A Survey on Deep Learning - Based COVID-19 Safety Monitoring

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ABSTRACT

COVID-19 caused drastic changes in civilization, eventually leading to a pandemic. Many businesses have remained unaffected by the rapidly spreading Corona virus. Investigate; the focus is on finding a way to avoid the transit rate. The current research is centered on delving into the many fundamental causes of the problem. The spread of disease and the technological systems' contributions keep it under control. Wearing a facemask and maintaining social distance are two basic ways to avoid transit right away. Deep learning technologies are examples of such technologies. Assisting developers in the analysis of publically available data such as X-rays, CT scans, and text data from numerous conversations in social media, and so on. To determine whether social distancing and facemask protection are being monitored, image and video processing are used. The connection of CCTV cameras in the Public areas, public transportation, and hospitals are useful for gathering information. In this survey paper, we will discuss about the technologies used for this in detail.

Keyword : *Social distancing, Facemask, Yolo v3, Deep learning , Keras and Tensorflow*

1. INTRODUCTION

Since COVID-19 has become a pandemic, people all across the world are brainstorming ways to stop it from spreading. Maintaining social distance and wearing protective clothing are the core rules for preventing the transmission of the disease. When going out, wear a mask. The COVID-19 initially began spreading in December of 2019 in China, in the city of Wuhan. The infection began in China with animals and has since spread globally as a pandemic situation. Coronavirus infection spreads to others, but only through direct contact with the infected people and through the air. The infection directly struck the patients' lung cells through their respiratory system, allowing it to replicate the infection and develop a very difficult problem in a very short amount of time.

1.1 Covid-19 symptoms:

Dry hack, fever, windedness, pain, and migraine are the most well-known symptoms of COVID. COVID's rapid delivery causes severe muscle aches and pains. Individuals with debilitated invulnerability should be empowered. It had no issue tainting the framework. COVID-19 is at an out-of-control phase, causing death in a variety of people groups due to severe lung and organ failure. Of the human body, various types of drugs are used to treat various ailments. By doctors, all across the world to develop a viable treatment a means of preventing the virus from spreading to the majority of people this is a bad stage.

1.2 Research towards COVID-19:

Three major networks have been aided by sophisticated technology and have a stronger dedication to fighting COVID-19. The computerized endeavors are moving forward. By compiling X-Ray and CT-Scan information to recognize COVID-19's expectations with the help of consciousness created by humans (AI). Because of a restricted ability to focus time by executing many difficult computations, AI and AI people groups have made a huge commitment to forecasting COVID19. Another academic network that includes breaking into the numbers with numerical experts and actual officials' dispersion models of the Corona infection that are overwhelming to investigate the various infection strategies' adaptability and social distancing needs.

2. LITERATURE SURVEY

With the recent outbreak and rapid transmission of the COVID-19 pandemic, the need for the public to follow social distancing norms and wear masks in public is only increasing. According to the World Health Organization, to follow proper social distancing, people in public places must maintain at least 3ft or 1m distance between each other. Now let us discuss some related works on this topic.

2.1 Social Distancing Detection with Deep Learning Model:

This research describes a method for detecting social distancing using deep learning to assess the distance between people in order to reduce the impact of the coronavirus. Pandemic. The detection tool was created to warn people about potential dangers. By examining a video, keep a safe distance between each other. feed. The camera's video frame was used as input, and Detection of open-source objects. The open-source object detection pre-trained model based on the YOLOv3 method was used to detect pedestrians using the video frame from the camera as input.

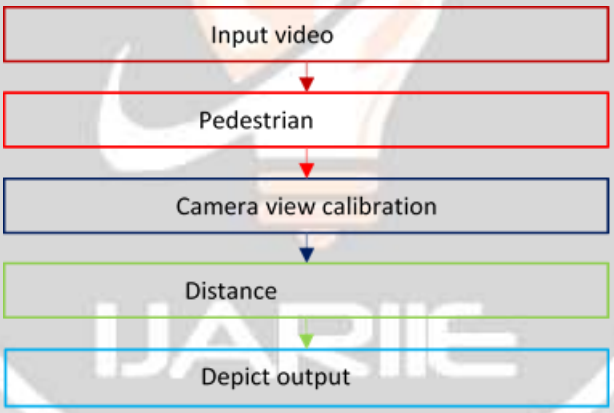

Fig -1: Pipeline for social distancing detection

A deep learning model is used to provide a way for detecting social separation. The distance between persons may be measured using computer vision, and any object can be detected. A red dot will be placed next to a noncompliant pair of people. A red line and a frame the recommended strategy has been proven to work using a video of people going along the street.

2.2 Monitoring COVID-19 social distancing with person detection:

This paper provides a deep learning-based system for automating the task of social distancing surveillance video monitoring. YOLO v3 object detection is used in the suggested framework. Deepsort and a model to separate individuals from the background a method for tracking recognised people using bounding boxes boxes and IDs that have been assigned to them. The YOLO v3 model's results are compared to those of other prominent state-of-the-art models, such as the quicker region-based CNN (convolution neural network) and the In terms of mean average precision, the single shot detector (SSD) is the best. (mAP), frames per second (FPS), and object-specific loss values Localization and classification . . The non-adoption of the social distancing protocol is quantified using the violation

index term. According to the results of the experiment, the YOLO v3 with With balanced findings, the Deepsort tracking strategy produced the best outcomes. To track social distancing in real time, use the mAP and FPS scores.

The study provides an effective real-time deep learning-based system for automating the process of social distancing monitoring using object detection and tracking techniques. where each person is identified in real time using with the use of boundary boxes. The bounding boxes that are generated assist in locating clusters or groups of persons who satisfy the pairwise closeness property. A strategy that is vectorized. The number of violations has been verified. by calculating the number of groups that have formed and the number of violations The ratio of the number of persons is used to calculate the index term in relation to the number of groups. The experiments included popular state-of-the-art object identification models such as Faster RCNN, SSD, and YOLO v3, with YOLO v3 demonstrating efficient performance with balanced FPS and mAP score. Because this method is highly sensitive to the camera's spatial placement, it can be fine-tuned to better align with the matching field of vision.

2.3 Efficient convolutional neural network for apparent age prediction:

This research introduces a high-performing convolutional neural network architecture for estimating apparent age from a single facial image without the need for pretraining. The design only has 79k parameters and comprises of 9 convolution layers and 2 max pool layers. We additionally improve the findings by using a weighted class distribution, which ensures that there is no overabundance of data. We also improve the findings by using a weighted class distribution, which ensures that the prediction results are not skewed by overwhelmingly represented classes. These are compared to other outcomes in the literature for both pretraining and nonpretraining strategies. While being characterised by efficiency in both training and testing, the suggested method achieves estimation errors equivalent to the human reference and existing methods while employing orders of magnitude less parameters and substantially less training time than other state-of-the-art methods.

The method is tested on the apparent age dataset ChaLearn15 which contains 4699 color images, 2476 for training, 1136 for validation and the rest 1087 for testing. The proposed system architecture, presented in Table I, consists in a convolutional neural network with nine convolutions and 2 max pooling layers.

Layer	Kernel	Stride	Output size	Parameters
Image	-	1	50x50x3	-
Conv1+ReLU	3x3x32	1	48x48x32	896
BN	-	-	48x48x32	128
Conv2+ReLU	3x3x32	1	46x46x32	9248
BN	-	-	46x46x32	128
Conv3+ReLu	3x3x32	1	44x44x32	9248
BN	-	-	44x44x32	128
Conv4+ReLu	3x3x32	1	42x42x32	9248
BN	-	-	42x42x32	128
Conv5+ReLu	3x3x32	1	40x40x32	9248
BN	-	-	40x40x32	128
MaxPooling2D	2x2	1	20x20x32	0
Conv6+ReLu	3x3x32	1	18x18x32	9248
BN	-	-	18x18x32	128
Conv7+ReLu	3x3x32	1	16x16x32	9248
BN	-	-	16x16x32	128
MaxPooling2D	2x2	1	8x8x32	0
Conv8+ReLu	3x3x32	1	6x6x32	9248
BN	-	-	6x6x32	128
MaxPooling2D	2x2	1	3x3x32	0
Conv9+ReLU	3x3x32	1	1x1x32	9248
Flatten	-	-	32	0
Dense+Softmax	-	-	101	3333

Table -1: CNN Architecture

This work proposes an efficient CNN architecture with a small number of parameters that can be trained in a short period of time (approximately 30 minutes on a K40 GPU). The results obtained using this method are lower than those obtained using methods that include a pretraining step, but they are better than those obtained without one.

This method is unique in that it uses class weights to establish an even class distribution, rather than the skewed class distribution caused by the huge number of face photos in the 20-40 year age range.

2.4 Person Detection for Social Distancing and Safety Violation:

The MobileNet Single Shot Multibox Detector (SSD) object tracking model and the OpenCV library for image processing are used in this work to detect people in regions of interest. The distance between the humans detected in the video footage will be calculated and compared to a set of predetermined pixel values. The distance between the central points and the overlapping boundary between persons is measured. When harmful distances between persons are detected, notifications or cautions can be sent out to maintain the distance safe. Aside from recognising the presence of individuals in limited areas, which may also be used to trigger warnings, another significant element of the system is identifying the presence of people in restricted regions. For both goals, some study has been done to see how effective the programme is.

One of the most significant precautions in avoiding physical contact that could contribute to the spread of coronavirus is social separation. Viral transmission rates will be increased as a result of non-compliance with these rules. Two planned functionalities have been implemented using Python and the OpenCV package. The first component detects social distancing infractions, while the second feature detects violations of entering restricted locations. The accuracy of both characteristics has been verified. This study appears to have met all of its objectives based on the overall results. The obtained results, however, have some limitations. According to the findings of the system's tests, the object detection model utilised for recognising individuals has trouble correctly detecting humans in the outdoor environment and tough scenarios with distant scenes. A better object detection model can be implemented in the future for further improvement.

3. SYSTEM WORKFLOW

Given the diagram of proposed system work flow:

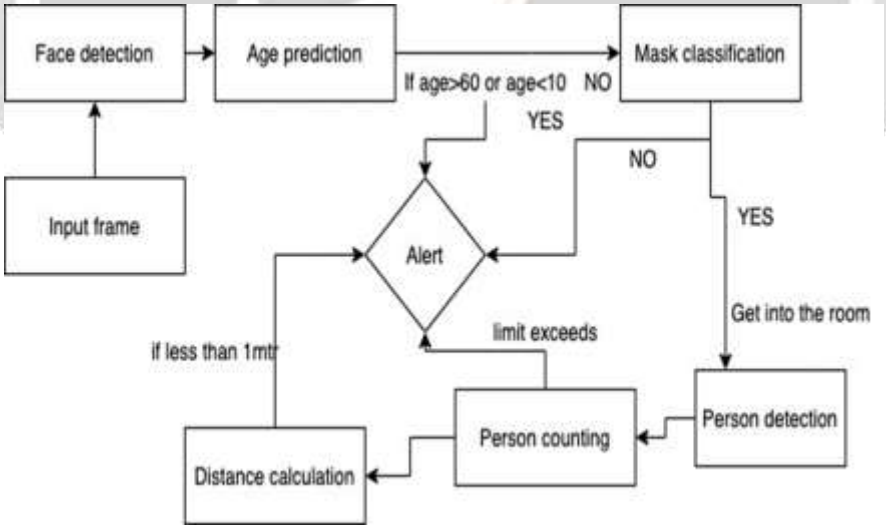

Fig 2-: Workflow of the proposed system

4. FUTURE WORKS

The numerous approaches presented in this paper can be tailored to the application's specific requirements. We must decide the ideal approach based on the necessity because each approach has its own set of advantages and disadvantages. Marketers are becoming more interested in face masking and social distance detection. It can be utilised in a variety of settings, such as airports, where this technology can be quite useful in detecting whether or

not passengers are wearing masks and maintaining adequate distance. The data of passengers can be recorded as movies in the system at the entrance. This technology can be connected with CCTV in hospitals. Hospitals - this system can be coupled with CCTV cameras, and the data may be used to determine whether or not their employees are wearing masks. Offices - This method may aid in the maintenance of safety standards in order to avoid the spread of Covid- 19. This system's scope includes a wide range of security systems, including those found in malls, hospitals, IT businesses, and other public places.

5. CONCLUSION

This paper examines various methods and approaches for detecting and recognising face masks. Haar-like characteristics, on the other hand, are digital picture features utilised in object recognition. They were utilised in the first real-time face detector and got their name from their intuitive resemblance to Haar wavelets. A Haar-like feature's main benefit over most other features is its calculation. This work, to the best of our knowledge, deals with the topic of face mask identification, social distancing detection and several techniques during the COVID–19 epidemic. It's worth noting that this research isn't confined to the epidemic time because many individuals are always self-aware, taking care of their health and wearing masks to protect themselves from pollution and minimise the spread of other viruses.

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