Problem Approach

The problem is divided into 3 different problem statements. The approach to these problem statements are addressed below.

- **Person (object) Detection**

  - *The initial problem that needed to be figured out was the detection of the person. This was resolved by using the YOLO v3 object detection algorithm, which is pre-trained on the Coco dataset.*
  - *The detected object (here, only the person) was then given an identification number ('person <ID>') with the help of openCV.*
  - *If there is no detection, the same will be shown.*

- **Face Mask Detection**

  - *The next step, once the person was detected, was to ascertain the presence of a mask on the detected person(s). Here, we have two steps, first is to detect the face and the second is to detect the mask, if the person(s) has any.*

  - *One of the simplest and the fastest way to detect the face is to use the well known haarcascade classifier (haarcascade_frontalface_default). Once the face is detected, only the detected face area can be used to determine the presence of the mask.*
    But the developer ran across a few issues while going through this approach and hence abandoned this and chose a different way.

  - *So instead, a pre-trained face detector was obtained online and then the mask detection was carried out. The model for the face mask detection, trained on a dataset of 4095 images was used. The dataset and other details were obtained through a GitHub repo compiled by 'chandrikadeb7'.*

  - *The mask detection is shown with a colour changing (green for affirmative and red otherwise) bounding rectangle around the face of the detected person.*

- **Lack of Social Distance Detection**

  - *This problem statement was resolved by once again using YOLO v3*

  - *The centroids of the blob representing the objects were detected and then the calculated Euclidean distances between them were used to determine whether the social distance was maintained or not.*

  - *If the social distance between two or more objects(people) was not maintained, a message saying the same pops up on the screen.*