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FACE MASK DETECTION WITH ALERT SYSTEM

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Abstract: In the recent world, as we all know the covid-19 this pandemic has arisen all over the world. This pandemic has affected our day-to-day life-disrupting our movements and also world trade. This pandemic has not only affected our movements but also results in the death of many people all around the world. And so to soothe the condition main contribution which is asked nowadays from all the citizens is to follow all the safety norms that are to wear facemask all the time immediately whenever they are stepping out of their home then to use hand sanitizer and maintain social distancing whenever they come in contact to any other person. This paper proposes one of the systems to ensure that at least all people who are coming under Webcam/phone's camera or any video stream wears masks and that too in a proper way. In this system, we are using a basic Convolutional Neural Network(CNN) model using TensorFlow with Keras library and OpenCV to detect if people are wearing a facemask to protect themselves. And we created a dataset of various images to train a neural network. This method attains training accuracy and validation accuracy which is nearly up to 99.87% and 94.41% respectively. This system is also designed in such a way that if it found out a person with no mask or not wearing the mask in a proper way then alarm buzz outs to alter. In this paper, we propose a system that restricts the growth of coronavirus by finding out those people who are not wearing any facemask by monitoring with cameras.

1. INTRODUCTION:

COVID-19 is a pandemic caused by a coronavirus which spreads from human to human due to which it is continuously spreading all over the world day-by-day since December 2019. So the situation in many countries is getting even worse while in some countries the situation is under control because many citizens still are not vaccinated so they are easily getting affected by this virus. According to the recent news from WHO approximately 210+ countries are being affected by this virus. This virus starts showing indication up to 14 days. It has infected over 121 million causing over 3.9 million deaths still the count is rising. The symptoms of this virus which are been reported by COVID-19 patients are severe illness, breathing problems. It transmits when people breathe in air contaminated by droplets and small airborne particles. So the spread of this virus can be stopped if all the safety norms such as wearing mask is followed by all the citizens regularly. But we can see many people are not wearing masks in public places and also when they come in contact with other people so this rises the need of monitoring so as to reduce the transmission. We propose a system in such a way that will somehow restrict the growth of COVID-19 which will be helpful to easily monitor the people who are not wearing a facial mask. So the webcam/phone's camera will detect mask on person's face, if they are wearing the mask in a proper way then ok but if they are not wearing the mask at all and not too in a proper way then an alarm starts beeping which will bring people's attention to properly wear the mask. This will urge people to wear a face mask, as we all know that wearing the mask is one of the effective preventive measures that must be followed by all. This system will be deployed by using the webcam of your PC and also by using the phone's camera. The camera will also capture real live footage of public places from which facial images will be extracted and further these images are used to identify mask on the face. Additionally, the system consists of CNN architecture capable of detecting masked and unmasked faces and can be integrated with pre-installed cameras. This process will help keep track of safety violations and also promote the use of face mask so as to ensure a safe working environment. This system gives more promising and accurate results more than 90%.The paper is structured accordingly firstly research methodology is described in detail in section2. Next, we have mentioned some related works in section3. Then we have discussed all results and conclusion in section4. Then we also have discussed the future scope of this system.

2. RESEARCH METHODOLOGY:

In this paper, we proposed an automatic smart framework of facemask detection with an alert system to do screening of people who are not wearing a mask. Now a day's public places consisting of shops, mall etc have Closed-Circuit Television(CCTV) surveillance at the entrance, this keeps the track of people entering and leaving that premises. So these can be used in a way to detect that people are wearing a mask or not by the shops, malls etc so as to keep safe working environment. Our system uses images captured by the camera, then it runs through an algorithm and easily, accurately detects whether a person wears a mask or not and if not then alarm starts ringing and continuously rings till that person wear the mask and that too in a proper way.

2.1 Data Collection and Pre-Processing: We have used a dataset for training and testing the model. We collected a 300 images dataset which contains 524 faces out of which 246 are masked and 278 are not masked. The images are split 50/50 over the validation and test set.

- **Training**: Here we focused on loading our face mask detection dataset from disk, training a model (using Keras /TensorFlow)

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on this dataset, and then serializing the face mask detector to disk.

▪ **Deployment**: Once the face mask detector is trained, we then move on to loading the mask detector, performed face detection, and then classified each face as with mask or without mask.

The figure below shows the example:

Figure 1: *Dataset without mask*

Figure 2: *Dataset with mask*

Pre-processing steps as mentioned below was applied to all the raw input images to convert the min to clean versions, which could be fed to a neural network machine learning model.

I. Resizing the input image (256x256).
II. Applying the colour filtering (RGB) over the channels (Our model MobileNetV2 supports 2D 3 channel image).
III. Scaling/Normalizing images using the standard mean of Py Torch build in weights.
IV. Centre cropping the image with the pixel value of 224x224x35.Finally Converting the min to tensors (Similar to NumPy array).

2.2 CNN Architecture Development:

This model is based on the CNN algorithm which is useful for pattern recognition from images. This network comprises mainly 3 layers that are the input layer, several hidden layers and the output layer. The hidden layers contain multiple convolution layers that learn suitable filters for feature extraction from the given samples. For classification purpose features extracted by CNN are used by the dense neural network.

2.3 Mask Detection and Alarm:

It is based on real-time facemask recognition that captures the facial image. Deep learning technologies are applied to construct a classifier that will collect an image of a person wearing the mask and no masks. And then it finally identifies a person without the mask and starts ringing an alarm and it will continuously be ringing until the person wearing the mask.

3. RELATED WORK:

Facemask detection has been attracted more attention and research due to outbreak caused by the COVID-19 pandemic. Face detection performs the main role in object detection. Many systems have been developed and implemented for COVID-19 such as Blue Dot and HealthMap services. The Blue Dot method was first used in Wuhan to mark the cluster of unusual pneumonia and now this method is also used in Wuhan to detect this COVID-19 as a pandemic. HealthMap service was used in San Francisco, to spot the patients with a cough which is the initial symptom of COVID-19 by using AI and big data.

4. RESULTS AND DISCUSSION:

Our dataset consists of 300 images which contain 524 faces out of which 246 are masked and 278 are not masked. The images are split 50/50 over the validation and test set Using Keras and TensorFlow, the training is done and architecture is trained. The training accuracy and validation accuracy came out to be 99.87% and 94.41% respectively causing a loss rate of nearly 0.3646.

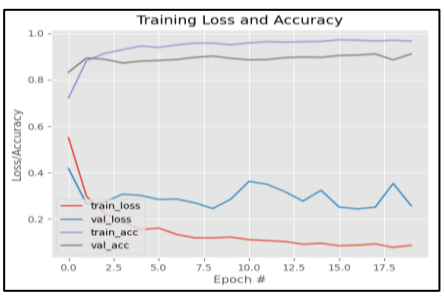

Figure 3: *Graphical representation of accuracy*

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4.1 Demonstration of model:

Our system accurately detects whether person is wearing mask or not and the working of model is shown below:

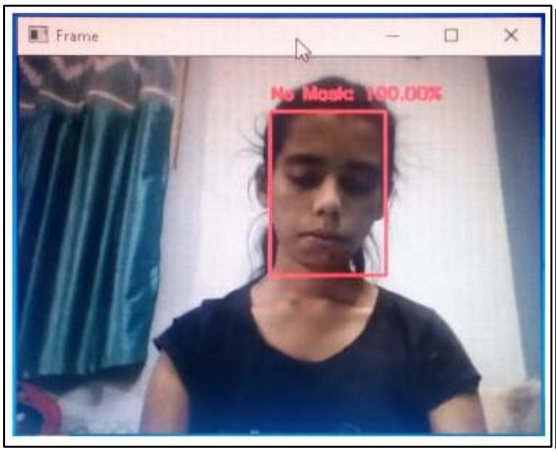

Figure 4: Person without mask

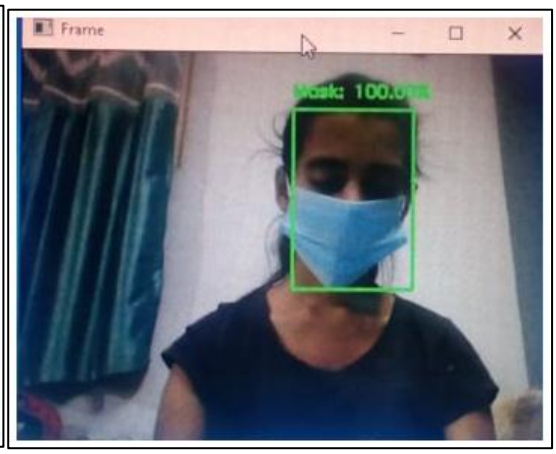

Figure 5: Person with mask

5. CONCLUSIONS:

In the proposed facemask detection with alert system model both training and development of the model have been successfully done. The pre-processing and training of the image dataset, which was further divided into two categories of people having "mask" and other people having "no mask", have been done successfully. The technique of OpenCV, TensorFlow, Keras, PyTorch and CNN which we used in this model generated fruitful and accurate results. By using these techniques, the problems of various wrong predictions have been easily and successfully removed and also the image dataset was cleaned successfully in order to get correct and accurate results. The model was successfully tested with images and also with real-time video streams. The accuracy of the model is achieved and the optimization of the model is a continuous process. So this system can be used easily all over the world to fight against this pandemic.

6. FUTURE SCOPE:

This model can be further designed in such a way that it will measure impressions on the digital display and promotional screens. The mask detection can be further determined by types of the mask such as N95, Bare, Surgical and homemade. Also implementing the attendance system which will mark the attendance of employee by retina scan can be done.

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