



e-ISSN: 2319-8753 | p-ISSN: 2347-6710

IJRSET

International Journal of Innovative Research in
SCIENCE | ENGINEERING | TECHNOLOGY

INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

Volume 11, Issue 5, May 2022

ISSN INTERNATIONAL
STANDARD
SERIAL
NUMBER
INDIA

Impact Factor: 8.118

9940 572 462

6381 907 438

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"Covid - 19 Mask Detection Using CNN Algorithm" to International Journal of Scientific and Research Publications

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ABSTRACT: The World Health Organization claims (WHO), Corona Viruses the COVID-19 pandemic is causing a nationwide crisis, wearing a mask on a face in public places is an effective protection measure. The COVID-19 pandemic forced governments all over the world to implement quarantine measures in order to deter virus spread. Reports suggest that the risk of transmission is clearly minimized by wearing face masks when at work. An effective and economic approach to the use of AI in a manufacturing setting to build a secure environment. Using a face mask detection dataset, we will use Open CV to perform real-time face detection from a live stream from our webcam. Using Keras, Python, Tensorflow and Open CV, and, it will build a COVID-19 face mask detector with computer vision. Using computer vision and CNN, I aim to decide whether or not the person in the image or video streaming is wear a mask.

I. INTRODUCTION

- presented that coronavirus disease 2019 (COVID-19) has globally infected over 2.7 million people and caused over 180,000 deaths. In addition, there are several similar large scale serious respiratory diseases, such as severe acute respiratory syndrome (SARS) and the Middle East respiratory syndrome (MERS), which occurred in the past few years Liu et al.
- reported that the reproductive number of COVID-19 is higher compared to the SARS. Therefore, more and more people are concerned about their health, and public health is considered as the top priority for governments.
- Fortunately, Leung et al. showed that the surgical face masks could cut the spread of coronavirus. At the moment, WHO recommends that people should wear face masks if they have respiratory symptoms, or they are taking care of the people with symptoms
- Furthermore, many public service providers require customers to use the service only if they wear masks. Therefore, face mask detection has become a crucial computer vision task to help the global society, but research related to face mask detection is limited.

II. LITERATURE SURVEY

Wenxuan Han:

Object detection, which aims to automatically mark the coordinates of objects of interest in pictures or videos, is an extension of image classification. In recent years, it has been widely used in intelligent traffic management, intelligent monitoring systems, military object detection, and surgical instrument positioning in medical navigation surgery, etc. COVID-19, a novel corona virus outbreak at the end of 2019, poses a serious threat to public health. Many countries require every-one to wear a mask in public to prevent the spread of corona virus. To effectively prevent the spread of the corona virus, we present an object detection method based on single-shot detector (SSD), which focuses on accurate and real-time face masks detection in the supermarket. We make contributions in the following three aspects: 1) presenting a lightweight backbone network for feature extraction, which based on SSD and spatial separable convolution, aiming to improve the detection speed and meet the requirements of real-time detection; 2) proposing a Feature Enhancement Module (FEM) to strengthen the deep features learned from CNN models, aiming to enhance the feature representation of the small objects; 3) constructing COVID- 19- Mask, a large-scale dataset to detect whether shoppers are wearing masks, by collecting images in two supermarkets. The experiment results illustrate the high detection precision and real time performance of the proposed algorithm.

:Ioan Buciu,” The paper deals with mask detection in the age of COVID - 19, by proposing a simple and efficient method to detect people not wearing mask. The approach includes a feature extraction step followed by a supervised learning model built with support vector machines. The features are formed of color information by considering red, green and blue channels for an RGB color image. Ratio of color channels is taken into account to discriminate between mask and non mask images. The approach has been tested on a set of 1211 facial images extracted from group of people wearing or not wearing a mask, by considering a 2 - class problem, where the mask class represents the positive examples, where the non-masked faces are negative examples. Part of the image data set is used to train the support vector machines for learning discriminant features for each class, followed by a prediction for each test sample. The image set for the mask class ranges from simple and common one-colored surgical masks to complex and challenging patterned masks. Cross- validation approach is adopted to test the approach, leading to 97.25 as recognition rate.

Si-Qi Liu, Xiangyuan Lan , and Pong C. Yuen , Senior Member, IEEE **Abstract:** With the advancement of 3D printing technologies, 3D mask presentation attack becomes a critical challenge in face recognition. To tackle the 3D mask presentation attack detection (PAD), remote Photoplethysmography (rPPG) is employed as an intrinsic detection cue which is independent of the mask material and appearance quality. Although the effectiveness of existing rPPG-based methods has been verified, they may not be robust enough when rPPG signals are contaminated by noise. To identify the heartbeat information from the noisy raw rPPG signals, we propose a new 3D mask PAD feature, multi-channel rPPG correspondence feature (MCCFrPPG) with the global noise-aware template learning and verification framework. To further boost the discriminability, temporal variation of the rPPG signal is considered and extracted through the multi-channel time-frequency analysis scheme. This paper also extends HKBU-MARs V2 dataset with more customized high-quality masks and increases the number of videos by two times. Comprehensive experiments were performed on existing 3D mask datasets and the extended HKBU-MARs V2+, which totally covers 3 types of masks, 12 different light settings and 6 cameras. The results not only justify the effectiveness and robustness of the proposed MCCFrPPG on 3D mask attacks but also indicate its potential on handling the replay attack with camera motion and dim light.

I.G. Kazantsev¹ , B.O. Mukhametzhanova^{2*}, Suvorovsky O. Yu³, “Corner Detection Based on Scalable Masks “[4] Scalable masks for the selection of angular structures in two-dimensional (2D) digital images are considered. The mask is a 2D window sliding over the image and convolved with image fragments. We propose the model of a scalable 2D mask based on expanding smaller mask along its sides and edges. In this case, the submatrices remain unchanged, and the generation of new elements consists in repeating the elements of the submatrix, preserving the structure of the corner. Numerical experiments with test images are performed.

Si-Qi Liu , Xiangyuan Lan , and Pong C. Yuen , Senior Member, IEEE, “Multi-Channel Remote Photoplethysmography Correspondence Feature for 3D Mask Face Presentation Attack Detection” [5] With the advancement of 3D printing technologies, 3D mask presentation attack becomes a critical challenge in face recognition. To tackle the 3D mask presentation attack detection (PAD), remote Photoplethysmography (rPPG) is employed as an intrinsic detection cue which is independent of the mask material and appearance quality. Although the effectiveness of existing rPPG-based methods has been verified, they may not be robust enough when rPPG signals are contaminated by noise. To identify the heartbeat information from the noisy raw rPPG signals, we propose a new 3D mask PAD feature, multi-channel rPPG correspondence feature (MCCFrPPG) with the global noise-aware template learning and verification framework. To further boost the discriminability, temporal variation of the rPPG signal is considered and extracted through the multi-channel time-frequency analysis scheme. This paper also extends HKBU-MARs V2 dataset with more customized high-quality masks and increases the number of videos by two times. Comprehensive experiments were performed on existing 3D mask datasets and the extended HKBU-MARs V2+, which totally covers 3 types of masks, 12 different light settings and 6 cameras. The results not only justify the effectiveness and robustness of the proposed MCCFrPPG on 3D mask attacks but also indicate its potential on handling the replay attack with camera motion and dim light.

Sohee Park, Geonwoo Kim,” Block-based masking region relocation and detection method for image privacy masking “[6] The widespread use of CCTV and various image devices has become a primary cause of privacy invasion, because these are possible to record, share and leak privacy images without owners’ consent. The image privacy masking is one of technology for privacy prevention, and its necessity has been increased owing to need of personal information protection and social safety in these days [1]. In this paper, we propose a block based masking region relocation and detection method to overcome the shortage of the meta-data typed privacy region information sharing method of restorable image masking service. This method is based on the histogram difference between the original image and the

masked image. It analyzes the histogram feature of images, and relocates the masking region information from the coordinate system to the block system. Therefore, it set and detect the masking region without additional information such as meta-data and the original image. For demonstration the feasibility of our approach, we used the real-world database and the experimental results show the applicability of the real privacy masking service.

Feiyang Son,” Multisize plate detection algorithm based on improved Mask RC “[7] The sorting of plates is an indispensable part of the plate processing production line. In order to achieve plate detection in complex detection scenarios, a multisize plate detection algorithm based on improved Mask RCNN is proposed. The model fusion method is used to introduce the Dense Net network structure to optimize the feature transfer path to make feature extraction more efficient. At the same time, the boundary distance constraint is added to the segmentation loss function, which makes the model more precise for the target with high stacking complexity and fuzzy boundary information. The experimental results show that the improved Mask RCNN performance is significantly improved, compared with other models, it achieves an optimization effect with an average accuracy of more than 98percent ages

III. PROPOSED SYSTEM

To detect face mask, we present a deep neural network technique. We Use the CNN algorithm for training and testing. We provide security through our application. Our work aims the develop technique that can accurately detect mask over the face in public areas.

SYSTEM ARCHITECTURE

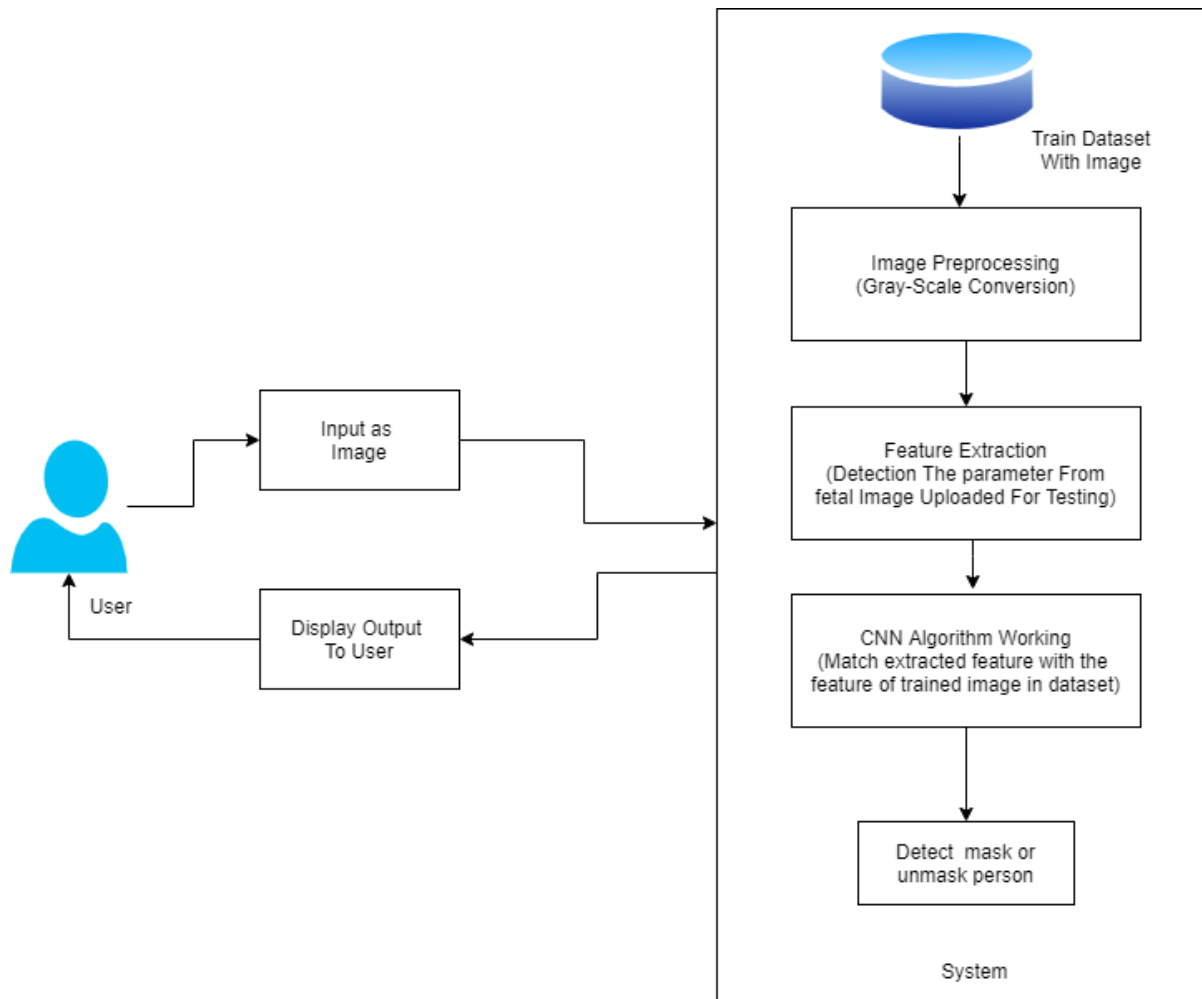


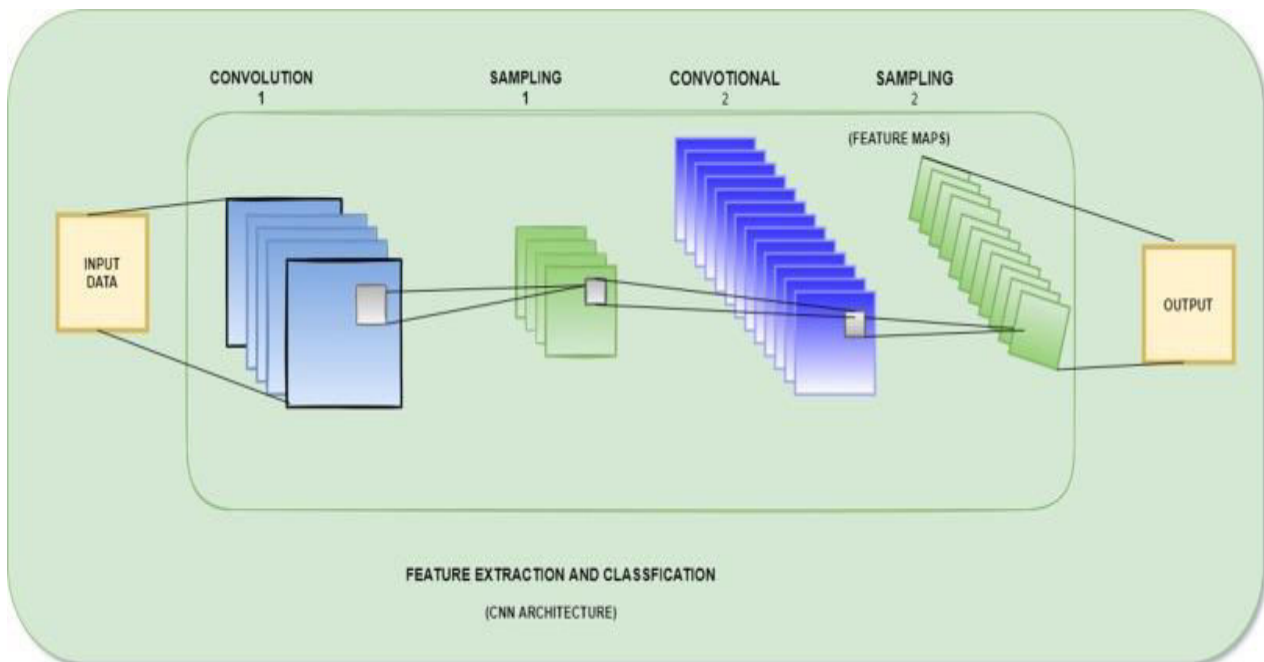
Fig. System Architecture

IV. ALGORITHM

CNN stands for Convolutional Neural Networks, which are specialized for image and video recognition applications. Image recognition, object detection, and segmentation are among of the most common image analysis tasks that CNN is employed for.

Convolutional Neural Networks have four different sorts of layers:

- 1) Convolutional Layer: Each input neuron in a conventional neural network is linked to the next hidden layer. Only a small portion of the input layer neurons connect to the hidden layer neurons in CNN.
- 2) Pooling Layer: The pooling layer is used to minimize the feature map's dimensionality. Inside the CNN's hidden layer, there will be several activation and pooling layers.
- 3) Flatten: Flattening is the process of transforming data into a one-dimensional array for use in the next layer. To construct a single lengthy feature vector, we flatten the output of the convolutional layers.
- 4) Fully Connected Layers: Fully Connected Layers are the network's final layers. The output from the final Pooling or Convolutional Layer, which is flattened and then fed into the fully connected layer, is the input to the fully connected layer.



Methodology

We used python script, tensor flow, and CNN as deep learning architecture to develop an efficient network for recognising facemasks. Our objective is to train a specialised CNN model to detect whether or not someone is wearing a mask. This project can instantly recognise the faces of the mask from any angle. It generates output from an RGB input image of any orientation. The primary responsibility of this function is to extract characteristics from photographs and predict which class they belong to. The feature extraction approach sketches the image and transforms it into a new image, which is more efficient than the previous image. The dimensionality of photographs is reduced to an efficient representation in this section. In our recommended concept, the camera might be utilised to recognise the mask face. To begin, resize the input image to 100*100 then extract and forecast features. We are provided some model data with their accuracy level when the training phase is done.

The implementation of the project is carried out in python notebook. Libraries like pandas, NumPy, matplotlib, sklearn, etc. are used. To train the CNN model ([Fig. 2](#)) and to run the python code for the project the following libraries with the given or higher version is required:

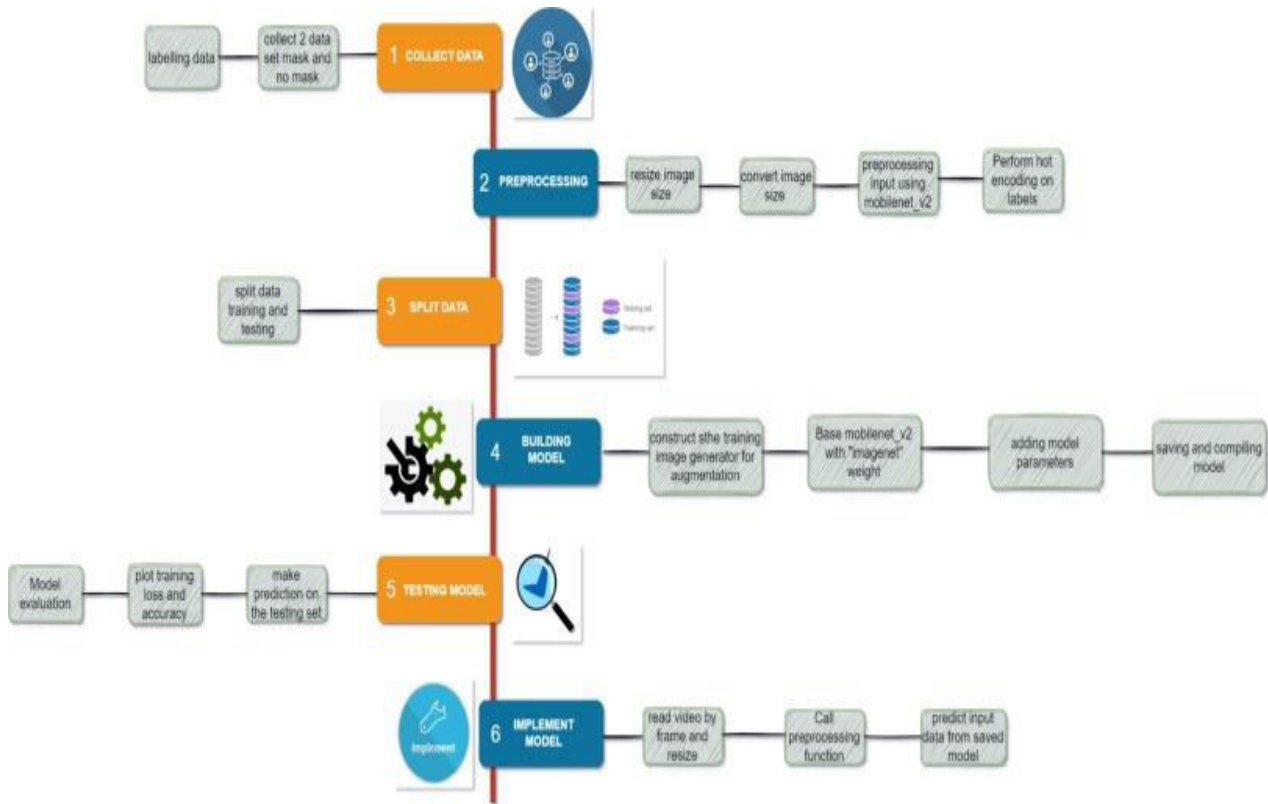
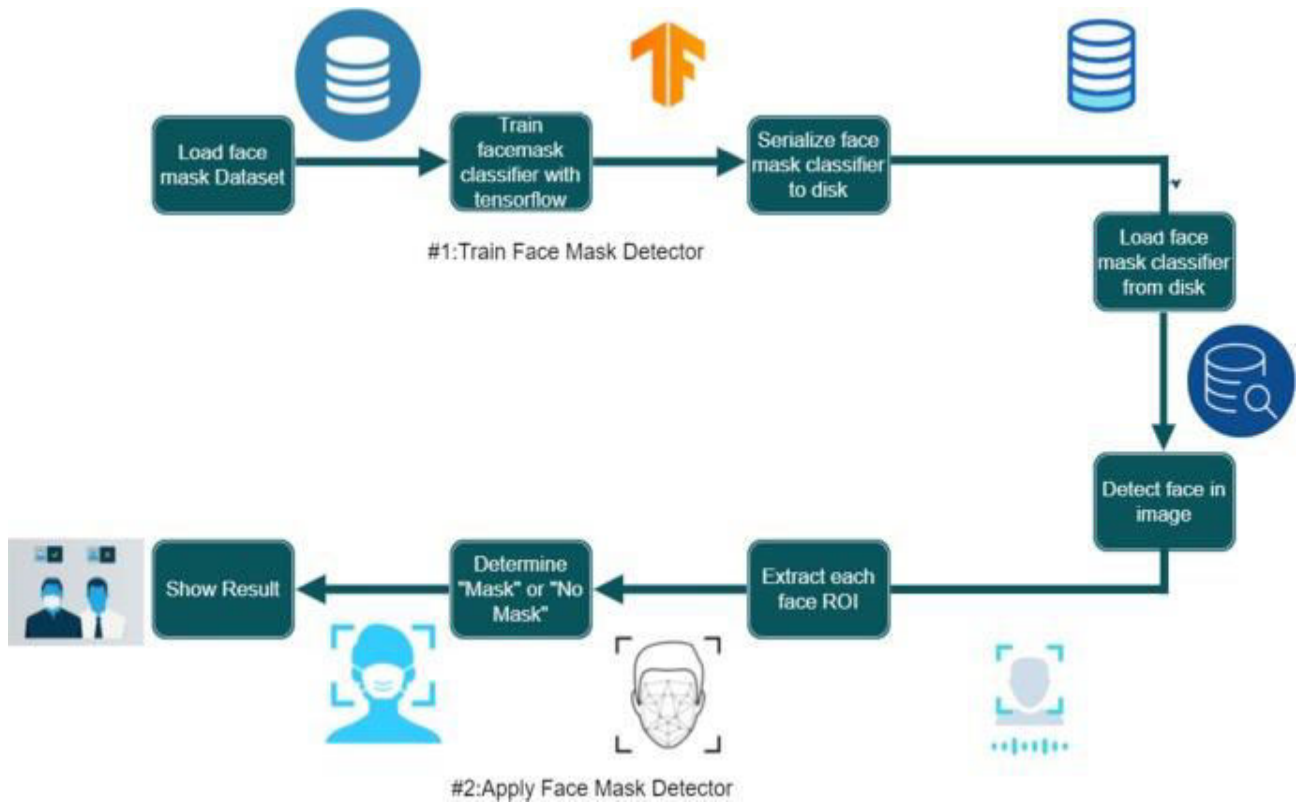


Fig. 2. Steps in building the CNN model.

TensorFlow 1.15.2, Keras 2.3.1, NumPy 1.18.2, Matplotlib 3.2.1, SciPy 1.4.1, Imutils 0.5.3, OpenCV-python 4.2.0.*
 To train the face mask detector, we have to divide our project into two stages:
 Training: We will collect our facial mask detection record of a hard drive to form a model (with keras / tensorflow) and finally serialize the facial mask detector on the disk.
 Deployment: After the face mask detector has been trained, we charge the mask detector, perform face recognition, and then decide whether each face is equipped with or without a mask. Also, it will require a webcam.
 The above two phases have their own sub-steps which is show in Fig.



V. CONCLUSION

Measures must be taken to control the spread of the COVID19 pandemic. This face mask recognition system is a very good and efficient way to do so. The system will separate the people from the crowd who are not wearing mask. The identification of people, violating the COVID norms increases the adaptability of the face mask detection system for the public sake. If applied in a correct way, the face mask detection system could be used to make sure our safety and for others too. This approach gives not only helps in achieving high precision but also enhance the face detection tempo considerably. The system can be applied in many areas like metro stations, markets, schools, railway stations and many other crowded places to monitor the crowd and to ensure that everyone is wearing mask. Finally, this work can be used for future researchers and enthusiasts. Firstly, this model can be used in any high-definition camcorders, this will make sure that this model is not limited to only face mask detection system. Secondly, this can be used for biometric scans with a mask on the face.

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Impact Factor: 8.118



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