



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

# IJRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 13, Issue 6, June 2024

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

Impact Factor: 8.423

9940 572 462

6381 907 438

[ijrset@gmail.com](mailto:ijrset@gmail.com)

[www.ijrset.com](http://www.ijrset.com)

# E Crime Identification Using Face Recognition

Dr. P. Santhanalakshmi, Mohamed Farook T

Assistant Professor, Department of Master of Computer Applications, Hindusthan College of Engineering and  
Technology, Coimbatore, India

II MCA Students, Department of Master of Computer Applications, Hindusthan College of Engineering and  
Technology, Coimbatore, India

**ABSTRACT:** Within the region of criminal discovery and law requirement, in specific, the human confront capacities as a principal and unmistakable identifier. Computerized arrangements are required for convenient and proficient recognizable proof of people due to the developing issues displayed by thickly populated metropolitan situations. As this A novel real-time criminal distinguishing proof framework is displayed by investigate that combines the capabilities of the Haar Cascade classifier for facial acknowledgment and discovery with profound learning—more particularly, Convolutional Neural Systems (CNN)—for confront discovery. By melding facial acknowledgment innovation with past criminal action information, the framework leverages live video nourishes in metropolitan settings to move forward law requirement capabilities. The recommended methodology depends on utilizing CNN to extricate exact facial highlights, giving solid location in troublesome scenarios. Real-time confront discovery with awesome accuracy is made conceivable by the joining of Haar Cascade. Through the presentation of a real-time strategy that creates utilize of live video bolsters and profound learning, our inquire about propels criminal recognizable proof frameworks. The innovation beneath thought shows impressive guarantee in increasing the capacities of law authorization, encouraging proactive distinguishing proof, and reinforcing the common security and security of metropolitan zones. Our inquire about serves as a forward-looking solution that not as it were handles show issues but moreover predicts prerequisites within the proceeded advancement of urban security. Our framework makes a difference decision-making specialists by joining real-time information analytics. reaffirming its position as an intelligence-driven, proactive resource for keeping up open security.

## I. INTRODUCTION

Within the advanced world, innovation is crucial to law authorization, and facial acknowledgment has risen as a major instrument for individual recognizable proof. In this ponder, a novel strategy of distinguishing conceivable guilty parties through the combination of facial acknowledgment and criminal history is presented. The purpose is to set up the personality speedier and more exact handling, especially in swarmed cities where manual recognizable proof is troublesome. Our strategy goes past facial acknowledgment innovation, which depends on an individual's confront uniqueness, by taking under consideration the person's criminal history. The thought is to donate law requirement a more total device so they can discover and capture suspects more quickly. Our innovation utilizes cutting-edge approaches like Convolutional Neural Systems (CNN) and Haar Cascade calculations to identify and recognize faces in real-time since conventional strategies are habitually wasteful and unworkable in congested regions. The joining of past criminal action information into the distinguishing proof method is what recognizes our investigate. Our innovation progresses exactness and offers a proactive way to recognize possible risks by consolidating confront acknowledgment with an individual's criminal history. This Employing a comprehensive approach makes a difference with distinguishing proof and gives law requirement with a more modern understanding of a person's chance profile. It is apparent that a modern and mechanized criminal recognizable proof framework is required, particularly in light of the deficiencies of human approaches. Our framework is made to operate with real-time video feeds without any issues, persistently including to a dataset that's utilized to prepare the CNN and Haar Cascade calculations. This ensures that the framework will continuously be adaptable and delicate to shifting circumstances, which makes it a adaptable arrangement for real-world circumstances. This model framework could be a major progression within the field of criminal recognizable proof. Over its Despite its mechanical complexity, the framework offers a apparatus that assists recognizable proof methods and effectively anticipates criminal action, which has the potential to convert law requirement. Our method seeks to contribute to the ceaseless advancement of criminal recognizable proof frameworks, making urban regions more secure and more secure, by intertwining profound learning with verifiable wrongdoing information. Within the parts that take after, we'll look at the system's engineering, calculations, and strategies as we

get more modern. With this careful investigation, our objective isn't fair to illustrate the gifts of our model approach, but too to goad extra debate and inventiveness within the zone of genuine criminal identification. Long haul of law requirement may be radically modified by the combination of innovation and valuable applications, making strides community security and security.

## II. RELATED WORK

Employing a machine learning calculation and a profound neural arrange, the confront discovery framework can be executed as a hassle-free criminal distinguishing proof framework. One of the hardware necessities may be a CCTV camera module. The project's essential objective is to outline special highlights, such as facial hair, lips, hair, etc. There are two fundamental stages included in facial acknowledgment. 1. Confirmation of confront 2. Acknowledgment of faces. [1] Confront recognizable proof is the essential result of confront discovery in conjunction with other highlights. Confront extraction is one of its highlights; confront net is the confront distinguishing proof library. Profound CNN is utilized to prepare the highlight. [2]The paper presents an imaginative approach by utilizing aspects to recognize offenders in genuine time. [3] The paper illustrates the utilize of criminal and missing children distinguishing proof utilizing confront acknowledgment and web scratching. It incorporates the method of a haar cascade classifier for sifting people into different stages as a result it decides recognized confront is criminal or not. [4] The include extraction from the picture is done by utilizing OpenCV. The highlight extraction is classified with the assistance of a include vector and prepared utilizing web scraping. [5] The proposed framework can recognize more than one confront in a single outline and it makes the application more solid and speedier. [6] The significance of video illustrations innovation in distinguishing hoodlums covering up behind the wrongdoing scene was highlighted in an request into facial acknowledgment for criminal recognizable proof in observation film. [7]It makes utilize of the viola-jones strategy as well as three crucial highlights: edge, line, and rectangular plan element.[8] For neural acknowledgment, the framework combines CNN and DNN calculations. [8] The extend employments a classification calculation to induce a result by comparing the dataset with coordinate information outlines. [9]In the ponder, the application of a criminal discovery framework based on criminals' past criminal action is demonstrated. For neural acknowledgment within the reenactment, the demonstrate employed tagged faces from the wild dataset and the CNN strategy. The robotized component is in activity to find the wrongdoer. [10] The essential work of the recommended framework is the mapping of photos with the database. CCTV cameras are ordinarily utilized to capture the picture.

## III. METHODOLOGY

Framework Progressed Our system's design was made to combine CNN and Haar Cascade calculations with profound learning methods. This presentation gives an outline of the most components and their working interior the framework.

- Employing a live camera as input: Camera Access: Getting into the camera gadget is the primary step. Python programming dialects are utilized to achieve this utilizing the OpenCV video capture protest. Outline Capture: The live video stream is isolated into isolated outlines as before long as the camera is gotten to. These outlines contain data in a backend database and speak to a few minutes.
- Information Collection: To prepare your demonstrate, compile a changed test of faces from criminal cases. Make beyond any doubt that the dataset incorporates a run of sexes, ages, and races. Information preprocessing: This organize involves sanitizing and changing over natural information into a organize fitting for demonstrate preparing. Kill Commotion: Evacuate any components from the photographs that are diverting or pointless that may meddled with the model's capacity to memorize. Keep up Steady Lighting: Make beyond any doubt that the lighting in each photo is the same to avoid inclinations brought approximately by changes in differentiate and brightness. All photographs should be resized to a uniform estimate. Amid preparing, this stage makes beyond any doubt the model can handle pictures with steady measurements. Normalize pixel values to a ordinary scale (such as to 1 or -1 to 1) utilizing the pixel esteem normalization procedure. Normalization improves the model's capacity to generalize over numerous pictures and helps in quickening merging amid preparing. Create Expanded Information: Utilize changes like flipping, turning, and zooming to include more points of interest to the dataset. By uncovering the show to a more extensive run of information, information increase makes a difference increment demonstrate strength and decrease overfitting. a assortment of circumstances.
- Highlight Extraction: A Convolutional Neural Arrange (CNN) is the most device utilized in your extend for include extraction. Profound learning models called CNNs are made to decipher organized framework information, like pictures. As a rule, the engineering is made up of completely associated, pooling, and convolutional layers. Convolutional Layers: Convolutional layers utilize channels or bits to extricate highlights and designs from the input picture. These channels recognize the image's edges, surfaces, and more complex components. Create Expanded Information: Utilize



transformations like flipping, rotating, and zooming to add more details to the dataset. By exposing the model to a wider range of data, data augmentation helps increase model robustness and reduce overfitting. Layers of Pooling:

Reducing the computational load by pooling layers to sample the spatial dimensions of the feature maps.

and concentrating on the salient characteristics. By assisting in the creation of spatial hierarchies, pooling enables the network to identify features at various scales.

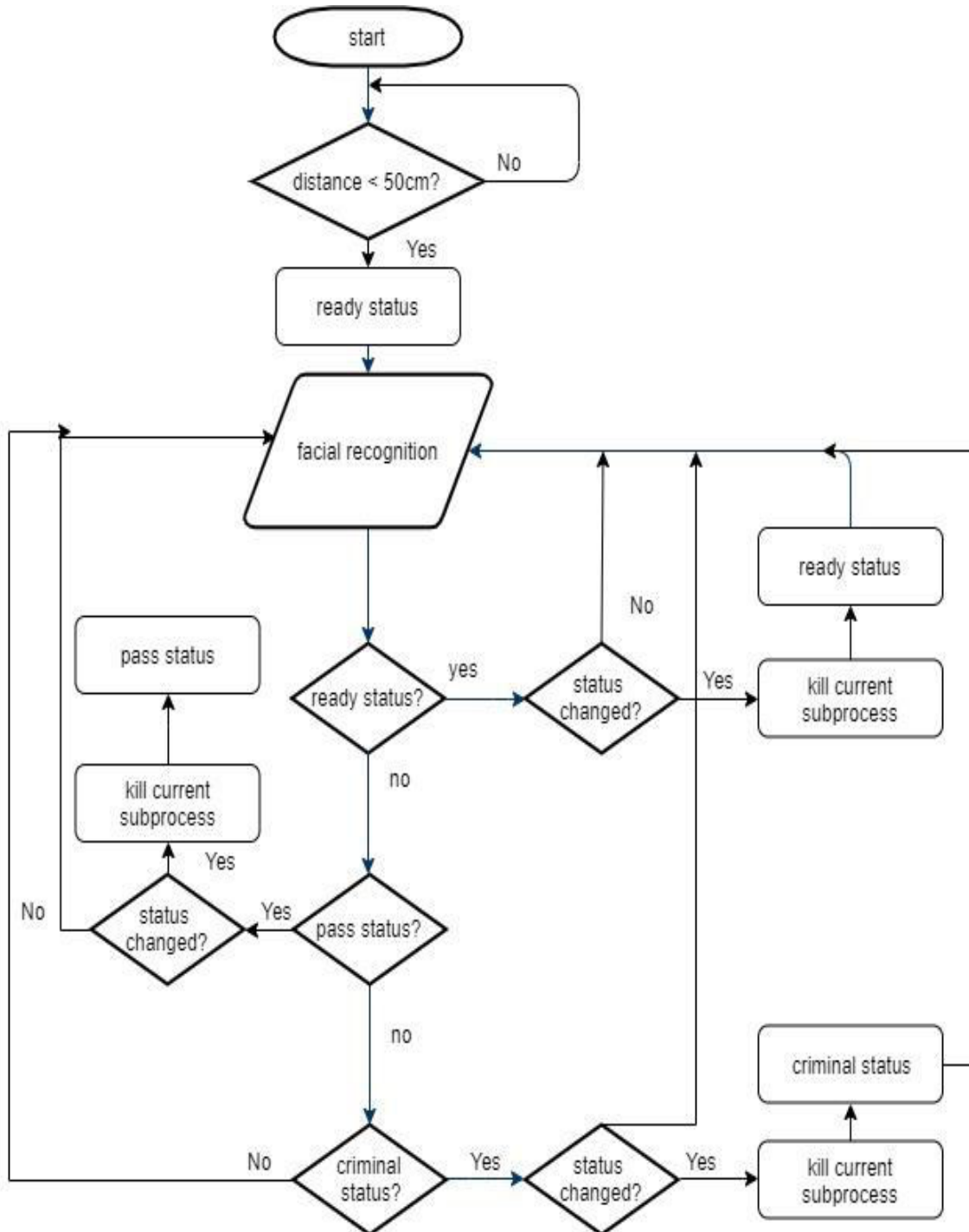
Fully Connected Layers: The feature maps are flattened into a vector after multiple convolutional and pooling layers, and this vector is the input for fully connected layers. Fully connected layers use the information gleaned from convolutional layers to capture global features and relationships between various input components.

Vectors of Features:

A feature vector that captures the key elements of the input face image is the final fully linked layer's output. Computer vision has undergone a revolution thanks to Convolutional Neural Networks (CNNs), especially in areas like picture identification, object detection, and facial analysis. CNNs are a class of deep neural network that is intended to learn hierarchical data representations automatically and adaptively. They are excellent at capturing complex characteristics and patterns from photos, which makes them very useful for jobs like facial identification.

Viola and Jones introduced the machine learning-based object detection technique known as Haar Cascade. It is a series of classifiers that have been trained to recognize faces and other objects by utilizing hierarchical feature analysis. Because of the speed and effectiveness of Haar Cascade, it has been frequently employed for real-time face detection.

Recognizable proof and Discovery: To adjust the recognized faces and account for contrasts in position and expression, utilize facial point of interest discovery. Utilizing the prepared CNN, extricate highlights from the adjusted faces. Utilize a coordinating framework, like Siamese systems, or triplet misfortune systems, to survey how closely the characteristics that were taken out and those within the criminal database taken after one another. • Show Information to the Client: Put in put an caution framework to educate security staff or other suitable specialists of the conceivable recognizable proof.



#### IV. IMPLEMENTATION

##### CNN ALGORITHMS 3.3.1

Convolutional Neural Networks (CNNs) process images in a methodical manner by applying layers of certain filters. These filters examine tiny areas of the image in the first convolutional layer to identify fundamental characteristics like edges and colors. After that, the model gains non-linearity from the Rectified Linear Unit (ReLU) activation layer, which improves the model's capacity to recognize intricate patterns. The geographic dimensions of the

data are then reduced by a pooling layer while important information is retained, such as the maximum values in localized places. After processing, the input is vectorized and fed into fully linked layers for complex analysis aimed at deciphering the learnt features. Every node in the final output layer represents a possible item category, and together they provide predictions. Through backpropagation, the network adjusts its internal parameters during training, steadily enhancing its capacity to identify and Sort pictures using several iterations. Essentially, the CNN can convert unprocessed pixel data into meaningful and precise predictions thanks to its hierarchical structure and convolutional procedures. The Haar Cascade For tasks like face detection, the Haar Cascade algorithm is frequently utilized as a machine learning-based object detection technique. It is predicated on Haar-like characteristics, which are patterns of contrasting areas of an image that are light and dark. The algorithm is shown positive images with the target object (faces, for example) and negative images without it during the training phase. An integral image is used to speed up computations, making it possible to quickly calculate the sums of the pixel values in rectangular regions. The approach creates a series of classifiers that cascade together, with each step having weak classifiers based on Haar characteristics and several stages. Using the Adaboost algorithm, the best weak classifiers are chosen at each step, with an emphasis on fixing mistakes committed by earlier classifiers. Because the cascade structure quickly eliminates picture portions that do not contain the object, it improves efficiency.

putting more thorough inspections on promising areas in later phases. The program use a sliding window technique to scan the image at different scales and positions. It then classifies regions that pass all stages as having the required object. Essentially, by cleverly prioritizing and quickly processing picture regions using a cascading system of classifiers, Haar Cascade excels at real-time object detection.

## DATABASE

The project's dataset is essential to the training and assessment of the suggested criminal identification system's efficacy. The implementation of a registration is where the procedure starts.

module made to take 41 pictures of a person's face and classify them as "not criminal" or "criminal." The succeeding live detection module is trained on the dataset generated in this step, which helps the system make judgments of people entering monitored locations in real time.

Dataset Acquisition via Registration Module: For every person, a set of 41 facial photos are taken by the registration module. This module includes easy-to-use interfaces for effective data gathering, guaranteeing that the dataset includes a wide variety of facial expressions, orientations and lighting circumstances. Each photo is painstakingly labeled during this procedure to identify whether the subject is suspected of being a criminal or not.

4.2. Labeling Scheme: One of the most important steps in setting up a supervised learning environment for the ensuing modules is labeling the dataset. A binary label is assigned to each facial image, designating the person as either "criminal" or "not criminal." The labeling procedure uses a methodical approach, perhaps using information from law enforcement or running simulations of actual situations using already-existing crime databases.

4.3. Dataset Size and Diversity: The dataset needs to be sufficiently vast and diverse to guarantee the system's robustness and generalization capabilities. Incorporating a significant number of individuals from different demographic groups is essential for training the system to manage heterogeneous populations. come across in actual life situations. Furthermore, real-world circumstances should be encountered by the dataset.

To improve the system's adaptability, the dataset should also include alterations in ambient variables, such as lighting and backdrop.

## Sample Source Code

```
import os
import cv2
import face_recognition
from tkinter import Tk, Label, Button, filedialog, simpledialog
known_criminals_folder = "images"
```

```
known_encodings = []
known_names = []
flag = 0
def load_known_criminals():
for file_name in os.listdir(known_criminals_folder):
image_path = os.path.join(known_criminals_folder, file_name)
name = os.path.splitext(file_name)[0]
image = face_recognition.load_image_file(image_path)
encoding = face_recognition.face_encodings(image)[0]
known_encodings.append(encoding)
known_names.append(name)
def match_criminal():
cap = cv2.VideoCapture(0)
while True:
ret, frame = cap.read()
face_locations = face_recognition.face_locations(frame)
face_encodings = face_recognition.face_encodings(frame, face_locations)
for face_encoding in face_encodings:
matches = face_recognition.compare_faces(known_encodings, face_encoding)
name = "Unknown"
flag = 1
if True in matches:
matched_indices = [index for index, match in enumerate(matches) if match]
first_match_index = matched_indices[0]
name = known_names[first_match_index]
flag = 0
top, right, bottom, left = face_locations[0]
cv2.rectangle(frame, (left, top), (right, bottom), (237, 255, 32), 2)
if flag == 0:
cv2.putText(frame, "Matched Criminal: " + name, (left-40, top - 40), cv2.FONT_HERSHEY_SIMPLEX, 0.9, (158, 49, 255), 2)
else:
cv2.putText(frame, "Not Matched", (left, top - 40), cv2.FONT_HERSHEY_SIMPLEX, 0.9, (255, 255, 37), 2)
match_label.config(text="Matched Criminal: " + name)
cv2.imshow('TechVidvan', frame)
if cv2.waitKey(1) & 0xFF == ord('q'):
break
cap.release()
cv2.destroyAllWindows()
def add_criminal():
file_path = filedialog.askopenfilename(initialdir="/", title="Select Image",
filetypes=(("Image Files", "*.jpg;*.jpeg;*.png"), ("All Files", "*.*")))
if file_path:
image = cv2.imread(file_path)
rgb_image = cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
encoding = face_recognition.face_encodings(rgb_image)[0]
name = simpledialog.askstring("Add Criminal", "Enter the name of the criminal:")
if name:
known_encodings.append(encoding)
known_names.append(name)
file_name = name + ".jpg"
save_path = os.path.join(known_criminals_folder, file_name)
cv2.imwrite(save_path, image)
print("Criminal added successfully.")
load_known_criminals()
```

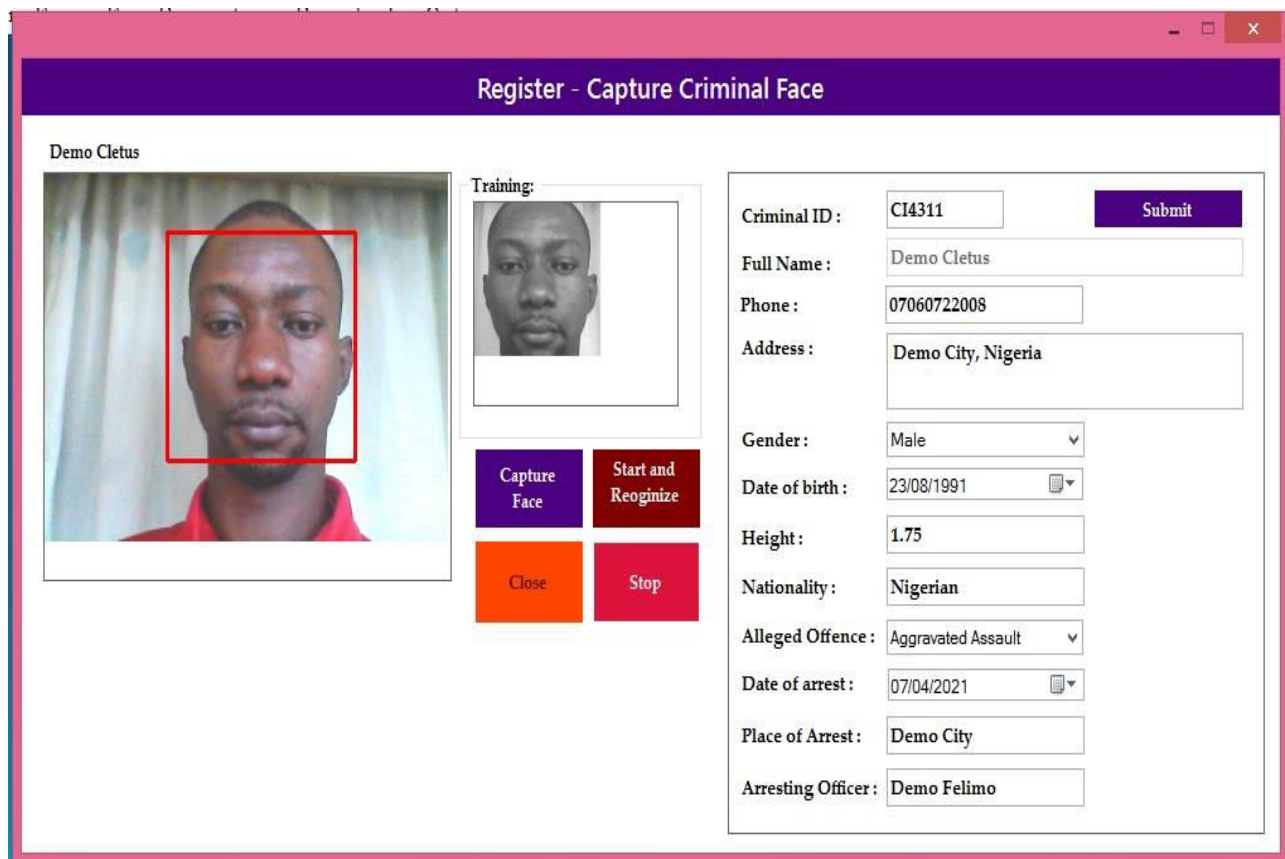
```

root = Tk()
root.title("Criminal Identification System")
root.geometry("500x300")
label = Label(root, text="Welcome to the Criminal Identification System by TechVidvan")
label.pack()
match_button = Button(root, text="Match Criminal", command=match_criminal)
match_button.pack()
add_button = Button(root, text="Add Criminal", command=add_criminal)
add_button.pack()
match_label = Label(root, text="Matched Criminal: ")
match_label.pack()
root.mainloop()

```

## V. RESULT ANALYSIS

In Malaysia, thumbprint recognizable proof is the strategy utilized to distinguish hoodlums. All things considered, this kind of distinguishing proof is constrained since most present day hoodlums are getting to be more clever in their endeavors to maintain a strategic distance from clearing out their thumbprints behind. Since the improvement of security innovation, numerous open and private spaces have CCTV cameras set to empower reconnaissance. Suspects at the scene can be distinguished utilizing the CCTV film. In any case, unique finger impression recognizable proof is implemented by the law due to the need of computer program outlined to naturally recognize likenesses between the captured photo of the criminal and the photo within the film. Utilizing the well-known Vital Component Investigation strategy, an robotized facial acknowledgment framework for a criminal database was proposed in this work. This innovation will have the capacity to consequently distinguish and recognize faces. In the event that there's no thumbprint on the scene, this will help law enforcement in distinguishing or identifying the suspect within the case. Almost 80% of the input photographs can be coordinated with the format information, concurring to the comes about.



**Register - Capture Criminal Face**

Demo Cletus

Training:

Criminal ID :

Full Name :

Phone :

Address :

Gender :

Date of birth :

Height :

Nationality :

Alleged Offence :

Date of arrest :

Place of Arrest :

Arresting Officer :

Buttons: Capture Face, Start and Reoginize, Close, Stop



## VI. CONCLUSION

The CNN calculation and Haar facial acknowledgment computer program are utilized in this think about to recognize offenders' faces. cascaded classification framework. CNN calculation encourages exercises like picture preparing and helps in learning progressive highlights. categorization, facial acknowledgment, and question location. Confront discovery is helped by Haar Cascade classifiers. successfully. Here, we are preparing our demonstrate employing a energetic dataset to decide whether the person is criminal or not. not illegal. The take note will be sent to the registered user as before long because it is expected that the person could be a criminal. versatile number to let them know the wrongdoer has been secured. .. By utilizing the previously mentioned approaches, the proposed demonstrate will too move forward the precision of confront location and acknowledgment. Right now, this approach is being utilized in little areas such as gems stores and ATMs, but it may eventually be expanded to banks. airports, retail centers, and law requirement organizations. It is additionally sensible to expect that within the future, facial acknowledgment innovation will development by amalgamating different strategies of recognizing people through their discourse or activities. It may well be conceivable to extend our model's exactness and strength by counting superior profound learning models.

## REFERENCES

- [1] "Face Detection and Recognition for Criminal Identification System," Aamani Tandasi, Sanika Tanmay Ratnaparkhi, and Shipra Saraswat, 11th International Conference on Cloud Computing, Data Science & Engineering, 2020, pp. 978-1-6654-1451, doi: 10.1109/Confluence51648.2021.9377205.
- [2] "Adaptable ReducedComplexity Approach Based on State Vector Machine for Identification of Criminal Activist on Social Media," in IEEE, pp. 2021, doi: 10.1109/ACCESS.2021.3094532, IMRAN SHAFI, SADIA DIN, ZAHID HUSSAIN, IMRAN ASHRAF, and GYU SANG CHOI.
- [3] S.AYYAPPAN, Dr. S.MATILDA, "Face Recognition and Web Scraping for the Identification of Missing Children and Criminals," IEEE, pp. 2020.
- [4] In the 6th International Conference On Computing, Communication, Control And Automation, 2022, pp. 978166548451, doi: 10.1109/ICCUBEA54992.2022.10010987, Swati Jagtap, Nilkanth B. Chopade, and Sanjay Tungar present "An Investigation of Face Recognition System for Criminal Identification in Surveillance Video."
- [5] Kelvin Andrew Fredrick Nyoka In the 11th International Symposium on Digital Forensics, Sauli Godfrey, Hapines Gideon Mwakilembe, Leonard Jonas Mugendi, Oscar David Mbita, Adramane Assoumana, and Dawson Ladislaus Msongaleli presented their paper, "Reliable Face Identification System for Criminal Investigation." & Security (ISDFS), 2023; doi: 10.1109/ISDFS58141.2023.10131738; pages. 979-8-3503-3698
- [6] Vaishali B, Dr. S.John Justin Thangaraj, "Innovative Facial Expression Identification for Criminal Identification using Unsupervised Machine Learning and Compare the Accuracy with CNN Classifiers," in 2022, pp. 978-1-6654-3986, doi: 10.1109/ICSCAN53069.2021.9526455, International Conference on Business Analytics for Technology and Security (ICBATS), 2202.
- [7] The paper "Real-Time Criminal Face Identification Based on Haar-Cascade and Lbph, with Automatic Message Delivery to Whatsapp" was presented by M. Saravanan and K. Kowsalya at the IEEE 2nd Mysore Sub Section International Conference (MysuruCon), 2022. It is available online at doi: 10.1109/ICBATS54253.2022.9759043.



INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  [ijirset@gmail.com](mailto:ijirset@gmail.com)



[www.ijirset.com](http://www.ijirset.com)

Scan to save the contact details