INTERNATIONAL JOURNAL OF
RECENT TRENDS IN MULTIDISCIPLINARY RESEARCH
January-February 2023, Vol 3(01), 09-11. ISSN No: 2583-0368

Deep Learning-Based Forensic Face Recognition System

Reshma J[1], Vinay G[2], Nishanth M[3], Vindhya J K[4], Yallappa Chalawadi[5]
[1]Associate Professor, Information Science and Engineering, Dayananda Sagar College of Engineering, India.
[2.3.4.5]Information Science and Engineering, Dayananda Sagar College of Engineering, India.

Article Type: Research

OPENACCESS
Article Citation:
Reshma J[1], Vinay G[2], Nishanth M[3], Vindhya J K[4], Yallappa Chalawadi[5], "Deep Learning-Based Forensic Face Recognition System", International Journal of Recent Trends In Multidisciplinary Research, January-February 2023, Vol 3(01), 09-11.

Accepted date: : January 30,2023

Published date : January 31,2023

Abstract: Face recognition is a vital one when it comes to recognizing people. It aids the law enforcement team to a very great extent as the probability that two individuals will be alike is very minimal. This survey paper aims to describe few of the existing methodologies that exist for forensic face recognition. With this knowledge, the future ide ais to come up with an innovative face recognition algorithm so that criminals are recognised with more efficiency.

Keywords: Deep Learning, Face Recognition System.

1. Introduction

A criminal can be easily identified and brought to justice using a face sketch drawn based on the description been provided by the eye-witness, however in this world of modernization the traditional way of hand drawing a sketch is not found to be that effective and time saving when used for matching and identifying from the already available database or real-time databases. During the past there were several techniques been proposed to convert hand-drawn facesketches and use them to automatically identify and recognize the suspect from the policedatabase, but these techniques could not provide the desired precise results. Application to create a composite face sketch were even introduced which too had various limitations like limited facial features kit, cartoonist feel to the created suspect face which made it much harder to use these applications and get the desired results and efficiency.The above applications and needs motivated us into thinking of creating an application which would not just provide a set of individual features like eyes, ears, mouth, etc. to be selected to create a face sketch but also would allow user to upload hand-drawn individual features on the platform which would then be converted in to the applications component set. This in turn would make the created sketch much more similar to the hand-drawn sketch and would be much easier for the law enforcement departments to adapt the application.Our application would even allow the law enforcement team to upload a previous hand-drawn sketch in order to use the platform to identify and recognize the suspect using the much more efficient deep learning algorithm and cloud infrastructure provided by the application.

2.Literature Review

1. K S Meghana, Neha Pawar KR, Dr. Roopa GM, "Face sketch Recognition Using Computer Vision"," International Journal of Engineering Research and Technology (IJERT)", Volume 9 Issue 8 July 2021 [https://doi.org/10.22214/ijraset.2021.36806.] Proposed an approach that follows a simple design structure. Initially a sketch image of a person is given as input to the model. In the second step, the given sketch image undergoes Gray-scaling. The Gray image is then resized to focus on the features of the face in order to recognize the given input sketch and generate the expected output accurately. The data is collected from the resized image in the form of Pixel values. Lastly, the sketch image undergoes RGB Channel Separation in which red, green, and blue light are added together in various ways to reproduce a broad array of colors. Thus, final output is generated that is, the original image of the person is matched with the given sketch image.

2. Chethana H.T, Trisiladevi C Nagavi, "A New Framework for Matching Forensic Composite Sketches with Digital Images", "International Journal of Digital Crime and Forensics", Volume 13 Issue 5 September-October 2021. [https://www.igiglobal.com/article/a-new-framework-for-matching-forensic-composite-sketches-withdigital-images/283124.]Proposed an approach that consists of three stages: preprocessing, classification and output. The input is provided to the proposed framework is the pair of composite sketches and its corresponding digital images. The steps involved in the pre-processing of these images are mentioned in the image pre-processing section. The process of collecting composite sketches is a very challenging and tedious task. Hence the input images are limited. Therefore, to get a better performance of the system, more input images are necessary. To tackle this issue, the images are heavily augmented in the training phase.

3. Manoj, Sugam "A Survey Paper on Sketch to Face Recognition by using Machine Learning"," International Journal of Engineering Research and Technology (IJERT)",Volume 2 Issue 2 July 2022.[https://ijarsct.co.in/Paper5862.pdf.]Proposed an approach that consists Two processes—training and testing—are included in the suggested composite sketch-based face detection system. Database images are trained during the training process, and each image face region is located, pre-processed, and extracted texture features like Multi-Scale Local Binary Pattern (MLBP) and Tchebichef moment invariant feature. Limitation. The Facial Composite created was not accurate and difficult to match with the database with accuracy.

4. Manish Bhoir, Chandan Gosavi, Prathamesh Gade, Bhavana Alte, "A Decision-Making Tool for Creating and Identifying Face", "ITM Web of Conferences 44, (2022)", CACC. [https://www.itmconferences.org/articles/itmconf/pdf/2022/04/itmconf_icacc2022_03032.pdf] Proposed an approach that consists of two stages: Face Sketch Construction and Face Sketch Recognition. The experiment is conducted using sketches that were previously seen. The dataset is downloaded and tested from an open store (available for free on the web) where the sketches are viewed. Limitation. The Face Sketch Construction and Recognition, project is currently meant to work on a limited number of scenarios, such as face sketches and matching those sketches to face images in law enforcement records.

5. Nannan Wang, and Xinbo Gao, and Jie Li "Random Sampling for Fast Face Sketch Synthesis," International Journal of Engineering Research and Technology (IJERT)", Volume-6, Issue-3,11-August-2017. [https://www.researchgate.net/publication/3208874_Random_Sampling_for_Fast_Face_Sketch_Syntheis] Proposed anapproach that is a simple yet effective framework for face sketch synthesis based on random sampling and locality constraint. Limitation. The common issue with all the proposed algorithm where that they compared the face sketches with human face which were usually front facing making it easier to be mapped both in drawn sketch and human face photograph, but when a photograph or sketch collected had their faces in different direction the algorithms were less likely to map it and match with a face from the database which is front facing.

6. Srujan Mahajan, Vipul Humbe, Advait Raorane, Asmita Deshmukh," Forensic Face Sketch Artist System "International Journal for Research in Applied Science & Engineering Technology (IJRASET)", Volume 10 Issue VIII August 2022. [https://doi.org/10.22214/ijraset.2022.46431] Proposed anapproach in which Platform was designed and developed using various technology stack in order to provide the law enforcement department with state-of-the-art security features and accuracy which in turn provide the law enforcement department with a better crime solving rate and efficiency. Limitation Sketch collected had their faces in different direction the algorithms were less likely to map it and match with a face from the database which is front facing.

7. Irfan Azhar, Muhammad Sharif, Mudassar Raza, Muhammad Attique Khan and Hwan-Seung Yong," A Decision Support System for Face Sketch Synthesis UsingDeep Learning and Artificial Intelligence","e Creative CommonsAttribution (CC BY)",2021. [https:// doi.org/10Survey Paper.docx3390Survey Paper.docxs21248178] proposed a framework that consists two neural nets. The first part is a compiler network C, which is based upon a residual network of two branches, and the skip connections are made in a spiral fashion. It is derived from [58], which was employed for neural-style transfer. For an input photo p, this part generates a raw sketch named s. The second part of the scheme is a feature-extractor called F, based on a pre-trained Vgg-19 network. These net and associated components formulate another intermediate entity, called feature sketch. The last step of the setup is a customized convolutional neural network, called discriminator D, to undertake a comparison between raw sketch s and feature sketch f. Their difference, combined with other loss functions, is then used to modify the weights of C and D networks iteratively during the training process. At end of the training, the C network is solely used to synthesize automated sketches from the test photos.

8. Alaa Tharwat, Hani Mahdi, Aboul Ella Hassanien," Face sketch recognition using local invariant features", "ResearchGate" November 2015, [10.1109/SOCPAR.2015.7492793] proposed a model that consists of two phases, namely, training phase, and testing phase. In training phase, the photo images, i.e., training images, are collected and then local features are extracted using feature extraction method. Thus, each photo image is represented by one vector as follows, X = x1, x2,...,xN , where xi ∈ Rd is the feature vector of the ith photo, X represents the feature matrix, and N is the total number of training images.to high dimensionality of some feature extraction methods, Direct-LDA

dimensionality reduction method is used to search for the LDA space (W) and then project the training data, i.e. feature vectors, on this space to reduce the dimension of the feature vectors as follows, Y = W X, where Y = y1, y2,...,yN represents the feature matrix after projection and yi∈ Rm , m<d. In testing phase, an unknown image (S), i.e. sketch image, is collected and then feature extraction method is used to extract the features, thus the unknown image is represented by one vector (S ∈ Rd). Project the feature vector on the LDA space to reduce the dimension as follows, Snew = W S. In the next step, the projected feature vector of the unknown image (Snew) is matched with the feature matrix after projection (Y) to determine the class label of the unknown image.

9. Vineet Srivastava, "Forensic Face Sketch Recognition Using Computer Vision"," International Journal on Recent and Innovation Trends in Computing and Communication", ISSN 2321 – 8169 Volume: 1 Issue: 4 [http://www.ijritcc.org] proposed a model that works based upon information collected and processed the study and research phase. The technique to be applied for the design and implementation of the forensic face sketch identification system is as follows: Data gathering of face images of subjects from CUHK database. Pre-processing of face images i.e. copping, grayscale conversion. Importing face images into MATLAB. Discrete Cosine Transform (DCT) image compression of face image classes. Design of a Self-Organizing Map (SOM) Neural Network in MATLAB. Input faces image classes into SOM Artificial Neural Network (ANN). • Training the neural network and simulating it for different input face sketch images. Testing and validation of the program and technique. Creating a user-friendly program (GUI) in MATLAB from the source code.

3. Conclusion

The paper 'DEEP LEARNING-BASED FORENSIC FACE RECOGNITION SYSTEM' is a detailed survey on the existing works related to face recognition. Face recognition is vital for identifying individuals and aids law enforcement teams specifically for identifying criminals. This paper focuses on some of the algorithms existing in Artificial Intelligence and Machine Learning for recognizing criminals. This is very much help the sketch artists in drawing the face of criminals so that crime rate can be brought down.

References

1. *K S Meghana, Neha Pawar KR, Dr. Roopa GM, "Face sketch Recognition Using Computer Vision", "International Journal of Engineering Research and Technology (IJERT)", Volume 9 Issue 8 July 2021.*
2. *Chethana H.T, Trisiladevi C Nagavi, "A New Framework for Matching Forensic Composite Sketches with Digital Images", "International Journal of Digital Crime and Forensics", Volume 13 Issue 5 September-October 2021.*
3. *Manoj S G, Sugam B K "A Survey Paper on Sketch to Face Recognition by using Machine Learning"," International Journal of Engineering Research and Technology (IJERT)", Volume 2 Issue 2 July 2022.*
4. *Manish Bhoir, Chandan Gosavi, Prathamesh Gade, Bhavana Alte, "A Decision-Making Tool for Creating and Identifying Face", "ITM Web of Conferences 44, 03032, (2022)", CACC.*
5. *Nannan Wang, and Xinbo Gao, and Jie Li "Random Sampling for Fast Face Sketch Synthesis," International Journal of Engineering Research and Technology (IJERT)", Volume-6, Issue-3,11- August-2017.*
6. *Srujan Mahajan, Vipul Humbe, Advait Raorane, Asmita Deshmukh," Forensic Face Sketch Artist System "International Journal for Research in Applied Science & Engineering Technology (IJRASET)", Volume 10 Issue VIII August 2022.*
7. *IrfanAzhar, Muhammad Sharif, Mudassar Raza, Muhammad Attique Khan and Hwan-Seung Yong," A Decision Support System for Face Sketch Synthesis Using Deep Learning and Artificial Intelligence","e Creative Commons Attribution (CC BY)",2021.*
8. *Alaa Tharwat, Hani Mahdi, Aboul Ella Hassanien," Face sketch recognition using local invariant features", "ResearchGate" November 2015.*
9. *Vineet Srivastava, "Forensic Face Sketch Recognition Using Computer Vision"," International Journal on Recent and Innovation Trends in Computing and Communication", ISSN 2321 – 8169 Volume: 1 Issue: 4.*