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A Review on Facial Mask Detection

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ABSTRACT:Face Detection has evolved as a very popular problem in Image processing and Computer Vision. Many new algorithms are being devised using convolutional architectures to make the algorithm as accurate as possible. These convolutional architectures have made it possible to extract small details. We aim to design a binary face classifier which can detect any face present in the frame of its alignment. Beginning from the RGB image of any size, the method uses an grayscale image from camera. Training is performed through Fully Convolutional Networks to semantically segment out the faces present in that image. Gradient Descent is used for training while Binomial Cross Entropy is used as a loss function. Further the output image from the FCN is processed to remove the unwanted noise and avoid the false predictions if any and make bounding box around the faces. Face Mask Detection system built with OpenCV, Keras/TensorFlow using Deep Learning and Computer Vision concepts in order to detect face masks in static images as well as in real-time videostreams.

KEYWORDS: Computer Vision, OLED, Convolutional Networks, OpenCv, Deep Learning.

I. INTRODUCTION

IA new strain which has not previously been identified in humans is novel coronavirus (nCoV). Coronaviruses (CoV) are a wide group of viruses which cause illness that range from colds to deadly infections like Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS). The first infected patient of coronavirus has been found in December 2019. From that period, COVID-19 has become a pandemic all over the world. People all over the world are facing challenging situations due to this pandemic. Many precautionary measures have been taken to fight against coronavirus. Among them cleaning hands, maintaining a safe distance, wearing a mask, refraining from touching eyes, nose, and mouth are the main, where wearing a mask is the simplest one. A face mask detection is a technique to find out whether someone is wearing a mask or not. It is similar to detect any object from a scene[1]. Many systems have been introduced for object detection. Deep learning techniques are highly used in medical applications. Recently, deep learning architectures have shown a remarkable role in object detection. These architectures can be incorporated in detecting the mask on a face. Moreover, a smart city means an urban area that consists of many IoT sensors to collect data. These collected data are then used to perform different operations across the city. This includes monitoring traffic, utilities, water supply network, and many more. Recently, the growth of COVID-19 can be reduced by detecting the facial mask in a smart city network. This paper aims at designing a system to find out whether a person is using a mask or not and informing the corresponding authority in a smart city network. Firstly, CCTV cameras are used to capture real-time video footage of different public places in the city. From that video footage, facial images are extracted and these images are used to identify the mask on the face[2]. The learning algorithm Convolutional Neural Network (CNN) is used for feature extraction from the images then these features are learned by multiple hidden layers. Whenever the architecture identifies people without face mask this information is transferred through the city network to the corresponding authority to take necessary actions. The proposed system appraised promising output on data collected from different sources. We also represented a system that can ensure proper enforcement of the law on people who are not following basic health guidelines in this pandemicsituation.

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II. MOTIVATION

The biggest motivation is to apply this application practically to avoid the spread of covid. In the context of transmitted virus between humans by sputtering (spraying), wearing the mask on the face appears necessary to protect people and to limit the propagation of the disease. Currently, we are facing the 2019–2020 coronavirus pandemic. Coronavirus disease 2019 (COVID-19) is an infectious disease with first symptoms similar to the flu. The symptom of COVID-19 was reported first in China and very quickly spreads to the rest of the world. The COVID-19 contagiousness is known to be high by comparison with the flu. In this paper, we propose a design of a mobile application allowing people able to take a picture with a smartphone to verify that his/her protection mask is correctly positioned on his/her face. Such application can be particularly useful for people using face protection mask for the first time and notably for children and old people.

Besides, the detection of mask through camera acquisition systems has also been investigated. In this context, applications are developed for detecting the presence of mask or not for the counting of individual wearing mask towards carrying out crowd statistics and even for facial identification of people wearing mask. Most of research systems in favor of the fight against COVID-19 are focused on people monitoring.

III. METHODOLOGY

The Methodology used to create this module using Machine learning is as follows:

• Training an Machine learning based model to detect and distinguish human faces with and without masks.

• Extracting relevant features from detected portion of face

• Apply the trained model to identify and distinguish faces with and without mask

• Raise an alarm on detection of faces without mask on.

Dataset: The dataset which we have used consists of 1000 pluse total images out of which 1916 are of masked faces and 1000 pluse are of unmasked faces. All the images are actual images extracted from Bing Search API, Kaggle datasets and RMFD dataset. From all the three sources, the proportion of the images is equal. The images cover diverse races i.e Asian. The proportion of masked to unmasked faces determine that the dataset is balanced

IV. SYSTEM ARCHITECTURE

This system represents to reduce the spread of coronavirus by informing the authority about the person who is not wearing a facial mask that is a precautionary measure of COVID-19. The motive of the work comes from the people disobeying the rules that are mandatory to stop the spread of coronavirus. The system contains a face mask detection architecture where a deep learning algorithm is used to detect the mask on the face. To train the model, labelled image data are used where the images were facial images with masks and without a mask. The proposed system detects a face mask with an accuracy of 98.7%. The decision of the classification network is transferred to the corresponding authority. The system proposed in this study will act as a valuable tool to strictly impose the use of a facial mask in public places for allpeople.

V. ADVANTAGES AND DISADVANTAGES

Advantages:

•The system is easy to implement in any existing organizational system.

• Custom alerts can be sent to the person with or without a face mask or the one whose face is unrecognizable in the admin system.

• No need to install any hardware as the system can be connected with your existing surveillance system only. The system can be used easily with any camera or hardware like surveillance cameras.

• The system restricts access for those not wearing the masks and notifies the authorities.

• You can customize the face mask detection system based on your business requirements.

• You can check the analytics based on the system generated reports.

• Easy to access and control the movements from any device through face mask detection applications.

• Partially occluded faces either with mask or hair or hand, can be easily detected

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Disadvantages:

• Sometimes the faces does not match with dataset that included in project and then face recognition may fail sometimes
• Poor Image quality limits facial recognition's Effectiveness
• Different face angle can throw off facial recognition's reliability
• Data processing and storage can limit facial recognition

VI. CONCLUSION

In the proposed face mask detection both the training and development of the image dataset, which was divided into categories of people having masks and people not having masks have been done successfully. The technique of OpenCV neural networks used in this model generated fruitful results. Classification of images was done accurately using the MobilenetV2 image classifier, which is one of the uniqueness of the proposed approach. Many existing researches faced problematic results, while some were able to generate better accuracy with their dataset. The problem of various wrong predictions has been successfully removed from the model as the dataset used was collected from various other sources and images used in the dataset was cleaned manually to increase the accuracy of the results. Admin will get the mail when person who is not wearing a mask has been detected Real-world applications are a much more challenging issue for the upcoming future. The model should hopefully help the concerned authorities in this great pandemic situation which had largely gained roots in most of the world.

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