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Face Mask Detection with Body Temperature Monitoring Using IoT

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Abstract - Recent years have seen a rise in the prevalence of the large family of viruses known as coronavirus common, communicable, and harmful to all human beings. It travels from person to person by exhaling the infectious breath, which leaves virus droplets on various surfaces, which are subsequently inhaled by other people, who then contract the infection. Therefore, it has become crucial that we safeguard both ourselves and those who are close to us from this circumstance. We may take safeguards like maintaining social distance, washing our hands every two hours, using hand sanitizer, and most importantly wearing a mask.
For offices or any other setting where there are lots of people working, this paper suggests a method to determine if a face mask is used or not. For face mask detection used Convolutional neural network model used here is the MobileNetV2 architecture. MobileNetV2 model is a network model using depth wise separable convolution as its basic unit the model is evaluated with live video streaming with good accuracy after being trained on a real-world dataset.

***Key Words*:** Face Mask Detection, Convolutional Neural Network, MobileNetV2, Corona virus Precaution

1. INTRODUCTION

Face masks are frequently used in public in China and other countries since the latest coronavirus disease pandemic started. As a result of recent. According to the Health Centre's advisory, research suggest that a sizable fraction of people with coronavirus are asymptomatic (or asymptomatic), and that even those who later develop symptoms (or pre-symptomatic) can spread the virus to others before developing symptoms. The recent information also gives trace of a new strain of corona virus, the mutant corona virus which, in which the virus has changed its structure and become mutant. The new strain is not even able to detect using the RT-PCR test we use now. So, it is inevitable for the people of an overpopulated country like India to wear masks and let the work go on. Nobody can keep an eye on every person coming in the work space is wearing a mask or not. So, the need of Face mask detection arose. The model in this paper uses the Convolutional Neural Network. It is a deep neural network model used for analyzing any visual imagery. It takes the image data as input, captures all the data, and send to the layers of neurons. It has a fully connected layer, which processes the final output that represents the prediction about the image. The Convolutional neural network model used here is the MobileNetV2 architecture. MobileNet model is a network model using depth wise separable convolution as its basic unit. Its depth wise separable convolution has two layers: depth wise convolution and point convolution.

As a result, detecting face masks is a difficult process. Because of the expansion of the corona virus sickness, it has gotten a lot of attention lately since numerous countries have adopted policies such as "No admission without a mask." Face mask detection is a critical issue in security and the prevention of Covid-19. In the medical industry, a mask minimizes the danger of infection from an infected individual, whether or not they show symptoms. Face mask detection is employed in a variety of settings, including airports, hospitals, offices, and educational institutions. Face recognition with no a mask is simpler, but faces recognition with just a mask is more difficult since masked face feature extraction is more difficult than conventional face feature extraction. Many facial characteristics, such as the nose, lips, and chin, are missing from the covered face.

2. RELATED WORK

In face detection method, a face is detected from an image that has several attributes in it. According to, research into face detection requires expression recognition, face tracking, and pose estimation. Given a solitary image, the challenge is to identify the face from the picture. Face detection is a difficult errand because the faces change in size, shape, colour, and they are not immutable. The pre-configured MobileNet builds a multi-dimensional component map from a shading image. The element map is converted into a 64-highlight element vector via the suggested model's use of a global pooling block. Finally, using the 64 highlights, the SoftMax layer executes paired order. We tested our suggested model using two freely available datasets. On DS1 and DS2 independently, our suggested model achieved 99% and 100% exactness. With the help of the suggested model's global pooling block, overfitting is avoided. Additionally, the suggested model outperforms previous models in terms of both the number of boundaries and preparation time. However, this model is unable to identify face masks for numerous faces at once.

3. PROPOSED SYSTEM

TensorFlow, OpenCV, PyQt5 are three Python libraries that were used to construct and model the model presented here. The MobileNetV2 of a convolutional neural network is the model that we employed. Transfer learning is a technique for using MobileNetV2. Transfer learning involves using a previously trained model to train your current model and obtain the forecast, saving time and simplifying the process of training various models. Using the hyperparameters learning rate, epochs, and batch size, we fine-tune the model. The model is trained with a dataset of images with two class, with mask and without mask.

The dataset has 993 images of with mask class and 1918 images of without mask class. Using the aforementioned libraries, we created a model for the paper. The results of our testing of the model under various circumstances and with various hyperparameters are discussed in the next section. The model is first fed the dataset, and the training procedure is then performed to train the model using the supplied dataset. Then we execute the detection software, which activates the video stream and uses object detection to continually capture the frames from the video stream using an anchor box. This is sent via the layers of the MobileNetV2 model, which categorises the image as having a mask or not. If the person is wearing a mask, a green anchor box is displayed and red if not wearing a mask with the accuracy for the same tagged on the anchor box.

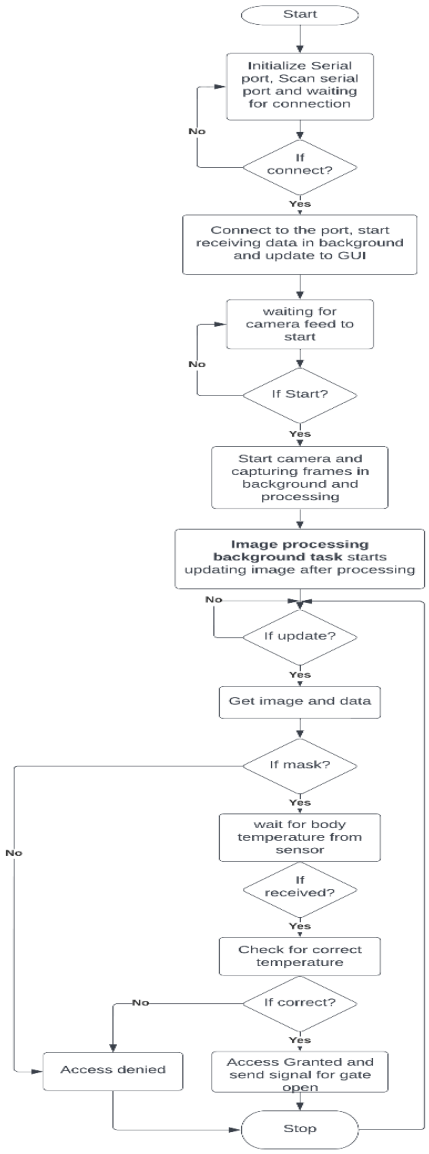

Fig -1: Flow Chart of Face Mask Detection

The face mask recognition system uses AI to determine if a person is wearing a mask or not. Any established surveillance system at your location can be connected to it. The

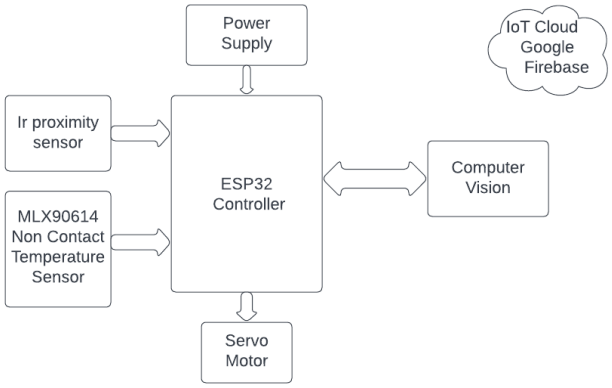

Fig -2: Block Diagram of Face Mask Detection

The person's identification can be verified by administrators or the police by running a system check on them. If a person enters the building without a face mask, the system alerts the authorized person. Depending on the digital capabilities, a person wearing a face mask can be accurately detected 95–97% of the time. To enable reports whenever you want, the data has been automatically transferred and saved in the system.

4. INCORPORATED PACKAGES

A. TensorFlow

TensorFlow, an interface for expressing machine learning algorithms, is utilized for implementing ML systems into fabrication over a bunch of areas of computer science, including sentiment analysis, voice recognition, geographic information extraction, computer vision, text summarization, information retrieval, computational drug discovery and flaw detection to pursue research. In the proposed model, the whole Sequential CNN architecture (consists of several layers) uses TensorFlow at backend. It is also used to reshape the data (image) in the data processing.

B. OpenCV

OpenCV (Open-Source Computer Vision Library), an open-source computer vision and ML software library, is utilized to differentiate and recognize faces, recognize objects, group movements in recordings, trace progressive modules, follow eye gesture, track camera actions, expel red eyes from pictures taken utilizing flash, find comparative pictures from an image database, perceive landscape and set up markers to overlay it with increased reality and so forth [20]. The proposed method makes use of these features of OpenCV in resizing and color conversion of data images.

C. Convolutional Neural Network

Convolutional Neural Networks (CNNs) are a type of deep neural network motivated by bio- logical phenomena. A CNN is composed of several components, including one with convolutional layer, pooling layer, as well as then fully connected layer, and it learns the spatial patterns of data autonomously and fluidly using the backpropagation method. The CNN kernels are common across entire image positions, making it incredibly parameter-efficient. The CNN is a

strong option for computer vision problems because of these properties. Because of major advancements in GPU computer capability, deep learning technologies have blossomed in recent years. Throughout computer vision, object recognition seems to be a critical task that has attracted a lot of attention. According to the recommended recommendations and tactics for improvement, figure 2 shows us the current object detection methods.

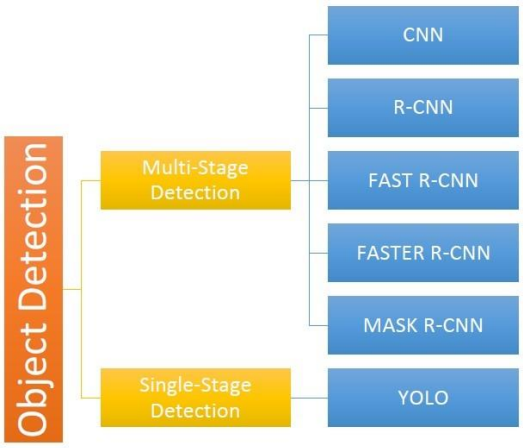

Fig -2: Object Detection Model

D. MobileNetV2

The MobileNetV2 architecture is based on an inverted residual structure where the input and output of the residual block are thin bottleneck layers opposite to traditional residual models which use expanded representations in the input an MobileNetV2 uses lightweight depth wise convolutions to filter features in the intermediate expansion layer. Additionally, we find that it is important to remove non-linearities in the narrow layers in order to maintain representational power. We demonstrate that this improves performance and provide an intuition that led to this design. Finally, our approach allows decoupling of the input/output domains from the expressiveness of the transformation, which provides a convenient framework for further analysis. We measure our performance on ImageNet classification, COCO object detection, VOC image segmentation. We evaluate the trade-offs between accuracy, and number of operations measured by multiply-adds (MAdd), as well as the number of parameters.

5. RESULT

The COVID19 pandemic is challenging to control, the mask plays a vital role in controlling the transmission. A system which detects mask automatically also measure body temperature that will help in reducing the manual labour. Also help slow the spread of the corona virus. As protective masks are said to lower the chances of coronavirus entering our respiratory system through droplets that are present in the air.

6. CONCLUSIONS

There should be action made to slow the COVID-19 pandemic's spread. Using Convolutional Neural Networks and motion learning strategies in neural networks, we have produced a facemask detector. The model was induced on pictures and live video transfers. To choose a base model, we assessed the measurements like precision, accuracy, and recall and chose MobileNetV2 architecture. This face mask detector can be placed at a variety of locations, including shopping malls, airports, and other high-traffic areas, to screen individuals in general and prevent the spread of the infection by determining who is adhering to the law and who isn't..

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