



# **Social Distancing Detector for CoVID-19**

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**Review-01**



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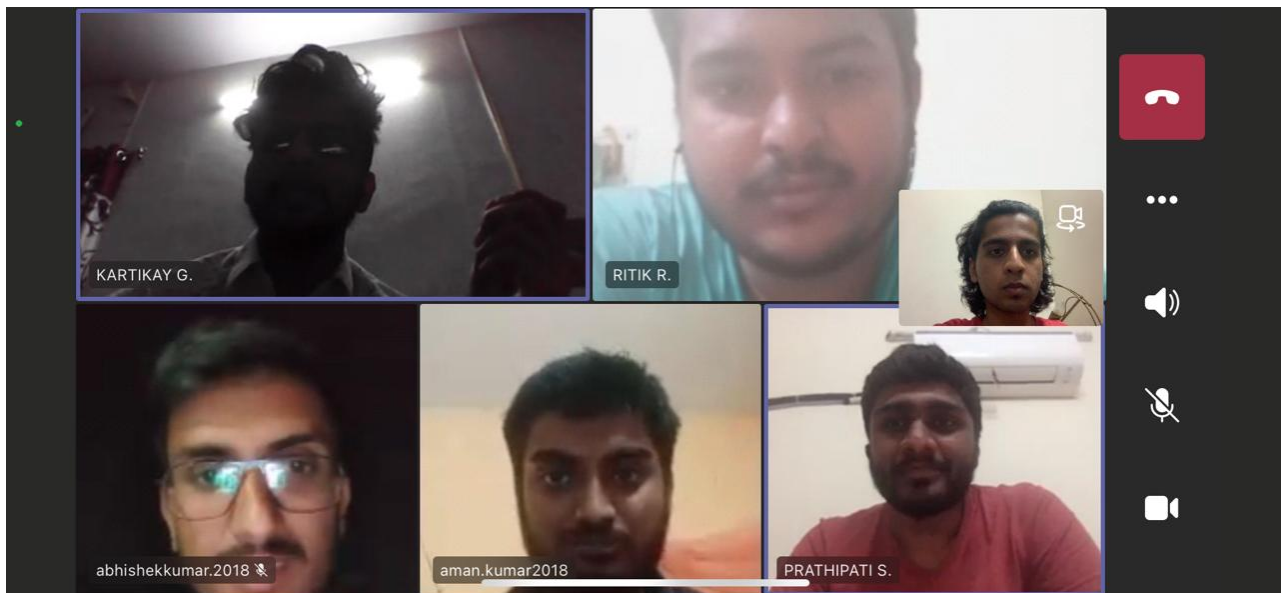
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**Fig:** Screenshot of the meeting conducted with all the members discussing the project.



## ABSTRACT

The battle of coronavirus and mankind is possible to be tackled as long as we maintain the basic norm of social distancing and wearing masks amongst ourselves as it is through

our droplets from the respiratory tract that the virus spreads and infects other people. With increasing demand of man force and people requiring to go to their workplaces post lockdown, it is very necessary that we maintain the basics and save each other from the virus. In the past also AI/Deep Learning has shown promising results on a number of daily life problems. In this project we will go through detailed explanation of how we can use Python, Computer Vision and Deep Learning to monitor social distancing at public places and workplaces are keeping a safe distance from each other by analyzing real time video streams from the camera and also detect facial mask monitoring using OpenCV and Python. To ensure social distancing protocol in public places and workplace, we intend to develop social distancing detection tools that can monitor if people are keeping a safe distance from each other by analyzing real time video streams from the camera. For example: People at workplaces, factories, shops can integrate this tool to their security camera systems and can monitor whether people are keeping a safe distance from each other or not. Social Distancing Algorithm Social Distancing is a method that used to control epidemic diseases. For COVID-19, we are using social distancing to protect us. This algorithm calculates distances between people and draws different colors of bounding boxes for three risk degrees. When this project was created, the references above were used. In order to detect persons, there are a few steps that have to be done: Load the file containing the model into a tensorflow graph; and define the outputs you want to get from the model; For each frame, pass the image through the graph in order to get the desired outputs; Filter out the weak predictions and objects that do not need to be detected. The way tensorflow models have been designed to work is by using graphs. The first step implies loading the model into a tensorflow graph. This graph will contain the different operations that will be done in order to get the desired detection.

## **LIBRARIES USED**

This project is implemented using Python 3, To implement this project we used libraries such as NumPy, Time, OpenCV, OpenCV\_Contrib. Also we used COCO dataset to train the model and identify the objects in it.

- **NumPy**- We use NUMPY when working with arrays. It is mainly helpful when we perform mathematical operation on a N-Dimensional arrays. This library provides a simple yet powerful data structure.
- **Time**- Time library is used to count the time an EPOCH was running, and also the time the model was put to sleep
- **OpenCV**- OpenCV is used to solve vision related problems. This library helps us read an image and uses NUMPY to perform the mathematical operations after converting the image to a n-dimensional array.
- **MATH**- MATH library imports all the math functions defined by C standards

## NEWSFEED (2021, 2020, 2019, 2018)

We are going to discuss how to Build Social Distancing Detection Tool using Deep Learning, Social distancing also called “Physical distancing” means to keep safe space distance between yourself and another human being. Is a set of non-pharmaceutical interventions or measure intended to prevent the spread of a contagious disease by maintaining a physical distance. This can be used by governments to analyze the movement of people and alert them if the situation turns serious.

COVID – 19 has created a seismic shift in the world. It is true that the trend of remote working had been steadily increasing in the last few years, but Covid-19 has precipitated the situation like never before, both in India and around the globe. So, some people have been using AI in easing the confusion. One of such ideas is Mayo clinic which helps in self-diagnosis in COVID-19 and suggests suitable treatments with might remove suspicion. Some models have been trained on testing the possible cures virtually, and even find the areas which are most susceptible. A group of MIT professors are developing models to restart the economy. The project involves analyzing the risk of infection, hospitalization and death of different age groups. This model will allow to restart the economy while simultaneously saving lives of the senior citizens that are more likely to be infected. Some other features might be mitigating rumors (using NLP).

A new study has thrown an ample number of proven results that people following social distancing are less prone to contract COVID 19 epidemic.

Nearly 1900 Americans are consulted for this study. Everyone was asked to situate themselves in various public settings based on their ardor towards social distancing. They were shown 10 virtual scenarios, four focused on walking routes participants would take along a street, a park path, in a library with people around, and which seat they would choose in a coffee shop. And for remaining scenarios participants were asked to show how much distance they would want between themselves and friends, grocery shoppers etc. They were also asked to draw the path they would take to cross a crowded plaza and where they would place their towel in a crowded beach. After a period of four months the participants were asked if they had tested positive for COVID 19 and around 200 of them were tested positive. And these were the people who were not serious about following social distancing.

Finally the researchers have published a report stating that people who were inclined towards social distancing are less prone to epidemic.

So it is evident from this study that social distancing plays a key role in the diffusion of COVID 19.

An exponential increase in cases has followed after the first case of COVID-19 in the Republic of Korea found on 20 Jan 2020, resulting in 10,683 confirmed cases and 237 deaths, as of April 21st, 2020. Social distancing and personal hygiene are advised by a different public health organization with firm testing for the virus and quarantine measures. At the end of February, Government imposes Social distancing to stop the growth of the virus. Empirical evidence during 1918–1919 shows that social distancing lowered the curve of an influenza epidemic.

Compared to the previous 4 flu seasons, within 1 month of the period percentage of patients decreased after imposing the social distancing and personal hygiene. In the 2019–2020 flu season, social distancing measures were imposed and the second wave of influenza virus was not observed. In response to COVID-19, striking social distancing has decreased the transmission of the virus and trodden the curve of the epidemic as shown by Korean national influenza virus surveillance data.

Cowling et al in his current paper stated that non-pharmaceutical interventions were associated with the reduced transmission of COVID-19 and were also likely to have a reduced transmission of influenza in Hong Kong. Evidence from other geographical regions could add validity to this finding and further highlight the role played by social distancing in the transmission of circulating respiratory viruses.

## MOTIVATION

### A) SOCIAL

Since people can spread the virus before they know they are sick, it is important to stay at least 6 feet away from others when possible, even if you—or they—do not have any symptoms. Social distancing is especially important for people who are at higher risk for severe illness from COVID-19.

### B) ECONOMICAL

If social distancing and wearing of mask is not practiced that results in increment of positive COVID 19 cases that may leave the affected people in financial crisis and also as the infected person may transmit the virus to other individuals even they get infected which results in financial crisis not only that particular individual but also for economic downfall directly or indirectly. Also if the death rate increases then GDP will go decreasing.

### C) DEMOGRAPHIC

This project will help in identifying people not maintaining distancing in the rural regions especially where awareness about Covid-19 is less and people tend to break the rule of social distancing there.

### D) POLITICAL

If the areas where people are wandering more are monitored it helps the local government to allocate police force in that particular area which protects from violation of rules passed by government. Also, this helps politically as the number of cases may not drastically rise and local governments need not rent buildings to allocate covid-19 infected people also they will be able to meet the needs of already infected people by providing ventilators which may not become possible if there are a lot many infected patients.

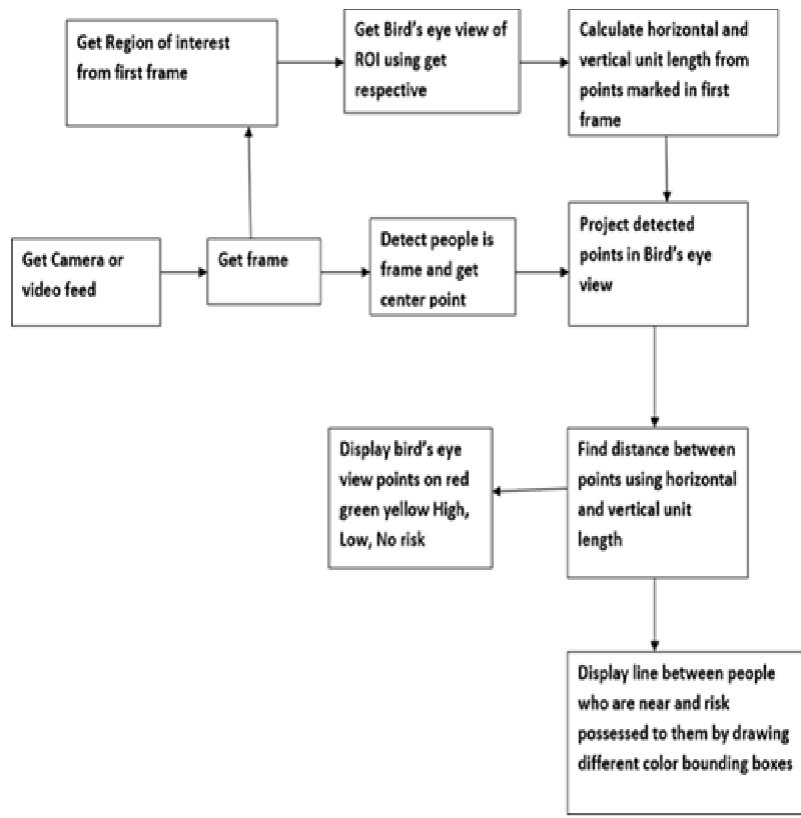
### E) ENVIRONMENTAL

Maintaining social distancing will help in gradual eradication of the virus, also natural restoration happening at the moment amidst human exploitation.

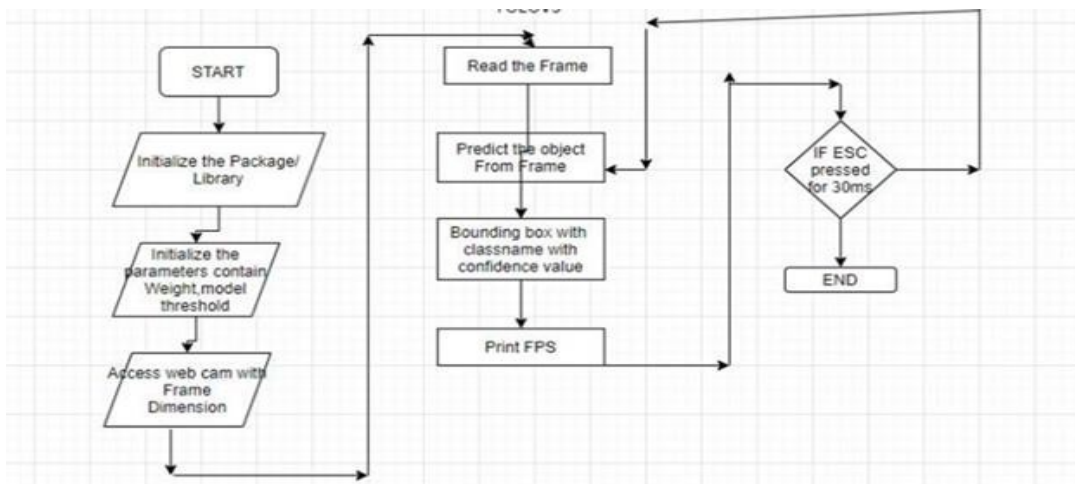
### F) TECHNICAL

Opencv and python are efficient for this project as it reduces code complexity and are one of the most trending languages in use. Also the task of recognizing and analyzing becomes easier with the usage of this language and becomes beneficial if future scope is identified; few more modifications to the code are to be made as python is most widely used language in these days.

## METHODOLOGY



**Fig.1** BLOCK DIAGRAM



**Fig.2** FLOWCHART

To ensure social distancing protocol in public places and workplace, we have developed social distancing detection tools that can monitor if people are keeping a safe distance from each other by analyzing real time video streams from the camera. For example: People at work places, factories, shops can integrate this tool to their security camera systems and can monitor whether people are keeping a safe distance from each other or not.

This tool has following features:

- 1) Detect humans in the frame with yolov3.
- 2) Calculates the distance between every human who is detected in the frame.
- 3) Shows how many people are at High, Low and Not at risk.

The first step is to transform perspective of view to a bird's-eye (top-down) view. As the input frames are (taken from a single camera), the simplest transformation method involves selecting four points in the perspective view which define ROI where we want to monitor social distancing and mapping them to the corners of a rectangle in the bird's-eye view. Also, these points should form parallel lines in the real world if seen from above (Birdseye view). This assumes that every person is standing on the same flat ground plane. This top view or bird eye view has the property that points are distributed uniformly horizontally and vertically (scale for horizontal and vertical direction will be different). From this mapping, we can derive a transformation that can be applied to the entire perspective image.

Below are the steps:

- **Step 1:** We take the input from a camera or video feed
- **Step 2:** We get the human frame upon which the calculation is done (Bird eye and normal box framed)
- **Step 3:** Frame to calculate bird's eye view
  - **Step 3.1:** We get our region of interest from the frame that we need to focus on
  - **Step 3.2:** Using get Perspective Transform we get the bird's eye view of our Region on interest
  - **Step 3.3** Following which we calculate the horizontal and vertical unit from points which was marked from the first frame



- **Step 4:** From Step 2 the frame of the people is detected and center points are fetched from the frame
- **Step 5:** Inputs from Step 4 and Step 3.3 is fetched according to the application and the detected points in the bird eye's view is projected
- **Step 6:** The distance between the horizontal and the vertical unit length is detected for calculate the social distancing between two frames
  - **Step 6.1:** The bird's eye view is displayed and are the points are colored red, yellow and green to indicate high, low and no risk respectively.
- **Step7:** For the normal frame line is displayed between people closer to them with different color as the bird eye's frame in the bounding boxes.

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