



# IJRASET

International Journal For Research in  
Applied Science and Engineering Technology



# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

**Volume:** 12    **Issue:** III    **Month of publication:** March 2024

**DOI:** <https://doi.org/10.22214/ijraset.2024.59009>

[www.ijraset.com](http://www.ijraset.com)

Call:  08813907089

E-mail ID: [ijraset@gmail.com](mailto:ijraset@gmail.com)

# Social Distancing Detector using Deep Learning

T.Lohith<sup>1</sup>, Dr.M.JaithoonBibi<sup>2</sup>

Computer Science with Cognitive Systems, Sri Ramakrishna College of Arts & Science, Coimbatore-641-004

**Abstract:** Social Distancing is the best possible way to detain the spread of Covid-19. Even though vaccine has been found and working effectively in saving the lives of people, social distancing is necessary to reduce the spread of virus to maximum extent which not only saves people from being infected but also reduces the impact of spreading of the disease. In our proposed system, we use Deep Learning with python to monitor social distancing in public places. This is a software tool that monitor if people are maintaining proper social distancing norms or not by analyzing real time video streams from CC camera. We use YOLO Model which is trained by COCO dataset.

**Keywords:** Social Distancing, Deep Learning, YOLO, COCO.

## I. INTRODUCTION

Covid-19 is the scientific name of corona virus. Till now around 27 crore people were affected by this pandemic including 5 Lakh deaths as per WHO statistics. This disease is considered as a pandemic when it is spread to different countries and caused fatalities. The spread of disease is due to the contact of infected persons with other persons. So, to detain the spread of virus we require an effective monitoring system which monitors people in public places. Monitoring social distancing is very tedious if done manually as it is difficult to monitor continuously by human naked eye. So this is implemented automatically by our software tool which not only monitors people but also highlight the persons who are violating social distancing norms with red color boxes. We use CCTV cameras for automatic monitoring of people.

This tool can be used in places like Airport, malls etc. The need for developing this tool is to help people and the government to identify and alert people who are being the main cause for the spread of epidemic. Deep learning, a subset of artificial intelligence, has shown remarkable capabilities in various applications, including computer vision. By training neural networks on large datasets, deep learning models can learn intricate patterns and features from visual data, making them well-suited for tasks like object detection and recognition. In the context of social distancing, deep learning algorithms can be trained to detect individuals in crowded scenes and analyze their spatial relationships. This involves identifying people and estimating the distances between them accurately. By employing convolutional neural networks (CNNs) and other deep learning architectures, researchers and developers have made significant strides in creating robust social distancing detection systems.

## II. METHODOLOGY

We have used YOLO V3 (Version-3) model which is pre-trained with COCO dataset. We have implemented this project with DNN functionalities like blobFromImage, NMS (Non maxima suppression), dark net. We use blobFromImage functionality for pre-processing of the image, NMS for suppressing the weak signals or weak detections and dark net as a framework of deep neural networks. COCO dataset contains 80 objects but we use only person object out of those objects in the project because we calculate social distancing between persons. If the detected object is person then only we proceed for next steps.

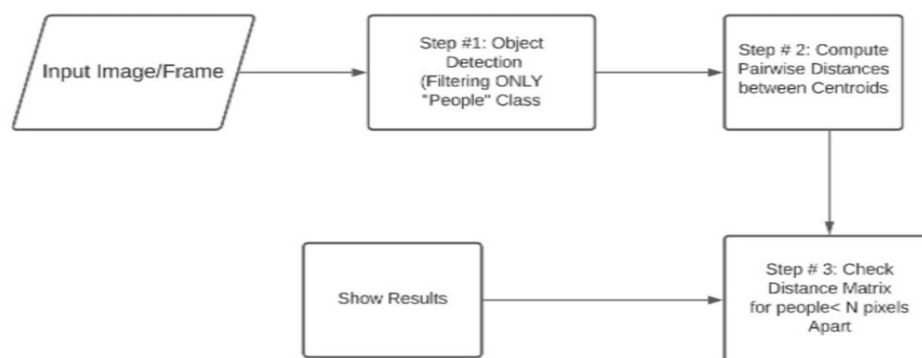
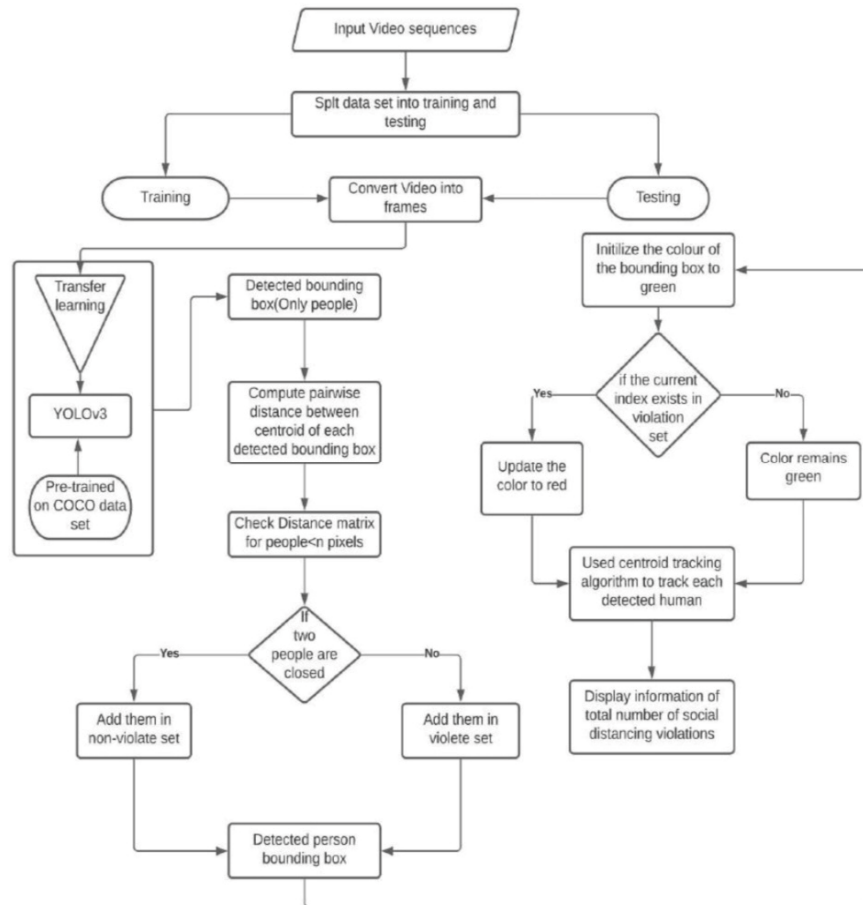


Fig.1. Architecture Diagram

We set minimum distance as 50 pixels with minimum threshold as 0.3 and minimum configurations as 0.3 in this project. Libraries used for the project includes OpenCv, imutils, scipy, NumPy, argparse. We have used OpenCv for image processing functionalities. It is an open-source library, some functionalities of imutils used in project are show (for displaying images) and resize. The scipy (scientific python) package is used for importing distance metrics i.e., Euclidean distance, NumPy (numerical python) is used for working with arrays and argparse is used for passing input video as a command line argument.



**Fig.2 Flow chart**

### III. IMPLEMENTATION

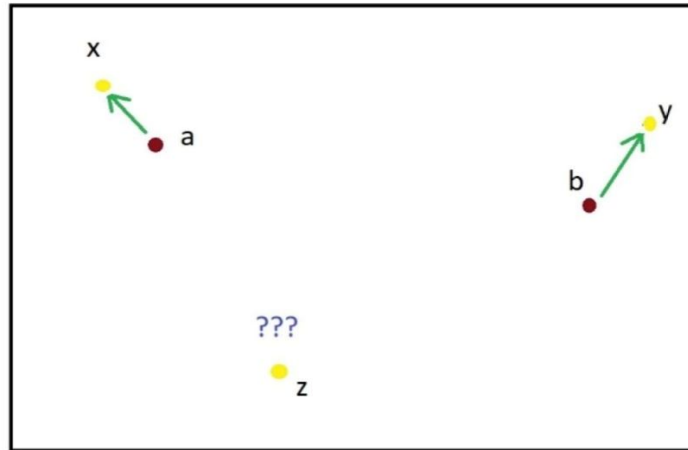
#### 1) Module 1: Object detection using YOLO V3 algorithm

Here object refers to the person from the COCO dataset which is used with YOLO weights for training. From the objects of COCO dataset we consider only person object. If the object is person then only the object will be detected other objects will not be detected.

#### 2) Module 2: Object Tracking using OpenCv

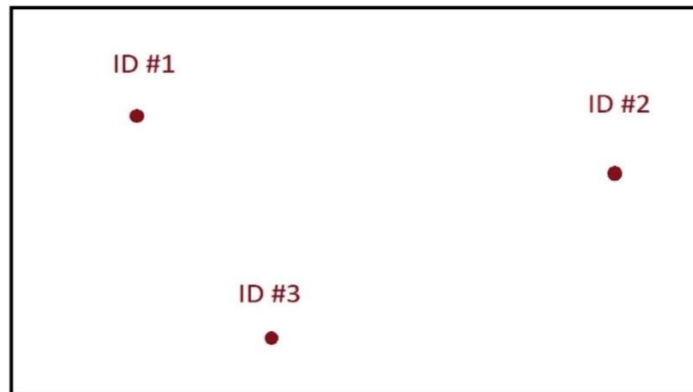
- Step 1: Accepting the bounding boxes and computing the corresponding centroids which means the center of bounding boxes.
- Step 2: Computing Euclidean distance between new centroids (yellow) represented by x, y, z and old centroids (brown) represented by a, b.
- Centroid tracking works on an assumption that the pair of centroids with minimum Euclidean distance or the closest pair is must be the same person. So, unique ID will be generated to that pair i.e., person.
- In the above image there are two existing centroids and three new centroids from the previous frame which describes a new person has been detected in this frame

- Step 3: Association of ID's as we know Euclidean distances



Step 3

- Step 4: New ID's will be registered by storing co-ordinates of bounding boxes of new object i.e., person.



Step 4

- Step 5: The object which leaves our frame area then we will just deregister the object.

3) Module 3: Distance computation using Euclidean distance as metric

Computation of distance between the pairs of detected persons using Euclidean distance as metric.

4) Module 4: Adding violations and displaying number of violations

The persons who are less than M pixels (M represents minimum distance set by us in the project) distance apart from each other will be considered as violation pair. They will be highlighted with red color bounding boxes and the number of violations at that particular frame will be displayed. The persons who are maintaining more than M pixels of distance will be considered as non-violation pair and they will be highlighted with green color bounding boxes.

**IV. RESULTS**

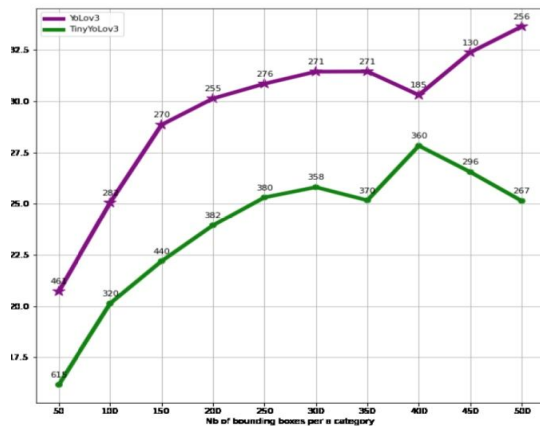
We used argparse by which we gave our input video as argument for displaying the output. In output, Social distancing violations will be displayed for that particular frame and violated persons will be highlighted and non-violated persons will also be highlighted.





These images are screenshots of output video, After implementing the code for social distancing.

Table 1: Comparison of YOLOv3 performance curve



#### IV. CONCLUSION

Centroid tracking algorithm is used for calculating pairwise distances between the objects. To automate the process of monitoring the social distancing it is an efficient real-time deep learning based framework. The bounding boxes aid in identifying group of people satisfying the closeness property computed using pairwise vectored approach. With Euclidean distance as metric we calculated pairwise centroid distance between detected bounding boxes. The violations are displayed in the output along with violated persons

#### V. FUTURE ENHANCEMENTS

This tool can be installed in CC cameras for monitoring social distancing in public places like malls, airports etc. We can also Use advance version of YOLO for faster detections in future and we can make GPU as true if we install required packages this will increase speed of execution of output.

#### REFERENCES

- [1] Covid-19 information available: <https://covid19.who.int/>
- [2] Ministry of Health Malaysia (MOHM) Official Portal.
- [3] COVID-19 (Guidelines), [online] Available: [https://www.moh.gov.my/index.php/pages/view/2019-ncov-wuhan1\\_guidelines](https://www.moh.gov.my/index.php/pages/view/2019-ncov-wuhan1_guidelines).
- [4] J. Redmon, S. Divvala, R. Girshick and A. Farhadi, "You only look once: Unified real-time object detection", Proceedings of the IEEE conference on computer vision and pattern recognition, pp. 779-788, 2016.
- [5] K. Simonyan and A. Zisserman, Very deep convolutional networks for large-scale image recognition, 2014.
- [6] COCO dataset available: [https://www.kaggle.com/awsaf49/coco1\\_2017-dataset](https://www.kaggle.com/awsaf49/coco1_2017-dataset)
- [7] Harvey A., LaPlace J. 2019. Megapixels: Origins, ethics, and privacy implications of publicly available face recognition image datasets. [Google Scholar]
- [8] YOLOv3 performance curve available: <https://images.app.goo.gl/KSZ8EgaahULzQs2B7> Simonyan K, Zisserman A. Very deep convolutional networks for large-scale image recognition. arXiv preprint arXiv:14091556. 2014
- [9] D.T. Nguyen, W. Li and P.O. Ogunbona, "Human detection from images and videos: A survey", Pattern Recognition, vol.51,pp. 148-75, 2016.
- [10] Suresh K, Adwitiya Mukhopadhyay, "Investigation on COVID-19 by using Machine Learning Techniques", Computing Power and Communication Technologies (GUCON) 2021 IEEE 4th International Conference on, pp. 1-5, 2021
- [11] M.JaithoonBibi, Dr.C.Yamini,(2018) "Survey on classification techniques in data mining", "International Journal of Theoretical & Applied Sciences", vol. 10(1): January – June, 2018. 9th February, 2018. ISSN No.:2249-3247
- [12] M. Jaithoon Bibi, Dr. C. Yamini,(2019) "An crop yield forecasting using fuzzy logic relationships", "International Journal of Research and Analytical Reviews", Pg.no:335-340. vol. 6(1): 1st January, 2019. ISSN No.:2348-1269.
- [13] Jaithoon Bibi, M., & Karpagavalli, S. (2021). Positional-aware Dual Attention and Topology Fusion GAN for Plant Leaf Disease Image Super-resolution and Classification. *Linguistica Antverpiensia*, 2021(3),ISSN No.: 0304-2294 Pg.no:(12-25).( Indexed in UGC Care & Scopus)
- [14] Jaithoon Bibi, M., & Karpagavalli, S. (2021), "An Evolutionary Optimization of Positional-Aware Dual-Attention and Topology-Fusion Generative Adversarial Network for Plant Leaf Disease detection",*Turkish Online Journal of Qualitative Inquiry (TOJQI)*,Volume 12, Issue 3, July 2021:E - ISSN No:1309-6591; Pg no : (2904-2922) ( Scopus, TRDizin)
- [15] M.Jaithoon Bibi & Karpagavalli.S, A. Kalaivani, (2021), " Critical Review of Deep Learning Algorithms for Plant Diseases by Leaf Recognition", *Journal of Contemporary Issues in Business and Government*, Pg no: 720 – 729. Vol. 27(5) , 2021. ISSN : 2204-1990; E-ISSN : 1323 – 6903. ( Indexed in UGC CARE List & Web of Science).
- [16] A. Kalaivani, S. Karpagavalli, M. Jaithoon Bibi (2021), " A Deep Learning Approach for Real-Time Defect classification in Skin disease", *International Journal of Contemporary Architecture "The New ARCH"* Vol. 8(2) (2021) ISSN: 2198-7688,PgNo: 443-451.( Indexed in UGC CARE List & Web of Science)
- [17] M. Jaithoon bibi, Dr. S. Karpagavalli, " Plant leaf disease image resolution classification using deep convolutional neural network ", *International Journal of Natural Sciences*, Vol.13, Issue 71, ISSN no: 0976-0997, Pg no40712-40722
- [18] Jaithoon Bibi Mohammed Saleem, Dr. S. Karpagavalli, "Pesticides Recommendation for different leaf diseases and related pests using multi dimensional feature learning deep classifier", *International Information and Engineering Technology Association*, Vol.28,Issue 1, ISSN no: 1633-1311 (print); 2116-7125 (online) & <https://doi.org/10.18280/isi.280113>, Pg.No :133-140
- [19] Dr. V. Krishnapriya & M.Jaithoon Bibi,"AN EMPIRICAL ANALYSIS OF METHODS & ALGORITHMS USED IN DETECTION OF SICKLE CELL DISEASE"" *International Journal of Innovative Science and Research Technology* ,ISSN No:-2456-2165,Volume 9, Issue 1, January – 2024,[pg.No:637](https://www.ijraset.com) to 649
- [20] Survey:E-Commerce Comparison App by Figma, "International Journal of Innovative Science and Research Technology" ,ISSN No:-2456-2165,Volume 9, Issue 1, January – 2024,[pg.No:1284](https://www.ijraset.com) to 1288



#### AUTHORS PROFILE



Lohith, is a Bachelor of Science Student, pursuing his final year in Computer science at Sri Ramakrishna college of arts and science college . Recently , he worked on the projects, object detection Using Deep Learning by python



Dr. M. Jaithoon Bibi, Assistant Professor, Sri Ramakrishna College of Arts and Science, Coimbatore. She received her M.Phil in the field of Data Mining from Sri Ramakrishna College of arts and Science for Women, Coimbatore. Completed PhD in the field of Data mining from PSGR Krishnammal College for women, Coimbatore. Her area of interest is data analysis and predictive models to reveal patterns and trends in data from exiting data sources. Her teaching experience is 4 year. She has published 11 research papers in international journals, Scopus, Web of Science and conferences in the area of data mining. She attended various international level conferences, seminars, workshops and technical symposium. She is a member of IAENG(International Association of Engineering..





10.22214/IJRASET



45.98



IMPACT FACTOR:  
7.129



IMPACT FACTOR:  
7.429



# INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Call : 08813907089  (24\*7 Support on Whatsapp)