PROPOSAL FOR PROJECT-1

(ECD-416)

COVID 19 Detection from radiograph using Computer Vision Deep Learning

Submitted By-

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Introduction (Project Overview)

Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered coronavirus severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2).

Currently, the detection of coronavirus disease 2019 (COVID-19) is one of the main challenges in the world, given the rapid spread of the disease. Recent statistics indicate that the number of people diagnosed with COVID-19 is increasing exponentially, 29.6 Million total confirmed cases worldwide.

Basic method Reverse Transcription-Polymerase Chain Reaction (RT-PCR) test has turned out as a gold standard for identifying COVID-19 patients [4]. However, the RT-PCR test becomes infeasible in the severely affected areas during early outbreak of the pandemic. In addition, the preparation of sample and poor-quality control techniques lead to increase in false-negative rates [5].

We are working on an an artificial-intelligence technique based on computer vision Deep Learning to detect COVID-19 patients using real-world datasets. Our system examines chest X-ray images to identify such patients. Our findings indicate that such an analysis is valuable in COVID-19 diagnosis as X-rays are conveniently available quickly and at low costs

Literature survey-

We are using Computer vision deep learning in this project.

Computer vision is a field of artificial intelligence that trains computers to interpret and understand the visual world. Using digital images from cameras and videos and deep learning models, machines can accurately identify and classify objects — and then react to what they "see."

deep learning is a machine learning technique. It teaches a computer to filter inputs through layers to learn how to predict and classify information. Observations can be in the form of images, text, or sound. The inspiration for **deep learning** is the way that the human brain filters information.

Objectives to be carried out- **Proper Segmentation of the X-Ray lungs images and classification of COVID-19 from other pneumonia and healthy subjects using the segmented X-Ray images.**

Brief methodology to be adopted-

Dataset –

In this project firstly we need a data set of Chest X-Ray of COVID-19 patients, pneumonia infected patients and Healthy peoples Real Time Dataset. So we will train our system to classification of these samples. And our main purpose to get a best accuracy. So we will try to use of the best model and techniques for this purpose.

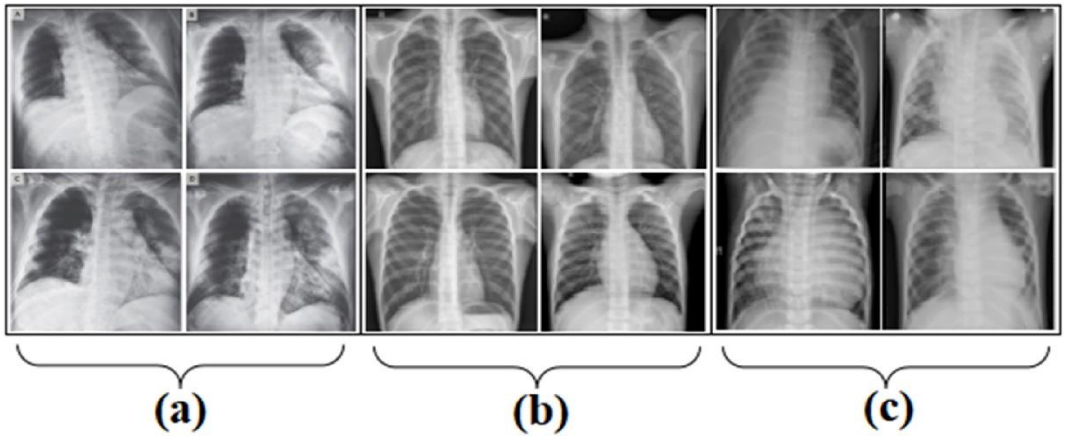


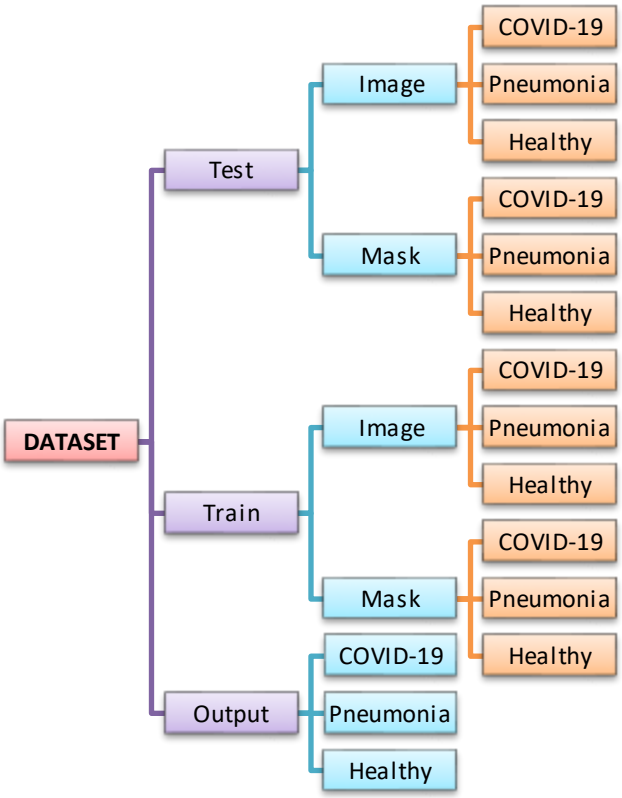
Fig. Sample images used in the experimental analysis of this study a) COVID-19 chest Images b) Normal Chest Images c) Pneumonia Chest Images

Dataset sources :

https://www.kaggle.com/paultimothymooney/chest-xray-pneumonia

https://github.com/ieee8023/covid-chestxray-dataset

Data Management (Folder Division)

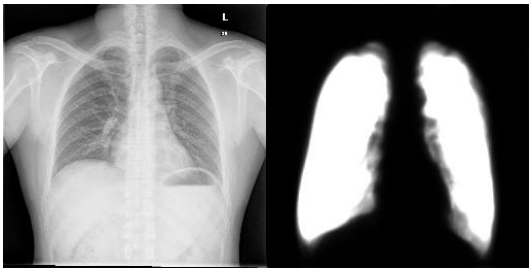


DATA Preprocessing

We have to obtain masked image from the dataset for this purpose we will train UNet model

UNet

In Deep Learning first step is masking and segmentation of the sample data (images). For this purpose, we use U-Net model. U-Net helps to identify where objects of different classes are present in an image. U-Net is a convolutional neural network architecture that expanded with few changes in the CNN architecture. It was invented to deal with biomedical images where the target is not only to classify whether there is an infection or not but also to identify the area of infection.



After this applying XOR/AND operation we will get Masked Image.

Classification

Now we have to classify the samples with highest possible accuracy. So for this purpose we will go through the various models and compare their accuracies.

Transfer Learning

Transfer learning used in machine learning, is the reuse of pretrained model on a new problem. In transfer learning, a machine exploits the knowledge gained from a previous task to improve generalization about another. For Example , in a training a classifier to predict whether an image contain boys , you could use the knowledge it gained during training to recognize girls.

VGG-16 Model (Oxford Visual Geometry Group)

VGG-19 Model (Oxford Visual Geometry Group)

The VGG model can be loaded and used in Keras deep learning library. Keras provides an Application interface for loading and using pre trained models.

	Layer	Feature map	Size	Kernel Size	Stride	Activation
Input	Image	1	224x224x3	-	-	-
1	2 X Convolution	64	224x224x64	3x3	1	Relu
	Max Pooling	64	112x112x64	3x3	2	Relu
3	2 X Convolution	128	112x112x128	3x3	1	Relu
	Max Pooling	128	56x56x128	3x3	2	Relu
5	2 X Convolution	256	56x56x256	3x3	1	Relu
	Max Pooling	256	28x28x256	3x3	2	Relu
7	3 X Convolution	512	28x28x512	3x3	1	Relu
	Max pooling	512	14x14x512	3x3	2	Relu
10	3 X Convolution	512	14x14x512	3x3	1	Relu
	Max pooling	512	7x7x512	3x3	2	Relu
13	FC	-	25088	-	-	Relu
14	FC	-	4096	-	-	Relu
15	FC	-	4096	-	-	Relu
Output	FC	-	1000	-	-	Softmax

Fig.- VGG-16 Model

Output of VGG-16 flatten layer is given to the three-layer Dense deep learning Network. Last layer will have Three outputs.

Supervised learning

Supervised learning is the machine learning task of learning a function that maps an input to an output based on example input-output pairs. It infers a function from labelled training data consisting of a set of training examples.

Optimizer

Optimizers are algorithms or methods used to change the attributes of your neural network such as weights and learning rate in order to reduce the losses.
In this project we will use **Adam Optimizer.**

Loose function

In this project we will use **"Categorical Crossentropy"** as the loss function.

Y label

The Y labels will be named according to the folder to which the image belonging to and divided into three classes i.e. 0,1,2 and then later are converted to categorical numpy array according to their assigned classes for the index position in the array as 1 otherwise 0.

Conclusion

After implementing this pipeline, we are hoping to achieve a decent amount of accuracy in classifying the COVID-19, Pneumonia and Normal Chest X-Ray scans.

References

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COVID-19 Detection in Chest X-Ray Images using Deep Learning (Preprint)