify suspects, and search criminal records, but it also cuts down on paperwork. The planned system is designed to reduce the need for human data entry, resulting in a greater

level of service and efficiency. It is intended to be user-friendly and engaging in order to provide optimal security while eliminating manual labour. The research tries to solve these challenges and, to some extent, alleviate employment and psychological conflict. As a result, the focus of this research is on the creation of a crime prevention system that employs facial recognition technology to detect suspects. The technology will employ JavaScript's Face API and will function in real-time, allowing law enforcement authorities to rapidly and effectively identify suspects. The scalability and flexibility of the technology will be evaluated using a database of known suspects and real-time video feeds. To guarantee that the privacy of innocent persons is not compromised, privacy problems will be handled in the system's architecture. The study's goal is to contribute to the creation of reliable and effective crime prevention systems that use face recognition technology, therefore assisting in crime prevention and the progress of facial recognition technology in law enforcement.

II. LITERATURE SURVEY

A. Survey of Existing System

This literature review focuses on using facial recognition technologies in law enforcement and associated research. Jain et al. (2016) assessed existing facial recognition technologies and discovered considerable gains in accuracy over the previous decade. They did, however, emphasize the need of building algorithms that can deal with differences in illumination, posture, and facial expression.[4][9]

Another research, this time by the National Institute of Standards and Technology (NIST), evaluated the effectiveness of face recognition algorithms in real-world scenarios. They discovered that accuracy varied depending on image quality, posture, and lighting conditions. Liao et al. (2020) performed a poll and discovered that while the public generally supports the use of facial recognition technology in law enforcement, they are concerned about privacy and the possibility of misuse. [3][7]

Several additional studies have looked into the usage of facial recognition technology in law enforcement, as well as the possibility of prejudice and inaccuracy. These studies emphasize the importance of exercising caution and carefully considering ethical and legal considerations when employing such technology in law enforcement.

Overall, the research demonstrates that, while facial recognition technology has the potential to help law enforcement identify suspects, it is critical to address issues about accuracy, prejudice, and privacy before using such technologies on a larger scale.

B. Limitations of Existing System

- Accuracy: Many factors, including image quality, posture, and lighting conditions, might impact the accuracy of facial recognition algorithms. This can lead to false positives and false negatives in law enforcement, which can have catastrophic repercussions.[5]
- Bias: It has been discovered that facial recognition algorithms are prejudiced towards specific demographic groups, such as individuals of color and women. As a result, excessive targeting and erroneous arrests may occur.
- Individual Privacy Concerns: Face recognition allows mass identification by governments. While not correct limits, some worry about the abuse of privacy rights. But what concerning is if it's a non-public company that uses the technology, they might track you, recognize that stores you visit; they'll even market specific merchandise to you. Businesses that attempt to use face recognition ought to address these issues in a purposeful, organized manner.
- Data Privacy Concern: With information breaches, face recognition info may fall under the incorrect hands. though systems are becoming higher at preventing fraud, it may still happen. Besides, corporations may use the information you provide them for analysis functions. As a result, they stand to achieve a benefit from it, while not your consent. Also, corporations may share or maybe sell this information to 3rd parties, permitting them, in turn, to acknowledge and track you.[9]

III. PROPOSED METHODOLOGY

As illustrated, the first stage is to create face databases that will act as the system's match template. A face database is developed by collecting many photographs of people. In a half-body picture, the subject's face should be facing front for the snapshot. When the identification of a picture is validated, the digitally acquired image is processed. The following step will begin when the picture has been detected and retrieved. The following stage, known as pre-processing, comprises removing any extraneous characteristics. The idea is to drastically minimize processing time. The program first extracts the vector representations of the images from the database, then computes the average face vector or mean, and then subtracts the mean face from each sample face. The application

determines the technique for getting facial pictures. Surveillance applications, for example, may benefit from capturing face images using a video camera, but image database research may necessitate static intensity shots recorded with a standard camera. Access to high-security domains, for example, may require the user to stand in front of a 3D scanner or an infrared sensor, eliminating the non-intrusive element of face recognition.[5][8]

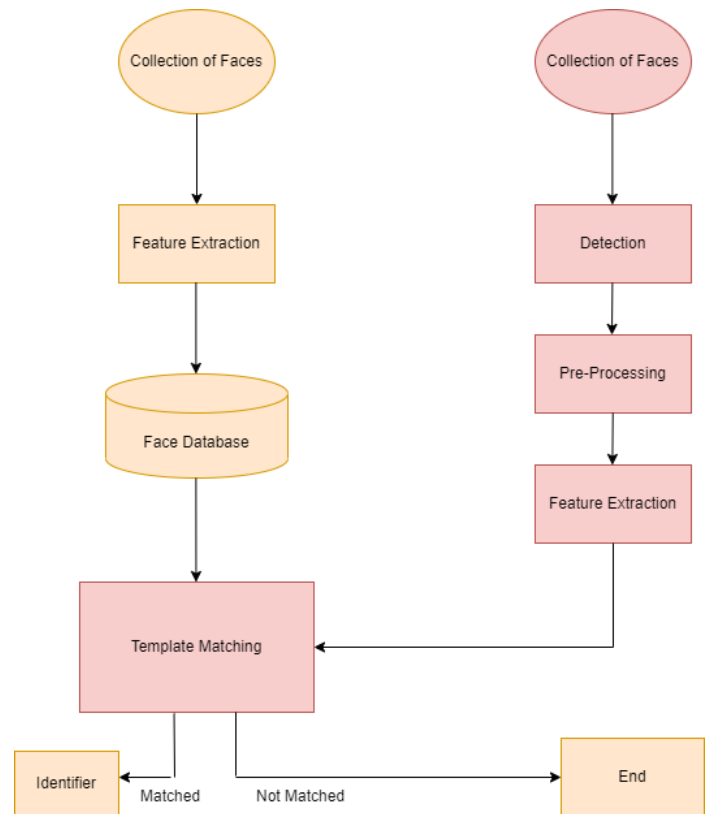


Fig. 1. Flowchart

Faceapi is a JavaScript library that enables real-time facial identification, recognition, and monitoring. It functions by analyzing raw images or video frames and applying deep learning algorithms to recognize faces, facial traits, and additional characteristics like gender, age, and expression.[1][2]

Based on machine learning models that have already been taught using a sizable collection of facial pictures, the library was created. These models categorize incoming pictures based on facial characteristics and extract features from the images using convolutional neural networks (CNNs).[4]

IV. IMPLEMENTATION AND RESULTS

A. Implementation Details

Welcome to our Crime Detection website, your one-stop shop for solving crimes and providing justice to victims. Our goal is to provide cutting-edge technology and resources to law enforcement and detectives to help them solve crimes more swiftly and efficiently.

Our Crime Detection website provides a wide range of innovative capabilities to assist law enforcement organizations

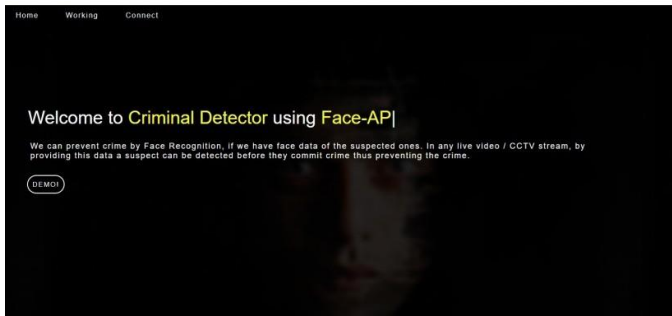


Fig. 2. Home Page

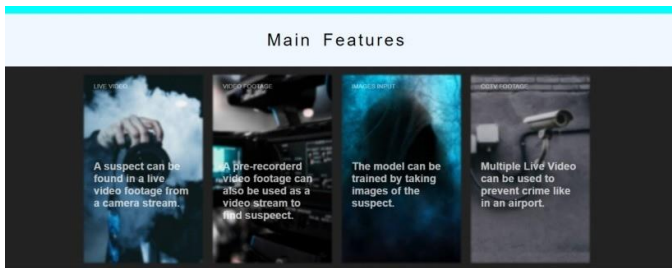


Fig. 3. Main Features

and detectives in solving crimes more quickly and efficiently. Here are some of the important features you'll discover on our website: Our face recognition technology can assist identify suspects and compare them to other photographs in our database.

Forensic analysis tools: Our forensic analysis tools can assist investigators in analyzing evidence and reconstructing crime scenes.

Advanced surveillance systems: Our sophisticated surveillance systems can assist monitor criminal activities and tracing suspects in real-time.

Data analysis tools: Our data analysis tools can assist investigators in identifying patterns and trends in criminal activity, making it simpler to solve crimes and avoid future ones.

We're always creating and enhancing our technologies at our Crime Detection website in order to keep one step ahead of crooks. Our mission is to deliver the most advanced crime detection systems available, therefore making the world a safer place for everyone.

B. Result Analysis



Fig. 4. Registering Suspect

Step 1: After Clicking on the Demo Button on the first page we will be redirected to a new page where we are having 2 options: 1. Register the suspect 2. Catch the suspect. We will start by registering the suspect.



Fig. 5. Suspect Details Entry

Step 2: After Clicking on register the suspect, we will have the option to choose many photos of the suspect which will help the model to train and detect easily.

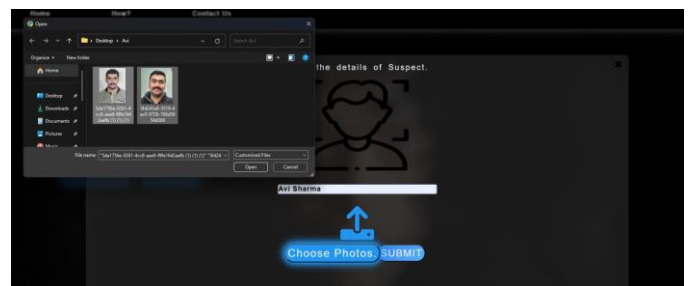


Fig. 6. Choosing Photos

Step 3: Hence after choosing the good amount of images we will click on Submit Button.

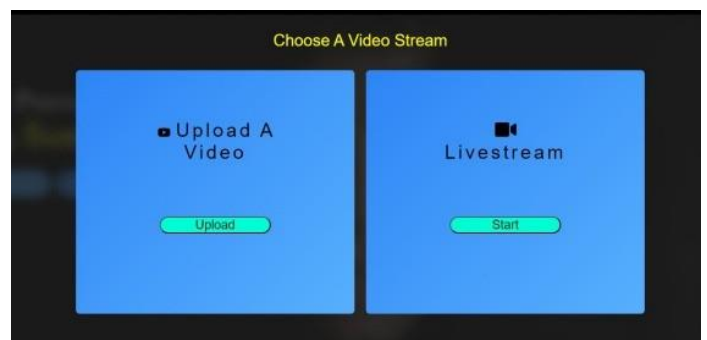


Fig. 7. Type of Video Stream

Step 4: After registering the suspect, we will click on the "Catch the Suspect" button, and then a new menu will be opened. The menu will be asking the user to input a Video or to run a live stream to detect/ catch the criminal.

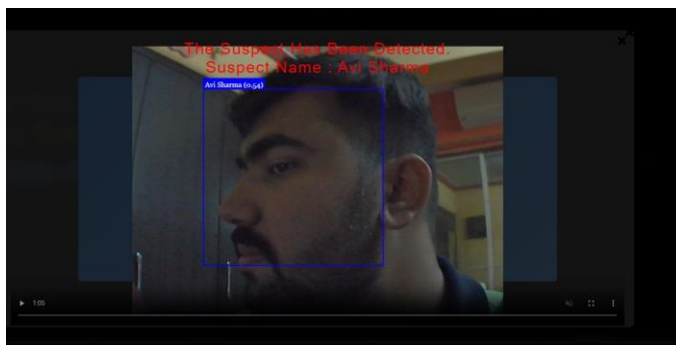


Fig. 8. Final Output

Step 5: At last the model is trained and the criminal is detected named: "Avi Sharma"

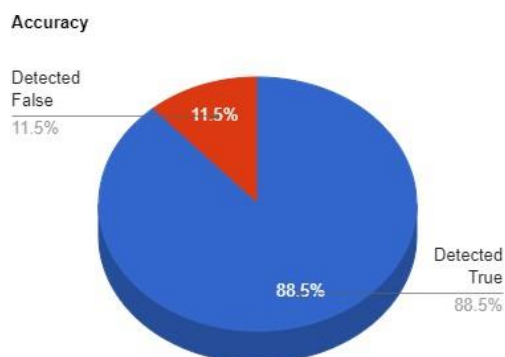


Fig. 9. Pie Chart for Accuracy

The accuracy of a facial recognition model created for law enforcement agencies is evaluated in this study. The model was evaluated with 136 test cases using various lighting conditions and cameras, yielding an accuracy rate of 88.5 percent. While the bulk of the faces were accurately recognized, 11.5 percent of the live broadcast faces were wrongly detected. According to the findings of this study, the face recognition model built for Law Enforcement Agencies is effective at detecting faces with a high degree of accuracy. However, there is still potential for improvement when it comes to successfully detecting all live broadcast faces.

The ramifications of this work are significant for law enforcement agencies, as precise and reliable facial recognition technology is critical in suspect identification and apprehending. The findings of this study can be used to guide the development and enhancement of facial recognition models for use in law enforcement agencies in the future. Overall, this study adds to the expanding corpus of research on facial recognition technology by highlighting the possible benefits and drawbacks of its application in law enforcement. More research in this field can improve the efficacy and dependability of facial recognition technology, benefiting law enforcement organizations and the communities they serve.

CONCLUSION AND FUTURE WORK

Finally, the Crime Preventer system, which uses JavaScript's Face API to detect suspects' faces, is a feasible choice for crime prevention and investigation. Deep learning and computer vision methods are used by the technology to recognize and recognize faces.

In real-time, boosting the effectiveness and efficiency of law enforcement forces. Future studies might focus on improving the system's accuracy and robustness, particularly when coping with tough situations including bad lighting, occlusions, and position fluctuations. Furthermore, the system might be modified to incorporate capabilities like automatic suspect identification and integration with other crime-prevention technology like CCTV cameras and alarms.

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