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REAL TIME FACE MASK DETECTION USING MOBILENET V2

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Abstract

Covid-19 has made us appreciate the need of Face Masks in the present pandemic, and we need to comprehend the critical consequences of not wearing one now more than ever. At the moment, there are no face mask detectors in use in populated areas. However, we feel that at transportation intersections, densely populated residential areas, markets, and educational institutions and healthcare areas, it is now very important to set up face mask detectors to ensure the safety of the public. In this paper, we attempted to construct a two-phased face mask detector that would be simple to install at the aforementioned locations. It is now possible to detect and apply this on a wide scale using Computer Vision. For the implementation of our model, we employed the MobileNet V2 architecture. The implementation is done in Python, and the python script implementation will train our face mask detector on our selected dataset using TensorFlow and Keras. We included more robust features and trained our model on multiple variations, ensuring that the dataset was large, varied, and enhanced such that the model could clearly identify and detect face masks in real-time recordings. The trained model was tested on both real-time videos and static pictures and in both the cases the accuracy was more than the other designed models.

Keywords:
MobileNet V2, VGG 16, ADAS,TensorFlow and Keras

INTRODUCTION

Due of the worldwide COVID-19 corona virus outbreak, the wearing of face masks in public is becoming more popular. People used to wear masks to protect their health from air pollution before Covid-19. Other others suppress their emotions in public to hide their faces because they are self- conscious about their appearance. More than five million cases were infected by COVID- 19 in less than 6 months across 188 countries. The virus spreads through close contact and in crowded and overcrowded areas.

Many countries have regulations requiring people to wear face masks in public. These guidelines and laws were created in response to the rapid increase in cases and deaths in several places. In public spaces, however, monitoring big gatherings of individuals is getting more challenging. As a result, we'll automate the face detection procedure.

Here we introduce a facemask detection model that is based on computer vision and deep learning. The proposed model can be integrated with Surveillance Cameras to impede the COVID-19 transmission by allowing the detection of people who are wearing masks not wearing face masks. The model is integration between deep learning and classical machine learning techniques with Open cv, Tensor flow and Keras. We will achieve the highest accuracy and consume the least time in the process of training and detection.

Most of the Face Mask Detection models have used various algorithms like Single Shot Detector, VGG16, Yolo, Haar Cascade Classifier etc. For every algorithm they use, the only thing that varies is the algorithm where as the remaining procedure is pretty much the same. Only thing is that we have to select the algorithm based on the requirements and amount of data to process.

In this paper, we have used proposed MobileNet V2 algorithm which is faster and requires less computation power. MobileNet uses depthwise separable convolution MobileNets, a class of light weight deep convolutional neural networks that are vastly smaller in size and faster in performance than many other popular models. It significantly reduces the number of parameters when compared to the network with regular convolutions with the same depth in the nets. This results in lightweight deep neural networks.

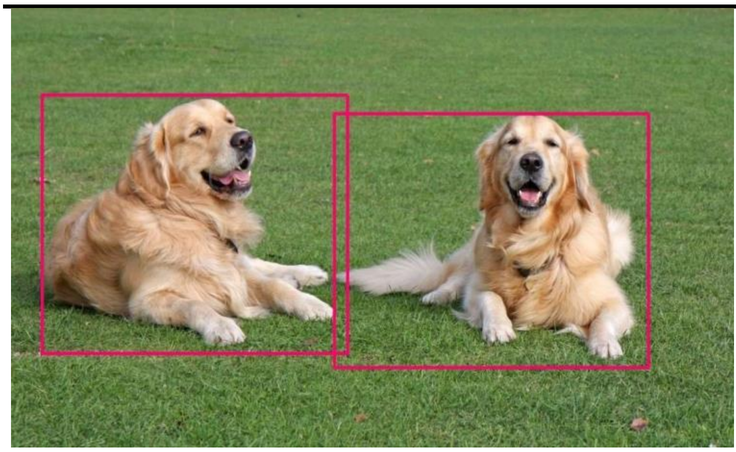
What is Object Detection?

Object detection is a computer vision approach for detecting things in pictures and movies. To achieve relevant results, object detection algorithms generally use machine learning or deep learning. We can detect and find items of interest in pictures or video in a few of seconds when we gaze at them.

Object detection is a fundamental component of advanced driver assistance systems (ADAS), which allows automobiles to identify driving lanes and pedestrians to improve road safety. Object detection is also useful in video surveillance and picture retrieval applications.

We need to identify and categorise numerous items at the same time while we iterate through the issue of localisation and classification. The issue of identifying and categorising a variable number of items on a picture is known as object detection. The key distinction is the word "variable." Unlike other tasks, such as classification, the outcome of object detection is variable in length.

Object identification methods are classified as either neural network-based or non-neural techniques. Non-neural techniques require first defining features using one of the methods below, followed by classification using a technique such as support vector machine (SVM).



Introduction to Deep learning

Deep learning is a kind of machine learning. It teaches a computer to learn how to anticipate and categorise information by filtering inputs through layers. Images, writing, and music can all be used to express observations.

The way the human brain filters information is the source of inspiration for deep learning. Its goal is to produce some actual magic by simulating how the human brain functions.

There are approximately 100 billion neurons in the human brain. Each neuron is connected to around 100,000 other neurons. We're re-creating it, but in a way and at a level that machines can understand. A neuron has a body, dendrites, and an axon in our brains.

The signal from one neuron travels down the axon and transfers to the dendrites of the next neuron. That connection where the signal passes is called a synapse. Neurons by themselves are kind of useless. But when you have lots of them, they work together to create some serious magic.

A deep learning method is based on this concept! You collect data from observations and combine it into a single layer. That layer produces an output, which becomes the input for the following layer, and so on.

This continues till you reach your ultimate output signal! The neuron (node) receives one or more signals (input values) that pass through it. The output signal is sent by that neuron.

Consider the input layer to be your senses: what you see, smell, and feel, for instance. For a single observation, they are independent variables. This data is broken down into integers and binary bits that a computer can understand. To get these variables into the same range, you'll need to either standardise or normalise them.

For feature extraction and transformation, they employ many layers of nonlinear processing units. The output of the previous layer is used as the input for the next layer. What they learn is organised into a hierarchy of ideas. Each level of the hierarchy learns to convert its incoming data into a more abstract and composite representation.

That means that for an image, for example, the input might be a matrix of pixels. The first layer might encode the edges and compose the pixels. The next layer might compose an arrangement of edges. The next layer might encode a nose and eyes. The next layer might recognize that the image contains a face, and so on.

Deep learning approach for object detection

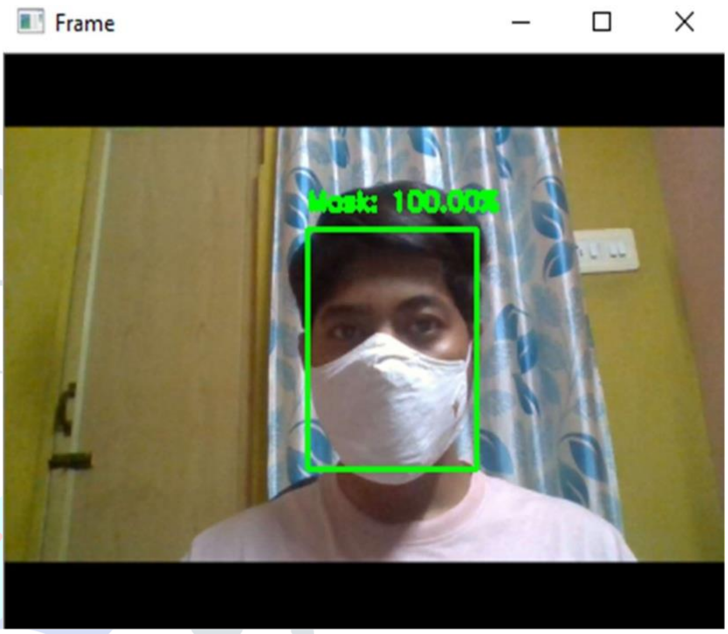
It's no secret that deep learning has revolutionised machine learning, particularly in computer vision. Deep learning models have beaten out other traditional methods in picture classification, and deep learning models are currently the gold standard in object detection as well.

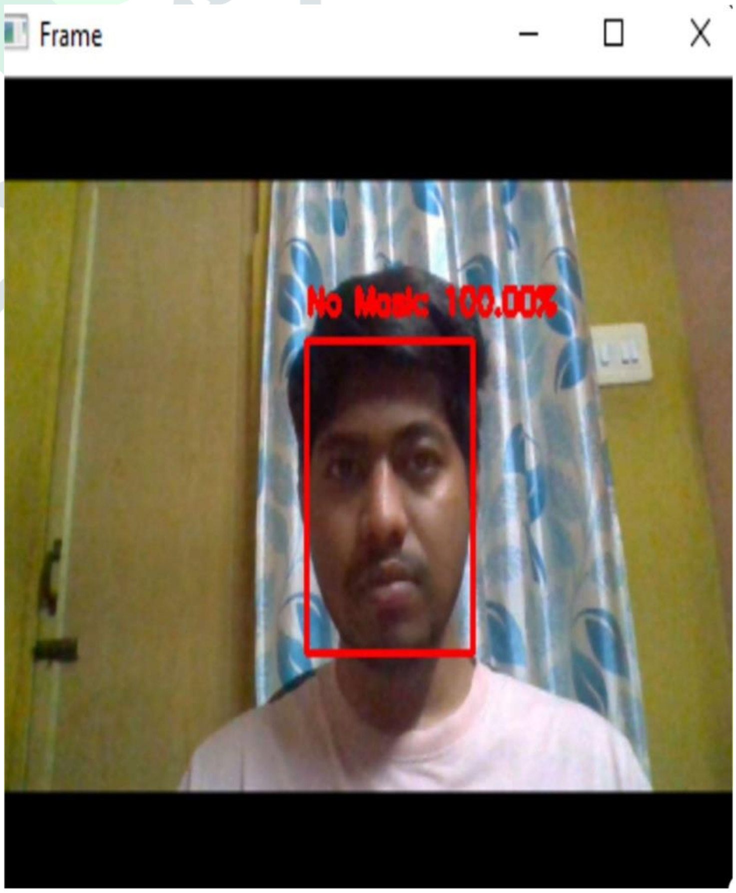
Now that you've gotten a clearer sense of what the issues are and how to address them.

Object detection technology evolved in the early 2000s, as did the detectors at the time. They used low-level and mid-level vision, as well as the 'recognition-by-components' approach. Object detection technology, as well as detectors at the time, advanced in the early 2000s. They employed low- and mid-level vision, as well as the "recognition-by-components" strategy.

With Mask

Without Mask





CONCLUSION

By the development of face mask detection we can detect if the person is wearing a face mask and allow their entry would be of great help to the society. The accuracy of the model will be achieved and the optimization of the model is a continuous process and so we are building a highly accurate solution. We can prevent peoples from Virus Transmission through this System.

FUTURE ENHANCEMETS

Bias evaluation and risk analysis are two areas where further research is needed in the long run. After those are handled, the next step would most likely be to deploy and monitor in the real world. Despite the fact that our dataset includes people of all ages, genders, races, backgrounds, and other demographics, the models are not evaluated in terms of social equality. Even if models achieve high accuracy, it's likely that they unfairly target some populations. As a result, it would be necessary to do some sort of testing to see how the model works in different groups. This would almost certainly necessitate the photos being labelled with demographic data, which may be a time-consuming procedure. Yet, this can help avoid inequalities resulting from a real-world deployment.

Furthermore, a risk assessment is essential prior to a real-world implementation. Can firms or governments utilise these techniques to determine private information? Is it possible to employ face mask detection in ways that are harmful to individuals and society? What are the advantages and disadvantages of utilising this technology?

Some of them aren't directly related to deep learning models, but they do affect the pipeline. The feeds and data security, for example, is crucial. Even if the model can't do much more than forecast whether a mask is worn correctly, bad actors may be able to break into the model pipeline and collect film or even predictions to determine whether or not people are masking. Someone could even break in and deceive the networks into sending out notifications that no one is disguising when this is not the case. This could deplete public resources devoted to public safety, potentially exposing the public to new hazards. This pipeline's security will be crucial.

Finally, the model would be deployed in the actual world after both social and technical problems had been resolved. After deciding on a deployment plan, deploying the model to the actual world and applying some type of continuous or human-in-the-loop learning could ensure that the model performs well enough to help boost accurate mask wear and prevent pandemics. Finding ways to include real- world data into the training data and, as a result, the performing models would grow in size, allowing researchers and engineers to use this data to improve face mask detection models over time.

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