Realtime Face-Mask Detection

Course : Computer Vision and Pattern Recognition
Section : A
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I. Introduction

Realtime Face Mask Detection is the subject of the project proposal. We present a deep learning and computer vision-based mask face identification algorithm. As an object detection technique, deep learning was applied.

A. Problem Statement

The World Health Organization classified COVID-19 as a pandemic in 2020, mostly because of how quickly and widely the illness was spreading. The world has stopped moving because to Covid-19, and everything has stopped. It has been established that airborne transmission is the main method of disease transmission and is extremely virulent. Consequently, it's getting more and more common to wear a face mask in public. Face mask detection is a challenging method. Therefore, in this project, computer vision techniques were suggested. Face mask detection is a major challenge for security and Covid-19 prevention. The face mask will be difficult to find and automatically detectable.

B. Proposed Model

The suggested methodology enables the identification of persons wearing and not wearing face masks, which is often integrated with security cameras to prevent COVID-19 transmission. The model combines TensorFlow, Keras, and OpenCV with deep learning. CNN is the name of the deep learning model employed in this project. The MobileNetV2 and CNN framework were used in the face detection method as the classifier.

II. Methodology

Incorporating mathematical equations through neurons and connected networks, artificial neural networks mimic the way the human brain operates. The evolution of popular artificial neural networks, or CNN is frequently based on uses with enduring patterns in a range of industries, such as image recognition or pattern recognition. Convolutional Neural Networks (CNN) are a type of structured deep learning that have made significant contributions to a number of applications with a concentration on computer vision and image-based applications. CNN is often utilized in the following areas: face recognition, object identification, picture categorization etc. Figure 1 and 2 display the CNN model's elements. The network's architecture affects how these components are used.

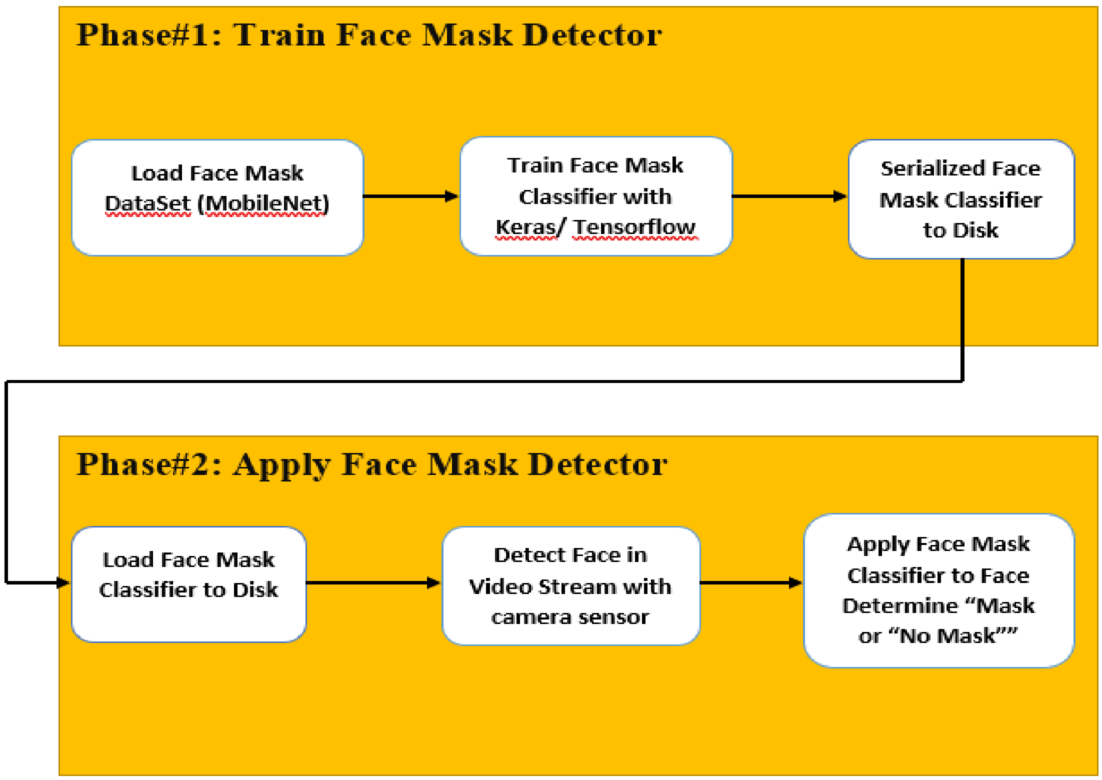

Fig. 1. Flow Chart

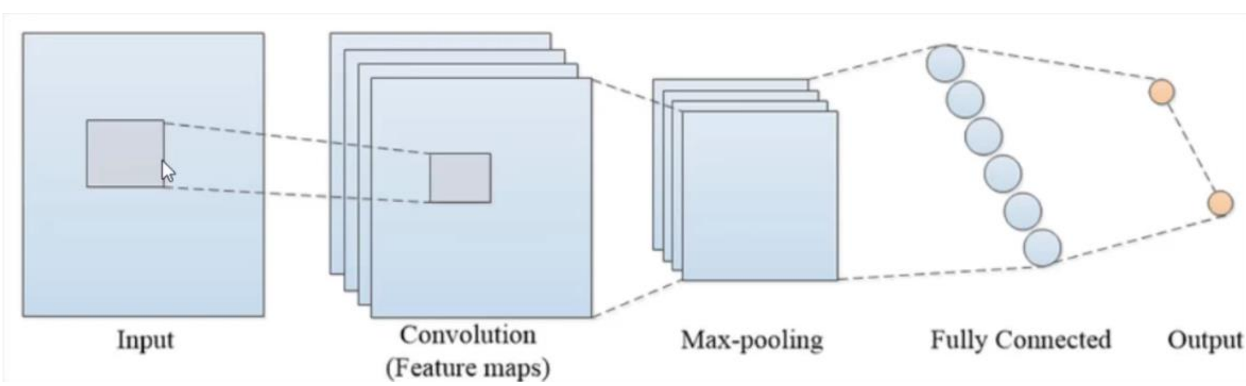

Fig. 2. Classification process using convolutional neural networks.

A. Image Acquisition

The real-time facemask recognition system starts with picture capture. With the use of the MobileNetV2 dataset, high-quality pictures of people wearing and not wearing facemasks may well be found.

B. Compilation of annotated data sets

By correctly assigning distinct classifications to the collected photos, a knowledge-based dataset is produced.

C. Data set construction

In this data set, there are total of 3833 images. 1,915 images are with mask and 1,918 images are without mask. 80% images are used to train the model and 20% are used for testing.

D. Image Preprocessing

To increase the utility of the data during preprocessing, it was stored in a NumPy array. Additionally, an image generator was employed to enhance the photos and lessen the reliance on data.

E. Classification

The last stage is to classify the photographs after which deep learning models are taught to detect and classify the images based on ingrained visual patterns using the labeled images. The input parameters were set equal to 224 according to the input image width and height. The MobileNetV2 model was utilized, together with TensorFlow and OpenCV. The training and test sets were divided to be used 80% for training and 20% for testing, according to the supervised learning model. Accuracy and learning error were used to gauge the model's effectiveness. The batch size during training is set to 32 pictures, the number of epochs is set to 20. By simply using rotation, rescaling, scrolling, and zooming techniques, the data augmentation approach is also used to amplify the amount of image-data. With the horizontal flip, nearest fill mode, 0.15 factor for zoom range, 0.2 width shift range, horizontal and vertical shift factors, and 20 rotation range, it results in a multiplier for each pixel of the picture.

III. Result

99% validation accuracy was attained while the CNN model was being trained. As shown in figs. 3 and 4, which provide the performance test results from visualization through accuracy and loss, this is the recorded rate following multiple trials with batch size set to 32 and 20 iterations for epochs.

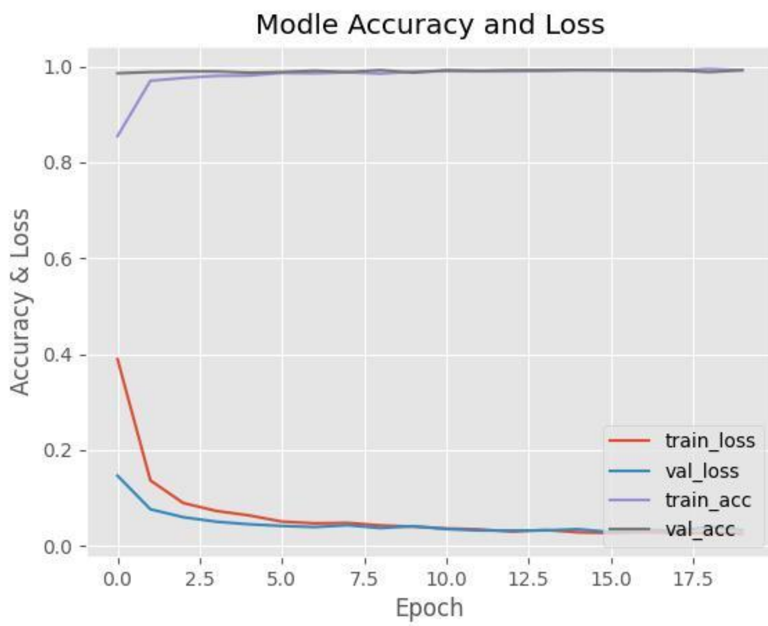

Fig. 3. Accuracy and Loss during model training

	precision	recall	f1-score
with_mask	0.99	0.99	0.99
without_mask	0.99	0.99	0.99
accuracy			0.99
macro avg	0.99	0.99	0.99
weighted avg	0.99	0.99	0.99

Fig. 4. Accuracy result of the trained model.

Figures 4 show the test results on how well the model performed in identifying people wearing or not wearing a face mask. Figure 5 illustration displays the outcome of a person in the image not wearing a facemask being detected with an average 99% rate, whereas Figure 6 accurately depicts a person without wearing a facemask.

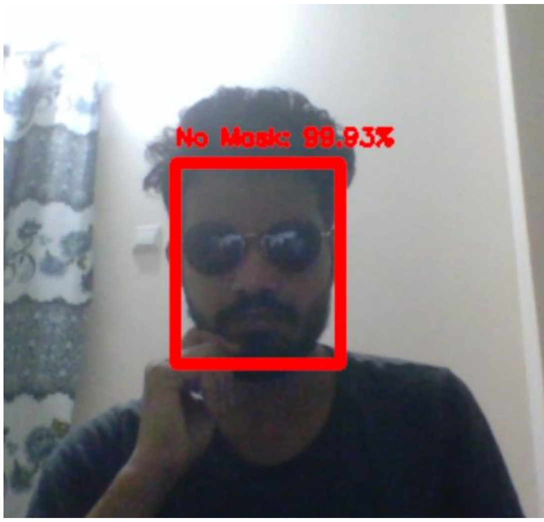

Fig. 5. Testing with No Mask **Fig. 6. Testing with Mask**

IV. Conclusion and Discussion

The project on real-time facemask recognition using deep learning methods via convolutional neural networks was described in this report. This method produces accurate and quick results for facemask detection. The test findings reveal a notable accuracy rate for identifying those wearing facemasks and those who are not. The trained model was able to complete its task using the MobileNetV2 model, attaining an accuracy score of 99%. By identifying whether a person is wearing a facemask or not, the project also offers a valuable tool in the battle against COVID and various disease.

A. Limitation

When someone utilizes their wear to mimic a face mask, it occasionally fails to identify the face mask.

B. Future Development

Future developments include a facemask alarm system that also integrates physical distancing, where a camera detects if someone is wearing a facemask or not while simultaneously measuring the distance between each individual and sounding an alert if the physical distancing is not done correctly and if they are not wear the mask properly.

The initiative ensures accurate and timely facial identification of users who are wearing masks or not. Additionally, the solution is simple to integrate into any system that maintaining the health security. Thus, the face mask detection system will be the leading mobile solution for the majority of industries, particularly those in retail, healthcare and enterprise.

V. Reference

[1] M. Dasgupta, O. Bandyopadhyay and S. Chatterji, Automated helmet detection for multiple motorcycle riders using CNN, IEEE Conf. Inf. Commun. Technol. Allahabad, India, 2019, p. 1–4.

[2] Firas Amer Mohammed Alia, Mohammed S.H. Al-Tamimi, Face mask detection methods and techniques: A review, Int. J. Nonlinear Anal. Appl. 13 (2022) 1, ISSN: 2008-6822, February 2022, p. 3811-3823