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CRIMINAL FACE DETECTION

[1] Amogh A Joshi, [2] Dr Shankaragowda B B

[1]Student 4th Semester, Department of MCA, BIET, Davangere

[2]Assistant Professor &HOD, Department of MCA, BIET, Davangere

emailid: amoghaj50@gmail.com

ABSTRACT

Criminal Face Detection has emerged as a critical technology in enhancing public safety and security. The proposed system encompasses several key components like data collection, data preprocessing, model training, real-time face recognition. Data collection involves assembling a diverse dataset of facial images, ensuring variations in lighting and expression. Data processing includes face detection using Multi-task Cascaded Convolution Network through facial landmarks, normalization and augmentation to enhance datasets variability. Feature extraction employs pre-detriment deep learning model like Face Net generating the robust feature embeddings for each face. The model training focus on the selecting and training the CNN's Network while addressing the class embrace the utilizing the Over-Sampling Synthetic Minority Technique (SMOTE) In the development the system integrates with the real time surveillance and alerting the criminal face. The alert notification system is implemented to automate the response. Ethical considerations and data privacy are paramount throughout the system development and deployment ensuring compliance with legal standards and protecting individual rights. The proposed system demonstrates significant potential in improving law enforcement capabilities and enhancing public safety through accurate and efficient criminal face detection.

Key Words: Criminal Face detection, deep learning, data privacy, model training, real time surveillance

I. INTRODUCTION

In the past few years, they are many security techniques that have been developed to assistance keeping within the confidential data which are secured and limiting the chances of the security breach. Over the years the face identification is among of the few biometric techniques that are deserving to everyone of excellent precision and minimal aggression that perhaps a on the computer virus where it employs a person's face mechanism to establish and verify that an individual from the digital picture or by a frame from the source of the video. Criminal visage detection is a contentious application of facial recognition technology, designed to identify individuals with a criminal background or those resembling known offenders. This technology has been a widely utilized in biometric for identity, authorization, verification and authentication. Many companies have installed the facial recognition in their lots, access controls and security camera. These days, a lot of businesses

victim facial recognition on their websites in an effort to create a digital profile for victim.

This technology relies on sophisticated algorithms to analyze facial features from images or videos and compare them against databases of mugshots or other law enforcement records. While proponents argue that it can enhance public safety and aid law enforcement efforts, critics raise significant concerns about privacy invasion, potential bias, and the risk of wrongful accusations. It contrasts with chosen facial expression from the images and a facial data. The ethical implications of criminal face detection are complex, requiring careful consideration of issues such as consent, accuracy, and the fair treatment of individuals, especially in light of the technology's potential impact on civil liberties and human rights. The automatically tagging feature adds a new dimension to shares the pictures among the people where in the picture and also gives the idea to the other people about who is exact person in the image.

The method of face recognition used is fast, robust, reasonably simple and accurate with the relatively simple and easy to understand algorithms and techniques. Criminal face detection is a technology which utilizes the facial recognition algorithm to identify the individuals who have the criminal history. By analyzing facial features from images or video footage, this technology aims to assist law enforcement agencies in identifying and apprehending suspects. However, its implementations raise significantly ethical and privacy concerns, including the potential based outcomes and infringements on the civil liberties. The roots of face detection technology can be tracked back to early computer vision research where the initial pattern was focused on the pattern recognition. In the modern law of the enforcement and public security system.

II. LITERATURE SURVEY

The Criminal Face detection which involves identifying individuals involved in criminal activities using advanced computer vision techniques. The survey reviews the methodologies, dataset, algorithms and the key for the contribution from the various research fields.

2.1Analysis of Principal Components Analysis (PCA): The PCA is a statistical technique which have utilized for the dimensional reduction. It transforms the datasets into a set like capturing the variance with least components. Its widely used for analysis, machine learning for data compression and visualization.

The PCA was used by Turk and Pentland in the year 1991 where the PCA was used for the facial recognition for laying foundation for the developments and this was also called as the Traditional Image Processing Techniques[1].

2.2Machine Learning Approaches and Deep Learning Techniques:

Viola and Jones developed the robust in real-time face detection framework in the year 2001 by using some feature like AdaBoost for signifying the face detection method[2]. In the year 2012 Krizhevsky et al has used the deep convolutional networks with AlexNet for demonstrating the face recognition in large scale for the face detection[4]. In 2015 Schoff et al present the Face Net by using a deep convolutional network for mapping the visage in Euclidean Space[3]. Parkhi et al developed the VGGFace in 2015 in deep face recognition for high accuracy and robustness[5]. In the year 2016 Zhang et al has proposed the combined face recognition by using the Multi-Task Cascaded Convolutional Network (MTCNN) for improving the detection in real-world[6]. In 2014 Goodfellow et al he

introduced the Generative Adversarial Networks (GANs) in which it enables the data augmentation through the face image generation[7]. He et al developed the ResNet in 2016 which a deep learning framework which adapted for various image recognitions tasks[8].

2.3Transfer Learning and Enhanced Techniques

Taigman et al has created DeepFace for leveraging the large datasets to train a deep learning neural networks for the face recognition[9]. In 2014 Sun et al has proposed DeepID to advance the model learning of face recognition[10]. Liu et al has developed SphereFace in 2017 where he introduced the angular SoftMax for loss of enhance power in the face recognition[11].

III. METHODOLOGY

We are able to see and identify the faces of the offenders in a very long video stream that we were able to get from a camera during this experiment. First is the national information, which can include the pictures and the individual identification numbers of every voter in the nation. The second is native watch list information, which can include at ten photos and personal information about each offender, including name, gender, crime history and unique identifier. The Untied Nation the third is International Watch List information, which can include ten photos and information on criminals that the United National Agency does not believe to be citizens of that nation. After that, it goes via feature extraction wherever Haar-cascade is employed. The video is captured from the police investigation camera that square measure reborn into frames. Once a face is detected in an exceedingly frame, it's preprocessed. Then it goes through feature extraction wherever Haar--cascade is employed. The options of the processed period of time image is compared with the options of processed pictures that square measure hold on within the national info. If a match is found, it's more compared with the options of pictures hold on in exceedingly native watch list info to spot if the person is criminal.

3.1Data Pre-Processing

Face detection: Identifying the face regions from the images or in video frames the methodologies used are Haar Cascades in which trained image will be classified into positive or negative image another methodology used is Multi-task Cascaded Convolutional Network (MTCCN) this use the robust method for face detection.

Face Alignmen from camera durinh: The methodologies are Landmark Detection which identify the facial landmarks (like nose, eyes, mouth) and align the face points. Affine Transformation where the transformation for alignment on face by the detected landmarks.

Face Segmentation: The objective of face segmentation is region from background and non-face region. The methodologies are Deep learning Based Segmentation which use the U-Net models to segment the face and Thresholding and Contour Detection this will process the image technique for isolating for face regions.

Feature Extraction: This extracts meaningful features from images the methodologies Classical Methods which Principles Components Analysis (PCA) and Deep Learning which uses the pre-trained models like VGGFace to extract deep features.

3.2ALGORITHM

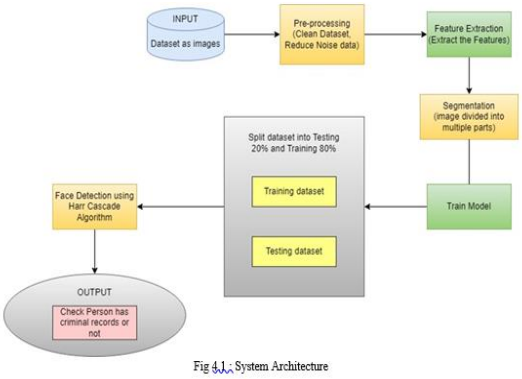

Fig 4.1 : System Architecture

Fig3.2: Architecture of Criminal Face Detection

In the above architecture it represents how the criminal face detection will processed firstly we have input the dataset or we can use the camera to insert the dataset into the database after inputting the dataset the preprocessing will be done by the program. After the preprocessing the dataset will be extracted after the extraction of dataset it will be segmented (divided into several parts) after this the dataset will be trained where the training will be 80% and testing will be 20% of the dataset after the training and testing by using the Haar Algorithm the dataset will be checked whether the dataset is given by user is criminal or the unknown.

3.3TECHNIQUES

1. Haar Cascades: This algorithm was used to for the face detection (Like images, videos) this technique is the one of the oldest techniques which is still in the use for the detection of the face. This algorithm was designed by the Viola and Jones where the series of the classification trained with the positive and negative images which have been detected.

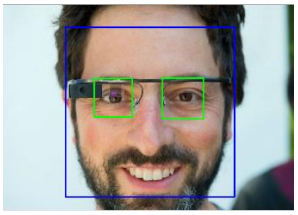

Fig3.3.1: By using Haar Cascades Algorithm

2. Multi-Task Cascaded Convolution Networks (MTCNN): This is also one of the algorithms which is used for the face detection in which it's a deep learning method where it performs the landmark location and alignment in cascaded manner which improves the accuracy.

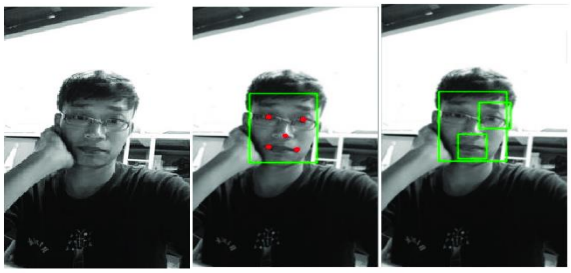

Fig3.3.2: By using Multi-Task Cascaded Convolution Network Algorithm

3. Eigenfaces and Fisherfaces: These algorithms are used in the recognition of face where these methods are used with Principal Component Analysis (PCA) and Linear Discriminant Analysis (LDA) which will help to reduce the dimensionality of the facial features and accuracy of recognition will be more accuracy.

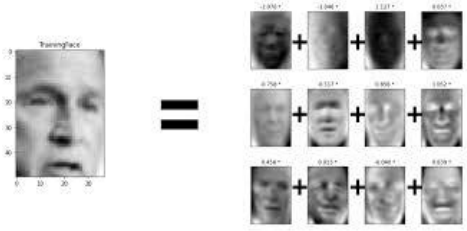

Fig3.3.3: By using the EigenFace Algorithm with the method PCA

Fig3.3.3: By using FisherFace Algorithm

4. Local Binary Pattern Histogram (LBPH): It is also one of the face recognitions where the method will be robust which changes the facial expression and the lighting[12].

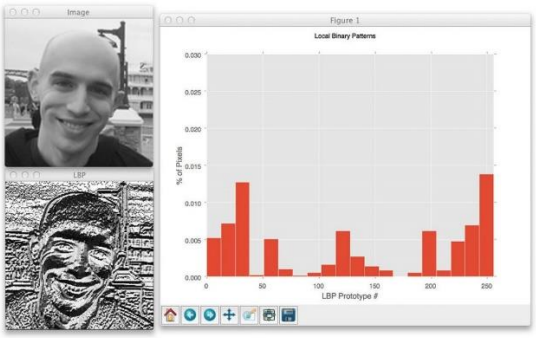

Fig3.3.4: By using Local Binary Pattern Histogram Algorithm

IV. RESULTS

The result of the criminal face detection is that the process where the input will be given either by using the folder method where we can input the images into a folder or by taking criminal photo by using the camera which we will be using after giving the input. Then the image will be processed whether the given input is criminal or the unknown person and after again run the program it will be shown in the output screen whether the person is criminal or the unknown person in the image given by the user.

4.1RESULT SCREENSHOT

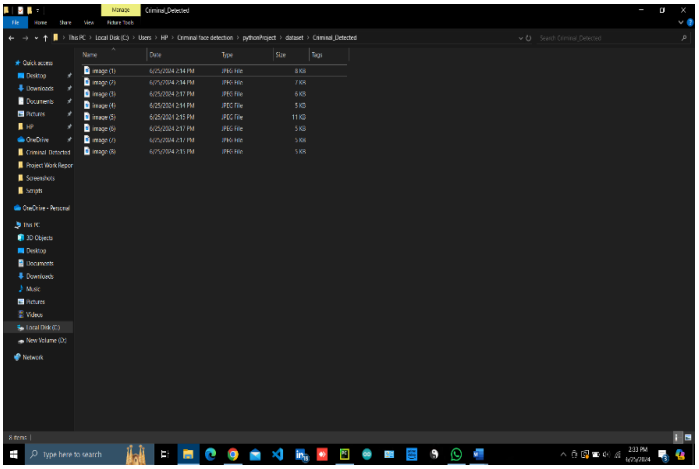

Fig4.1.1: Giving the dataset by folder

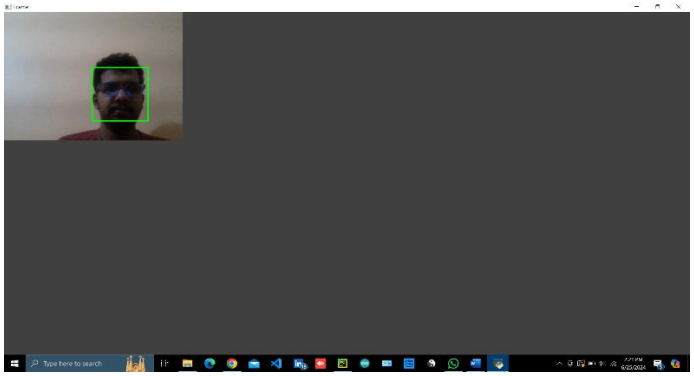

Fig4.1.2: Giving the image dataset by using camera

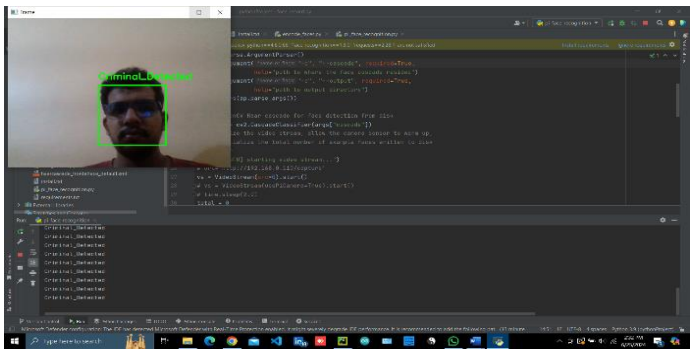

Fig4.1.3: Person is detected as criminal

V. CONCLUSION

Conclusion, even though criminal face detection technology offers law enforcement encouraging developments, its implement needs to be approached with a careful evaluation of both its advantages and potential disadvantages. We can clear the path for the ethical and responsible application of this technology by tackling the social, ethical and technical issues raised in this study.

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