Social Distance Analyzer along with Face Mask Detection using AI and ML

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ABSTRACT
The COVID-19 virus spreads through the midst groups of people who are in close contact for an extended period. The chances of spreading a virus are higher when a person who is infected with the virus sneezes, coughs, or talks near others. It is very important for us to stay a minimum of 6 feet away from other people even if you or they do not have any symptoms. Social distancing is the best technique to be followed to reduce the spread of the virus. People are informed to avoid contact with other people, thereby supervising the spread of the virus. Artificial Intelligence and Deep Learning have shown good outcomes for some daily life problems. Computer vision and deep learning techniques are used to see social distancing between people in public places. It uses the YOLOv3 object recognition paradigm to categorize. The detection algorithm uses a pre-trained algorithm that is associated with an extra trained layer using an overhead human data set. Euclidean distance is used in the detection of bounding box centroid's pairwise distances of people are determined. Accuracy up to 98% is achieved by the detection model. Coronavirus outbreaks can be solved by social distancing as well as putting on a face mask. Wearing a mask as well as the ensuing social distancing would save large numbers of lives. So, Face Mask Detection would be used efficiently for the purpose.

Keywords
Deep Learning, Computer Vision, OpenCV, YOLO, Python, Image Processing, Artificial Intelligence, Machine learning

1. INTRODUCTION
The pandemic situation has created problems all over the world and has made the conditions worse, as of now social distancing has become one of the best methods to prevent the spread of COVID-19. Monitoring public places provides a promising solution. CCTV or live footage of human activities can be tracked in public places and also helps in monitoring the social distance between people. And also, with the help of Face Mask Detection, the required data can be generated. Monitoring people and calculating the distance between the people using deep learning techniques and establishing the ordinary distance of 6 feet to be sustained. Helps in minimizing the contact between infected people and healthy people. The purpose is to diminish the spread of the virus and help the healthcare systems. This project is focusing on surveillance of public places and detecting whether the people are maintaining social distancing or not. To make certain that the social distancing guiding principle is followed in public places and workplaces, the social distancing detection system can be used to monitor people who are upholding distance least distance of 6 feet from each other. This project is focusing on surveillance of public places and detecting whether the people are maintaining social distancing or not. Social Distancing is the only best option for us to protect everyone from diseases, not limited to COVID-19, where no medicinal antidote has been prepared, and that may be transmitted through human contact. The project uses the development of technology through the use of AI bAI-based procedures to detect whether the social distancing norm is followed or not, in any public video stream. The software embedded can distinguish between a person maintaining social distance will be marked green and a person who is not will be surely marked red. Keeping a count of incidents where social distancing was not followed. Moreover, likewise, the people who are wearing a mask will be detected as Green & one not wearing a mask would be detected as Red.

2. LITERATURE SURVEY
SD-Measure: [1] A Social Distancing Detector, IEEE 2020- Savyasachi Gupta, Rudrakshi Kapil, Goutham Kanahasabai, Shreyas Srinivas Joshi, Aniruddha Srinivas Joshi Here a framework called SD-Measure is proposed that helps to notice whether distancing is maintained or not. The framework uses the Mask R-CNN architecture for object detection to detect people in the frame. Here a centroid tracking method is used to identify the centroid of each detected person. The Distance conniving approaches are used to analyze the distance among centroids and built on the distance this framework determines whether distancing rules.

Crowd study for overcrowding control initial warning system on foot over bridge, [3] IEEE 2019- N. S. Punn and S. Agarwal. When people come together in large numbers in any events, marathons, and public places they form a crowd. To stop any problems that may occur in a crowd, crowd analysis is very important with respect to safety and surveillance. The overcrowding creates a panic among people. The cumulative crowd amount causes congestion which surges the crowd and generates uneven crowd movement. Here a software-based method called Congestion Control Early Warning System (CCEWS) is used. Object detection and tracking techniques are used to control overcrowding. R-CNN architecture is used to perform object detection

Detection in respect to deep learning: A review, IEEE 2019-[4] Q. Zhao, P.Zheng, S.-t. Xu, and X. Wu. The normal object detection methods are built on basic features from the image and by using neural networks that have fewer hidden layers. Here object detection frameworks are reviewed that begins with the concept of deep learning and the convolutional neural network concept is explained. Focus is done to advance the presentation of object detection. A survey is done on various detection tasks. An analysis is achieved on numerous detection approaches and detailed strategies are given in the development of object detection.
You Only Look Once: Unified, Real-Time Object Detection, [9] IEEE 2016- Joseph Redmon, Santosh Divvala, Ross Girshick, Ali Farhadi Here object detection is performed using YOLO. Previously object detection was performed using classifiers. Regression complications that generate a bounding box around the detected object and create the class prospects are solved. A single neural network is considered for detecting the object. YOLO produces more localization error results but, in the background, predicts fewer false positives. YOLO accuracy is higher than other object detection methods.

Tracking people by multiple cameras using optical flow-based, [6] IEEE 2001-H. Tsutsui, J. Miura, and Y. It describes a method called optical flow-based individual tracking method that practices numerous cameras in indoor environments. If several objects, the sight of the camera will be blocked while tracking a person. Single-camera is used to track, occasionally the sight may be blocked by objects and the tracking of individuals by the camera will fail. To overcome this issue multiple cameras are preferred. If using multiple cameras, each camera tracks the target person individually. The sight of the camera that is tracking the individual is blocked by any objects, the individual is tracked using the data.

3. OBJECTIVES OF THE SYSTEM

Various objectives of the proposed system are as follows:

- Detect people in the frame using yolov3.
- Calculating centroids of each detected person.
- Perform perspective transformation of detected people.
- Calculate the distance between centroids of each person detected in the frame.
- Shows whether social distancing is maintained or not.
- Also detects whether people are wearing masks or not.

4. IMPLEMENTATION DETAILS OF MODULE

1. Applying object detection to spot all the individuals in an image or video.
2. Pairwise remoteness is calculated amid each detected individual.
3. Grounded on the distance calculated, check whether two individuals are fewer than N pixels separately.

In view of all the studies accessible in the earlier chapter, applying the system architecture. The accurateness of the model hinges on the exercise and the images seeing numerous circumstances. This chapter presents the approach for the classification problem using a deep learning algorithm and the system architecture with a detailed description of each stage. The main objective of this work was to construct a model which is able to detect whether or not a person is wearing a mask or not, and if people adhere to the social distance, by using a picture of people in a public place. A framework was designed using deep learning techniques to train the model on a set of images that include people with and without masks. The images were analyzed, and it worked fine.

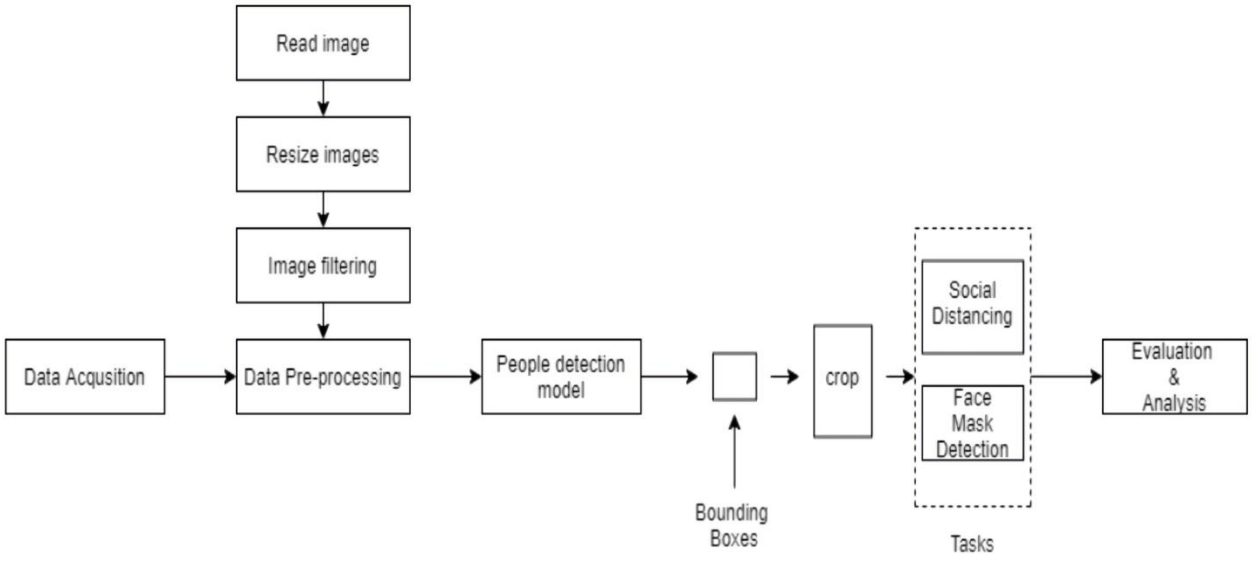

Fig 1: System Architecture

5. RESULT & DISCUSSION

To validate the performance of the algorithm, using different tests to validate whether the development made was successful or not. Surprisingly results were above 90%.

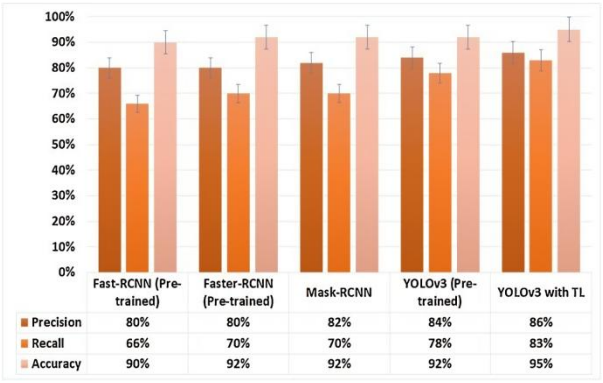

Fig 2: Accuracy comparison

6. CONCLUSION

Picturing the world post-pandemic, the need for self-accountability should be established in society. Everyone should focus on accepting the safeguards and guiding principles provided by WHO. The accountability of distinct hinges entirely on themselves and not on the government. Social Distancing will be an important factor to reduce the spread of the virus. To control a huge crowd, an effective solution is needed, in this project, mainly focuses on that. Live footage or recordings are used by the system can monitor individuals and can also regulate congestion in any events and thus helping in maintaining social distance. Also, the proposed model also needs to be implemented in the large coverage area to improve the accuracy of the prediction model with respect to improving the training model. Discovering masks, determining if a person is wearing a face mask, and giving them the opportunity to do so, and would be a great help to the community. This solution has the potential to significantly reduce bad real-world events. Believing that this will help to increase the safety of the people. The Future Scope of the project is as again we can clearly see that Covid-19 is rapidly increasing so by using this development we can firmly help the surveillance team in having an eye on people who are not following government norms of Covid-19. This development is something which will be in continuous use for coming few years to prevent the spread of deadly virus.

7. REFERENCES

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