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A SURVEY PAPER ON SOCIAL DISTANCING BY DISEASE DETECTION

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ABSTRACT

To reduce the consequence of viral diseases it is necessary to avoid it's spread which can be achieved by asserting social distance. All viral diseases whose means of communication is air, and enters via mouth or nose definitely will affect our organs which cause changes in our voice and which could be traceable using feature analysis of voice employing deep learning. The detection of an infected person can be done by deep neural networks and tracking that individual will be helpful in the implementation of the physical distancing wherever it is needed. The main aim of this paper is to study how we can detect viral disease and implement social distance around that infected person. In this paper, we implemented and analyzed scenarios on the basis of viral disease patient detection using deep learning techniques and preventing it's spread.

Keywords: Deep Learning, Viral Disease Detection, Social Distancing.

I. INTRODUCTION

Viral diseases in humans were first noted in ancient times and have since shaped our history. Scientific approaches to the study of viruses and viral disease began in the 19th century and led to the identification of specific disease entities caused by viruses. Careful clinical observations enabled the identification of many viral illnesses and allowed several viral diseases to be differentiated. Progress in an understanding of disease at the level of cells and tissues, exemplified by the pioneering work of Virchow, allowed the pathology of many viral diseases to be defined. Finally, the work of Pasteur ushered in the systematic use of laboratory animals for studies of the pathogenesis of infectious diseases, including those caused by viruses.

Viruses require an intact cell to replicate and can direct the synthesis of hundreds to thousands of progeny viruses during a single cycle of infection. In contrast to other microorganisms, viruses do not replicate by binary fission. Instead, the infecting particle must disassemble in order to direct synthesis of viral progeny.

Viral diseases are infections caused by viruses. Different types of viruses cause different infections. Common cold is the most common type of viral infection that is caused by infections in the respiratory tract. Other viral diseases include: Chickenpox, Herpes, Influenza, AIDS, Mumps, Measles, Viral Hepatitis, Poliomyelitis, Rabies.

There is strong evidence linking RSV infection in infancy with a subsequent increase in pulmonary symptoms. This association persists for 8–13 year, while histamine hyper responsiveness is evident for at least 10 years after bronchiolitis. In one study of 48 children who had suffered from infantile bronchiolitis, 44 (92%) had symptoms suggestive of asthma in the 5 year of follow-up and 25 had clinically confirmed asthma. In a second study of 73 children with a history of bronchiolitis for an average age of 6, wheezing was reported in 42.5% of children previously admitted with bronchiolitis, compared with 15.1% of control subjects. Similarly, of 47 infants hospitalized with RSV bronchiolitis at a mean age of 3.5 months, 23% were diagnosed with asthma in the ensuing 3 year, compared with 1% of control subjects. In this latter study, a positive test for serum IGE antibodies was found in 32% of the patients with bronchiolitis compared with 9% of controls. Long-term follow-up of children with lower respiratory tract symptoms during RSV infection in infancy showed a strong association with recurrent wheeze. There was also an increase in reversible airflow obstruction in such children but no association with atopic asthma that increases in frequency during childhood. In contrast, the effect of infantile RSV infection declines during childhood and becomes unmeasurable by the age of 13.

The proposed study deals with viral diseases by using the modern on demand technique. These include detection of an infected person, finding its location, alerting others if the infected person comes in their physical contact, and informs the uninfected people if there is a violation of social distancing rules by mainly focusing on deep learning techniques, moreover, their comparisons, advantages and disadvantages, their future scope, and usage complexities for respective DL methods are examined.

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II. LITERATURE SURVEY

In the past period, the world has seen artificial intelligence (AI) in numerous domains such as medical to business media. The aptness to learn useful intellect and address helpful discovery from data in decision-making and forecast are the most astonishing attribution of deep learning. These peculiar features of deep learning conduct us to more intelligent automation, decrease operational costs, and have a great evolving competence.

On the other hand, computer vision is a major field of artificial intelligence facilitate the computer to estimate visual data. The current progress of AI such as applying convolution-based neural networks (CNN) generally in the field of deep learning is an aid for a computer to analyze digital data, prediction, or objects identification and categorize it with a great accuracy [13]. In the area of diagnosis, a hybrid model i.e combination of two or more model to dissect the signal from multiple directions perform well contrasting with simple model like CNN, ANN, and gcForest [3]. Such proficiencies of computer vision change plain camera-based appliances into intelligent devices. Artificial intelligence and its subset deep learning algorithms also play an important role in social distancing, mostly in the current rampant, with copious practical applications. Computer vision-enabled devices open a door to using such technologies in the implementation of social distancing estimates.

Specifically in the field of medical deep learning has confirmed itself by presenting precise results in forecasting and detection. The developers had published quality work in developing a product for medical tests that will help physicians in analyzing data. Where authors [4] review multiple CNN models used in various fields of testing, diagnosis, and analysis including CT scans, MRI, X-Rays, etc. The accuracy report of almost every model under analysis was greater than 90%. Deep learning might be useful in determining viral diseases. In the paper, fine-tuned ImageNet model trained using twice transfer learning techniques on NIH ChestX-ray14 dataset as an intermediate set. Accuracy of 100% is obtained by the test dataset. While researchers [8] obtained an accuracy of 99% with 98% area under the curve by analyzing the Covid-net model.

The results which the paper demand on the technique called deep learning-based transfer learning for binary classification were 92.85% of accuracy. In the research [10], the authors required the maximum precision of 93% with Resnet-50 architecture using breathing signal and 87% through cough signal. The technique was similar to that of the previous research that is the extraction of MFCCs features. While in the issuing [7], the authors use breath with audio cough signal for determination. They crowd-sourced the data, trained, and tested the model on 355 samples. The technique has segmented the audio into different coughs, and used the MFCCs of each segment to classify it separately, and used SVM to categorize it into two classes. On the cross K-fold validation technique the accuracy of the model was 84.6%. In the paper [13], the authors used three Resnet-50 models on MFCCs to classify the signal as cough or not and got the AUC score of 95%. They didn't mention the overall precision but the false positive was 16.8%.

In the state of social distancing, there needs someone or something to detect rule infraction. For such grounds, a popular automation in human detection is computer vision which could help us in real-time detection of crowds through CCTV. An automatic forewarning the authorities to take suitable action when the number of individuals on a patch exceeds a certain boundary or the place becomes jammed.

In object detection algorithms or models, we have had two main approaches i.e region based and unified-based algorithms. The region-based technique involves two steps, i) propose a couple of regions in the image and ii) look into that region for human detection [6]. The approach is RCNN which is way slower because it needs to run the process equal to the number of regions proposed by selective region technique [7]. The Fast-RCNN runs the process fast by making it possible to run the model on all-region at once [7], also Faster RCNN makes it faster by changing the technique from selective search to regional proposal network (RPN) [9].The Faster-RCNN has great precision in detection and recognition [10]. The only enigma is the need for high quantitative cost which is not favorable for devices like smartphones and cameras. In such circumstances, an immediate solution in human detection is a unified-based approach which is less intricate as well. This approach creates a large number of anchors in the image and then uses the probability of object in each anchor or box and removes overlapped bounding boxes by using high probability anchors to detect humans or objects in real-time. The specific technique used in a unified approach is You Only Look Once (YOLO) which is used in real-time detection and help in the detection of small objects faster with great accuracy rate [11]. In [1] authors proposed another faster solution known as Single Shot Multibook Detector (SSD). This method first uses a CNN to calculate a feature map from an image further identify or detect objects in the image from that feature map.

As if it comes to social distancing implementation on top of object detection models. Customization in object detection model named Faster-RCNN would be found in research [12]. The researchers customize the models for predictions of social distancing on top of object detection. The work achieves approximately 93% of accuracy.

Paper Title	Year	Work description	Advantage	Disadvantage
Implementation of smart Social Distancing for covid-19 based on deep learning algorithm	(Springer 2022)	1. analysis of the covid-19 patients and then implementing social distance	Great evolving capability and less operational cost	it can only detect covid and not other viral diseases
Deep Learning Techniques for the Real Time Detection of Covid-19 and Pneumonia using Chest Radiographs	(IEEE 2021)	1. Chest radiographs were provided as input to various deep learning CNN architectures for the purpose of feature extraction.	VCG models have potential to diagnose the respiratory disease using chest radiographic	A massive volume of data is needed to train the various deep learning models for the purpose of feature extraction which increases the complexity.
Face mask detection and social distance monitoring system for COVID-19	(Springer 2022)	1. YOLO-v3 architecture is further optimized by tuning its feature extraction	Face mask detection on public spot	this detection network was the vanishing gradient problem, which commonly occurs by increasing network layers

III. METHODOLOGY

The proposed methodology of the project is to analyze viral diseases and prevent their spread in community use using deep learning models. Convolutional neural networks were specifically used because we were interested in the accuracy of the predictions. The trained model is deployed on the server. The application can be accessed from any device as it will not require higher spec hardware to process the data. YOLOv3 is a real-time object detection model that will be used for human distance detection.

The first step in this project is to get the relevant data for the project. The data should include information about the person's health, location, and any other variables that could be used to determine the presence of the disease. After data is acquired, it must be cleaned and preprocessed to make it suitable for analysis. This idea involves removing all irrelevant information, normalizing the data and transforming it into a machine-readable format.

The next step is to extract the relevant features from the data. These traits may include age, sex, and many other factors that may be associated with disease risk. Using the extracted features, a machine learning model can be trained to detect the presence of disease. This can be done using supervised or unsupervised learning techniques,

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depending on the nature of the data. After training the model, it must be evaluated on a test set to determine its accuracy. This can be done by comparing predicted results with actual results. Once the model is tested and evaluated, that's it.

IV. MODELING AND ANALYSIS

A system design describes the progress of the project. The input taken from the user about the disease and feature extraction is done on it using SVM algorithm. This will help detect the disease.

Social distancing using computer vision. In this section, computer vision technology was used to monitor social distancing. More specifically, check if individuals are two meters apart. The YOLO V3 transformation algorithm was used for this purpose. The algorithm needs a region of interest, which should actually be a rectangle, but could be any four-sided closed surface in the image or video, based on the cameras' viewing angle. The area of interest in the image would be transformed in such a way that the area of pixels per area is similar or the same as if the camera were installed over that area. Since each pixel covers the same area, counting the pixels would allow the distance between individuals to be calculated.

Layer flattening and max-polling are performed, which helps to find social distance using the formula.

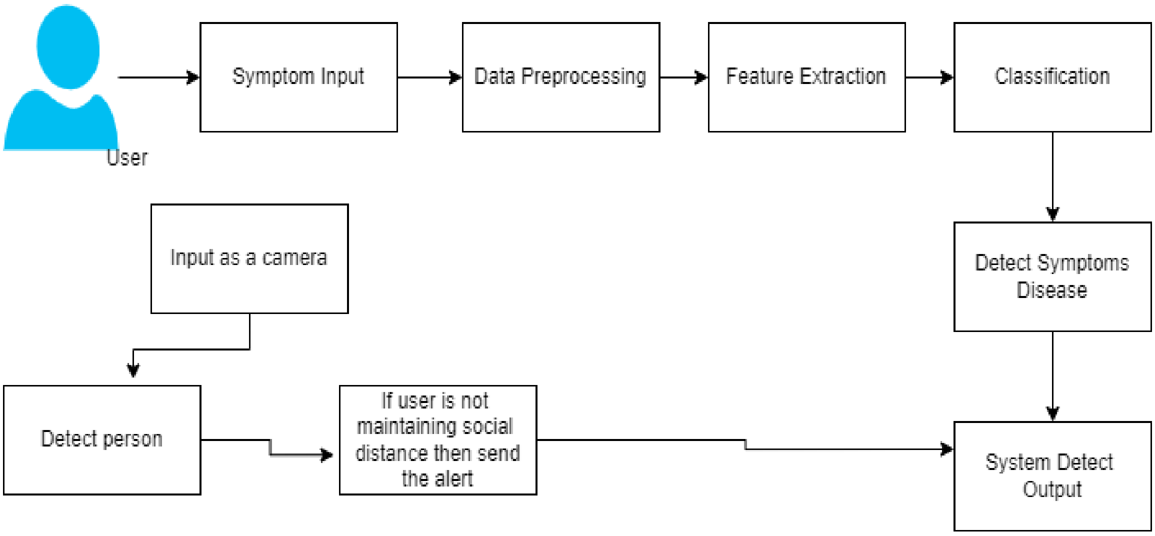

Figure 1: System Flow

V. RESULTS AND DISCUSSION

The proposed methodology for the implementation of effective social distancing was based on multiple sub-systems and their collaboration. The results of each sub-system will be discussed separately. First, the performance of the classifier model will be presented. Next, the performance of the social distancing algorithm, detection of a person, and measuring the distances between them, will be discussed. The model exhibited an accuracy of 97.28% on test data while 97.58% on validation data. The classification scores on the test dataset which were not used in the training step. It shows more than 95% scores in all categories i.e precision, recall, and F score. The confusion matrix of the test data shows that the accuracy of true value detection is higher than that of false detection. The overall accuracy is higher than that of the previously published results mention in the literature review i.e 92.8% in the publication [19], 93% in another research [28], 84.6% claimed by authors using the dataset of 355 samples [20], and the false positive is also in the range of 10% which is less than 15.8% claimed by [13].

As the distance between the individual using computer vision was already implemented and analyzed. The challenging part was that it would be implemented on short areas and ranges. The fact is that it is depended on cameras and provides the present situation. There are some other techniques which could be used in long-range as well as provides the future positions of individuals. Train a Temporal-Spatial Bayesian model on it, and analyze the accuracy of a user's location prediction. In [17], authors employed deep learning model for prediction of the next position of users for coordinated beamforming in high mobility in the milli meter wave system. Where in [18] researchers used long term user location prediction is done through deep learning models i.e LSTM-PPM.

VI. CONCLUSION

The detection and discovery of viral diseases by DL techniques and with the least cost and complications are the basic steps in preventing the diseases. In the near future, with the unification of DL algorithms it will be possible to achieve a faster, cheaper, and safer diagnosis of this viral diseases. This research supports the idea that DL algorithms are a promising way for optimizing healthcare and improving the results of diagnostic and therapeutic procedures.

Social distancing is one of the necessary measures to limit and prevent the spread of infectious diseases. So the future scope of our project is that by adding some other algorithm, we will be able to give alerts to people in close range.

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