

Face Mask and Social Distancing Detection

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Abstract—The outbreak of Corona virus Disease 2019 (COVID-19), took place at the end of 2019 has affected the millions of lives and businesses even in 2020. Now the world is trying to recover from the pandemic. There is some kind of anxiety among all people, especially those who intend to resume in person activity. One of the common steps need to be taken to avoid transmit immediately is by wearing face mask and maintaining proper social distancing. Studies have proved that wearing a face mask and following a proper social distancing significantly reduces the risk of transmission of the virus as well as provides a of protection. Moreover, it is not possible to manually track the implementation of this. Technology is the important thing here. Image processing and video processing are mainly used to evaluate the monitoring of social distancing and face mask protection. Our machine includes a dual-degree Convolutional Neural Network (CNN) structure able to detecting masked and unmasked faces and may be incorporated with pre-mounted CCTV cameras. From this we can track safety violations, promote the use of face masks, social distancing violations and ensure a safe working environment.

Keywords—Machine learning, Convolutional Neural Network (CNN), face mask detection, social distancing detection

I. INTRODUCTION

Corona virus disease usually called as COVID-19 is a fatal infectious disease and it is caused by a newly discovered corona virus. Since the first outbreak which is recognized in February 2020, the disease spread rapidly around the world. According to the ECDC-European Centre for Disease Prevention and Control, until seventeenth of June 2020; 8,142,129 instances of COVID-19 and 443,488 deaths had been stated international considering thirty first December 2019. The COVID-19 symptoms are similar to the common cold and also includes respiratory symptoms like fever, dry cough, shortness of breath and other breathing problems. In many critical cases, infection also leads to pneumonia, severe

acute respiratory syndrome, kidney failure, and even death. Most of the people who are all infected with COVID-19 will encounter mild to moderate respiratory illness and return to normal without requiring special treatment. Aged people, and those who have health issues like diabetes, chronic respiratory disease, cardiovascular disease and cancer are more likely to develop serious illness. The COVID-19 virus primarily spreads through the droplets of saliva or even from the nose when an infected person sneezes or coughs, so it's mandatory that you also practice respiratory etiquette (for example, by coughing into a flexed elbow). The virus that causes COVID-19 spreads mainly if any person comes to contact with the infected person. The precise route of this transmission is rarely proven, but infection mostly happens when people are near each other for long enough. People also get infected by touching a contaminated surface or touching their eyes, nose or mouth before washing your hands properly. According to the current data, time from exposure to onset of symptoms is usually between two and 14 days, having an average of 5 days. It is very important to create awareness about the COVID-19 situation, the problem it causes and how it spreads to reduce and prevent the virus transmission.

- 1) Maintaining at least a 1-metre distance between ourselves and others.
- 2) Wearing a mask when we are around other people. The proper usage, storage and cleaning or disposals are mandatory and make masks as effective as feasible

II. LITERATURE SURVEY

The related work on this project shows that there have been several methods of implementing the system under different domains namely computer –vision-based approach, classification-based approach, soft computing like neural networks mainly Convolutional neural network, OpenCV, deep learning frameworks etc. Vision-based approach and for image processing requires camera to capture image in 2D or 3D format.

[1] Face mask detection had been a significant progress in the domains of Image processing since the pandemic time. Several algorithms and techniques are used in creating face mask detection. This paper uses deep learning, TensorFlow, Keras, and OpenCV for the detection of face mask. This

model can be used for safety purposes because it is very resource efficient to deploy.

[2] Face Detection has developed as a completely famous problem in Image processing and Computer Vision. Many new algorithms are being devised the usage of Convolutional architectures to make the set of rules as correct as feasible. These Convolutional Architectures have made it feasible to extract even the pixel details. We aim to layout a binary face classifier which can detect any face gift with inside the body irrespective of its alignment. We gift a technique to generate correct face segmentation mask from any arbitrary length enter photo. Beginning from the RGB photo of any length, the technique makes use of Predefined Training Weights of VGG – sixteen Architecture for feature extraction. Training is done thru Fully Convolutional Networks to semantically section out the faces found in that photo. Gradient Descent is used for education even as Binomial Cross Entropy is used as a loss function.

[3] The cease of 2019 witnessed the outbreak of Corona virus Disease 2019 (COVID-19), which has persevered to be the purpose of plight for hundreds of thousands of lives and companies even in 2020. As the international recovers from the pandemic and plans to go back to a kingdom of normalcy, there's a wave of anxiety amongst all individuals, especially people who intend to renew in-man or woman activity. Studies have proved that wearing a face masks extensively reduces the danger of viral transmission as properly as gives a experience of protection. However, it is not viable to manually tune the implementation of this policy. Technology holds the important thing here. We introduce a Deep Learning primarily based totally machine that could stumble on time in that face masks aren't used properly. Our model includes dual-stage Convolutional Neural Network (CNN) structure able to detect masked and unmasked faces and can be incorporated with pre-mounted CCTV cameras. This will assist tune safety violations, sell the usage of face masks, and make certain a safe operating environment.

[4] In addressing the global Covid-19 pandemic situation, the technique of pulling down the curve for corona virus instances might be hard if the residents do now no longer take action to save you the unfold of the virus. One of the maximum vital practices in those outbreaks is to make certain a secure distance among human beings in public. This paper gives the detection of human beings with social distance tracking as a precautionary degree in lowering bodily touch among human beings. This looks at makes a speciality of detecting human beings in regions of interest using the MobileNetV2 Single Shot Multi-Container Detector (SSD) object monitoring version and OpenCV library for picture processing. The distance might be computed among the men and women detected in the captured pictures after which in comparison to constant pixels values. The distance is

measured among the principal factors and the overlapping boundary among men and women in the segmented monitoring area. With the detection of hazardous distances among human beings, signals or warnings may be issued to preserve the gap secure.

[5] With no doubt, the COVID-19 pandemic has put the international to a halt. The international we lived in some months prior is completely one of a kind than what it is now. The virus is spreading fast and is a hazard to the human race. Seeing the necessity of the hour one need to constantly take sure precautions of which one being social distancing. Maintaining social distancing all through COVID-19 is to make certain a slowdown within side the increase charge of latest cases. Our manuscript focuses on detecting if the human beings round are keeping social distancing or not.

[6] The ongoing COVID-19 corona virus outbreak has prompted a worldwide catastrophe with its lethal spreading. Due to the absence of powerful remedial retailers and the immunizations in opposition to the virus, populace vulnerability increases. In the present day situation, as there aren't any vaccines available; therefore, social distancing is an good enough precaution in opposition to this unfold. The dangers of virus unfold may be minimized through heading off bodily touch amongst humans. The reason of this paintings is to offer a deep mastering platform for social distance monitoring the use of an overhead perspective. The framework makes use of the YOLOv3 item popularity paradigm to become aware of human beings in video sequences. The switch mastering technique is likewise carried out to growth the accuracy of the version. In this way, the detection set of rules makes use of a set of rules this is linked to a further educated layer the use of an overhead human information set. The detection version identifies peoples the use of detected bounding container information. Using the Euclidean distance, the detected bounding container's pair smart distances of humans are determined. To estimate social distance violations among humans, we used an approximation of bodily distance to pixel and set a threshold. A violation threshold is mounted to assess whether or not or now no longer the space fee reaches the minimal social distance threshold.

III. DATASET

We have created dataset for face mask detection containing images of each category by training the system we get mass and accuracy of the images and video for social distancing detection where we find person who are not following the rules by bounding boxes.



Fig 1- Image with and without mask



Fig 2-Image of Pedestrians walking

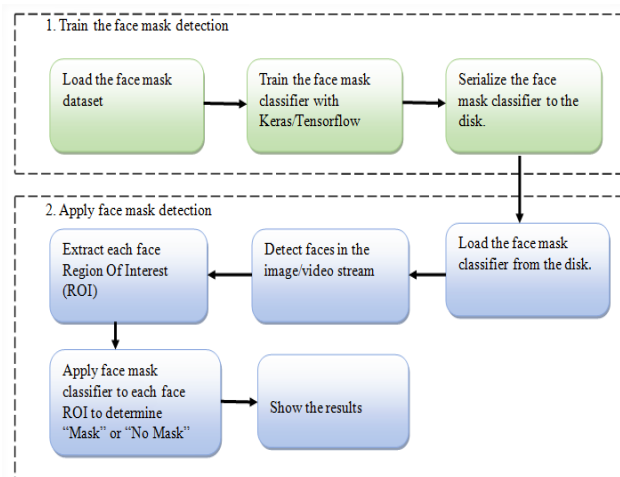


Fig 3-Phases of Face mask detection

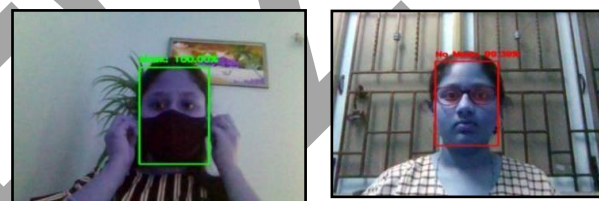


Fig 4-Real webcam face mask detection

III. PROPOSED SYSTEM

1. Face mask detection

[1] The proposed system focuses on how to identify whether the person on image/video stream wears the mask or not with the help of deep learning algorithms by using the OpenCV, keras and deep learning framework Tensor flow.

[2] Approach for face mask detection is to train Deep learning model (MobileNetV2) and apply mask detector over images / live video stream flow.

[3] We use OpenCV to augment the images. The set of images in the dataset are labeled "mask" and "no mask". Augmentation allows the images to be present with different sizes and resolutions, probably extracted from cameras of different resolutions or other sources.

[4] Data preprocessing steps are applied to all the input images which are raw to convert them into cleaner versions, which could be fed to a neural network machine learning model.

[5] A pre-trained model provided by the OpenCV framework was used to identify the faces. The model was trained using web images. The flow to identify the person in the webcam wearing the face masks or not is two-fold process. First identify the faces in the webcam and then classify the faces based on the mask.

2. Social distancing detection

[1] The proposed system focuses on how to identify the person on image/video stream whether the social distancing is maintained or not with the help of computer vision and deep learning algorithm by using the OpenCV, Tensor flow and MobilenetV2 frameworks.

[2] Approach for social distancing is to detect humans in the frame with Detectron2 then calculates the distance between every human who is detected in the frame. Followed by that convert center coordinates into rectangle coordinates and display the risk factors which person bounding boxes are close to each other.

[3] Detectron2 is an open-source library for object detection and segmentation created by the Face book AI Research team, popularly known as FAIR. It implements state of the art architectures like Faster R CNN, Mask R CNN, and Retina Net . It solves different computer vision tasks such as Object Detection, Instance Segmentation, Key point Detection, and Panoptic Segmentation. Detectron2 is built using Pytorch. It has a very active community and continuous updation & bug fixing capability. All the models present in the model zoo of the Detectron2 library are pre-trained on COCO Dataset but

we can also train an object detection model with a custom dataset . It is important to fine-tune any custom dataset on the pre-trained model. Detectron2 originates from Mask R-CNN benchmark, Detectron2 detects the objects as different objects are present in an image, we identify classes and bounding boxes related to only the people and find the total number of persons in the frame.

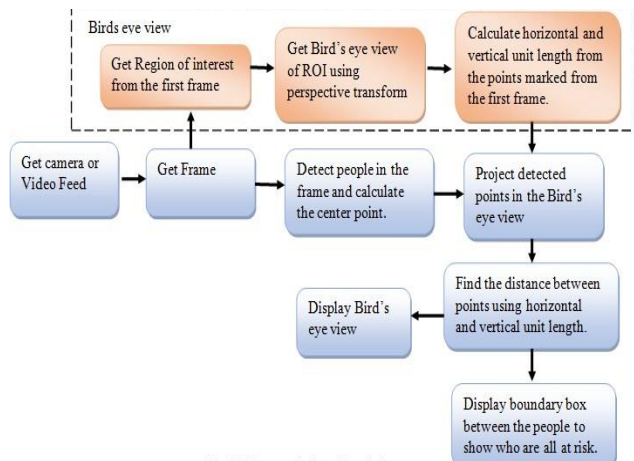


Fig 5-Steps in finding social distancing

[4] Now we have bounding box for each person in the frame. We need to estimate person location in frame. i.e we will find the bottom center of bounding box and use it as a location in frame. Apply transformation to the bottom center point of each person's bounding box to estimate (x,y) location in bird's eye view by which results in their position in the bird's eye view. Scale the distances through the scaling thing in horizontal and vertical path expected from calibration after computing the bird's eye view distance among each pair of people.

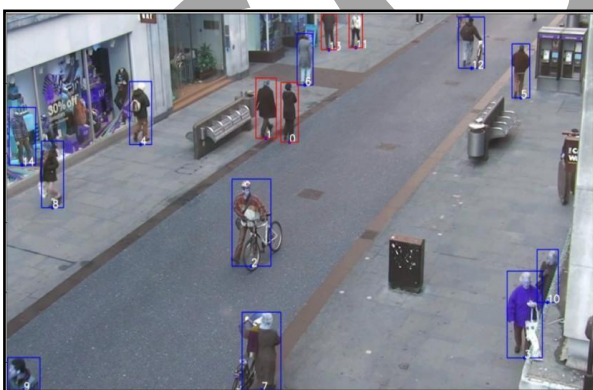


Fig 6-Video Capturing for social distancing

IV. CONCLUSION

In this project, we illustrated the learning and performance task of the Face Mask Detection model. The model can provide the percentage of people using face mask in some cities with high accuracy after the training, validation, and testing phase .It can be used for a various applications. Wearing a mask may be obligatory in the near future, considering the Covid-19 crisis. Many public service providers will ask the customers to wear masks correctly to use of their services. The deployed model will contribute immensely to the public health care system. The divided into categories of people having masks and people not having masks have been done successfully during the training and development of the image dataset. OpenCV deep neural networks techniques used in this model generated great results. MobilenetV2 image classifier, which is one of the uniqueness of the proposed approach classifies the images accurately.

V. REFERENCES

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