Real Time Social Distance Detector using Deep learning

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Abstract - *The COVID-19 epidemic has unquestionably stopped all human activity. The world we were living in a few months ago is quite different from the one we are living in now. The virus is dangerous to humanity and is rapidly spreading. Given the urgent need, one must constantly take some measures, one of which is social estrangement. To guarantee a decrease in the growing rate of new cases during COVID-19, maintaining social distance is essential. The major goal of our text is to determine whether others around us are keeping social distance. The SocialdistancingNet-19 model we created for identifying a person's frame and presenting labels marks them as safe or dangerous depending on whether the distance is more than a certain threshold. People may be watched over with this technique and CCTV video surveillance. Our model has a 92.8 percent accuracy rate.*

Key Words: Covid19, Social Distance, Object detection.

1. INTRODUCTION

The corona virus-2 severe acute respiratory syndrome is the viral illness that causes coronavirus. The illness was originally discovered in Wuhan, China, in December, which helped it spread over the globe. The virus mostly transmits between people when they are in proximity, particularly via microscopic droplets produced while coughing or sneezing. Droplets that fall on the ground will go through a person's body and through the air. The illness is most contagious during the first three days. Several common symptoms include weariness, a dry cough, and nausea. A global pause has resulted from severe and catastrophic human consequences. Such symptoms often include headache and sore throat. A person with minor symptoms needs two weeks to recover. Individuals with severe symptoms may take longer to heal depending on the severity and immune system of the person. The World Health Organization (WHO) recommends using the phrase "social separation" considering the disease's destructive spread.

Maintaining physical distance is crucial to reduce the disease's pace of transmission. To be secure and return to the world we lived in a few months ago, two metres must always be maintained between any two people. Following the COVID-19 pandemic, the CDC revised the definition of social distance as staying away from congregate areas, forbidding public gatherings, and maintaining, where necessary, a space of about six feet or two metres from everyone. Recent research has shown that during exercise, sneeze or deep inhale droplets may travel more than six metres. Thus, maintaining the social distance standard is both necessary and advantageous for us to live a safer and better life. Our research suggests a way to assess a person's compliance with the social distance norm. The results are validated via a video feed and a live webcast. We can determine if a person is maintaining social distance by gauging the distance between two frames of them from their centroids. They are marked as safe and harmful as well.

2. Literature Review

Several studies, including a wide range of research approaches, have been conducted on the topic of social distance. To put a halt to the transmission of the Covid-19 virus, Yadav et al. [1] proposed a system that used a Raspberry Pi4 computer that was fitted with a camera to carry out automated, round-the-clock surveillance of public areas. A trained model and a bespoke data set were loaded onto a Raspberry Pi 4 before it was equipped with a camera and given its configuration. The model in the raspberry pi4 receives real-time footage of public spaces from the camera, and it continuously and automatically analyses those spaces to determine whether people are wearing masks and whether individuals maintain acceptable social distances between themselves and one another. Their system operates in two stages: first, when a person is recognized without a mask, a photo is taken and sent to a control center at the State Police Headquarters; and second, when an individual consistently violates the social distance rule within the threshold time, an alarm sounds, warning them to keep their distance from one another, and a critical alert is sent to the control center at the State Police Headquarters for further action. When a person is recognized without a mask, the photo is sent to a control center at the State They achieved an accuracy level of 91 percent. Singh Punn et al. [4] presented a real-time based deep learning method to assess social distance. This method makes use of object recognition and tracking methods. After counting the number of groups that were formed, we were able to determine the total number of violations, and the violation index term was computed by dividing the total number of persons by the total number of groupings. A variety of object detection models, such as Faster RCNN, SSD, and YOLO v3, were used. These models achieved a satisfactory balance of FPS and mAP score performance. Yang et al.proposed an AI monocular camera-based real-time system to measure social distance [5].

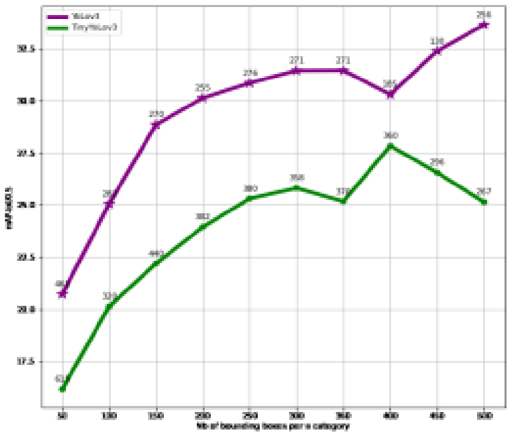

Chart -1: Comparison of YOLO v3 performance curve

3. Methodology

We made use of the pre-trained YOLO V3 (Version-3) model that was developed using the COCO dataset. In order to complete this project, we made use of many technologies offered by DNN, such as blogFromImage, NMS (Non maxima suppression), and dark net. We use NMS, the blobFromImage functionality, and the dark net design for deep neural networks to suppress weak signals or weak detections. These are all deep learning techniques. There are eighty items in the COCO dataset; however, we only use one of those objects—a person object—to calculate the social distance between different people. After confirming that the object in question is really a person, we will go on to the next step only then.

The suggested system would function to keep individuals safe in public spaces by automatically monitoring their behavior to determine whether they maintain an appropriate social distance and identifying those who are wearing face masks. In the following paragraphs, the design of the suggested system and the way it would operate automatically to stop the spread of the coronavirus will be discussed. The system that has been developed makes use of a deep learning algorithm, computer vision, and an approach that is based on transfer learning to optimize its performance.

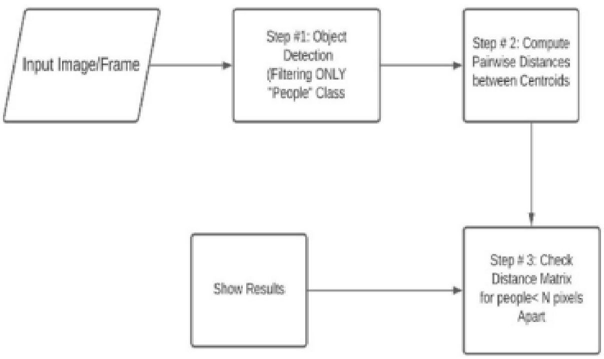

Fig 1. Architecture Diagram

With regard to this undertaking, we came to the conclusion that the minimum distance need to be fifty pixels, the minimum thresh hold ought to be thirty-three, and the minimal configurations ought to be thirty-three. A number of different libraries, including OpenCV, imutils, SciPy, NumPy, and argparse, were used in the development of this project. Our team was able to perform features relating to image processing by using OpenCV. It is a library that can be used by anybody, and some of the functions of imutils that are being utilized in the project are show (for displaying photographs) and resize. This library is open for anyone to use. NumPy, which stands for "numerical Python," is used when dealing with arrays, the SciPy package, which stands for "scientific Python," is utilized when importing distance measures such as the Euclidean distance, and argparse is utilized when supplying input video as a command line option. The scientific Python programming language has a library called SciPy that is one of its components.

The RestNet50 is having weights loaded onto it, the network head is being removed, a new FC head is being constructed and will replace the old one when it is joined to the base, and the network's base layers are being frozen. In addition to these steps, the network is having its base layers frozen. Only the weights of the head layer will be adjusted during the fine-tuning stage of the backpropagation process; the weights of the base layers will continue to be the same. Once the data have been collected, the model will be built, trained, and its architecture will be prepared so that it may be fine-tuned. This process will begin once the data have been collected. Because we feel that deploying our model to edge devices in order to conduct continuous monitoring of public spaces would lessen the load that is associated with physical monitoring, we opted to adopt this architecture. As a result of this decision, we are now using this architecture. This system may refer to edge devices that are used to ensure that public safety requirements are adhered to in locations such as airports, train stations, companies, schools, and other public spaces. These devices may be employed to ensure compliance.

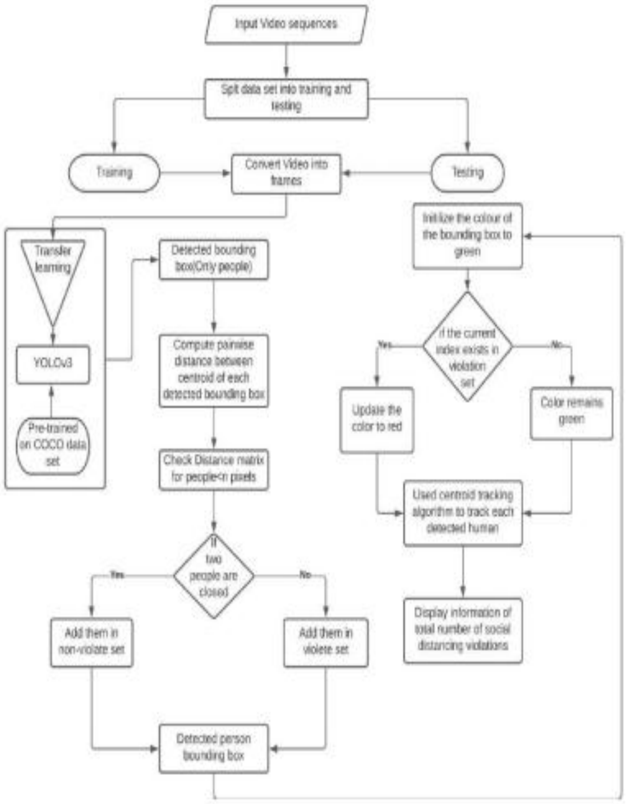

Fig 2. Flow chart

4. Results

To show the result, we used argparse and provided our input video as an argument. In the output, social distance violations will be shown for that specific frame and violated individuals will be marked alongside non-violated individuals.

Fig 3. Result

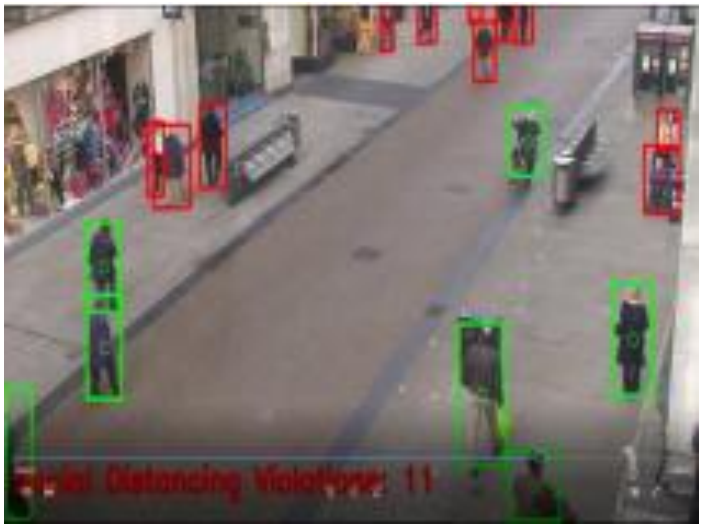

Fig 4. Result

These pictures are snapshots of the finished film after the social distance code was applied.

5. CONCLUSIONS

According to the findings of our research, changes in social distance may be classified as either violating or upholding the social distance norm. Additionally, labels are shown in accordance with the objects that have been detected. After that, the classifier was used on both continuous live video streams and single-frame photos. This device might be used in combination with CCTV to keep an eye on individuals when there is a pandemic going on. It is possible to conduct mass screening at crowded areas such as train stations, bus stops, marketplaces, streets, entrances to shopping malls, schools, universities, and other similar establishments. We are able to control the spread of the virus by keeping a close eye on the physical distance that exists between people and ensuring that they keep an appropriate social distance from one another.

6. Future Enhancements

This technique might be applied in CC cameras and used in public places like shopping malls and airports to monitor social distance between individuals. If we install all of the required packages, we will be able to utilize the more sophisticated version of YOLO, which will allow for faster detections in the future, and we can activate GPU support, which will make output execution go more quickly.

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