Social Distancing Detector For CoVID-19

DA-2

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Literature review

Following the outbreak of the COVID-19 epidemic from late December 2019, social isolation is considered a reliable practice to prevent the transmission of an infectious virus and was selected as a common practice on January 23, 2020 (B. News, 2020). In one month, the number of cases rises differently, with 2,000 new confirmed cases reported on the first week of February 2020. Later, there was a sign of release for the first time in five consecutive days until March 23, 2020, with no new confirmed cases. This is due to a social distance practice that started in China and, eventually, was universally accepted to control COVID-19. Ainslie et al. (2020) investigated the relationship between the economic situation in the region and the strength of social distancing. Studies have shown that moderate levels of exercise can be allowed to avoid major outbreaks. To date, many countries have used technology-based solutions (Punn, Sonbhadra, & Agarwal, 2020a) to overcome the epidemic. Many developed countries use GPS technology to monitor the movements of infected and suspected individuals. Nguyen et al. (2020) provides research on a variety of emerging technologies, including Wi-fi, Bluetooth, smartphones, and GPS, location (localization), computer vision, and in-depth learning that can play an important role in some useful social media situations. Some researchers use drones and other surveillance cameras to detect masses (Harvey and LaPlace, 2019, Robakowska et al., 2017).

To date researchers have done a lot of diagnostic work (Iqbal, Ahmad, Bin, Khan, & Rodrigues, 2020; Patrick et al., 2020; Yash Chaudhary & Mehta, 2020), and others have provided an intelligent health care program using the Internet of Things. (Chakraborty, 2021; Chakraborty et al., 2021). Prem et al. (2020) studied the effects of social exclusion on the prevalence of COVID-19 outbreaks. Studies suggest that early and early social exclusion may slightly reduce the risk of infection. As we all know, while social segregation is important in curbing the curve of infection, it is an unfortunate step for the economy. In Adolph, Amano, Bang-Jensen, Fullman, and Wilkerson (2020), Adolph et al. highlighted the situation in the United States of America during the epidemic. Due to the lack of general support by decision makers, it was not used at first, it started to harm public health. However, social segregation has had an impact on economic productivity; however, many scholars sought other ways to overcome the loss.

Researchers offer effective community-based measurement solutions using surveillance videos and computer vision, machine learning, and more in-depth learning methods. Punn et al. (2020b)proposed a framework using the YOLOv3 model to locate people and Deepsort's method of tracking people found using binding boxes and ID details. Use open image data center (OID), a preset view data set. The authors also compared the results with faster RCNN and SSD. Ramadass et al. (2020) developed an independent drone-based model for community distance monitoring. They trained the YOLOv3 model with a set of custom data. The data set is made up of pre-existing and sidebar images of limited people. The function is added to the look of face masks. The drone camera and the YOLOv3 algorithm help to identify public distance and monitor people on the side or in front of the face mask. Pouw, Toschi, van Schadewijk, and Corbetta (2020)proposed an effective monitoring framework based on a graph of physical orientation and crowd management.

Sathyamoorthy, Patel, Savle, Paul, and Manocha (2020) have made human discovery in a complete state. The model is designed for people who do not obey the social distance limit, that is, six feet of space between them. The authors used a mobile robot with an RGB-D camera and a lid-2-D to make non-collision navigation in most conventions.

From the literature, we conclude that the researcher has done a lot of work to monitor the public distance in public places. However, most of the work focuses on front or side camera viewing. Therefore, in this work, we have introduced a overview framework for public distance monitoring framework that provides a better field of observation and overcomes closure issues, thus playing an important role in public distance monitoring to calculate the distance between people.in this we are planning to detect social distancing between people from image , live camera and also from video.

S. No	Title	Data base	Journal	Author Names	Year of public ation	Objective	Proposed Methodol ogy	Inclusio n Criteria	Metrics	Research Gap

1	Person Detection for Social Distancing and Safety Violation Alert based on Segmented ROI	IEEE	Conference	Afiq Harith Ahamad, Norliza Zaini, Mohd Fuad Abdul Latip Faculty of Electrical Engineering Universiti Teknologi MARA (UiTM) Shah Alam Selangor, Malaysia	2020	In tending to the overall Covid-19 pandemic circumstance, the way toward straightening the bend for Covid cases will be troublesome if the residents don't make a move to forestall the spread of the infection. Perhaps the main practices in these flare-ups is to guarantee a protected distance between individuals in broad daylight. This paper gives the recognition of individuals social distance observing as a careful step in decreasing actual contact between individuals. This	Item Detection Model Stringing Parallelism Covering outline for ROI zone assessment Decide individual area Figure the middle mark of a bouncing box Figure distance between bouncing box	Notwithstanding social distancing measure, this examination additionally remembers distinguishing individuals for limited or risky zones that will trigger an admonition in case of wellbeing infringement. Substantial transportation pathway, airplane pathway, individual	A system has been developed using Python and OpenCV library to implement two proposed features. The first feature is on detecting violations of social distancing, while the second feature is on detecting violations of entering restricted areas. Both features have been tested for accuracy. Based on the overall results, this study is seen to	Based on the tests performed on the system, the results show that the object detection model used for detecting persons is having the difficulty in detecting people correctly in the outdoor environment and difficult scenes with distant scenes. For further improvement in the future, a better object detection model can be implemented.

						examination centers around distinguishing individuals in territories of interest utilizing the Mobile Net Single Shot Multi-box Detector (SSD) object following model and OpenCV library for picture handling. The distance will be processed between the people recognized in the caught film and afterward contrasted with a fixed pixels' qualities. The distance is estimated between the essential issues and the covering limit between people in the sectioned following region.		property, development territory and gas plant can be considered as significant or unsafe locales ordinarily require visual reconnaissance	meet all of its objectives.	

2	A deep learning-based social distance monitoring framework for COVID-19	NCBI	Research	Imran Ahmed, Misbah Ahmad, Joel J.P.C. Rodrigues, Gwanggil Jeon,d, and Sadia Din	2021	In the current situation, as there are no vaccines available; therefore, social distancing is thought to be an adequate precaution (norm) against the spread of the pandemic virus. The risks of virus spread can be minimized by avoiding physical contact among people. The purpose of this work is, therefore, to provide a deep learning platform for social distance tracking using an overhead perspective. The framework uses the YOLOv3 object recognition paradigm to identify	In this work, YOLOv3 is used. The model used single-stage network architecture to estimate the bounding boxes and class probabilities. The model was originally trained on the COCO (Common objects in context) data set. For overhead view person detection, transfer learning is implemented to	A deep learning-based social distance monitoring framework has been presented. To determine the distancing between people, clustering and distance-based methods are utilized. In addition, a tracking algorithm is used to detect individuals in video	The detection model gives bounding box information, containing centroid coordinates information. Using the Euclidean distance, the pairwise centroid distances between detected bounding boxes are measured. To check social distance violations between people, an approximation of physical distance to the pixel is used, and a	For a pre-trained model without transfer learning, the model achieves detection accuracy of 92% and 95% with transfer learning. The tracking accuracy of the model is 95%. The work may be improved in the future for different indoor and outdoor environments. Different detection and tracking algorithms might be used to help track the person or people who are violating or breaches the social distancing threshold.

						humans in video sequences. The transfer learning methodology is also implemented to increase the accuracy of the model. In this way, the detection algorithm uses a pre-trained algorithm that is connected to an extra trained layer using an overhead human data set.	enhance the detection model's efficiency, and a new layer of overhead training is added with the existing architecture.	sequences such that the person who violates/ crosses the social distance threshold is also being tracked.	threshold is defined. A violation threshold is used to check if the distance value violates the minimum social distance set or not. Furthermore, a centroid tracking algorithm is used for tracking peoples in the scene.	

3	The Visual Social Distancing Problem	IEEE	Research paper	MARCO CRISTANI, ALESSIO DEL BUE, VITTORIO MURINO, FRANCESCO SETTANDALESSANDRO VINCIARELLI	2020	One of the main and most effective measures to contain the recent viral outbreak is the maintenance of the so-called Social Distancing (SD). To comply with this constraint, governments are adopting restrictions over the minimum inter-personal distance between people. Given this actual scenario, it is crucial to massively measure the compliance to such physical constraint in our life, in order to figure out the reasons of the possible breaks of such distance limitations, and understand if	This study aims to support the reduction of the corona virus spread and its economic costs by providing an AI-based solution to automatically monitor and detect violations of social distancing among individuals. Developed one of the most (if not the most) accurate deep neural network (DNN)	The aim is to truly detect potentially dangerous situations while avoiding false alarms (e.g., a family with children or relatives, an elder with their caregivers), all of this by complying with current privacy policies.	VSD problem and its connection to the Computer Vision and Social Signal Processing research domains. Starting from a geometrical point of view, i.e. estimating inter-personal distances between people from an image, we show that this first step does not take into account scene and social context. For this reason, a further stage needs to	A more cleaver has to be developed to understand the interpersonal distances. For example, a family moving together on a road has to be ignored. It should not be counted or flagged in social distancing and monitoring system.

						this implies a potential threat. To this end, we introduce the Visual Social Distancing (VSD) problem, defined as the automatic estimation of the inter-personal distance from an image, and the characterization of related people aggregations. VSD is pivotal for a non-invasive analysis to whether people comply with the SD restriction, and to provide statistics about the level of safety of specific areas whenever this constraint is violated.	models for people detection, tracking, and distance estimation called DeepSOCIAL. Performed a live and dynamic risk assessment, by statistical analysis of spatio-temporal data from the people movements at the scene.		elaborate the geometrical VSD in order to interpret whether the violation of the distance is a real cause of alert or an acceptable situation (e.g., a family walking). Then, we contextualize the VSD in different application domains and we finally conclude with a description of the possible ethical shortcomings of VSD.	

4	Monitoring COVID-19 social distancing with person detection and tracking via fine-tuned YOLO v3 and Deepsort techniques	IEEE	Journal	Narinder Singh Punn, Sanjay Kumar Sonbhadra and Sonali Agarwal	2020	This paper proposes a deep learning based framework for automating the task of monitoring social distancing using surveillance video. The proposed framework utilizes the YOLO v3 object detection model to segregate humans from the background and Deepsort approach to track the identified people with the help of bounding boxes and assigned IDs. The results of the YOLO v3 model are further compared with other popular state-of-the-art	Fine-tune the trained object detection model to identify and track the person in a footage. The trained model is feeded with the surveillance footage. The model generates a set of bounding boxes and an ID for each identified person. Each individual is associated with	The violation index term is proposed to quantize the non adoption of social distancing protocol. From the experimental analysis, it is observed that the YOLO v3 with Deepsort tracking scheme displayed best results with balanced mAP and FPS score to monitor the social distancing in	The proposed framework outputs the processed frame with the identified people confined in the bounding boxes while also simulating the statistical analysis showing the total number of social groups displayed by same color encoding and a violation index term computed as the ratio of the number of people to the	Since this application is intended to be used in any working environment; accuracy and precision are highly desired to serve the purpose. Higher number of false positive may raise discomfort and panic situation among people being observed. There may also be genuinely raised concerns about privacy and individual rights which can be addressed with some additional measures such as prior consents for such working environments, hiding a person's identity in

						models, e.g. faster region-based CNN (convolution neural network) and single shot detector (SSD) in terms of mean average precision (mAP), frames per second (FPS) and loss values defined by object classification and localization. Later, the pairwise vectorized L2 norm is computed based on the three-dimensional feature space obtained by using the centroid coordinates and dimensions of the bounding box.	three-dimensional feature space (x, y, d), where (x, y) corresponds to the centroid coordinates of the bounding box and d defines the depth of the individual as observed from the camera. For the set of bounding boxes, pairwise L2 norm is computed. The dense matrix of L2 norm	real-time. The article proposes an efficient real-time deep learning-based framework to automate the process of monitoring the social distancing via object detection and tracking approaches, where each individual is identified in the real-time with the help of bounding boxes.	number of groups. The frames with detected violations are recorded with the timestamp for future analysis. The extensive trials were conducted with popular state-of-the-art object detection models: Faster RCNN, SSD, and YOLO v3, where YOLO v3 illustrated the efficient performance with balanced FPS and mAP	general, and maintaining transparency about its fair uses within limited stakeholders.

							is then utilized to assign the neighbors for each individual that satisfies the closeness sensitivity. Any individual that meets the closeness property is assigned a neighbor or neighbors forming a group represented in a different color coding in contrast to other people.	The generated bounding boxes aid in identifying the clusters or groups of people satisfying the closeness property computed with the help of pairwise vectorized approach. The number of violations is confirmed.	score. Since this approach is highly sensitive to the spatial location of the camera, the same approach can be fine tuned to better adjust with the corresponding field of view.	

							The formation of groups indicates the violation of the practice of social distancing			

5	Monitoring social distancing under various low light conditions with deep learning and a single motionless time of flight camera.	plos	Journal	Adina Rahim, Ayesha Maqbool	2021	The purpose of this work is to provide an effective social distance monitoring solution in low light environments in a pandemic situation. The raging coronavirus disease 2019 (COVID-19) caused by the SARS-CoV-2 virus has brought a global crisis with its deadly spread all over the world. In the absence of an effective treatment and vaccine the efforts to control this pandemic strictly rely on personal preventive actions, e.g., handwashing, face mask usage, environmental cleaning, and	The proposed framework utilizes the you only look once v4 (YOLO v4) model for real-time object detection and the social distance measuring approach is introduced with a single motionless time of flight (ToF) camera. The risk factor is indicated based on the calculated distance and safety distance violations	This paper aims to mitigate the effects of coronavirus disease along with minimum loss of resources; this disease has badly impacted the global economy. Secondly, to provide a highly accurate solution for the detection of people to help out in monitoring social distancin	To evaluate the performance of our social distance monitoring solution, we perform few tests at three different fixed camera distances 400 cm, 500 cm, and 600 cm. Test frames are collected from the motionless ToF camera of Samsung galaxy note 10+ placed 4.5 feet above the ground where Cp is 0° (a regular camera view). At each	This application is meant to be used in a real-time environment so, precision and accuracy are highly required to serve the motive. The technique is limited to a few scenarios, social distance among people can be only monitored at fixed Cd values. Secondly, in order to initialize the monitoring process, we have to place two temporary target objects in an environment.

						most importantly on social distancing which is the only expedient approach to cope with this situation. Low light environments can become a problem in the spread of disease because of people's night gatherings	are highlighted. Experimental results show that the proposed model exhibits good performance with 97.84% mean average precision (mAP) score and the observed mean absolute error (MAE) between actual and measured social distance values is 1.01 cm.	g during the night. Especially, in summer when the heat is at its peak, people having congested homes find ways to get out of their homes during the night with their families to take fresh air. During this serious situation, it is necessary to take proper action.	specific fixed camera distance, we tested 2 scenarios one above the specified safety threshold (100 cm) at 140 cm and one below the specified safety threshold at 52 cm. The model exhibited overall good performance in low light environments	

6	Real-Time Social Distancing Detector Using Socialdistancingnet-19 Deep Learning Network	IEEE	confrance	Rinkal Keniya, Ninad Mehendale	2020	Thie objective of this paper is to focused on detecting if the people around are maintaining social distancing or not. Using a self developed model named SocialdistancingNet-19 for detecting the frame of a person and displaying labels, they are marked as safe or unsafe if the distance is less than a certain value. This system can be used for monitoring people via video surveillance in CCTV.	In the present article, a deep learning based framework is proposed that utilizes object detection and tracking models to aid in the social distancing remedy for dealing with the escalation of COVID-19 cases. In order to maintain the balance of speed and accuracy, YOLO v3 alongside the Deepsort	In this paper the author proposed ,method for social distancing monitoring using a different model named SocialdistancingNet19 . Which is different from our model YOLO v3 and it is also implemented model	Our algorithm used Yolo v3 for object detection but in this paper author used their own algorithm SocialdistancingNet-19 .but the Yolo v3 is the fastest and pretrain model for object detection.	In this paper their algorithm works only on web camera for taking input they can also take input as photo or videos

							are utilized as object detection and tracking approaches while surrounding each detected object with the bounding boxes. Later, these bounding boxes are utilized to compute the pairwise distance to show wether thy are following social distancing or not.			
7	The impact of socil distancing on	IEEE	Journal	Pinar Keskinocak, Buse Eylul Oruc ,	2020	The goal of this study was to project the number of COVID19 infections and	The model utilized COVID19-specific	This paper is mainly focus on the detail analysis	The following outcomes were compar	In this paper they are mainly focus on theoretical aspect to reduce the infection they are not giving

	COVID 19 spread: State of Georgia case study			Arden Baxter , John Asplund , Nicoleta Serban		resulting severe outcomes, and the need for hospital capacity under social distancing, particularly, shelter-in-place and voluntary quarantine for the State of Georgia. An agent-based simulation model was developed to project the infection spread.	parameters and data from Georgia on population interactions and demographics. The simulation study covered a seven and a half-month period, testing different social distancing scenarios, includingdbaselines (nointervention or school closure only) and combinations of shelterin place and	Of sprade of covid19 and the different measures to control the sprade of coven19	ed at the state and community levels: the number and percentage of cumulative and daily new symptomatic and asymptomatic infections, hospitalizations, and deaths; COVID19-related demand for hospital beds, ICU beds, and	any idea about implementation

							voluntary quarantine with different timelines and compliance levels.		ventilators.	
8	Remote Diagnostic and Detection of Coronavirus Disease (COVID-19) System Based on Intelligent Healthcare and Internet of Things	IEEE	Journal	S.K.Elagan, Sayed F. Abdelwahab, , E.A. Zanaty, Monagi H. Alkinani, Hammad Alotaibi, Mohammed E.A. Zanaty	2020	In this paper, a novel system for remote detecting COVID-19 patients based on artificial intelligence technology and internet of things (IoT) has been produced in order to stop the virus spreading at an early stage.	The proposed system consists of several devices called smart medical sensors such as: pulse, thermal monitoring, and blood sensors. The system was working sequentially starting by pulse sensor and end by blood	In this paper, a novel system for remote detecting COVID-19 patients based on artificial intelligence technology and internet of things.		

							sensor including an algorithm to manage the data given from sensors. The pulse sensor was devoted to acquire a high quality data using a smartphone equipped by a mobile dermatoscope with 20X magnification. The processing was used RGB color system to perform moving			

							window to segment regions of interest (ROIs) as inputs of the heart rate estimation algorithm. The heart rate (HR) estimation was then given by computing the dominant frequency by identifyin			
9	Social Distancing Detection with Deep Learning Mod	IEEE	confrance	Yew Cheong Hou1,Mohd Zafri Baharuddin,Salman Yussof, Sumayyah	2020	The objective of this paper design machine learning for social distancing detection using deep learning to evaluate the distance between people	This social distancing detection tool was developed to detect the safety	This paper used Deep CNN method to model ML algorithm which is	YOLO is orders of magnitude faster(45 frames per second)	The limitation of YOLO algorithm is that it struggles with small objects within the image, for example it might have difficulties in detecting a flock of birds. This is due to the

	el			Dzulkifly		to mitigate the impact of this coronavirus pandemic.	distance between people in public spaces. The deep CNN method and computer vision techniques are employed in this work	different from our algorithm YOLO v3 . To monitor social distancing	than other object detection algorithms like CNN.	spatial constraints of the algorithm.
10	Performance Evaluation of COVID-19 Proximity Detection Using Bluetooth LE Signal	IEEE	Journal	ZHUORAN SU, KAVEH PAHLAVAN,EMMANUEL AGU	2021	The objective of this paper is to deploying Covid-19 contact tracing apps that use Bluetooth Low Energy (LE) to detect proximity within 2m for 15 minutes.	The methodology used in this paper is most prominent TCTL detection ideas being explored involves utilizing the Bluetooth Low-Energy (BLE) Received Signal Strength	This paper also deal with the social distancing monitoring to prevent the sprade of covid19. using bluthooth low energy signal	Classical algorithms showed an average confidence of 69.60% in correctly estimating the social distance threshold of 6 ft. The GBM ML	The main drawback of this model is that it work only when if both the person have smartphone, having bluthooth

							Indicator (RSSI) to determine whether the owners of two smartphones are observing the acceptable social distance of 6 ft. However, using RSSI measurements to detect the TCTL situation is extremely challenging due to the significant signal variance caused by multipath fading in indoor radio		algorithm demonstrated that using the thirteen feature it can increase the confidence in the estimation of this social distance using BLE RSSI with an average confidence of 89.58%, which was 19.98% higher than the average confidence achieved using the	

							channel, carrying the smartphone in different pockets or positions, and differences in smartphone manufacturer and type of the device.		classical approach	
11	Fighting against COVID-19: A novel deep learning model based on YOLO-v2 with ResNet-	This paper conducted its experiments based on two public medical face mask datasets. The first datas	IEEE	MohamedLoeya Gunasekaran Manogaranbc Mohamed Hamed N.Tahad Nour Eldeen M. Khalifad	Feb, 2021	The main contributions of this paper are conducted as follows: 1) A novel deep learning detector model that automatically finds and localize medical masked face on an image. 2) A New masked face dataset using two public masked face datasets to	The introduced model includes three main components: the first component is the number of anchor boxes, the second component is the data augmentation, the final	To evaluate the YOLO v2 with ResNet-50 performance to find and localize the medical masked face, different experiments have been conducted througho	The average precision (AP) (Padilla, Netto, & da Silva, 2020) combines recall and precision as shown in equation (6) to evaluate the	Furthermore, performance metrics such as AP and log-average miss rates score had been studied for SGDM and Adam optimizer experiments. We have shown that the proposed model scheme of YOLOv2 with ResNet-50 is an effective model to detect a medical masked face. As a future study, we plan to detect a kind of masked face in

	50 for medical face mask detection	et is Medical Masks Dataset (MMD) published by Mikolaj Witkowski (https://www.kaggle.com/vtech6/medical-masks-dataset).				get rid of the dataset's scarcity problem. 3) The proposed model improves detection performance by introducing mean IoU to estimate the best number of anchor boxes. 4) Two optimizers are used in training to get the highest performance possible. 5) YOLO-v2 detector is an effective model to find a masked face on input image based on ResNet-50.	main component is the detector. It illustrates the proposed detector model. Mainly, the detector used YOLOv2 with ResNet-50 for the feature extraction and detection in the training, validation, and testing phase.	ut this research. The proposed model was implemented on the system having the following specifications: The GPU used NVIDIA RTX with the CUDA with Tensorflow, MATLAB, and Deep Neural Network library (CuDNN) for GPU learning.	ability of the detector to find all relevant objects and the ability of the detector to detect objects correctly. At all recall levels, the ideal precision is one. log-average miss rates are a mean of nine False Positives Per Image (FPPI) miss rate in the range of to give stable performance	image and video-based on deep learning models.

12	A hybrid deep transfer learning model with machine learning methods for face mask detection in the era of the COVID-19 pandemic	Most of the work available uses smaller datasets with less variability in terms of types of masks (i.e. standard N-95, surgical masks) or only look at specific regional datasets that have been scraped from the	Research Paper	Prateek Khandelwal1, *Anuj Khandelwal1, *Snigdha Agarwal1, Deep Thomas1, Naveen Xavier1, Arun Raghuraman1	2020	This paper describes an efficient and economic approach of using AI to create a safe environment in a manufacturing setup. We demonstrate our approach to build a robust social distancing measurement algorithm using a mix of modern-day deep learning and classic projective geometry techniques. We have deployed our solution at manufacturing plants across the Aditya Birla Group (ABG). We have also described our face mask detection approach which provides a high accuracy across a range of customized masks.	Their work comes very close to the work described in [11]. The cited work looks at identifying people with full face or partial occlusion. The paper categorizes people with hand over their faces or occluded with objects. This approach is unsuitable for our scenario which requires to essentially detect faces that have their	For training the mask detection model, we used the Face Detection model as described above to extract face-crops from few video feeds of a single manufacturing plant. These facecrops of about 500 images were manually annotated into mask and no mask categories.	They used 20% of our overall data as a validation set with 380 as mask and 460 images as no mask which is not exposed during training of the model. We used the MobileNetV2 architecture for building the model. We resized the images to 224 × 224 pixels to be fed into the	They are training deep learning models to detect faces and extract embeddings which are then matched against a repository of embeddings created using the HR database. These efforts are showing promising results and are likely to be deployed in production soon.

		web.					mouths covered with mask like objects such as scarves, mufflers, handkerchiefs etc.		network	

13	Visual Social Distance Alert System Using Computer Vision & Deep Learning	IEEE	Conference on Electronics, Communication and Aerospace Technology (ICECA)	Degadwala, Sheshang Vyas, Dhairya Dave, Harsh Mahajan, Arpana	2020	The Research Paper will discuss how video social distancing is connected with past writing in social signal processing and defines a path to explore new computer vision techniques that can provide solutions for such issues.	.For increasing speed up profound learning-based article locators, Single Shot Detectors (SSDs) and YOLO uses a one-stage finder system. These designs treat object position as a degene	For increasing speed up profound learning-based article locators, Single Shot Detectors (SSDs) and YOLO uses a one-stage finder system. These designs treat object position as a degene	This context predicts jumping boxes. The organization predicts 4 directions for each bouncing box, tx, ty, tw, th. Compute Euclidean separation between two focuses then	Cosy contacts can certificate nearer social separations just as being a paternal figure of people with delicate conditions. It is designated that,

							ration issue, taking a given inform ation portrait . YOLO is an astonis hing case of a solitary stage locator	ration issue, taking a given inform ation portrait . YOLO is an astonis hing case of a solitary stage locator	Transla te focus facilitat es into square shape arrange s. Now Sieve the individ ual class from the acknow ledgem ents and get a jumpin g box centroi d for each individ ual identifi ed. The functio n convert Back gets parame ters x, y—the midpoi nt of the boundi ng box—a nd wand h—the width and height of the boundi ng box—as inputs.	seeing such social setting is a substan tial issue in the inscript ion of sign social treatme nt that needs further examin ation endeav ours for a depend able preparation. As the arrange ment is mingle d with the decrypt ing of social connect ions from images, there are solid moral

									Then it will convert the center coordinates to rectangle coordinates and return the converted coordinates, x1, y1, x2, and y	and security uncertainties that should be tended to with novel protection by-plan preparation
14	Developing Smart COVID-19 Social Distancing Surveillance Drone using YOLO Implemented in Robot Operating System simulation environment	IEEE	Journal	Pray Somaldo; Faizal Adila Ferdiansyah; Grafika Jati; Wisnu Jatmiko	2021	This paper recommends a drone that has the ability of localization, map reading, people detection, crowd identifier, and social distancing warning. YOLO-v3 is used to sense people and define adaptive social distancing indicator. Road segmentation on the IRIS	Social Distancing Surveillance system by means of a drone to identify abuses of social distancing policy. The drone senses people and identifies if there are two people or further who are	The system utilized the YOLO-v3-tiny which is the fast object detection algorithm [7]. This algorithm uses a lightweight detector that fits an embedded system which has small computation [8].	the projected method needs to confine the target so that the organization can be validated to impersonate real world scenarios. Hence the x, y, and z coordinate of the target in the Gazebo	For forthcoming work, Author has to implement design and methodology in the real drone. Drones can also be equipped with a thermal radar so drones can identify Covid-19 inspection

						PX4 drone in the Robot Operating System and Gazebo simulation is implemented in this paper. .	nearby each other at a convinced distance. The drone is implanted with a global positioning system that localizes the pragmatic area and also detects roads by flying over them using a course plotting scheme. The planned framework consist of significant part namely, Object Detector, drone agent, , and Social Distancing System and		environment adjusted to real world coordinate. Distance formula defined as: ds2 = dx2 + dy2 + dz. The image which is restrained in pixels is adjusted to real-world measure in meters. K value is assumed which is obtained by adjusting the pixel units and meters unit. Since dx and dy in 2D image can be premed	quickly.

							localization navigation		itated directly, the calibrated dx and dy is formulated as: dxcalibrated = |K ∗ dx| ∩ dy calibrated = |K ∗ dy|	
15	Real-time Face Mask and Social Distancing Violation Detection System using YOLO	IEEE	Conference	Krisha Bhambani; Tanmay Jain; Kavita A. Sultanpure	2021	This paper concentrates on a solution to assist enforce proper social distancing and wearing masks in public by means of YOLO object detection on video material and images in real time. The investigational results shown in this paper conclude that the detection of masked faces and human subjects based on YOLO has	This paper suggests a solution which performs real-time recognition of individuals to trail social distancing norms being tailed and real-time face detection to trail usage of	YOLO v3 object detection and a Deep sort object pursuing algorithm was implemented to trail individuals in surveillance tape. Each specific location (x, y) is hence mapped to a 3-Dimension	For arbitrating the Performance of the answer, evaluative of certain metrics which had been 1) Precision: T P T P + FP (9) 2) Recall: T P T P + F N (10) where, TP =	After severe testing, the model yields impartially accurate results for a wide park of view. With accumulation of time-consuming computations or image warping somewhat, light weight model

						stronger strength and faster detection speed as equated to its competitors.	face-masks, in several setups, together with complex setups which are crowded besides unwell lit. A. Dataset The dataset used encompasses 7,959 images containing specific images from WIDER-FACE with facial remarks belonging to two programs, masked faces and unmas	al feature space (x, y, d), where d is the apparent depth of the person with reference to the camera.	True Positives, FP = False Positives, FN = False Negatives. 3) F1 Score : 2 × (Precision × Recall Precision + Recall) (11) 4) Intersection over Union (IoU): area(Bp ∩ Bgt) area(Bp ∪ Bgt) .	is calm to standardize and can be fine used in real time due to high FPS and good veracity in near future.

							ked faces. manually adding 3rd class by interpreting individual people in every image. B. YOLO v4 Architecture proposed some major changes from its forerunner YOLO v3 . resulting in significant enhancements in both speed and accuracy. YOLO v4 is extremely fast, easy to			

							train, robust, stable and gives promising results even for tiny objects, hence, it is nominated as our object detector of choice. For an input image/ frame, it senses objects fitting to three classes — unmasked faces, masked faces and people			
16	A Novel Detection Framework About Conditions of Wearing	IEEE	Journal	JUN ZHANG1, FEITENG HAN1, YUTONG CHUN 1, AND	2021	This paper presents a new practical dataset casing various conditions,	The determination of paper is to sense	The Churns in R-CNN was projected by the	This paper uses a VGG16 pre-trained on	there was continually one delinq

	Face Mask for Helping Control the Spread of COVID-19			WANG CHEN2		which covers 8635 faces with diverse wearing status. It suggests a novel recognition framework about conditions of tiring face masks, called Context-Attention R-CNN, which increase the intra-class distance and shorten inter-class distance by extracting distinctive features. Precisely, Atfirst extract the numerous context features for region suggestions, and use the attention component to weight these context features from network and spatial levels. dissociating the arrangement	the fine-grained situations of wearing face mask, and additionally make contributions to the restriction of COVID-19. It use the prevalent open-source classification tool to interpret the raw images	Discerning Search. For each Churn, the R-CNN used the CNN-based extractor to abstract the feature map. In order to save superfluous computation, Fast R-CNN removed the feature for an entire image, and communal the whole feature for all Churns. For a quicker speed, the Faster R-CN	ImageNet as the support network. In command to better exhibit the advantages of spatial devotion, It set the size of churns merging as 14 × 14. In decoupling divisions, It set the length of fully-connected layers as 2048. In addition, the kernel size of three-dimensional attention is 3 × 3.In train and	uent with CNN-based detectors: sensitive to hyper parameters. Thus, the hyper parameter optimization is another important research track, which can be implemented in near future.

						and localization divisions to extract more suitable feature for these two responsibilities		N familiarized a region proposal system to automatically suggest the applicant region offers	test phrase, the image is first resized to 600 × 1000. Then pixel morals of the resized image are standardized to [-1,1]. Moreover, the horizontally-flip process is used to supplement the training samples	
17	Real time data analysis of face mask detection and social distance measurement using Matlab	Elsevier	Journal	S.Meivela K.Indira DevibS.Uma MaheswaribJ.Vijaya Menakab	2021	The planned work composed face restriction, colour variations, brightness changes, and divergence changes. Separation and feature	Face area parted into squares of skin comparable pixels and non-sk	Yolov 2 file identifies recognition after the trained model using the	.Mask finding bounding box files is used in matlab. picture.	sensitive to hyper parameters is a problem in the CNN detector.

						extraction used in face constraint of the person image. RCNN, Fast RCNN, and Faster RCNN algorithm for sensing Mask detection and Social distance. Sections with Convolutional neural network Founded on Socializing pictures, pixel prediction, and specific enhancements. The chief objective was to resolve multiple and multitask picture recognition problems with speed rates. The Procedure used for face detection and detection of Unveil person in a dataset of face database	in like pixels as the sensed face contains some dark and skin like portions. Primary, the skin colour range considered. It has skin color like pixels. It is better to describe skin like pixels found in colour space. It is the hesitant distribution by inspection of distinctive designs. It is	classifications of bird seeds eye concept used to detection of masking persons using faster R-CNN algorithm l Social distance mea-sured between points. High Contrast and High brightness image adjusted using the Faster R-CNN algorithm, when capture complex image	This file takes out different datasets and provides pounded information. This is	Hence optimization has to be done to overcome this problem.

							humble in use and gives better consequences. It decided cautiously the nature of results depend on model and precision of rule. After precise face discovery, skin color subspace, and non-skin color To find the skin and non-skin pixel ideals, we proposed a 3x3			

							pixel square & it will route on the whole face area. Mean of the entirely pixel values estimated and. Subsequently taking the mean, the original value equated with all the additional square values, and on behalf of that, It will differentiate the skin colour ward and non-skin coloration			

18	IoT-based System for COVID-19 Indoor Safety Monitoring	Els	IEEE	Nenad Petrović and Đorđe Kocić	2020	In this paper, we introduce an affordable IoT-based solution aiming to increase COVID-19 indoor safety, covering several relevant aspects: 1) contactless temperature sensing 2) mask detection 3) social distancing check. Contactless temperature sensing subsystem relies on Arduino Uno using infrared sensor or thermal camera, while mask detection and social distancing check are performed by leveraging computer vision techniques on camera-equipped Raspberry	There are three OpenCV library classifiers11: 1) haarcascade_frontalface_default – which is used for detection of human face from frontal side 2) haarcascade_mcs_mouth – recognizes human mouth within the provided image 3) haarcascade_mcs_nose –	The performance of distancing check varies together with distance of objects from camera, as it changes with respect to initially calculated ratio between pixels and meters.		experiment with various deep learning and computer vision frameworks for object detection on Raspberry Pi in order to achieve higher framerate. Moreover, we would like to extend this solution with environment sensing mechanisms for adaptive building air conditioning and

						Pi.	to detect nose			ventilation airborne protection in order to reduce the spread of corona virus indoors [4, 8, 24], especially during summer.
19	SSDMNV2: A real time DNN-based face mask detection system using single shot multibox detector and MobileNetV2	https://github.com/TheSSJ2612/Real-Time-Medical-Mask-Detection/releases/download/v0.1/Dataset.zip	IEEE	Preeti Nagrath,a Rachna Jain,a Agam Madan,a Rohan Arora,a Piyush Kataria,a and Jude Hemanthb	March 2021	The main contributions of the paper are as follows: i.) AGitHub repository is made available, which contains a self-made Dataset of masked faces, including datasets taken from online resources. This dataset could be used for developing new face	For doing this task, the DNN module was used from OpenCV, which contains a 'Single Shot Multibox Detector object detection model	Using pre-trained models helps avoid unnecessary computational costs andhelps in taking advantage of already biased weights without losing alread	The evaluation metrics used in this paper are accuracy, the area under the Receiver Operating Characteristics (ROC) curve, classification report,	Many existing researches faced problematic results, while some were able to generate better accuracy with their dataset. The problem of various

						mask detectors and performing several applications. This has been explained in Section 3.1. ii.) OpenCV DNNs have been used for face mask detection, which allows for real-time detection without much resourceusage. It can also detect faces in different orientations and can also detect occluded faces with good accuracy.The proposed SSDMNV2 model outperforms various previous models. iii.) Several provocations that were faced during the development of this model have been	with ResNet-10 as its backbone architecture. This approach helps in detecting faces in real-time, even on embedded devices like Raspberry Pi. The following classifier uses a pre-trained model MobileNetV2 to predict whether the person is wearing a mask or not	y learned features	confusion matrix, and comparison of models. The plots are based on model accuracy; the pyplot command style function makes matplotlib work like MATLAB.	wrong predictions have been successfully removed from the model as the dataset used was collected from various other sources and images used in the dataset was cleaned manually to increase the accuracy of the results. Real-world applications are a much more challenging issue for the upcom

						considered in this paper; this may help the reader to develop more improved face mask detectors.				ing future. 210
20	`A Convolutional Neural Network Cascade for Face Detection	The Face Detection Data Set and Benchmark (FDDB) dataset contains 5, 171 annotated faces in 2, 845 images. This is a large-scale face detection benchmark with standardized evaluation process	IEEE	Haoxiang Li†, Zhe Lin‡, Xiaohui Shen‡, Jonathan Brandt‡, Gang Hua†	2015	They propose a CNN cascade for fast face detection; • we introduce a CNN-based face bounding box calibration step in the cascade to help accelerate the CNN cascade and obtain high quality localization; • we present a multi-resolution CNN architecture that can be more discriminative than the single resolution CNN with only a fractional overhead; • we further	The proposed method runs at 14 FPS on a single CPU core for VGA-resolution images and 100 FPS using a GPU, and achieves state-of-the-art detection performance on two public face detecti	There are 6 CNNs in the cascade including 3 CNNs for face vs. non-face binary classification and 3 CNNs for bounding box calibration, which is formulated as multiclass classification of discretized	We uniformly extend our square detection bounding boxes vertically by 20% to be upright rectangles on FDDB to better approach their ellipse annotation. A	s. On the public face detection benchmark FDDB, the proposed detector outperforms the state-of-the-art methods. The proposed detector is very fast, achieving 14 FPS for typical VGA images on CPU

						improve the state-of-the-art performance on the Face Detection Data Set and Benchmark (FDDB)	on bench marks	displac ement pattern		and can be acceler ated to 100 FPS on GPU

Related Work

In past years, object detection techniques using deep models are potentially more capable than shallow models in handling complex tasks and they have achieved spectacular progress in computer vision. Deep models for person detection specialise in feature learning, contextual information learning, and occlusion handling. Deep learning object detection models can now mainly be divided into two families: (i) two-stage detectors such as R-CNN, Fast R-CNN and Faster R-CNN and their variants and (ii) one-stage detectors such as YOLO and SSD. In two-stage detectors detection is performed in stages, within the first stage, computed proposals and classified within the second stage into object categories. However, some methods, such as YOLO, SSD Multi-Box, consider detection as a regression issue and look at the image once for detection.

Implementation:

Our project Social Distancing Detector has 3 modules which include Image, Video, Live WebCam. We have successfully implemented the Image Module of our project. This module can detect the social distancing if an input image is given.

Code:

SDD_Image.py

```
import numpy as np
import time
import cv2
import math

labelsPath = "./coco.names"
LABELS = open(labelsPath).read().strip().split("\n")

np.random.seed(42)
COLORS = np.random.randint(0, 255, size=(len(LABELS), 3),
        dtype="uint8")

weightsPath = "./yolov3.weights"
configPath = "./yolov3.cfg"

net = cv2.dnn.readNetFromDarknet(configPath, weightsPath)


image =cv2.imread('./images/test_image.jpg')
(H, W) = image.shape[:2]
ln = net.getLayerNames()
ln = [ln[i[0] - 1] for i in net.getUnconnectedOutLayers()]
blob = cv2.dnn.blobFromImage(image, 1 / 255.0, (416, 416),swapRB=True, crop=False)
net.setInput(blob)
start = time.time()
layerOutputs = net.forward(ln)
end = time.time()
print("Frame Prediction Time : {:.6f} seconds".format(end - start))
boxes = []
confidences = []
classIDs = []
for output in layerOutputs:
    for detection in output:
        scores = detection[5:]
        classID = np.argmax(scores)
        confidence = scores[classID]
        if confidence > 0.5 and classID == 0:
            box = detection[0:4] * np.array([W, H, W, H])
            (centerX, centerY, width, height) = box.astype("int")
            x = int(centerX - (width / 2))
            y = int(centerY - (height / 2))
            boxes.append([x, y, int(width), int(height)])
            confidences.append(float(confidence))
            classIDs.append(classID)

idxs = cv2.dnn.NMSBoxes(boxes, confidences, 0.5,0.3)
ind = []
for i in range(0,len(classIDs)):
    if(classIDs[i]==0):
        ind.append(i)
a = []
b = []
color = (0,255,0)
if len(idxs) > 0:
        for i in idxs.flatten():
            (x, y) = (boxes[i][0], boxes[i][1])
            (w, h) = (boxes[i][2], boxes[i][3])
            a.append(x)
            b.append(y)
            cv2.rectangle(image, (x, y), (x + w, y + h), color, 2)


distance=[]
nsd = []
for i in range(0,len(a)-1):
    for k in range(1,len(a)):
        if(k==i):
            break
        else:
            x_dist = (a[k] - a[i])
            y_dist = (b[k] - b[i])
            d = math.sqrt(x_dist * x_dist + y_dist * y_dist)
            distance.append(d)
            if(d<=100.0):
                nsd.append(i)
                nsd.append(k)
            nsd = list(dict.fromkeys(nsd))

color = (0, 0, 255)
text=""
for i in nsd:
    (x, y) = (boxes[i][0], boxes[i][1])
    (w, h) = (boxes[i][2], boxes[i][3])
    cv2.rectangle(image, (x, y), (x + w, y + h), color, 2)
    text = "Alert"
    cv2.putText(image, text, (x, y - 5), cv2.FONT_HERSHEY_SIMPLEX,0.5, color, 2)

cv2.putText(image, text, (x, y - 5), cv2.FONT_HERSHEY_SIMPLEX,0.5, color, 2)
cv2.imshow("Social Distancing Detector", image)
cv2.imwrite('output.jpg', image)
cv2.waitKey()
```

SDD_Image.py


```
net = cv2.dnn.readNetFromDarknet(configPath, weightsPath)

image =cv2.imread('./images/test_image.jpg')
(H, W) = image.shape[:2]
ln = net.getLayerNames()
ln = [ln[i[0] - 1] for i in net.getUnconnectedOutLayers()]
blob = cv2.dnn.blobFromImage(image, 1 / 255.0, (416, 416),swapRB=True, crop=False)
net.setInput(blob)
start = time.time()
layerOutputs = net.forward(ln)
end = time.time()
print("Frame Prediction Time : {:.6f} seconds".format(end - start))
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classIDs = []
for output in layerOutputs:
    for detection in output:
        scores = detection[5:]
        classID = np.argmax(scores)
        confidence = scores[classID]
        if confidence > 0.5 and classID == 0:
            box = detection[0:4] * np.array([W, H, W, H])
            (centerX, centerY, width, height) = box.astype("int")
            x = int(centerX - (width / 2))
            y = int(centerY - (height / 2))
            boxes.append([x, y, int(width), int(height)])
            confidences.append(float(confidence))
            classIDs.append(classID)

idxs = cv2.dnn.NMSBoxes(boxes, confidences, 0.5,0.3)
ind = []
for i in range(0,len(classIDs)):
    if(classIDs[i]==0):
        ind.append(i)
a = []
b = []
color = (0,255,0)
if len(idxs) > 0:
        for i in idxs.flatten():
            (x, y) = (boxes[i][0], boxes[i][1])
            (w, h) = (boxes[i][2], boxes[i][3])
            a.append(x)
            b.append(y)
            cv2.rectangle(image, (x, y), (x + w, y + h), color, 2)


distance=[]
nsd = []
for i in range(0,len(a)-1):
    for k in range(1,len(a)):
        if(k==i):
            break
        else:
            x_dist = (a[k] - a[i])
            y_dist = (b[k] - b[i])
            d = math.sqrt(x_dist * x_dist + y_dist * y_dist)
            distance.append(d)
            if(d<=100.0):
                nsd.append(i)
                nsd.append(k)
            nsd = list(dict.fromkeys(nsd))

color = (0, 0, 255)
text=""
for i in nsd:
    (x, y) = (boxes[i][0], boxes[i][1])
    (w, h) = (boxes[i][2], boxes[i][3])
    cv2.rectangle(image, (x, y), (x + w, y + h), color, 2)
    text = "Alert"
    cv2.putText(image, text, (x, y - 5), cv2.FONT_HERSHEY_SIMPLEX,0.5, color, 2)

cv2.putText(image, text, (x, y - 5), cv2.FONT_HERSHEY_SIMPLEX,0.5, color, 2)
cv2.imshow("Social Distancing Detector", image)
cv2.imwrite('output.jpg', image)
cv2.waitKey()
```
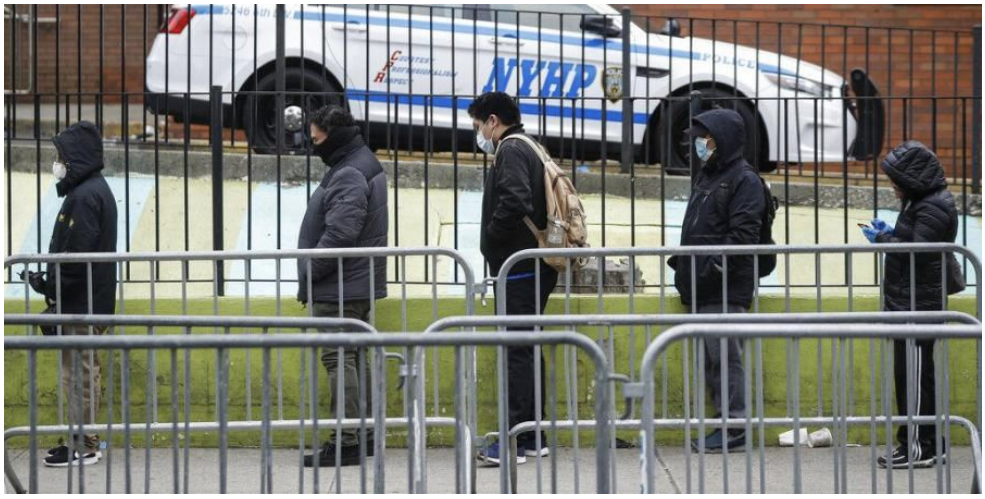

Input Image:



Output Image: