A Deep Learning Technique To Predict Social Distance And Face Mask

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Abstract: The impact of covid-19 has changed the lives of many people. Most of the people in the world have lost their employment and their lives too. In order to protect ourselves from this pandemic we need to follow the guidelines given by the World Health Organisation(WHO).The mainly suggested precautions by them are maintaining social distancing and wearing a face mask. We can easily identify whether the persons are following the guidelines given by WHO or not.Here we use Deep Learning Algorithms in order to predict social distancing and face mask detection.

Keywords: COVID-19,Social Distancing,Face Mask,Deep Learning

1.   Introduction

One of the major challenge which is facing by every country in the world is COVID-19.The traces of COVID-19 were found in China and within less span of time it effected many countries. It brought a tremendous change in the economy of the world. It also leads to loss of many people lives. During the month of June and July the impact of COVID-19 has reached to peaks. There is no alternative to remove to this virus.
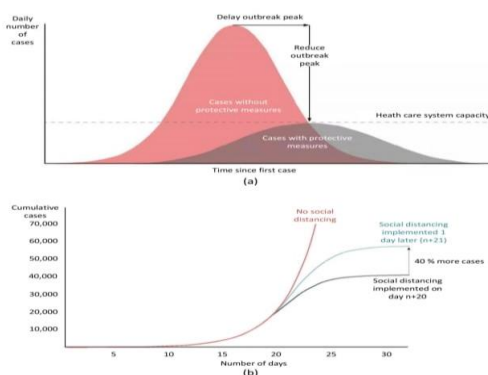

We can just protect ourselves by maintaining social distancing and cover the face by using a mask. By using these precautions we can eliminate the spread of virus upto 80%. Here we implement this by using deep learning algorithms like mobilenetV2,SDBox. The word Social distancing refers to physical distancing. Every Government has taken necessary measures to protect their country from this attack. The only way to eliminate this by having self realization.

We can create awareness among the people by explaining the usage of masks and also the side effects caused by the virus without following the safety measures. The government has to impose a fine on the people who are not following the proper guidelines. Over crowding should be eliminated in the public places to avoid spreading of virus. Public gatherings ,functions should be given limited permissions. Most of the countries had made the collection of fine as a law.

We need to monitor the social distancing in the real time between the two persons. This should be done through a real time monitoring system. The first thing our model will do is whether the particular person is wearing a proper mask or not. The other thing we do is whether the distancing between two persons is acceptable or not. We implement this by using deep learning techniques along with computer vision to detect the person faces.

There are many technologies like AI,ML etc that are currently working on COVID-19 which focuses on different areas of COVID-19.Our paper mainly focuses on Deep Learning techniques.

2.   Working Methodology:
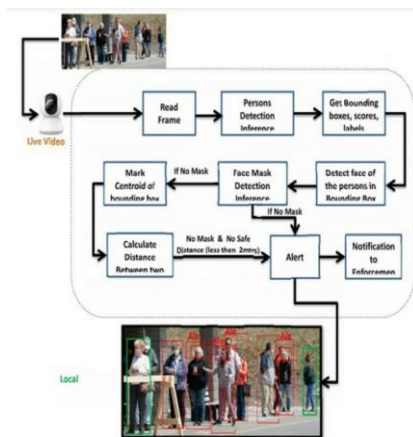
Our proposed paper works on the above figure.Initially we read the data from our system camera and the received data is perceived as a frame.Here frame is the pictures that we are reading through camera.We will identify any person is detected through the camera.If detected we give them labelsand boundary surfaces as it is a supervised learning.Once every thing is detected we identify person mask and social distance between two individuals.if the person is not wearing a proper mask and if the distance between two individuals is less than 2 meters or 200 centimeters then we will send an immediate notification to the enforcement team and it will be indicated as green and red rectangular boxes on the persons image.Here green box indicates acceptable and red box indicates not acceptable.The final output will be displayed as the local image in the above figure.

3.   Working Flow For Face Mask Detection:

As we know that the first step of any algorithm is reading of data. Loading of face mask data is the initial step in order to detect the faces.We perform image preprocessing in order to resize the image of into size of 256 x 256.We apply colour filtering like RGB over the channels.The model MobileNetV2 supports 2 Dimensional 3 channel image.Once applying colour filters is done,we normalize images by using standard mean of PyTorch.Finally convert these into tensors which is similar to NumPy array.We train the dataset by using classification algorithms.Finally we see the there is mask for particular person or not.Based on that we announce the result.
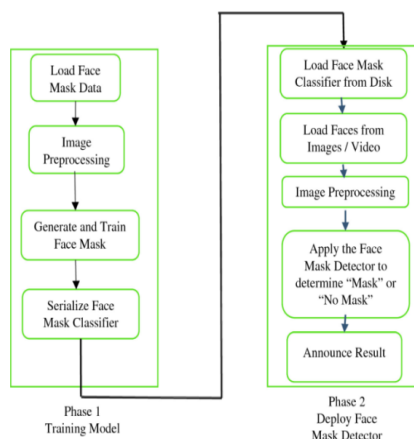

4.   Working Flow For Social Distancing:

In the initial stage we read the input through the frames.We identify the people in the frame by using object detection techniques.As we need to predict the social distancing we filter "people" class only.Calculate the distance the between centroids of two individuals using Euclidean distance formula.If the distance between the people is less than the assumed distance then the individuals are not having social distance.Based on this we show the results to the end user.
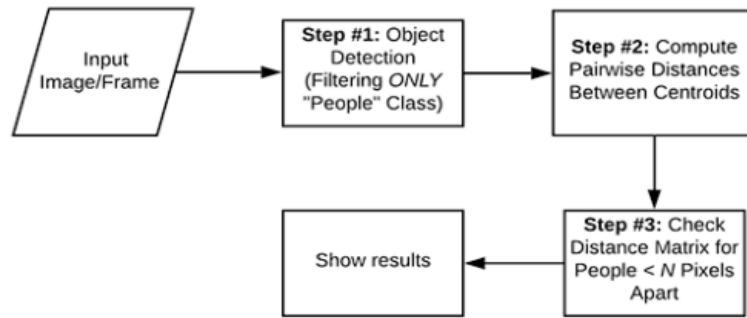
5.   Datasetsfor The Proposed Work:

Here we take 4095 images with two classes.The images with face mask are2165 and the images without face mask are 1930.The images we are using here are real time images and these images are collected from Kaggle.com,RFMD.
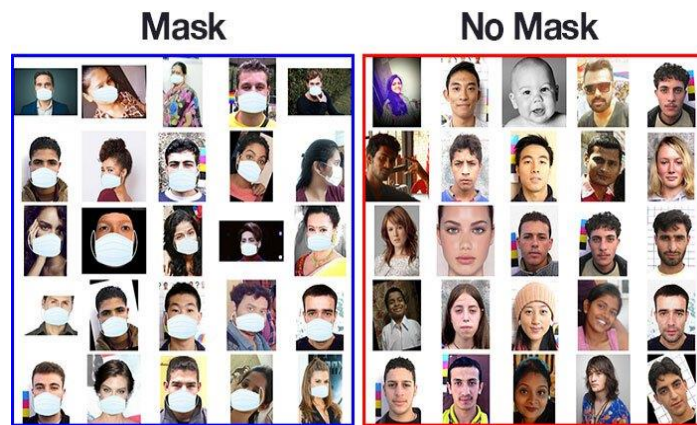
6.   Libraries For Proposed Work:

OpenCV for face mask detection:

OpenCVis an open-source computer vision library which is used to identify Open-Source can also trace camera actions. In general face detection uses classifier algorithms which detects whether it is face or not in a particular image. It gives values as binary classification i.e., either 0 or 1. We train the face mask with Tensor flow and Keras.


TensorFlow:

It is an end-end-end open source platform. TensorFlow is a symbolic representation of math library.TensorFlow is based on dataflow and differentiable programming.TensorFlow has main concentration on training dataset.These are automated image-captioning software.

MobileNetV2 model:

We combine MobileNetV2 model with SSD Framework for efficient identification of persons. MobileNetV2 is used as an image classifier. It is used for lightweight and accurate predictions for particular classification. In our project MobileNetV2 classifies whether a mask is worn by particular person or not.
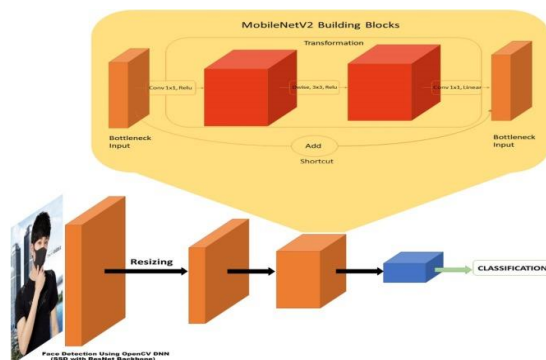
7.   Face Detection:

ALGORITHM:

The detection of face mask depends on the given algorithm.The algorithm starts from pre-processing of the collected data to the final identification of image with accurate results.
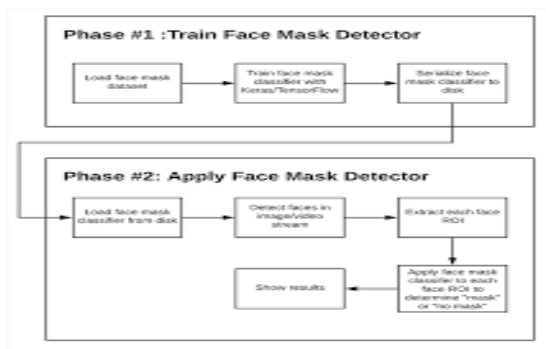
Triangular similarity Techniques:

Here we use Triangular similarity techniques in order to find the social distancing between two individuals.Let us assume that person is located at a distance D, the height of the person is H,the pixel height of the person using boundary box coordinates is P,then the focal length is calculated as

$$F=(P \times D)/H$$

Once the focal length is calculated we can calculate the distance from the camera as $D' = (H \times F) / P$

As we know the depth of the person from the camera, we can calculate the distancebetween two individuals in a video. Let us assume that n number of individuals are detected in a video.Now,the Euclidean distance is calculated between the mid-point of the boundary boxes of the identified individuals.we get pixel values as x and y coordinates.The pixel values are converted in to centimeters by using second equation of Triangular Similarity Techniques.If the distance between two people is less than 2 meters or 200 centimeters then a red boundary box is labelled around them indicating that the two individuals are not maintaining social distance.If the distance is greater than 2 meters it is indicated with green boundary box.The images will look like

8.   Conclusion:

In this paper we gave a brief introduction about social distance and face mask which are key resources in this current situation. As there are many techniques to detect the social distance and face mask, we use deep learning models. By using this approach, we can achieve maximum accuracy.

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