VASIREDDY VENKATADRI INSTITUTE OF TECHNOLOGY

LITERATURE SURVEY ON DETECTION OF COVID-19 USING DEEP LEARNING

Batch-4

SUMMARY

The COVID-19 pandemic, also known as the coronavirus pandemic, is an ongoing pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The World Health Organization (WHO) confirmed this virus as a worldwide pandemic as it has infected millions of people and has taken away many lives across the globe. An infection caused by Covid19 disease majorly destroys the respiratory tract of human beings that ends with multiple organ failures or death in the worst case. This, when left untreated in the stipulated time can be more dangerous. This is the reason why people have been developing more predicting models that help people identify the dangerous covid-19.

These ML/DL techniques have achieved astounding performance results in every domain, along with medical research and radiology. However, DL has become dominant in various complicated tasks such as image classification and detection. The quality of machine learning methods depends on choosing the right features. Various pre-processes, size reduction, feature selection, etc. transactions are made. To reduce the cost at this stage, it is necessary to get rid of the dependence on features. This is where deep learning comes into play. Deep learning takes care of these things we do in machine learning. Deep learning uses many nonlinear layers for feature extraction and feature modification. In sequential layers, the exit of the previous one is the entrance of the next. Deep learning makes a hierarchical selection that best represents the data, rather than manual feature selection.

In Research paper-1, Noran Hany, Nourhan Atef and Nura Mostafa did research on the Detection of COVID-19 using Machine Learning from Blood Tests. In this paper, they studied the capability of ML models to detect Covid-19 in its early stages using blood samples datasets. Here they used Machine Learning techniques with different classifiers such as Random Forest, Support Vector Machine and Naive Bayes. The accuracy achieved was

76% for RF, 88% for SVM and 85% for Naive Bayes. For future work, they aim to collect more datasets to get higher accuracy and build a more reliable model. Also, they aim to classify the dataset by using Deep learning techniques such as CNN Model.

In Research paper-2, Mohammas Mahmudur Rahman Khan, Shadman Sakib, and Md. Abu Bakr Siddique did research on the Automatic Detection of COVID-19 Disease in Chest X-Ray Images using Deep Neural Networks. In this paper, they have analysed the performances of six deep neural networks for COVID-19 detection from chest X-rays. Finally, by observing their accuracies they have concluded that ResNet-50 yielded the best performance with a classification accuracy of 96.91%, closely followed by DenseNet201.

In Research paper-3, Akshay Kumar Siddhu, Dr. Ashok Kumar and Dr. Shakti Kundu researched on the Detection of COVID-19 from Medical Images and/ or Symptoms of Patients using Machine Learning Approaches. The main focus of this review paper is to select the best DL models to detect the segment of the lungs and predict COVID-19 patients using DL techniques.

In Research paper-4, Amir Rehman, Muhammad Azhar Iqbal did research on COVID-19 Detection Empowered with Machine Learning and Deep Learning Techniques. The analysis was performed to select appropriate ML/DL techniques to predict and diagnose the virus using radiological and clinical datasets. It is revealed that the highest accuracy of various ML/DL techniques such as CNN, D.N.N, SVM, K-NN, and R.F. Finally they have concluded that DL has become dominant in various complicated tasks such as image classification and detection.

In Research paper-5, Areej A.wahab Ahmed Musleh and Ashraf Yunis Maghari did research on COVID-19 Detection in X-ray Images using CNN Algorithm. In this paper, they experimented with applying a convolutional neural networks (CNN) algorithm in a similar way to the mechanism of work in the CheXNet algorithm. They are almost certain that it is possible for the proposed CNN model, which shows the equivalent of the highest accuracy that is a very effective examination tool for rapid diagnosis.

In Research paper-6, Mehmet Sevi and İlhan AYDIN did research on COVID-19 Detection Using Deep Learning Methods. Here they analysed the performances of some deep learning methods like CNN, VGG16, VGG19, and InceptionV3 that achieve accuracies 95%,93%,85% and 48% respectively.

In Research paper-7, Mohamed Berrimi, Skander Hamdi and Raoudha Yahia Cherif did research on COVID-19 detection from Xray and CT scans using transfer learning problems. As part of the transfer learning approach advocated in their study, they fine-tune

two pre-trained models : DenseNet, InceptionV3 and New DenseNet which achieve 84.51%, 60% and 95.98% accuracies respectively. They have concluded that New DenseNet achieves better accuracy which demonstrates the feasibility and effectiveness of the proposal.

In Research paper-8, Amit Kumar Das, Sayantani Ghosh and Samiruddin Thunder did research on COVID-19 Detection from X-Ray images using Ensemble Learning with Convolutional Neural Network. According to their study, they show that the use of ensembling techniques have generated the best accuracy rate which is 95%.

In Research paper-9, Ravneet Punia, Lucky Kumar and Mohd. Mujahid did research on Computer Vision and Radiology for COVID-19 Detection. In their work, they selected ResNet-34 and ResNet-50 which were originally trained on the ImageNet data set which achieves 66.67% and 72.38% accuracies. They concluded adding more layers and increasing the number of parameters in Residual Network architecture definitely helps in improving the accuracy of the overall classification.

In Research paper-10, Avnish Panwar, Rishika Yadav and Kishor Mishra did research on Deep Learning Techniques for the Real Time Detection of Covid19 and Pneumonia using Chest Radiographs. More precisely in this work, different deep learning models such as VGG16 and InceptionV3 were adopted for the purpose of feature extraction. After extraction were passed to distinct machine learning classifiers such as SVM, RF etc. It can be observed from the tables below that the Inception V3 model along with the neural network classifier gives the highest accuracy of 88.8%. In future work, they stated that adding more images to the dataset can increase the accuracy.

After reviewing these ten papers, we understood that by increasing the size of the dataset used to train the data, there is a possibility of increasing the accuracy of the prediction. We also observed that models based on CNN architectures like 2-D CNN, ResNet-50, InceptionResNetV2, InceptionV3, DenseNet201, and MobileNetV2, VGG-16 and VGG-19 are mostly used to detect covid-19.

It is observed that among all the models, ResNet stood out with the highest accuracy, followed by DenseNet. The disadvantage of both VGG models is that they consume a lot of memory as they contain a lot of parameters. Hence, we decided to use ResNet and DenseNet for our project.

PROBLEM STATEMENT

The COVID-19 pandemic has resulted in a dramatic loss of human life worldwide, posing an unprecedented public health challenge. If not detected in time, it can affect the entire lung in a matter of days, resulting in death. Thus, rapid diagnosis is the first and most important step in controlling the COVID-19. Despite the fact that PCR is the standard method for diagnosing COVID-19, the long turnaround time for PCR results resulted in disease progression and worsening in certain variants. One of the most important tools for monitoring suspects is radiological testing, which includes CT and X-ray scans. We will use predefined Convolution Neural Networks based architectures to identify COVID-19 in the early stages of the disease using the most recent and efficient deep learning algorithm in the field of extracting X-ray and CT scan image features.

Hence, we decided to use ResNet and DenseNet for our project. DenseNet utilizes a dense network that provides models with easy and highly efficient parametric training due to the possibility of reusing features by different layers that increase diversity at the next layer input and improve performance. ResNet networks have been proposed as a family of multiple deep neural networks with similar structures but different depths. ResNet introduces a structure called a residual learning unit to reduce the destruction of deep neural networks.

Along with these, we are increasing the existing layers in our model to increase the accuracy. Studies have shown that, With the increase in the number of layers, the features extracted will be more specific. The number of layers in a model is referred to as its depth. Increasing the depth increases the capacity of the model. Training deep models, e.g., those with many hidden layers, can be computationally more efficient than training a single layer network with a vast number of nodes. Thus, there is a chance of getting better accuracy, which can further be increased by adding more layers before the fully connected layer.