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FACE MASK DETECTION SYSTEM USING AI

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Abstract :- In current pandemic, Covid-19 has created United States understand the importance of Face Masks and that we ought to perceive the crucial effects of not carrying one, currently over ever. Right now, there aren't any mask detectors put in at the jammed places, however we tend to believe that it's of utmost importance that at transportation junctions, densely inhabited residential district, markets, academic establishments and care areas, it's currently vital to line up mask detectors to make sure the security of the general public. during this paper we've tried to make a 2 phased mask detector which can be simple to deploy at the mentioned shops. With the assistance of pc Vision, it's currently attainable to sight and implement this on massive scale. we've used CNN for the implementation of our model. The implementation is completed in Python, and also the python script implementation can train our mask detector on our selected dataset victimization TensorFlow and Keras. we've side additional sturdy options and trained our model on numerous variations, we tend to created bound to have massive varied and increased dataset so the model is in a position to obviously, determine and detection the face masks in real time videos. The trained model was tested on each time period videos and static footage and in each the cases the accuracy was over the opposite designed models.

1) Introduction :-

In the last few years, we have seen Science and Technology advancing so much that now we are at a stage where, we know that with the right knowledge of the technology, the humans can achieve things that seemed nearly impossible just a few decades ago. Now, we have the advancing technologies and knowledge of Machine Learning and Artificial Intelligence, which has been proven to ease our lives from the micro levels to big impossible tasks. In the last few years, there has been a rise in the onset of algorithms that have been proven to be the solution to our complex, life threatening problems. One such field is the image and object detection, which has helped us find and spot people and things with just one click. Computer Vision plays a crucial role in our lives now. Who would have thought that while sitting in one city you can easily spot the people in the other cities? It's almost unimaginative how Computer vision is now a very innovative aspect of the technology. In 2019, the whole world witnessed the onset of the deadly Corona Virus, which now, still after almost a year has not left us and is still making the human race fight for its existence. In between the survival fights, we have realized how technology is very much our only life saver. From extensive internet facilities to 24/7 services online, technology has been our true companion in these hard times. But even when we have everything present at one click, there can't be no lives outside. In the past few months every country, every state has found its own new norms to fight the pandemic. And no matter what we do, we do need to step outside to survive. Schools, Offices, Colleges, Markets, Transportation, are the few crucial check points for any country. As much as we ask the public to be safe, the people miss their [without any restrictions lives. And so, it is now very important to closely watch the public and make them understand the importance of the tiny and small details of survival kit. "FACE MASK DETECTION SYSTEM USING AI" One such crucial factor is the extensive usage of face masks in our lives. Studies have proven that with the help of use of face masks, we can lower the chances of catching the Corona Virus by 80 to 85%, if it's used properly. But, even so, it is nearly impossible to enforce the face masks

completely on the human race. With the help of AI and Computer Vision, we have the best chance at enforcing the mask policy on the humans. With the help of our system, we aim on detecting the presence of face masks on static images and real time videos. Object detection, Classification, Regression, image and object tracking and analysis are our key aspects of the paper. We are aiming at a two phased CNN face mask detector. The first phase is the training phase wherein we have trained our model and the second phase the application, where the masks are detected with "with" or "without masks" tags. Other than the images we also aim to implement this on the real time videos, where the real time faces are detected, tracked and the data about the faces with or without masks is returned. Our paper can be of crucial help at the Stations, airports, Markets, Hospitals, Offices, Schools and many more, where the crowd can be monitored in real time.

2) LITERATURE REVIEW:-

The existing models have used deep learning but they lack the variation in the dataset which means that their model is not that efficient when it comes to real time images and videos. Deep learning technique has been useful for big data analysis work focuses on some commonly implemented deep learning architectures and their applications. Deep learning can be used in unsupervised learning algorithms to process the unlabelled data. A CNN model for speedy face detection has been introduced by Li et al that evaluates low resolution an input image and discards non-face sections and accurately processes the regions that are at a greater resolution for precise detection. Our model is a trained custom deep learning and computer vision model which can detect if a person is wearing a mask or not. Our model has not used morphed or unreal masked pictures in the dataset. Our model is very accurate as we have used MobileNetV2 architecture, it has made the model computationally efficient too. This made it easier to deploy the model to embedded system. We can use this face mask detection system in places that require face mask detection in view of the current pandemic. The model can be deployed at Airports, Railway Stations, Offices, Schools and other public places.

3) PROPOSED WORK:-

The goal of the face mask detection system is to detect whether a person is wearing a face mask or not, warn authorities, and impose penalties on the person before sending a message to that person's mobile phone in order to reduce the spread of COVID-19. This system uses a Convolutional Neural Network (CNN) to analyse images captured by CCTV and classify whether or not people are wearing masks.

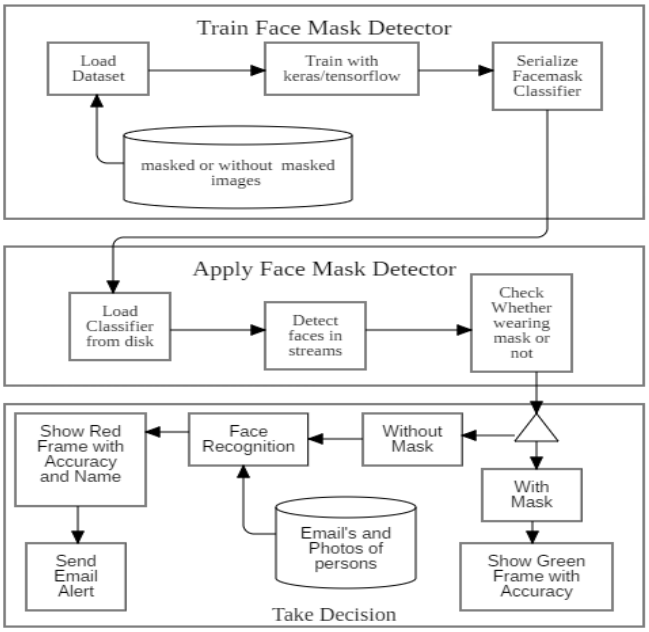

Fig 1. Architecture of Proposed System

CNN plays a vital part in computer vision related instances in pattern recognition. To remove top-level features, CNN uses convolution parts to blend with the primary pictures. The recommended starting network allows the network to become acquainted with the kernel mix. Planning to construct a good Convolutional Neural Network architecture is still a primary concern. K. He et al. suggested Residual Network (ResNet), which may use personality planning from the previous layer, to construct a much more advanced neural network. Because article locators are typically carried on portable or embedded devices with limited computational resources, Mobile Network (MobileNet) is proposed. This

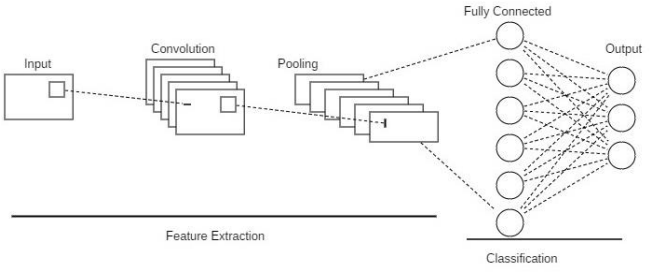

Fig 2-Convolutional Neural Network

Convolutional Layer:-

It is the fundamental block of CNN. Convolution is basically the fusion of two functions to receive another function. Here. the input data, which is a four-

dimensional tensor (number of images. height. width and number of channels) is convolved with a convolutional filter called kernel to obtain the convolved feature. It has been utilized to remove features using back propagation with the removed feature can be used for pattern recognition. The result of the convolutional layer is turned to be a feature map. The attributes which are followed in CNN are convolution filter with width and height, sum of input and output channels. convolution filter depth and convolution operations.

Pooling Layer:-

The obtained feature map is influenced by the area of features in the input. This sensitivity can be overtaken in which the feature map requires down sampling of features. This makes the resulting feature map more speed to the variations in bearings of the aspect in the image. Pooling operations can be applied to make calculations faster, reducing the dimensions of the input matrix except any loss in aspect by summing up the existence of aspects in the feature map. This average presence of an aspect is summed up using two types of pooling methods. One is Average pooling and the other is maximum pooling also called Max pooling. In this paper, average pooling has been implemented. This pooling function sums up the average of all the values in the current kernel region and turns up a single value as the result. Average Pooling Layer is put in 2×2 patches of the feature map with a pace of (2, 2). This process includes summing the average for each patch of the feature map. Which is meant that every 2-2 square of the feature map is sampled down to an average value in the square.

Flatten Layer:

Flatten layer combines all available native aspects of the preceding convolutional layers without affecting the batch size. Every feature map channel in the outer of a CNN layer is a result of multiple 2-D kernels which are developed from each channel of the input layer and stacked to form a "flattened 2-D array. This layer converts a two-dimensional feature of a matrix into a one-dimensional array of vectors which is given into a fully connected neural network classifier. The tf.keras.layers. Flatten function reforms the tensor to a shape which will be equal to the sum of elements present in the tensor.

Fully-connected Layer:

The fully connected layers are added in the model and they have complete connections to activation layers. In this layer all the inputs are connected to the activation unit of the upcoming layer. The given images are classified as multi class and the activation function which is used in layers and they give out the result of estimated output classes in terms of probability.

Dataset:-

The collection is made up of 3918 photos separated into two categories: faces with masks and faces without masks. Faces without masks is a Kaggle dataset that comprises faces with diverse skin colours, angles, occlusion, and other features. Faces with masks comprises masks with hands, masks, and other items that cover the face, giving us an advantage when it comes to improving dataset variants.

The second collection contains photographs of persons associated with the organisation where our project is installed. This data is essential for facial recognition and sending emails to certain individuals.

4) MATHEMATICAL MODEL:-

we take a little matrix of numbers (called kernel or filter), pass it over our image, and rework it supported on the values from the filter.

$$\mathbf{G\,[m,n]=(f\times h)\,[m,n]=\Sigma j\Sigma i\ h\,[j,k]\ f\,[m-j,n-k]}$$

Since our image shrinks on every occasion, we tend to perform convolution, we are able to have it off solely a restricted range of times before our image disappears fully,

$$\mathbf{P=(f-1)/2}$$

Instead of shifting the kernel by one pel, we are able to increase the amount of steps. So, step length is additionally treated mutually of the convolution layer

hyper parameters.$nout = floor(1 + \frac{n+2p-f}{s})$

The filter and also the image you would like to it to should have a similar range of channels.

$$[n,n,nc] \times [f,f,nc] = \left[floor\left(1+\frac{n+2p-f}{s}\right), floor\left(1 + \frac{n+2p-f}{s}\right), nf\right]$$

Fig 3 -Dataset With and without face mask

5) MODEL TESTING:-

Our system helps to identify the organizational person if he or she is wearing or not wearing mask

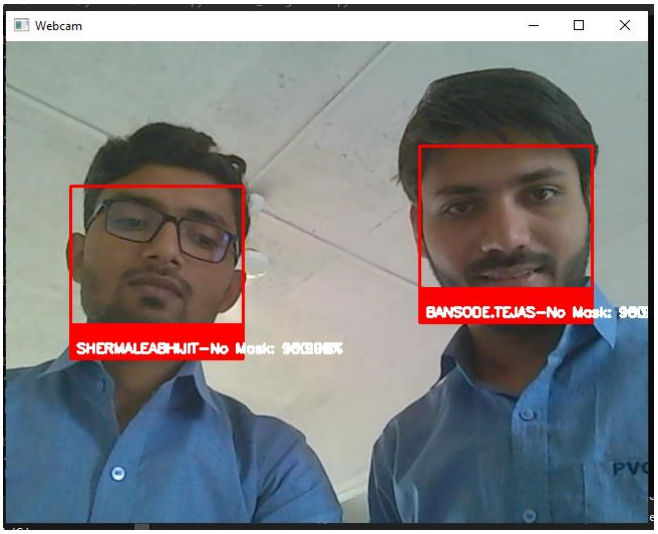

Fig 4 : Face recognition of organizational person

In the above fig System identify the person is not wearing mask and show the output by using red frame, Name of person, accuracy of wearing mask or not.

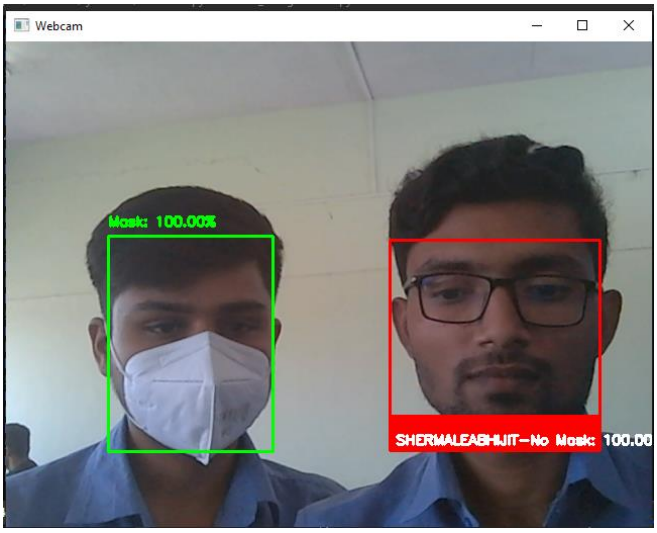

Fig 5 : Mask Detection

The figure above helps to identify whether the person is wearing a mask or not. And email alerts are sent to people who don't wear masks.

Fig 6 :Email alert

The above figure shows an e-mail alert that has been sent to a person who is not wearing a mask.

6) CONCLUSION:-

We have developed the system which might monitor the world through the period of time camera, with none extra devices. The planned system may be a easy period of time video analyzer. It's the potential to examine whether or not the individuals wear masks or not. It will be put in in any supermarkets and public places. This helps America to defeat the widespread of COVID-19 virus. as a result of carrying masks reduces the community unfold of COVID-19 virus. we will use this for several different choices like checking and collateral all the purchasers have carrying facemask. The system completely checks the persons enter through the most gate. we will method the video recorded and notice whether or not the person is carrying a facemask or not. If the person wears his/her facemask, then everything is ok; otherwise it should

send some email alert message like " You are not wearing a mask. If you try to re-enter the campus without a mask, you have to pay 50 rupees fine"

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