iJRASET
International Journal For Research in
Applied Science and Engineering Technology

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 9 **Issue:** VII **Month of publication:** July 2021

DOI: https://doi.org/10.22214/ijraset.2021.36735

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VII July 2021- Available at www.ijraset.com

Social Distancing Using AI and Deep Learning

Mr. Kiran Mudaraddi[1], Preethi T[2], Priyanka T[3], R. Sravani[4], Sahana Sai B[5]
[1, 2, 3, 4, 5]*Assistant Professor, Department of CSE, BITM, Karnataka, India*

Abstract: The paper presents a deep learning-based methodology for detecting social distancing in order to assess the distance between people in order to mitigate the impact of the coronavirus pandemic. The input was a video frame from the camera, and the open-source object detection was pre-trained. The outcome demonstrates that the suggested method is capable of determining the social distancing measures between many participants in a video.

I. INTRODUCTION

The new Corona Virus Disease 2019 (COVID-19) pandemic can be effectively combated via social distancing. The general population, on the other hand, isn't accustomed to enveloping itself in a fictitious safety bubble. Individuals' perceptual abilities can be aided and enhanced by an automatic warning system. Deploying an active monitoring system like this necessitates careful ethical considerations as well as clever system design. In this regard, a connectionist machine learning system, such as a deep neural network with no feature-based input space, is far more equitable, with one caveat the training data distribution must be equitable. Another important factor is to avoid becoming invasive. The warning system should not be used to target specific individuals to do this, a non-alarming audio-visual cue can be transmitted to the location of the social distancing breach. It is necessary for the system to be open-sourced. This is critical for building trust between society and the active surveillance system. In light of this, we present a non-intrusive augmentative AI-based active monitoring system that sends omnidirectional visual/audio cues when a social separation breach occurs. To detect humans with bounding boxes in a monocular camera frame, the proposed method employs a pre-trained deep convolutional neural network (CNN). The picture detections are then converted into real-world bird's-eye view coordinates. The system emits a non-alarming audio-visual indication if a distance less than the threshold is detected. Simultaneously, the system assesses societal conditions.

II. LITERATURE SURVEY

1) COVID-19 faces social isolation. Since December 2019, COVID-19 has been linked to severe acute respiratory symptoms all around the world. According to recent research, social separation is an efficient way to halt the transmission of COVID-19. To avoid possible touch, social distance is defined as keeping a minimum of 2 metres (6 feet) between each people. Further research indicates that social separation has significant economic benefits. COVID-19 may not be totally abolished in the near future, but an automated system for tracking and assessing social distancing measures would be extremely beneficial to our society.
2) Detection of pedestrians. Pedestrian detection can be thought of as either a subset of a larger item detection problem or as a separate task dedicated just to detecting pedestrians. In this paper, we look at 2D object detectors in depth, including datasets, metrics, and basics. Deep learning techniques for both generic item detection and pedestrian detection are the focus of another survey. Deep learning techniques, which are commonly classified into two types, are used by state-of-the-art object detectors. The first are two-stage detectors, which start with region suggestions and then do classification and bounding box regression. They are generally based on R-CNN. The second type is known as one-stage detectors, and popular versions include the YOLOv1-v4, SSD, Retina Net, and Efficient Det. There are also various anchor-free detectors, such as Corner Net, Center Net, FCOS, and Rep Points, in addition to these anchor-based techniques. These models were typically tested on Pascal VOC and MS COCO datasets. These techniques' accuracy and real-time performance are sufficient for deploying pre-trained models for social distance detection.
3) Monitoring of social distancing. The technique of social separation can be aided by emerging technologies. Emerging technologies such as wireless, networking, and artificial intelligence (AI) have been shown to facilitate or even compel social separation, according to a new study. Basic concepts, measurements, models, and practical scenarios for social distancing were explored in this paper. Another study categorised developing technologies as either humancentric or smart-space, as well as a SWOT analysis of the approaches in question. To detect and track pedestrians, a social distance monitoring strategy based on YOLOv3 and Deep sort was developed, followed by the calculation of a violation index for non-social distancing actions. The concept is intriguing, but the data lack statistical analysis. Aside from the violation index, there is no implementation or privacy-related discussion. A visual social distancing (VSD) problem is also known as social distancing monitoring. The study

presented a skeletal detection-based method for determining inter-personal distances. It also addressed the impact of social environment on people's social distancing, as well as privacy concerns. The talks are enlightening, but they do not produce concrete findings for social distancing monitoring, leaving the subject unanswered. Several prototypes based on machine learning and sensing technologies have recently been created to aid in the monitoring of social distancing. In a manufacturing factory, a similar system was used to monitor worker behaviour and give real-time voice alarms. In addition to surveillance cameras, LiDAR-based and stereo camera-based systems were developed, demonstrating that multiple types of sensors can be useful in addition to surveillance cameras. Furthermore, our technology assesses crucial social density and controls intake into a target area.

4) The use of social context and SGs in recommendation has been shown to be successful, however there is no understanding of the context. Furthermore, there are many different types of connections, such as users who work for the same firm, share similar hobbies, or are the same gender, yet they may not be related on the social graph. Deep learning has recently been shown to be an effective computational model for analysing the context of an image. In several applications, including as speech recognition, object recognition, and face recognition, it outperforms state-of-the-art approaches. Deep learning is used on social media to detect trending topics and make recommendations. It is made up of numerous processing layers that represent input at different levels of abstraction and is learnt using a two-step method, a feed-forward and back-propagation algorithm, and a learning goal of minimising the discrepancies between the target class and the deep learning output. Object recognition uses a CNN to generate labels based on the things that show in the image. A CNN's structure consists of several layers of nonlinear feature detectors that may learn weights and biases from data. In an unsupervised way, the CNN learns the characteristics to be retrieved for a particular objective. When using an object recognition-based approach, such as a CNN, the strength does not reflect the social signals, and the follower/follow suggestion performance may be poor since related people may exchange images with different objects. Even when two photographs do not share the same things, people with connections are likely to have a higher strength if a social signal-based technique is applied. Human actions toward a social setting that can be captured by photos, or other visual elements that can identify the relationships of users who shared them, could be used as social signals. This is why researchers are looking into ways to get an optimum W in a CNN to improve the efficiency of an application like follower/follow recommendation.

III. PROJECT DESCRIPTION

In our paper, we use both hardware and software components; the hardware detects the temperature of the human body, while the software detects social separation. A fundamental computer vision problem is object detection in the image domain. The purpose is to find semantic items that correspond to specific classes, such as humans, cars, and buildings. Deep convolutional neural networks (CNNs) models have recently dominated object detection benchmarks. Top results on MS COCO, for example, have nearly doubled thanks to a recent breakthrough in deep CNNs, which has around 123K images and 896K objects in the training-validation set and 80K images in the testing set with 80 categories. These models are typically trained using supervised learning, with data augmentation techniques used to expand the variety of data.

A. Implementation

In this research, we constructed a supervised learning model to predict social distance based on a dataset and classification using a deep learning technique. The model's accuracy was measured using a testing approach.

1) Modules

We have identified two modules:

a) Input Module

- We can use videos from scenes we've recorded or movies we've found online, and then process the video file to create an annotated output video.
- As an input, we may also use a camera to capture live video.
- It will determine whether the given path is for a video file or a camera, and then process it frame by frame using image processing.
- For image processing, we use open CV, a cross-platform framework that allows us to create real-time computer vision applications.

b) Human Detection Module

- The SSD Mobile Net object detector module, which is pre-trained on the COCO dataset, is used to recognise humans.
- One of the most famous open source object identification datasets used to train deep learning applications is the common object in context dataset.
- Hundreds of thousands of photos with millions of ready-labelled items for training are included in this dataset.
- The COCO dataset contains 80 labels, of which we use the index of people, which is specifically for the person class, as we will ignore the other items.

B. System Analysis

1) *Existing Sysytem:* In a pandemic event, evaluated a human detection framework for monitoring social distancing and safety misuse. To identify the distinct models, they used a pre-trained recurrent CNN model. Blob segmentation is used in the human detection procedure. These blobs are tracked in relation to one another to determine the distance between them. Because of the correlations of other items around, they had difficulty detecting the person's body blobs in the outdoor region. They discovered that this problem has to be addressed in future study.
2) *Proposed System:* Our system operates in real time and does not save data. When a person's social distancing is breached and temperature is recognised, an audio-visual cue is emitted. We also contribute something new by identifying a critical social density value pc for gauging overcrowding. This variable can be used to control entry into the region of interest.

C. Functional Requirements

1) Requirement analysis is a software engineering job that connects the dots between software allocation at the system level and software design.
2) It allows the system engineer to specify how software interacts with other system components and to set design limitations for the software.
3) It gives the software designer information and function representations that can be transformed into date, architecture, and procedural design.

D. Non-Functional Requirements

1) Security
2) Reliability, Availability, Maintainability
3) Configuration and Compatibility
4) Usability

E. Hardware Requirements

1) Processor : Pentium IV 2.4 GHz.
2) Hard Disk : 250 GB.
3) Monitor : 15 VGA Colour
4) RAM : 1 GB
5) Mouse : Optical
6) Keyboard : Multimedia

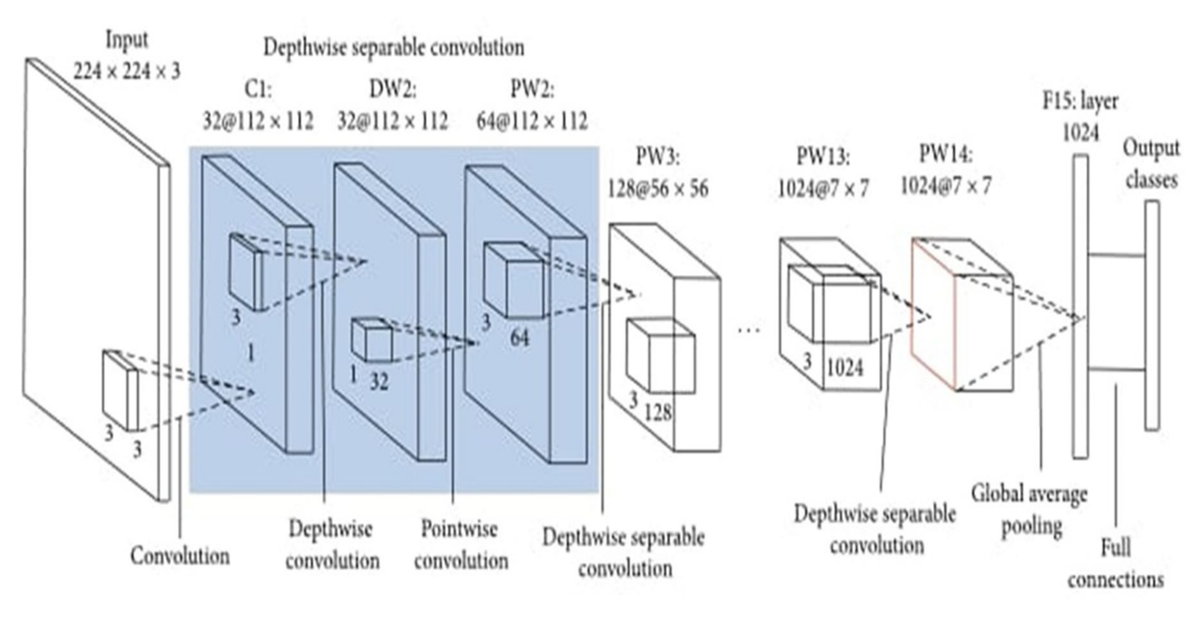
F. Sofware Requirements

1) Operating system : Windows XP Professional / Windows7 or More
2) Coding Language : Python
3) IDE : Jupiter Notebook

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VII July 2021- Available at www.ijraset.com

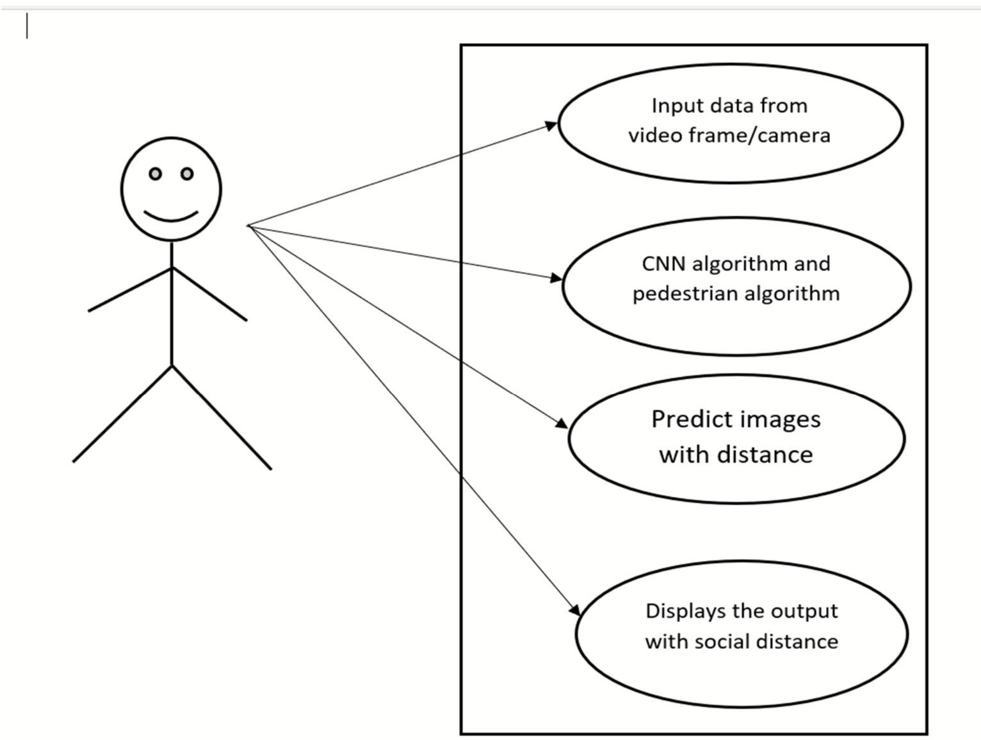
G. Design

1) System Architecture



Mobile Nets, which are based on a streamlined architecture that leverages depth wise separable convolutions to generate light weight deep neural networks, are presented for mobile and embedded vision applications.

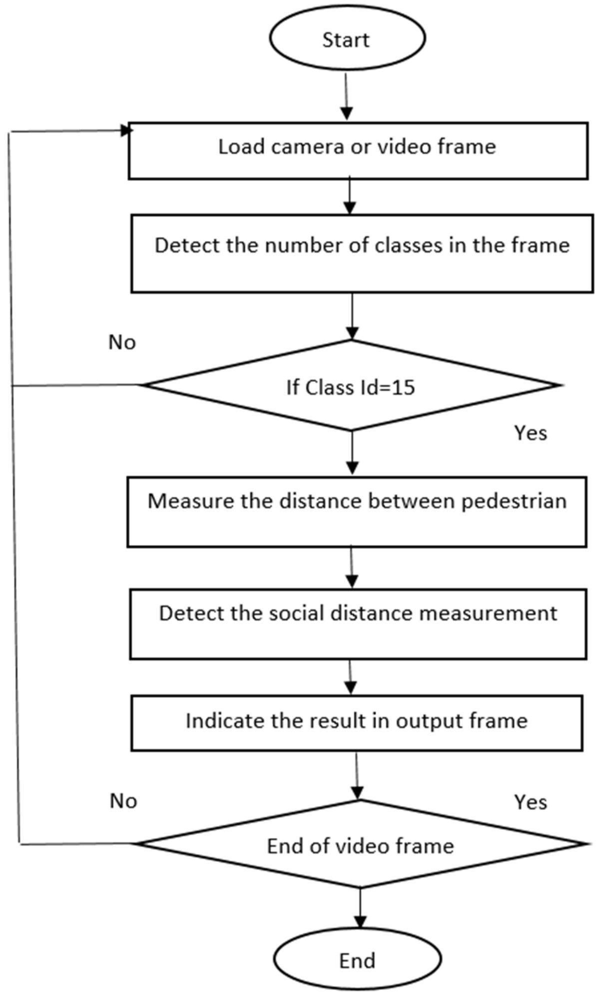
2) Use Case Diagram



A use case is a collection of situations that describe how a source and a destination interact. The relationship between actors and use cases is depicted in a use case diagram.

International Journal for Research in Applied Science & Engineering Technology (IJRASET)
ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429
Volume 9 Issue VII July 2021- Available at www.ijraset.com

3) Flow Chart



IV. RESULTS AND DISCUSSION

Fig 1

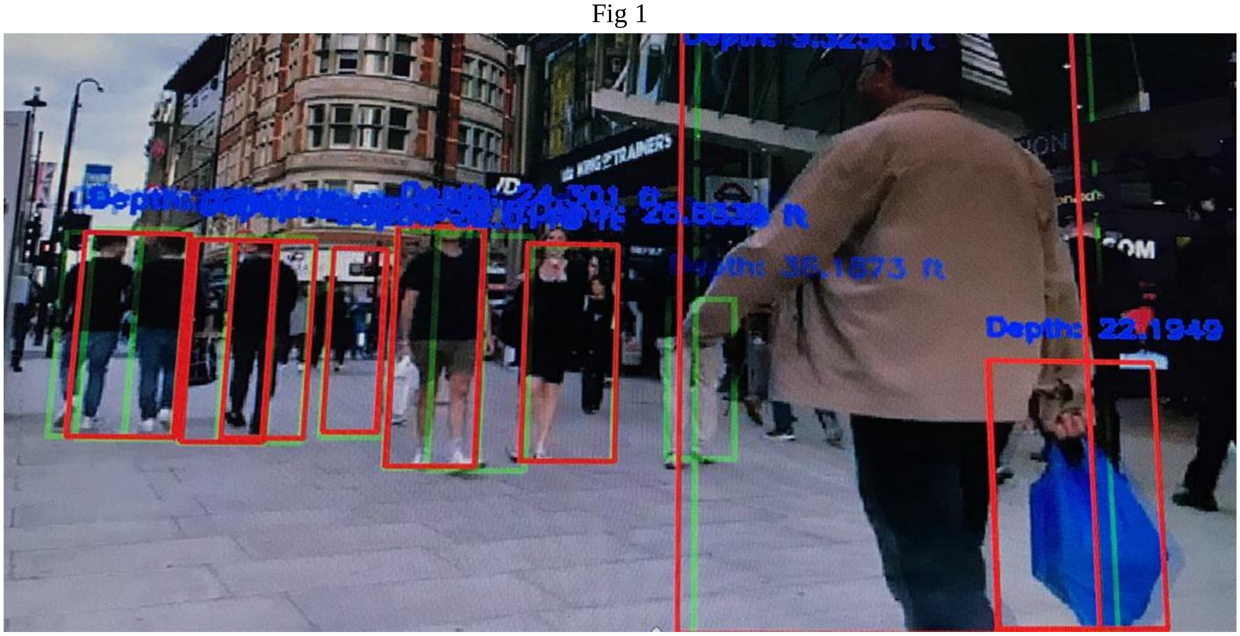


Fig 2

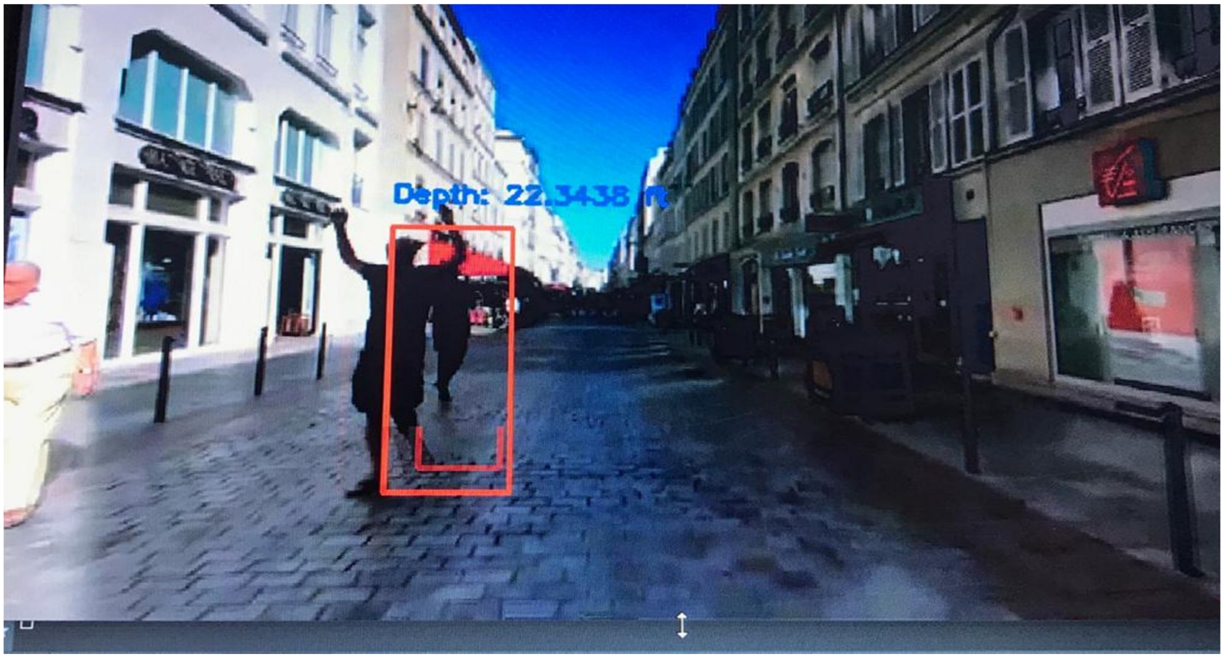
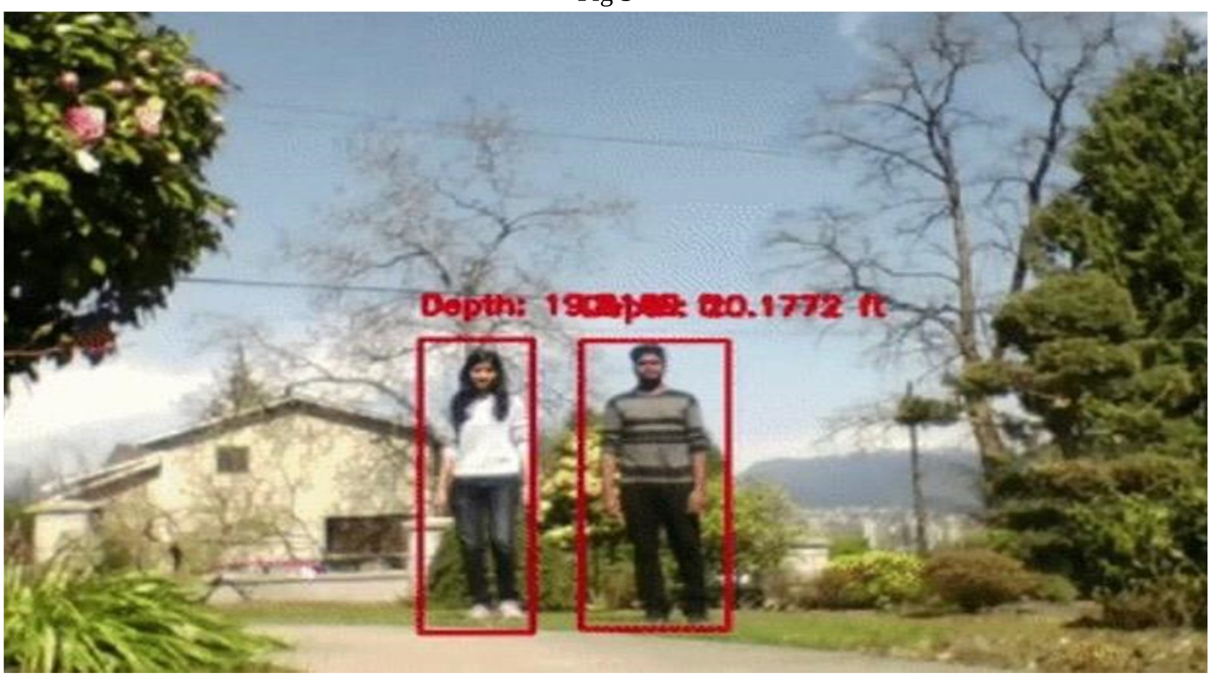


Fig 3

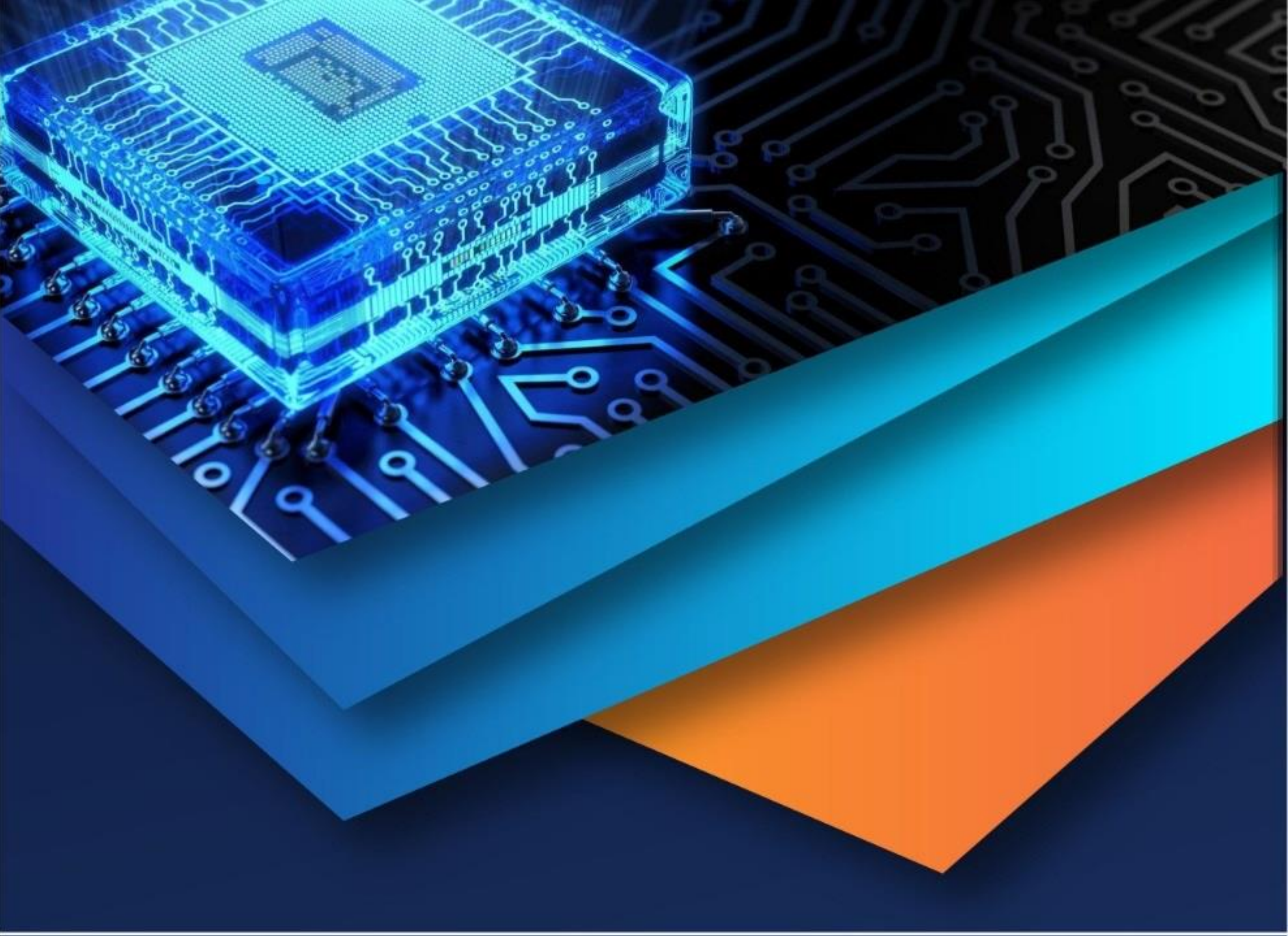


V. CONCLUSION AND FUTURE WORK

A deep learning model is used to provide a way for detecting social separation. The distance between persons may be assessed using computer vision, and any noncompliant pair of people will be marked with a red frame and a red line. A video of pedestrians going down a street was used to validate the suggested method. The visualisation results revealed that the suggested method is capable of determining social distancing measures between people, and that it might be further refined for usage in various settings such as the office, restaurant, and school. Furthermore, by enhancing the pedestrian detection algorithm, integrating other detection methods such as mask detection and human body temperature detection, increasing the computing capacity of the hardware, and calibrating the camera perspective view, the work can be improved even further.

REFERENCES

[1] C. Courtemanche, J. Garuccio, A. Le, J. Pinkston, and A. Yelowitz, “Strong social distancing measures in the united states reduced the covid-19 growth rate: Study evaluates the impact of social distancing measures on the growth rate of confirmed covid-19 cases across the united states.” Health Affairs, pp. 10–1377, 2020.
[2] C. T. Nguyen, Y. M. Saputra, N. Van Huynh, N.-T. Nguyen, T. V. Khoa, B. M. Tuan, D. N. Nguyen, D. T. Hoang, T. X. Vu, E. Dutkiewicz et al., “Enabling and emerging technologies for social distancing: A comprehensive survey,” arXiv preprint arXiv:2005.02816, 2020.
[3] S. Agarwal, N. S. Punn, S. K. Sonbhadra, P. Nagabhushan, K. Pandian, and P. Saxena, “Unleashing the power of disruptive and emerging technologies amid covid 2019: A detailed review,” arXiv preprint arXiv:2005.11507, 2020.
[4] M. Cristani, A. Del Bue, V. Murino, F. Setti, and A. Vinciarelli, “The visual social distancing problem,” arXiv preprint arXiv:2005.04813, 2020.
[5] A. B. Chan, Z.-S. J. Liang, and N. Vasconcelos, “Privacy preserving crowd monitoring: Counting people without people models or tracking,” in 2008 IEEE Conference on Computer Vision and Pattern Recognition. IEEE, 2008, pp. 1–7.
[6] F. Z. Qureshi, “Object-video streams for preserving privacy in video surveillance,” in 2009 Sixth IEEE International Conference on Advanced Video and Signal Based Surveillance. IEEE, 2009, pp. 442–447.
[7] S. Park and M. M. Trivedi, “A track-based human movement analysis and privacy protection system adaptive to environmental contexts,” in IEEE Conference on Advanced Video and Signal Based Surveillance, 2005. IEEE, 2005, pp. 171– 176.
[8] S. Ren, K. He, R. Girshick, and J. Sun, “Faster r-cnn: Towards real-time object detection with region proposal networks,” in Advances in neural information processing systems, 2015, pp. 91–99.
[9] A. Bochkovskiy, C.-Y. Wang, and H.-Y. M. Liao, “Yolov4: Optimal speed and accuracy of object detection,” arXiv preprint arXiv:2004.10934, 2020.
[10] M. Greenstone and V. Nigam, “Does social distancing matter?” University of Chicago, Becker Friedman Institute for Economics Working Paper, no. 2020-26, 2020.
[11] Z. Zou, Z. Shi, Y. Guo, and J. Ye, “Object detection in 20 years: A survey,” arXiv preprint arXiv:1905.05055, 2019.



10.22214/IJRASET

INDEX COPERNICUS 45.98

IMPACT FACTOR: 7.129

TOGETHER WE REACH THE GOAL

IMPACT FACTOR: 7.429

INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY