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A Fast CNN Method for Detection the Facial Mask

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***Abstract*--In this study, a "Safety system for mask detection during the current COVID-Face mask detection has made great strides in the fields of computer vision and deep learning, among other areas of research, since the extraordinary COVID-19 global pandemic, which has mandated the wearing of masks in public places. For this reason, machine-learning techniques have become increasingly important in face mask detection.**

In order to overcome the situation, learning specialists have created a number of approaches and tactics for recognizing unmasked persons using a range of mask detection models. Several current technologies, including face detection, biometric identification, and facial expression detection, can be combined into this user-friendly architecture to enable further advances in the future in order to give Facial Mask Detection Using Boosted CNN in Smart City Network.

***Keywords*—Facial Mask Detection, CNN, COVID-19.**

I. INTRODUCTION

Facial modelling and analysis has always been a prominent topic of research in the field of biometrics[1]. However, for many types of research, the use of high-quality photographs is a necessary requirement[2]. Recent years have seen a rapid increase in the development of related study areas such as face detection, face recognition, facial attribute classification, head pose classification, and estimate, among others. As a result, facial photographs with a slight head tilt are more common than others. The goal of this work is to examine the subject of head posture categorization, which has the potential to enhance the functionality of numerous face-related algorithms.

This research also has important ramifications for a variety of applications, including as human attention monitoring, driver fatigue monitoring, and interaction-based face liveness identification, among others. The COVID-19 [3] virus will have spread throughout the world by 2020 [4], and because it may spread through contact, identity authentication systems that rely on During the COVID-19 corona virus outbreak,[5] the majority of people are compelled to wear masks. As a result, the performance of several algorithms that deal with faces is being tested. These algorithms must be validated in order to be successful in resolving the problem. Therefore, the categorization issue for head postures that this study looks at is for those who are wearing masks.

Even though the methods mentioned above have shown favorable outcomes for head position categorization, every performance is significantly influenced when photos of the face are obtained while wearing a mask.

This occurs as a result of masks hiding a lot of information on the face. Additionally, adequate information must be provided[6] in order to get trustworthy results from the method of head posture categorization. Particularly, clear, high-quality face images taken without the use of a mask are needed for pose estimation, facial and mark detection. We carefully consider the colour texture of the photographs in order to address the issue of head position categorization with masks. Our emphasis is focused on the facial features that have data that can be used to classify head positions. In addition, our method extracts features using CNN rather than relying on face and mark detection.

II. RELATEDWORK

G. H. Minarietal.[7] The goal of this research was todesignasystemthatcoulddetectanomaliesinimages recorded on a city street by surveillance videocameras. In order to find faces in pictures, we'll usethe Mask R-CNN detection method. A binary mask is used to identify abnormalitiesintheindividuals' behavior. We used facial landmarks to ensure that the algorithm can discriminate between individuals and authorized people in order to reduce false positives.

The study by I. M. Revinaetal.[8] uses the convolutional neural network to train the facial expressions needed to convey expressions like surprise, disgust, and sorrow (CNN). The CNN channel features four different facial expressions: disgust, grief, a smile, and astonishment. The proposed technique offers a significant improvement to the accuracy of recognition and is appropriate for any requirements that may arise in the future.

The academics M. A. K. and colleagues carried out the study. [9] Face and veil recognition were studied using the Gabor wavelet and deep transfer learning. Using Gabor wavelet features in addition to deep learning CNN features to give a more robust feature vector that may aid in more accurate face recognition. It was demonstrated in this instance that it had an average recognition accuracy of 97%.

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Lost facial signals can be partially restored by improving face movements and expressions, according to S. Ge et al. [10] This strategy can greatly reduce noise-induced facial cues. Finally, a unified CNN architecture that simultaneously runs classification and regression operations is put in place to locate face areas and refine their placements.

This study, conducted by P. Mittal et al. [11], attempts to develop a novel, lightweight convolutional neural network-based approach to address this issue. The proposed model is a little more realistic than other models that have been built in the past. This methodology also seeks to offer a stable system that conforms with COVID-19 standards in real-world settings.

R is the author of this. This technique was developed by B. Hadiprakoso et al. [12] and incorporates two modules: a CCN classifier module and an eye-opening/lip movement analysis module (the blinking eye module) (theCNNclassifiermodule). Datasets created from freely available data are used to train our CNN classification algorithm.

This face recognition programmed was created by sequentially assembling these two parts and integrating them into the Android operating system. The results of the tests demonstrate the module's ability to recognize various types of face-spoofing offences, including those committed with posters, masks, or cellphones.

S.'s research makes use of binary image masks made from the positions of face landmarks. A innovative method of storing form characteristics is described by Jaiswale et al. [13]. Dynamic CNN features, when paired with bi-directional long short-term memory, efficiently express temporal information.

III. Proposed Methodology

Although it is well known that manual spoof detection techniques are extremely accurate, theoretical studies have shown that applying multilayer algorithms for feature extraction is beneficial. is crucial for systems handling difficult tasks like photo analysis [14]. Convolutional neural networks, or CNNs, are deep learning architectures that use multiple filters (convolution and sampling) and several layers of neurons (initially two-dimensional images). Top-level neural networks contain high- We presented a width-extended CNN (MCNN) in this work by using an algorithm inspired by [15] called PatchNet to a smaller CNN known as PatchNet. This produces a level and durable representation of the input signal. This is a condensed representation of PatchNet, as seen in Fig. 2.

Two layers at the bottom have kernels and strides that are 5 5 and 2 2 in size.for convolution and pooling, respectively, of 1 and 2 pixels. The pooling procedures sample the maximum values of the input feature maps in order to aid in their interpretation and the drawing of general conclusions. The top of the network also contains a separate, higher-dimensional layer with 2 neurons and an additional layer of 931 neurons with ReLU (Rectified Linear Unit) activations. battling the enemy Here is a description of face recognition procedures. Before an alert can be sent, preprocessing, face detection, and recognition are all necessary actions. An alarm is transmitted to the appropriate authorities if facial recognition decides that a face is present.

Algorithm:

The image database will be used as the system's input in step 1 of the process.

The video input will be inspected by the face detection algorithm in this step.

Step 2: To identify someone or something in an image, use a camera input to search for a face or a number of faces, or check for features like a nose, lips, and so on.

Step 3: The image obtained in this step will be outputted at a specific size after being shrunk in the previous step. When lighting conditions are fixed, images have uneven contrast with higher intensity levels concentrated in specific areas. The Histogram Equalization Approach can level these levels.

Step 4: We advocate using the Eigen face-based approach and the discrete cosine transform method in this stage.Next, we utilise feature extraction to extract some important features from the image, and then we use these features to generate an image feature vector.

Step 5: can start after the retrieved characteristics have been matched with the features that are stored in the datacenter. The code sequence 6 will begin in the event of a match, and in Step 6 an alarm message will be sent to the nearest police station or other interested authorities if a match was found in Step 1.

IV. Results Analysis

We compared the proposed mCNN's performance with two state-of-the-art CNNs—the well-referenced face spoofing detection CNN Fine-Tuned [18] VGG-Face [19] and the recently proposed CNN[20] built on random patches, which has not yet been benchmarked—in order to estimate the computational demand of the proposed mCNN to identify face spoofing.

We offer the multiplication operations required by the chosen CNNs in the forward pass of each face image rather than merely providing the length of time that each of the multiplication operations on the input side of face recognition took (orpatches). The hardware being used has nothing to do with this option. to actively study and experiment with new computing environments, including Python. To categorise face mask data, a machine learning library has been created using Python. One of Jupiter's main functions is to analyse and store databases. Its i3-2.8GHz CPU and 8GB of RAM for notebook installations were used to develop a Python application. To fulfil these requirements, a GPU will be used to quickly manipulate and modify memory in order to quickly change the images in a framebuffer and deliver the desired output for a display device.

V. Conclusion And Future Work

The suggested idea helps in locating people's faces in the datacenter, which can be used to detect criminals. Officials who have access to the Database are given the face data. Additionally, it is possible to store a suspect's face in the database and utilise it in the future for quicker trials to search in public places. The technique may be applied in a special way to find a missing person. By addressing societal imbalance, this strategy can lessen crime and lighten the strain of police officers. When people are obliged to wear masks in public spaces, it is also done on the system in light of the current COVID-19 difficulties. In this promising outcomes were also attained in the area. We aim to examine the CNN's capabilities in several picture domains, such as representation of faces for face spoofing detection in other colour spaces, and to determine the capability of learning local features for face spoofing detection in other colour spaces. The system is now in place and has been thoroughly verified on campus. With cloud architecture, it will be possible to build a large network of this system by linking multiple cameras to it and tracing criminals wherever and whenever.

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