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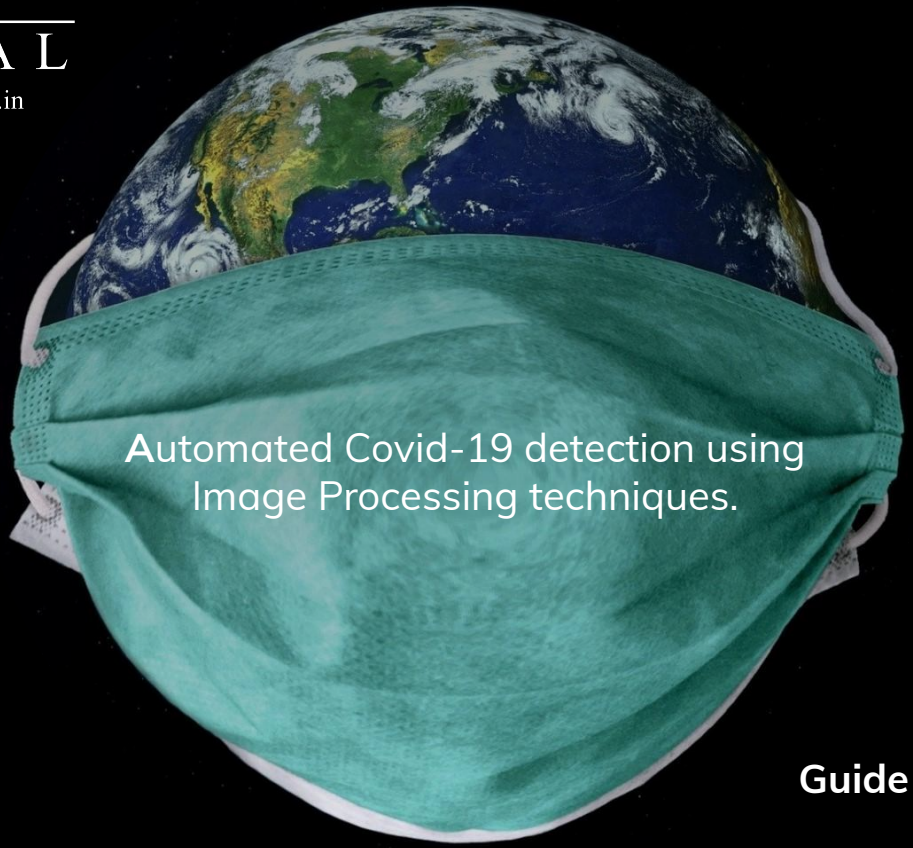

Automated Covid-19 detection using Image Processing techniques.

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Table of Contents

Introduction

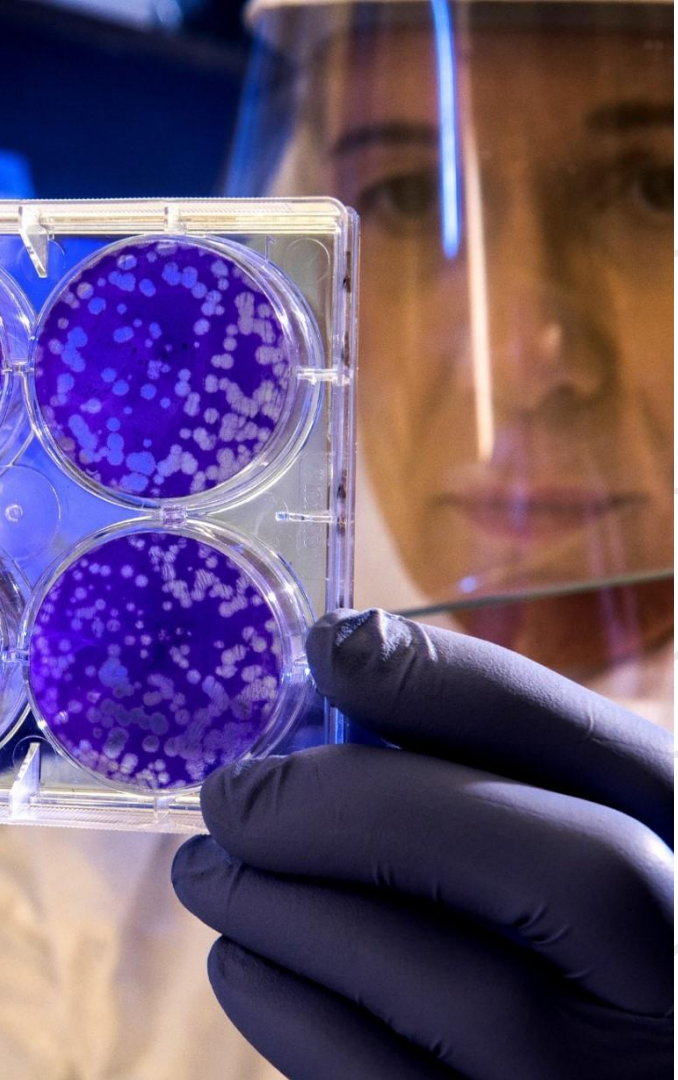
The COVID-19 is an infectious disease caused by the most recently discovered coronavirus which initially spread from Wuhan, China, in 2019. Now, COVID-19 has become the most dangerous disease all over the world.

As of 16th october 2021, around 200 million cases have been confirmed, with more than 4 million deaths across the world, making the coronavirus pandemic one of the worst pandemics recorded in human history.

A coronavirus usually cause an infection in the sinus, nose, or upper throat. While, most coronaviruses are benign (not harmful) but the SARS-CoV-2, causes the respiratory tract infection and can eventually infect the lungs. The infection may trigger respiratory heart problems, failure, pneumonia, septic shock, liver problems, and death, making COVID-19 a severe threat to humans.

Covid-19 is a highly infectious air borne disease which caused a lot of damage to life worldwide. The disease peaked in mid 2020 and brought various health organizations across the globe on the brink of collapse. Subsequently, curbing the pandemic became the prior goal via isolating the identified infected people and search for an efficient vaccine. There are different types of coronavirus tests in practice. The most common one is the RT-PCR test.

New method for tagging the COVID-19 infection by analyzing the images obtained from CT-scan images of a patient's lungs. Convolution neural network (CNN) based architectures like VGG-19, Inception, ResNet, MobileNet, AlexNet, and GoogleNet are implemented to detect COVID-19 automatically.



Tests

There are different types of coronavirus tests in practice. The most common one is the RT-PCR test, in which a special swab is used to collect samples from the throat and nose to direct detection of the virus.

The Rapid diagnostic test (RDT) of a sample helps to detect viral proteins, which is related to COVID-19, and ensuring a speedy and accurate diagnosis.

Recent studies revealed that Computed Tomography (CT) scan images can detect the COVID-19 disease in patients. The aim of this study is to. We present. This study aimed to establish an early approach which is over-fitting independent and show accurate classification of covid-19 infection using CT-Scan images of lungs.

Automatic detection of COVID-19 based on DNN models are utilized in this work, along with the six distinct image processing models are applied on publicly available 402 COVID-19 infected and 397 normal images of lung CT-scan images. Firstly, the data collected are pre-processed, and images are augmented for robustness, and further utilized for training and testing in the CNN based models.

Existing work

- Mishra et al. used CNN model to detect COVID-19 from CT-scan images of chest. The highest 86% accuracy is achieved with 88%, 86% AUROC, and F1-score, respectively.

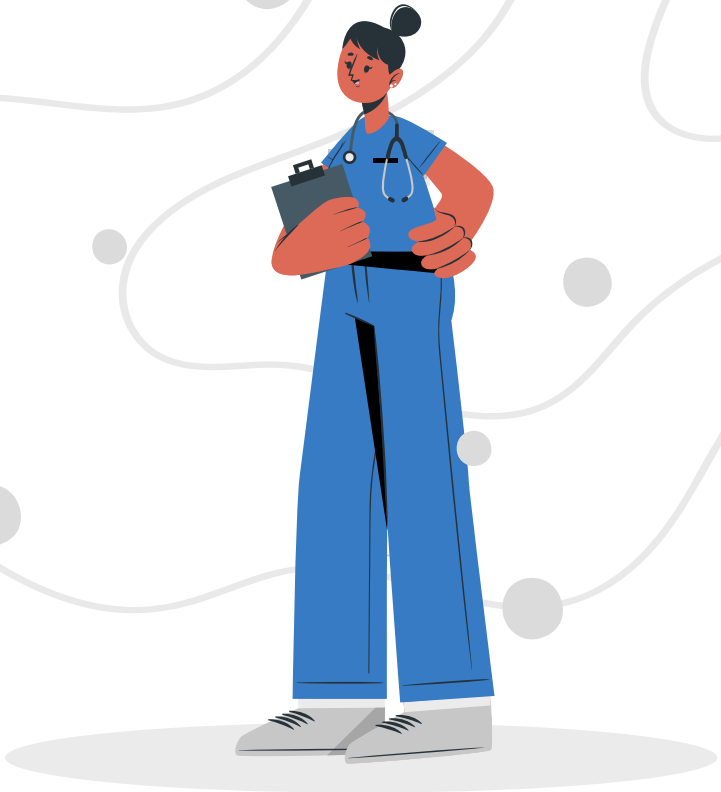
- Wu et al. applied a DNN technique for segmentation and classification of COVID-19 by using images of lung CT-scan. The highest 95% and 93% sensitivity and specificity have been achieved, respectively. Wang et al. utilized a DNN approach on images of CT-scan to detect COVID-19 infection.

- Multitasking deep learning model is applied by Amyar et al. for segmentation and tagging of COVID-19 lesions via images of CT-scan. The highest 0.78 and 93% of dice coefficient and AUC has achieved, respectively

- Polsinelli achieved 85% accuracy by applying SqueezeNet based lightweight Image Processing model to identify COVID-19 infected with normal, and pneumonia infected images of CT-scan.

- Jaiswal et al. used deep learning with DenseNet-201 for the classification of COVID-19 infected with normal CT-scan images. The highest 96.25% accuracy is achieved with 2492 CT-Scan images of SARS-CoV-2 data set.

- Deep transfer learning approach to detect COVID-19 using images of CT-scan is employed by Pathak et al. The highest 96.26% accuracy was achieved.



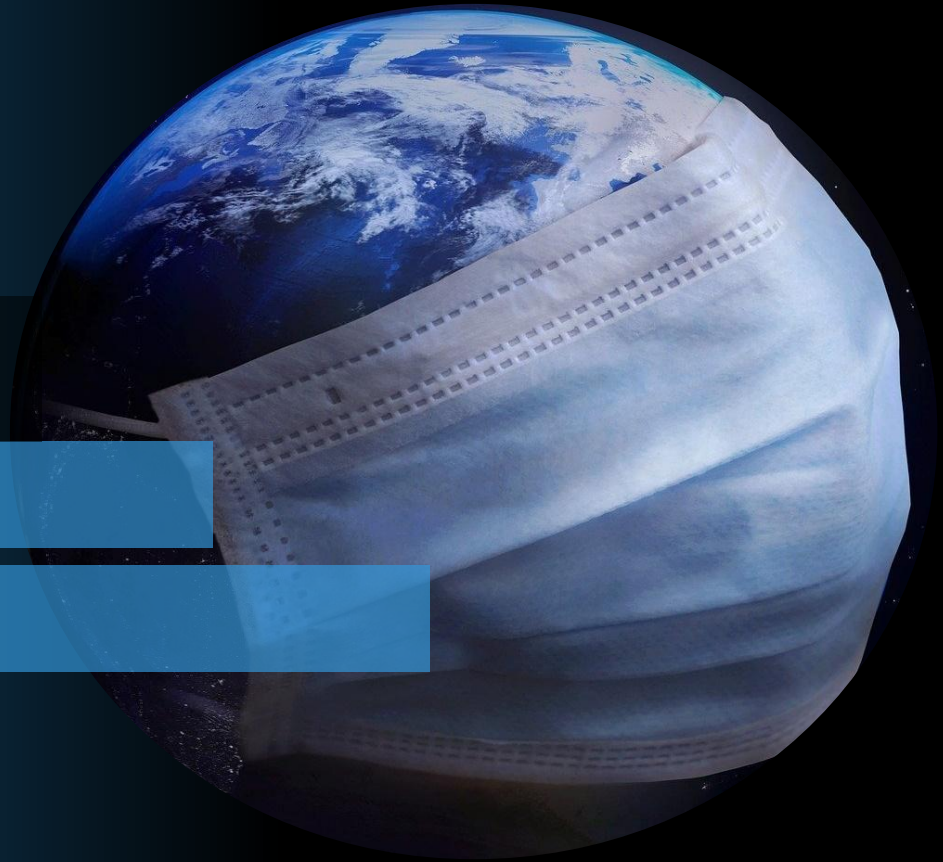
- Automatic segmentation and detection of SARS-CoV-2 infected regions based on the deep learning approach on CT-scan image is employed by Shan et al.

- Barstugan et al. extracted various features from chest CT-scan images. The highest 99.68% accuracy is achieved having 10-fold cross verification technique and SVM classifier.

- Asnaoui et al. applied various DNN models for detection and classification of bacterial pneumonia, viral pneumonia, and coronavirus.

- Yang et al. used DNN based CSSL model to detect COVID-19

Proposed work and methodology



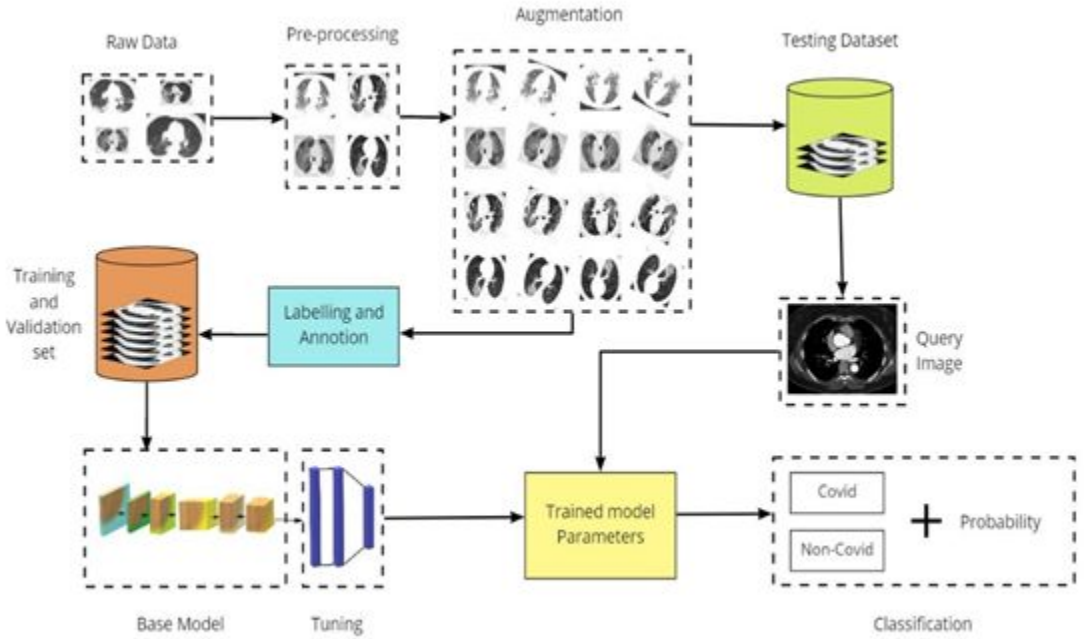
- The proposed automatic COVID-19 detection system is ready-to-use, gives fast and accurate results using various CNN-based architecture for large scale processing of data can be performed rapidly.

- The test output of the methods are juxtaposed among the image processing models which give comparable results to bolster the efficiency.

- The system for the automatic detection of COVID-19 consists of raw image acquisition, pre-processing, image augmentation, training of various image processing models, and testing of the model.

  Finally, efficient algorithm is to be identified for best performance in utilizing Computed Tomography (CT) scan images to detect the COVID-19 disease in patients.

- A total of 6 different models were implemented consisting of AlexNet, VGG-19, MobileNet, Inception, GoogleNet and ResNet Model.



The Architecture diagram of the Proposed Deep Learning for the Detection of COVID-19


Real time usage

The CT-scan images of lungs are preprocessed and augmented for the better learning of the neural network and to avoid the over-fitting.

The highest training and testing accuracy of 93.89% and 94.09% is achieved by the VGG-19 model.

The VGG-19 models outperform the other CNN-based techniques in terms of both training and testing accuracy. Further the model will be evaluated using new and enhanced datasets and the trained model will be deployed on the web application, so that people can avail a chance to use the model.

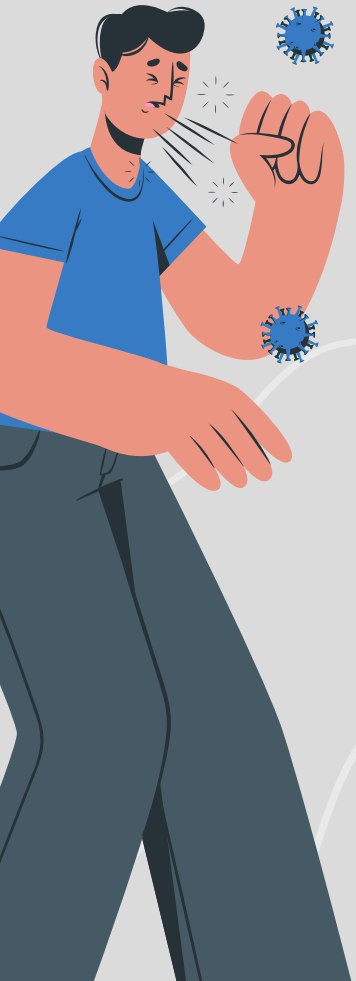
Hardware & software requirements

Hardware Requirements:

- Any CPU (Intel i5/ i7/ Ryzen 7).
- Any GPU that is compatible with OpenGL 3.2.
  (integrated graphics cards Intel HD 4000 or above).
- 8 GB RAM, 20 GB HDD Free Space.

Software Requirements:

- Windows 10, 64 bits (PC or Mac computers using Boot Camp).
- NVIDIA GPU Driver
- CUDA Deep Neural Network Learning Library (version 7.5 or more)
- NVIDIA CUDA (version 10.1 or more)



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Thank You