

# Pneumonia and Covid-19 Prediction using CNN

Dr. V.Vinodhini<sup>1</sup>, C.S.Charan<sup>2</sup> and A.Deepa<sup>3</sup>

<sup>1</sup>Professor, Department of Computer Science, Dr. N.G.P. Arts and Science Coimbatore, Tamilnadu, INDIA

<sup>2</sup>Final Year Student, Department of Computer Science, Dr. N.G.P. Arts and Science Coimbatore, Tamilnadu, INDIA

<sup>3</sup>Final Year Student, Department of Computer Science, Dr. N.G.P. Arts and Science Coimbatore, Tamilnadu, INDIA

<sup>2</sup>Corresponding Author: 212cs005@drngpasc.ac.in

Received: 11-03-2023

Revised: 09-04-2023

Accepted: 24-04-2023

## ABSTRACT

Convolutional Neural Network (CNN) is used to automatically process large amounts of medical images, and to identify complex associations for disease diagnosis. An automatic diagnostic system has been developed using Convolutional Neural Network (CNN) which uses chest X-ray results to diagnose whether a person is affected by Pneumonia or COVID-19. It also determines the type of Pneumonia along with the newly discovered COVID-19. The diagnostic deep learning method uses computed tomography (CT) images, chest X-rays to classify Pneumonia, types of Pneumonia and COVID-19.

**Keywords**— Deep Learning, Machine Learning, Convolutional Neural Network (CNN)

It has the ability to optimise itself, which allows it to extract and classify characteristics from photos more precisely than any other algorithm. Additionally, it produces findings that are extremely exact and precise while requiring very little preparation of the incoming data. In many image classification and object detection applications, including medical imaging, CNN is widely employed. A few well-known CNN models for image categorization that excel in real-world applications include Alexnet, ZFNet, and VGGNet.

The new Coronavirus, which was initially discovered in December 2019, has been causing an enormous outbreak that is affecting the entire planet. As a result, a respiratory infectious disease is created that is rapidly growing and spreading throughout society.

## I. INTRODUCTION

Deep Learning (DL) is a branch of Machine Learning (ML) which draws inspiration from how the human brain functions. Unsupervised learning, or learning from examples with unlabeled data, is a capability of DL. DL is particularly popular with Artificial Intelligence (AI) and Big Data analysis because to qualities including unlabeled data utilisation, operating without feature engineering, and prediction with high accuracy and precision. DL has been extensively employed in a variety of domains, including business, autonomous vehicles, face and object recognition, image categorization, and many more. Convolutional Neural Network (CNN) is a deep learning (DL) technique that has demonstrated excellent performance in handling issues like document analysis, various picture classifications, position identification, and action recognition.

The popularity of CNN, a deep learning method based on Artificial Neural Networks (ANN), has increased recently. The foundation of CNN is the human nervous system, particularly the brain, which is made up of billions of neurons. In 1943, the concept of an artificial neuron was first developed. Building models like the neocognitron was heavily influenced by Hubel and Wisel's discovery that visual cortex cells play a significant role in the detection of lights in the receptive fields. This model is regarded as CNN's foundation and forerunner. Artificial neurons used to create CNN have the same self-optimization and learning capabilities as brain neurons.

For any contagious disease like COVID-19, the rate of transmission and the method of transmission are crucial variables. The World Health Organisation (WHO) claims that respiratory droplets larger than 5 to 10 micrometres (m) operate as a mechanism of transmission that may entail airborne transmission. As a result, there is a grave risk to the public's health because unprotected contact can spread disease quickly. As a result, this disease has a high growth factor and a 2-5% projected fatality rate. As of the date of 8 August 2020, there have been 19.18 million confirmed COVID-19 cases worldwide, with 0.716 million fatalities.

It demonstrates how quickly this spreads using geometric progression. The severity of the issue is depicted in this graph. On January 11, 2020, there were just 41 verified instances; by February 11, 2020, that number had almost double by a thousand, reaching 43,109. The number of verified cases increased quickly over the following three months, reaching 4.04 M on May 11, 2020, over 94 times the number on February 11, 2020. Even after taking several precautions, such as donning masks and maintaining social distance, the number of infected patients climbed three times over the course of the following two months, reaching 12.32 M on July 11, 2020.

We can only hope that as people become more aware, the growth factor will start to decline. One of the most crucial factors in preventing the spread of the COVID-19 virus is the early diagnosis of patients. WHO

listed a few quick and thorough diagnostic procedures for COVID-19 identification, including cobas SARS-CoV-2 for use on the cobas 6800/8800 systems and genesis Real-Time PCR Coronavirus (COVID-19) testing. These tests are expensive and time-consuming, but CNN can be very helpful in automatically identifying positive patients.

This has the potential to save money and time, which will ultimately save lives. Moreover, as none of the currently used tests guarantee 100% accuracy, this can add an additional degree of validation. In terms of medical imaging, CNN has been doing exceptionally well. It has been heavily utilised recently for the diagnosis of various diseases or anomalies. CNN performs Coronary Artery Disease (CAD) diagnosis, malaria-infected blood stages recognition from bright-field microscopy images, and Parkinson's disease detection using electroencephalogram (EEG) signals.

In order to categorise dental photos, find skin problems, investigate Alzheimer's disease, and many other ailments, researchers have also suggested various CNN models. CNN can be quite helpful in detecting COVID-19 in CT or X-ray images. A CNN model is suggested in this study to identify COVID-19 positive patients from chest X-ray pictures. This programme successfully and accurately diagnoses Coronavirus patients with a little investment of time and resources. Additionally, the CNN models' comparative analytical study for identifying COVID-19 is included in this paper. This can make it easier to carry out COVID-19 testing on a much larger scale, which would substantially save time and money.

## II. LITERATURE SURVEY

Using their chest X-ray pictures, Zhang et al. suggest a DL model for Coronavirus patient screening. This study's team examined 100 chest X-ray images of 70 COVID-19 patients and 1431 X-ray photos of other pneumonia patients, who were categorised as having COVID-19 and not having COVID-19, respectively. The backbone networks, classification head, and anomaly detection head are the three key components of this model. The backbone network is a pre-trained 18 residual CNN layer using the ImageNet dataset. It should be noted that.

A sizable generalised dataset for image classifications is provided by ImageNet. This model has an accuracy of 96% for diagnosing COVID-19 patients and 70.65% for non-COVID-19 patients.

As well, Hall et al, on using DL to identify COVID-19 patients from a small collection of chest X-ray pictures. The overall accuracy produced by their pre-trained ResNet50 model is 89.2%. Li et al. employed the created CNN architecture known as COVNet to detect COVID-19 from the patients' chest CT images. The sensitivity, specificity, and Area under the Receiver Operating Curve (AUC) for this study team were 90%, 96%, and 0.96, respectively.

A DL model based on CNN and long short-term memory (LSTM) was proposed by Islam et al. In this

study, 1525 X-ray pictures from the dataset are divided into three categories: normal, COVID-19, and pneumonia. This CNN-LSTM-based model attained an F1-score of 98.9 and an overall accuracy of 99.4%. With their suggested DarkCovidNet model, which is based on the Darknet-19 model, Ozturk et al. also do binary and multi-class classification. For training and model validation, this model used 127 COVID-19 chest X-ray images and 500 normal X-ray images.

This model has an average overall accuracy of 98.08% for binary classification, however it drops to 87.02% for multi-class classification. Decompose, Transfer, and Compose (DeTraC), a deep CNN, was utilised by Abbas et al. to categorise COVID-19 positive images. For training and verifying the model, it used 105 COVID-19 chest X-ray images with image augmentation and 80 normal chest X-ray images. The accuracy of this model was 95.12%.

## III. IMPLEMENTATION METHODS

An Automatic diagnostic system has been developed using Convolutional Neural Network (CNN) which uses chest X-rays results to diagnose whether a person is affected by Pneumonia or COVID-19.

Preliminary analysis of proposed technique has shown promising results in Identification of the disease in a cost-Effective and time-Efficient Manner.

The Proposed technique can segment the Lung Region for more data Accuracy.

### 1. DATA PREPROCESSING

Preprocessing the data is the first module. The Appropriate datasets are collected from the Internet that are required at all stages starting from preprocessing phase to the testing phase. Images which are in various formats along with different resolutions and quality are preprocessed in order to get better feature extraction and consistency.

### 2. DATA AUGMENTATION

Data Augmentation is a technique that is used to expand the size of a dataset by creating versions of images. The augmentation technique creates different orientations that improves the ability of the model.

### 3. TRAINING THE MODEL

Training the Model helps it to learn the features that distinguishes one class from the others. Therefore, when using more augmented images, it increases the model's efficiency and testing makes it a skillful model.

### 4. CLASSIFICATION

Finally, the trained model is used to predict the

Input Images Belonging to the Appropriate Class of Diseases.

### 5. ADVANTAGES

- Versatility of the Proposed system.
- The system makes the classification easy at a single shot.

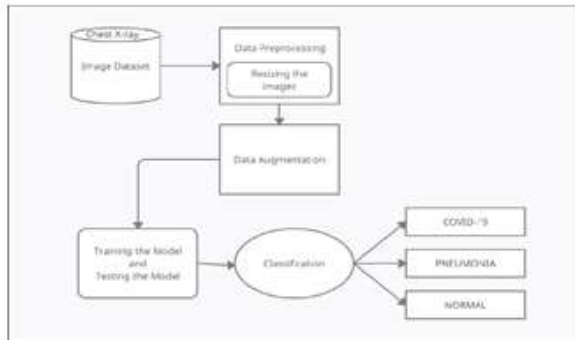


Figure 1: Process Flowchart

## IV. CONCLUSION AND FUTURE ENHANCEMENT

The latest global epidemic can be stopped in its tracks by mass testing and early COVID-19 detection. The three main considerations in any disease detection procedure, particularly COVID-19, are speed, expense, and accuracy. In order to solve these problems, a CNN-based model for identifying COVID-19 cases in patient chest X-rays is proposed in this study. Multi-class categorization and the availability of a larger dataset can help this task even more. Last but not least, CNN has excellent chances of identifying pneumonia and COVID-19 with a minimum of effort. Despite promising results, the proposed model has not been clinically tested.

The suggested approach, however, can undoubtedly contribute significantly to the early and quick detection of COVID-19 and pneumonia, hence cutting down on testing time and expense, thanks to its improved accuracy.

For a binary class, a CNN-based model is suggested for identifying COVID-19 cases in patients' chest X-rays. Multi-class categorization and the availability of a larger dataset can help this task even more.

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