The Covid detection_181014115

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Chapter 1

Introduction

1.1 Introduction:

COVID-19 is the colloquial name for the Coronavirus Pandemic, has posed a threat to the global socioeconomic order. Nobody expected human beings to suffer such a loss of health and money after witnessing enormous technological breakthroughs. Due of the lack of a precise cure, authorities are depending solely on behavioral interventions to combat such pandemics. To break the virus's chain dissemination, most several countries have undergone an utter stoppage. The World Health Organization (WHO) is an international organization that promotes (WHO) has issued rules in the subject of personal and social hygiene, as well as how to maintain social distance. To stop the virus from spreading and to provide timely medical care, testing and surveys are being carried out in a hurry. undertaken. Because medical treatments are so expensive, Stopping the pandemic is particularly difficult for low- and middle-income countries. Early diagnosis and efficient technology deployment can save money and effort in this situation by reducing false instances. COVID-19 is a form of respiratory condition that looks a much like pneumonia. Coughing that is dry, tiredness, breathing disorders, and the most typical symptoms include a mild fever. These characteristics make diagnosing these disorders much more complex. Radiographic pictures of the lungs, X-rays and CT scans, for example, can provide adequate detectable information Coronavirus invasion. The application of Cross radiography to diagnose lung infections is a cost-effective method. Multiple research centers and researchers are involved. are putting together a collection of COVID victims' chest x-ray scans and going public. The COVID-19 epidemic has caused a worldwide human life has been lost emotionally. While somehow serving as a thorough review of our cognitive intelligence. For COVID-19, "Dos and don'ts" for social attentiveness activities are being introduced in public spaces. The coronavirus may also benefit from environmental conditions. The loss and recovery rates, on the other hand, indicate that the epidemic is not being adequately managed. In most cases, They weren't even able to deliver the results in a timely manner. The patient's condition deteriorates or dies as a result. Using publicly available radiologist data, the COVID-19 deep neural methodology was developed is one of many corona detection systems that uses Transfer Learning and Haralick characteristics, as well as the internet of things and issuing alarms. Tandem polypeptide synthesis (qrt-PCR) and other pharmaceutical applications are examples of nodal molecular diagnostics procedures. Algeria is a country in North Africa, state similarly commercial healthcare facilities used Chest x ray as a non-invasive diagnostic tool to identify COVID-19 in patients who have been exposed to it as a result of to a paucity of diagnostic kits and inaccurate RT-PCR predictions. Computed tomography images, according to Covid-19, are a variety of image created by scanning a superior to anything else in the field even though they are made possible owing to the availability of Fluoroscopic equipment and its capabilities maintained. Neither of the research sought to duplicate the capacity of the models by combining them to persons to recognize. They're all medical professionals. A number of studies have made use of deep learning-based algorithms to diagnose pneumonia, numerous types of X-rays of respiratory problems, cervical cancer, drain

classification, and other medical images. A few of these projects have shown promising results using relatively simple engineering. An example of a convolutional neural network (CNN) was utilized to discriminate patients from Covid-19 participated in a study, using C.T. check photos. A few other trials with low accuracy using diagnostic tests are used to diagnose Infection with Covid-19 in pulmonary system. The authors looked at how well VGG16, CNN-AD, Densenet, Resnet50, Custom CNN, and other deep learning formulae performed in diagnosing Covid-CXR and the accuracy of normal-CXR pictures was in the range of (85 percent to 98.9%), which is quite good. The scientific community acknowledges employed Technologies for deep learning to X-ray imaging will be used to develop methodological approaches for detecting COVID-19 infection, thanks to advances in deep learning technologies.

Whenever it comes to Coronavirus tests, there are a few options, the study's major purpose is to forecast the most precise outcome in order to reduce energy and expense. It demonstrates a completely infrastructure that has been developed for distinguishing Illustrations of coronavirus-infected lungs and other lung illnesses caused by chest X-rays. The originality of this paper is that we compared two types of models (CNN and DenseNet). The CNN model achieved an accuracy of 89.44 percent.

The following are some of the contributions of this work:

- A CNN-based detection algorithm is used to classify COVID-19, pneumonia, and uninfected patients.
- A well-designed image processing pipeline that extracts the ROI mask to highlight valuable information.
- To speed up the procedure, The training program can receive preprocessed data in batches via a bespoke picture data generating method.

- The first segment begins with an introduction. The second half is devoted to related works are outlined. While in third section, method as well as methodology and object detection are displayed. The outcomes as well as conversations are available in section four. Summary seems to be on the fifth portion. Finally, in portion six, the premise is explored and future remarks.

1.2 Motivation:

Covid is one of the biggest global problems for us. It is highly contagious and has many variants with different symptoms. We can't surely say if someone is covid positive without running tests. Now days covid is tested using saliva or swab of the patient. As we all know, covid attacks only the lunges of a patient. We might be able to detect covid 19 utilizing image processing from a patient's chest x-ray image if we can train a neural network model to distinguish covid positive chest x-rays from covid negative chest x-rays. So, if we can use image processing and Covid

detection using a computational model from a chest x-ray, it would be easier than running tests from saliva or swabs. It would also be a practical solution, because in most underdeveloped country covid tests are not available everywhere and it is a hassle to get tested for covid in medieval way. But one can manage an image of his chest x-ray more easily and using this model test if he is covid positive or negative.

1.3 Rational of the study

In this global humanitarian disaster, the biomedical field community is seeking for these few people new ways COVID-19 (coronavirus) outbreak tracking and containment Artificial intelligence is a platform that scientists can embrace since it can detect high-risk individuals in real time, track the virus's expansion, and efficiently manage the outbreak. Although the rates of correctness, true negatives, and false positives can still be improved to minimize medical misinterpretation, this technology can also assess the severity of illnesses by looking at preceding patients' records (Haleem et al., 2020; Bai et al., 2020; Hu et al., 2020). Early infection detection and diagnosis is a critical use of AI in the COVID-19 pandemic, which is the focus of this research.

The desire for higher quality and effectiveness in clinical therapy drove the adoption of AI in medical imaging. Radiology imaging data grows at a rapid rate in comparison to the number of skilled readers accessible. This has put pressure on medical practitioners to compensate by becoming more efficient when processing photos (Wu et al., 2016). Deep learning has been used to claim remarkable advancements in various AI technologies in the literature. These accomplishments drew researchers into the field of computational medical imaging to investigate the capabilities of deep learning in medical pictures recorded using computed tomography (CT), magnetic resonance imaging (MRI), positron emission tomography PET, and X-ray. The following are examples of deep learning implementations for image identification, cell structure recognition, tissue segmentation, and computer-assisted disease diagnosis (Shen et al., 2017b). Artificial neural networks are a type of AI model that mimics the structural beauty of the human neural system in order to understand and learn from hidden patterns through vast observations. The perceptron was the first trainable neural network with only one layer (Rosenblatt, 1958). The modified perceptron is a linear model with many output units that prohibits applications from dealing with complex input patterns, even when nonlinear functions are used in the output layer. By placing a hidden layer between the input and output layers, this restriction has been effectively eliminated. The input and output layers are separated by a concealed layer, this constraint is effectively removed. A two-layer neural network with a finite number of hidden layers may estimate any continuous function when certain assumptions on the activation function are taken into account (Chen et al., 1995), and is hence referred to as a universal approximator. However, a complex construction, which has two or perhaps more strata and fewer total number of units, may typically predict functions with the same precision (Bengio, 2009). As a result, the number of trainable parameters can be lowered, which makes training with a data set easier. (Schwarz, 1978).

I do this research, because of covid 19 one the most dangerous global problem now a days and with the blessing of AI I want to develop a model which will be trained using chest x-ray images of healthy, pneumonia and covid patient. Covid affects the lunges of a patient. But, there are also some common disease that affects lunges and shows almost same symptoms as covid, example- pneumonia. So, we need a model that can identify healthy and effected lunges and also differ covid from diseases with similar symptoms. My objective is to train my model so that it can identify healthy, pneumonia and covid from chest x-ray.

1.4 Research Question:

1. How to detect Covid 19 and Pneumonia using image processing and deep learning?

1.5 Expected Output:

The adaptive moment estimation (Adam) optimization strategy was applied in the experimental scenario. For superior gradient estimation with little adjustment, Adam optimization employs a collection of roles of activation and a personalized learning rate. When the dataset is large enough, this optimizer is ideal. The model's performance criteria are to maximize the value of the F1-score for resilience and accuracy without classifiers.

- **Confusion Matrix**: This is a table of model's ability is shown in the content shows when the forecast falls short to anticipate incidences of accurate portrayal. As a result, the total number of correct and incorrect prophesies is determined and broken down by overall outcome labeling.
- **Accuracy**: The most basic performance statistic is accuracy, which is expressed even as fraction of accurately experiments expected to total data. Other metrics may be studied to determine the model's utility because correctness is a simple concept but a key indicator of model achievement.

  Accuracy=(TP+TN)/(TP+TN+FP+FN)

  True Positive, True Negative, False Positive, and False Negative are the terms for True Positive, True Negative, False Positive, and False Negative, respectively.

- **Precision**: The proportion of positives that are correct predictions to all correct classification model is known as precision.

  Precision=TP/(TP+FP)

- **Recall (Sensitivity):** Sensitivity is a metric that calculates the amount of time it takes for something to happen. The number of out of all potential positive judgments, the right positive assumptions were created .
  - Recall=TP(TP+FN).

- **F1-score**: It aims to increase the model's robustness (i.e., how few cases it misses) and exactness (i.e ,the number of repetitions it correctly classifies). Precision and recall provide a harmonic mean.

- **Final prediction**: I will upload one image, this image will be normal, covid and pneumonia chest x-ray. Thus, my function will predict it from the model.

The proposed model was trained to try to increase both accuracy and precision and around the same time, the F1-score value. This method confirmed the model's tolerance and ability to Apply the same principles to all triple piecewise objects.

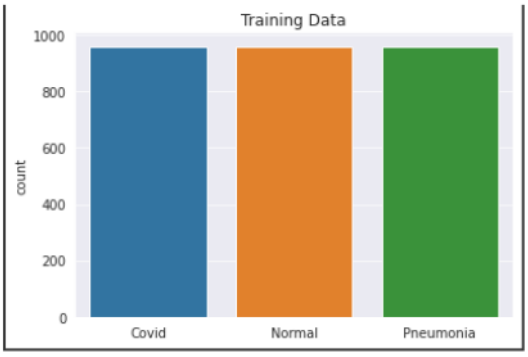
Chapter 2

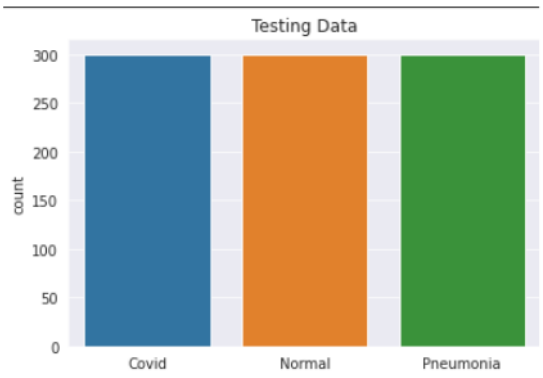
Background

2.1 Related work:

This section covers a wide range of topics relating Artificial intelligence strategies are being used in a variety of therapeutic imaging applications. This section also includes discusses additional segmentation techniques and computerized vision guidelines in the context of COVID-19 diagnosing diseases.

2.2 Graphs and Data Analysis:





Firstly, there is the Training data and Testing data set and lastly is shown the whole dataset graph. The training data is 2880 and the testing data is 900.

2.3 Literature Review:

Author and Year	Aim	Similarities/dissimilarities with my project
Salehi, A. W., Baglat, P., & Gupta, G. (2020).	The main aim of this paper is to distinguish Coronavirus from Influenza-A viral pneumonia and normal cases with the use of CT images.	The goal of my project is to use CT images to distinguish covid, normal, and pneumonia.
Pillalamarry Mahesh et al 2021.	Our project, we need to find whether the x-ray image is COVID or normal, for that we need to train the model by giving two image sets COVID and normal as labeled. Convolution neural network is one of the deep learning techniques with wide and deep structure.	In my project I need to find whether the x-ray image is COVID or Normal and Pneumonia for that I need to train the model by giving 3 image sets Covid, normal and Pneumonia labeled.

	Where pixels extracted from images and transfer those pixels to neural networks. we process the pixels of the image for less complexity of the model.	
Meem, A. T., Khan, M. M., Masud, M., Aljahdali, S. (2022).	It demonstrates a completely programmed framework for distinguishing coronavirus-infected lungs from chest CT scan images and other lung conditions.	The study's main goal with Coronavirus tests is to predict the most accurate result in order to save time and budget.
Sugirtham, V., 2022.	This article examined the quality of the model using supervised machine learning algorithms machines, decision greenery, and deep neural networks for the better effect on classifying chest X-ray images are divided into two categories: covid and normal, and the final a prototype integrated into a web app and hosted. Because our dataset comprises annotated images corresponding to binary classes COVID or NORMAL, supervised machine learning algorithms were initially used. By labelled photos, we mean that the images have already been assigned to the correct class, and the model learns from the annotated training data	CNN was chosen for its superior performance in classifying chest x-rays into three categories: covid, normal, and pneumonia in my project. Our collection includes tagged photos from the COVID, normal, and pneumonia classes. By labelled photos, I mean that the images have already been assigned to the correct class, and the model learns from the labelled training data and forecasts based on the unexpected data.

	and makes conclusions based on the unsupervised learning.	
Hussein Kaheel Etl , 2021	In this context, we describe an AI therapeutic framework that seeks to obtain heterogeneous information from multiple sources, combining both infrastructure and healthcare sensory systems, in order to effectively engage in the worldwide fight against this pandemic data that has been predicted.	Kaggle was the source of all the data for this model, which I collected and tweaked on my local machine with the purpose of contributing effectively to the global fight against the pandemic.
Saurabh Kumar, Shweta Mishra, Sunil Kumar Singh First Published October 8, 2021	For the time being, chloroquine and hydroxychloroquine have been found effective for controlling the incisiveness of pneumonia, improving lung imaging findings and promoting a virus-negative conversion (Gao et al., 2020; Gautret et al., 2020). Still, it is not a satisfactory solution because the rapid increase in the number of cases cannot be checked effectively and that leading to infect many others. Therefore, identifying the cases in the early stage and quarantining the infected persons is going to be a relevant solution.	Nowadays, taking a Covid test is a hassle. It was tested the antiquated approach, using a swab or saliva sample from the patient. I'd like to create a model using CT images and a neural network in order to save time and money. Going in a different direction would be a practical solution. One can readily manage his chest x-ray and determine whether he is covid positive or negative utilizing this model.

2.3 Challenges:

Limited resources are one of the most significant difficulties in any health-care system (Abdellatif et al., 2019; Abdellatif et al., 2020; Abdellatif et al., 2021; Abdellatif et al., 2022; Abdellat). The study's and architecture's dependability and quality are determined by the availability and quality of data. To secure the previously discussed document influences, CT scans require a large dataset. As a result, a huge dataset of 3,780 CT scans was used in this investigation. I propose a foundation for medical clusters based on AI combines image acquisition and artificial intelligence to detect various serious medical issues early. This platform is designed to address medical imaging issues. It detects abnormalities and categorizes them properly. COVID-19 is a serious medical disorder that requires immediate attention for the purposes of this research. In this design, the chest photos in the dataset pass through various blocks. I resize all the images into 224, 224 and set the labels.

2.6 Image Augmentation:

Data augmentation is a technique for extracting more information from an existing dataset. In this example, it makes perturbed duplicates of the existing photos. The major purpose is to strengthen the with perhaps a neural network diverse heterogeneity, resulting in a framework that can distinguish between significant and irrelevant dataset properties. Several techniques are available for image enhancement. When data availability and quality dictate, augmentation techniques are applied effectively.

My approach combines several strategies in order to a vast number of datasets for various situations the following:

- Rotation: The image rotation range is 30 degrees.
- Zoom: Zooming in or out on the image will also increase the number of items in the set. There is a 0.2 zoom range
- Width shift range: The image has been moved horizontally by 0.1 pixels.
- Height shift range: The image is vertically shifted by 0.1

- Horizontal flip = True
- Vertical flip = False

```
[ ] datagen = ImageDataGenerator(
        featurewise_center=False,  # set input mean to 0 over the dataset
        samplewise_center=False,  # set each sample mean to 0
        featurewise_std_normalization=False,  # divide inputs by std of the dataset
        samplewise_std_normalization=False,  # divide each input by its std
        zca_whitening=False,  # apply ZCA whitening
        rotation_range = 30,  # randomly rotate images in the range (degrees, 0 to 180)
        zoom_range = 0.2, # Randomly zoom image
        width_shift_range=0.1,  # randomly shift images horizontally (fraction of total width)
        height_shift_range=0.1,  # randomly shift images vertically (fraction of total height)
        horizontal_flip = True,  # randomly flip images
        vertical_flip=False)  # randomly flip images
```

The raw data was extended and utilized during the training period using these methods. Nonetheless, the testing set will not be expanded throughout the testing phase. This would ensure the architecture's robustness and prevent over-fitting.

Chapter 3.

Method and Methodology

Applying Deep Learning and Convolutional Neural Networks, the developed model anticipates Covid-19 from chest X-ray scans. The datasets that were used in this research study were downloaded from the Kaggle dataset repository and modified for further use. There are 1500 images of covid, 1500 images of healthy and 1500 images of pneumonia chest x-ray. The images are divided into test and train in 20/80 ratio manually. This chapter reviews the materials and procedures used to implement the system's aim. The system's categorization and datasets building procedures are discussed in the first subsection. The platform's fundamentals are presented in the next section. Following that, it'll happen to focus on the system's experimentation and layout.

The above study suggests using Chest Xray pictures to classify Covid-19 positive and negative cases, as well as Pneumonia cases, using a Convolutional Neural Network (CNN) and Deep Learning-based algorithm that is simple and effective.

The system's process is depicted in Figure 1.

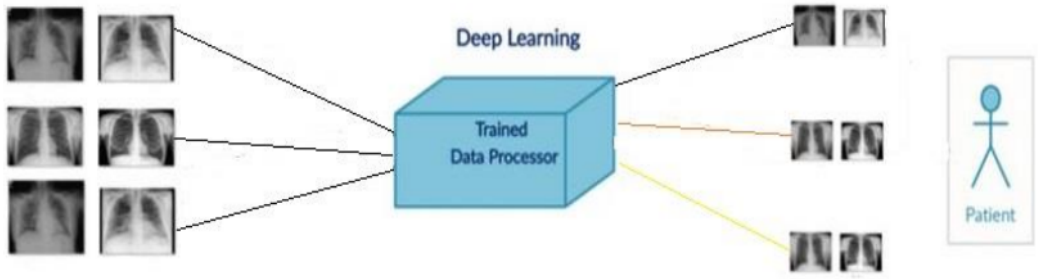


Fig1. Demonstrating the Process.

An overview of the entire system*:*

Fig 2 is a block diagram of full system.

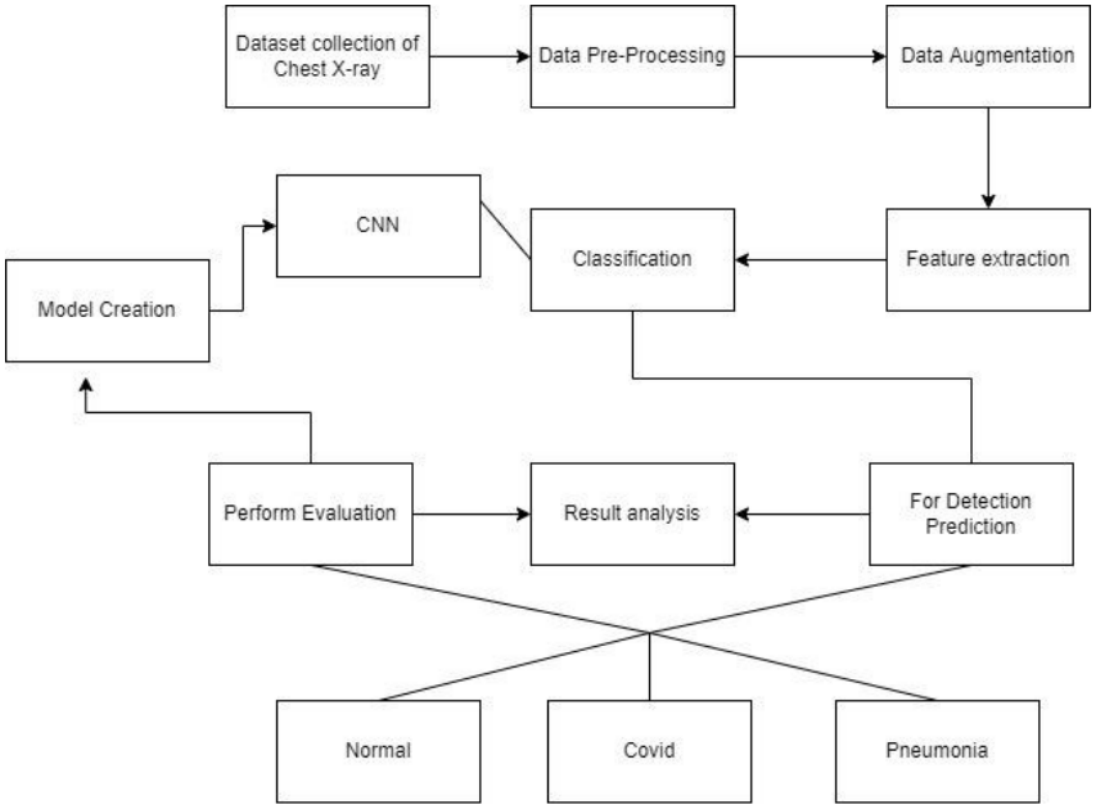


Figure 4- The system's block flow diagram.

The system is implemented with data source containing images of covid, normal and pneumonia chest x-rays. So, I preprocessed the data by splitting it into 80-20 ratio. Then the data was augmented to increase accuracy. After that, features have been extracted. The features were labeled as 0 for covid, 1 for normal and 2 for pneumonia. I then used AI Technologies to determine the presence of the plasmodium Covid based on the X-ray. Then, utilizing Deep Learning, data augmentation and dataset training for a prediction model. Well, here's how it works demonstrating the set of data creation aspect; data representation could get to be a a preparation for organizing

the raw data and constructing it acceptable in the case of machine learning example. The pair-wise similarity of Radiograph readings is great, while based on inter fluctuation compared to earlier image classification tests. This sort of information is easily lead to departure from the framework but instead overfitting concerns, lowering the network's generalization performance and complicating image classification tasks. It is a necessary and vital stage in illustrating machine learning. Then there's data augmentation, which is done with Tensorflow and Keras on CNN. However, a few instances recently, any procedure:

Resized images are used. Code cases and representation of photos following extension are the most often used image expanding methodologies. Data will be alluded to like pictures from now on. In all of our scenarios, we'll be using Tensorflow or OpenCV written in Python. The feature was removed after that. Classification could be an administered learning strategy in machine learning and measuring. The computer application adapts from the information provided data as well as creates a display it may have been the case used to assess achievement as well as analyze results. Following CNN image generation and X - ray images image testing on a chest x-ray image collection, the system will display the coronavirus detective result.

2.2 Object Detection:

To load and resize image I've worked with OpenCV. This photo recognition pattern aids in the instrument recognition based on images coloration, texture, and geometry. This image recognition technique aids in object recognition using image color, scale, and contour. I employed a number of benchmark CNN models in my research schemes. They have each been taught to make separate forecasts. The models are then merged to predict a class value using the new weighted average assembling procedure. For the Covid-19 detection system, To detect particles in chest X-ray images, I utilized Tensorflow. Using the image's colors, structure, and form, this computer vision technique aids in object detection. I used a range of benchmark CNN models in our proposed work. They've all been educated to generate a forecast independently. I used Keras and TensorFlow with specified parameters to train models.

2.3 Densenet Architecture:

With the exception of the first convolutional layer, each convolutional layer gets the output of the previous convolutional layer and produces an output feature map that is then passed on to the next convolutional layer in a conventional feed-forward Convolutional Neural Network (CNN) (which takes in the input). As a result, for 'L' layers, there are 'L' direct connections between each layer and the next layer.

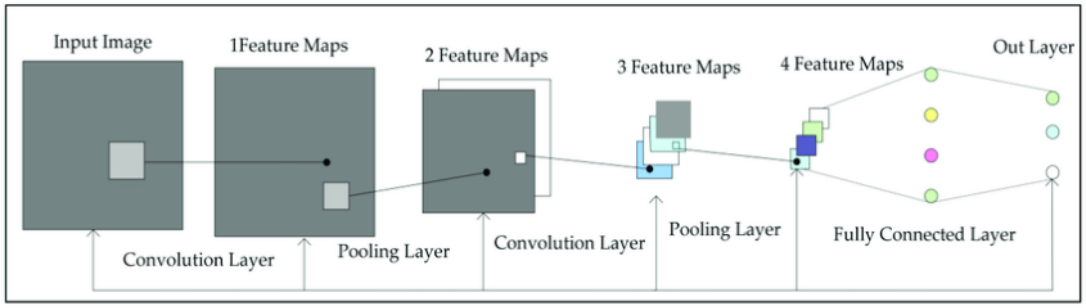


Figure 5

The 'vanishing gradient' problem emerges as the number of layers in the CNN grows. This means that when the communication channel between the input and output layers lengthens, some data may 'disappear' or be lost, lowering the network's capacity to train successfully.

DenseNets tackles this problem by simplifying the layer connectivity pattern and changing the standard CNN design. A DenseNet architecture has each layer directly connected to every other layer, hence the term Densely Connected Convolutional Network. For 'L' levels, L(L+1)/2 direct connections are used.

2.4 Convolution Neural Network:

Deep learning methods have been utilized extensively in the computer vision arena to solve difficulties. Deep layered architecture can extract hidden information and high-level features input of a multilayered image. Convolution layers are designed to tackle activities involving object recognition with little data preprocessing and no need for handmade features. CNN models use the nonlinear activations of preceding layers to get knowledge of low-level to high-level characteristics. CNN employs feature- algorithms or filtering that are specialized that detect the existence a lesser subset of the supplied image's attributes. As CNN's strata become more complex, it begins to discover global structures and processes in addition to the information retrieved in earlier layers.

2.5 Why are CNN Models so popular in image classification?

Using appropriate filters or kernels, CNN can capture the spatial and temporal variance in a picture. These filters are multifunctional spatial learning matrices rather than the value of a pixel value, and the filtration remains constant throughout the learning process. This method drastically minimizes the number of learnable factors. Along with the lack of the trick with cereals, if a picture

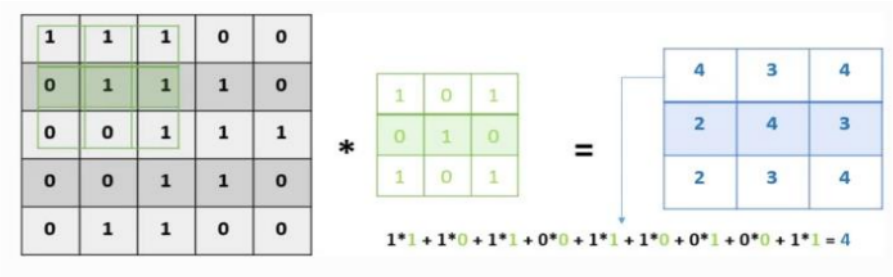


Fig:6 An illustration of the kernel trick used in CNN models.

is supplied to an artificial neural network (ANN) concept, it'll happen; try to comprehend the information provided by individual photons, learnable factors will become unsustainable for greater image sizes in this instance.

2.6 The Structure of a CNN:

As demonstrated, the CNN model is made up of three components in Fig 6.

Convolution Layers: These strata are in charge of mastering the input image's slightly elevated attributes. Multiple convolution layers can be used to learn visual functions in a step-by-step method

Layer of Pooling: It shrinks the geographical extent of the volume that is concatenated, lowering the amount of computing resources required to process the data. Extracting the dominant traits is also beneficial. Noise suppression is also performed by this layer.

Densely linked or fully linked after the volume of the stream has been properly lowered by combining layers, learning is done by using layers with sophisticated and high-level nonlinear sequences features.

Fully connected layers are frequently fed a one-dimensional matrix obtained from the pooling layer's output and function as ANN models.

Traditionally, a pair of convolution and pooling layers is regarded a single CNN layer, and there can be any number of such pairs.

2.7 Model Architecture:

The suggested prototype is a ten-layered CNN construction with layers with three conv2D layers, three maxpool2D layers, one dropout layer, one flatten layer and two dense layers, with the output layer being the last. The pictures are fed in RGB format in shape 244,244,3. The dropout function is needed to avoid overfitting, and the rectified linear unit (RELU) activation function is used to activate each of these convolution layers. A regularization strategy in which a preset number of layer nodes are disregarded or dropped out at random throughout the training phase is known as dropout. In this training model parameters are calculated using this method, and changed in diagonal applying a variety of designs with varying numbers of nodes and permutations. The dropout function accepts probability distributions eligibility criteria. are used to make this random selection. The suggested model uses a dropout rate of 0.4. RELU activation is used in the dense layers solely, with the exception of the SOFTMAX activation technique is used in the output units.

2.8 Dataset Generate:

Three chest X-ray datasets were evaluated, and convolutional neural networks were employed to detect items. It consists of chest X-ray samples from Normal, COVID-19, and Pneumonia patients. The dataset was downloaded from Kaggle. The radiographs in this collection are divided into three categories: normal, pneumonia, and covid patients. It comprises roughly 3780 photographs, which are quite large, therefore I divided 1260 random normal, covid and pneumonia images. I need positive and negative instances to train a classifier. Patients' chest X-ray image sets include women, men, and children of all ages. Some X-rays are taken from the front, while others are taken from the top or side. I separated the X-ray images and views of X-rays because I only required the front view. The images in the collection are separated into three segments. These are Covid positive images with pneumonia and normal CXR. The visuals are then normalized and transformed into (224,224) formats. The images are then sorted and divided into data preparation and analysis. As a result, the mentoring section has 2880 images and three sectors, which divided 960 into 3 classes. There are 900 images and three classes in the same testing section and which is also divided 300 into 3 classes. It's possible that the same X - ray images of the same individuals are used in both training and testing sections. It may be intermingled, but it seems encouraging that the model's development, which has been checked, specifies the trained model's competence.

Chest X-Ray scans of Covid-19 positive, negative, and pneumonia patients below in Fig 7, 8, 9:

Fig 7: Covid-19 positive cells

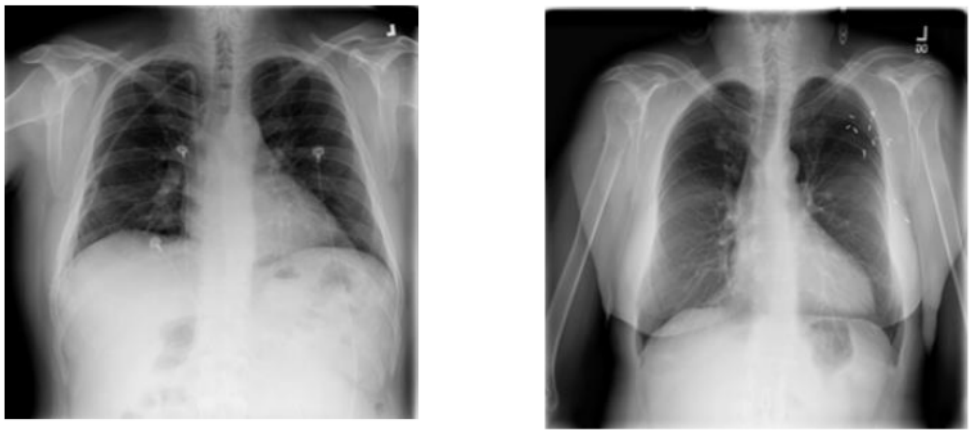


Figure 8: Covid-19 deficient cells

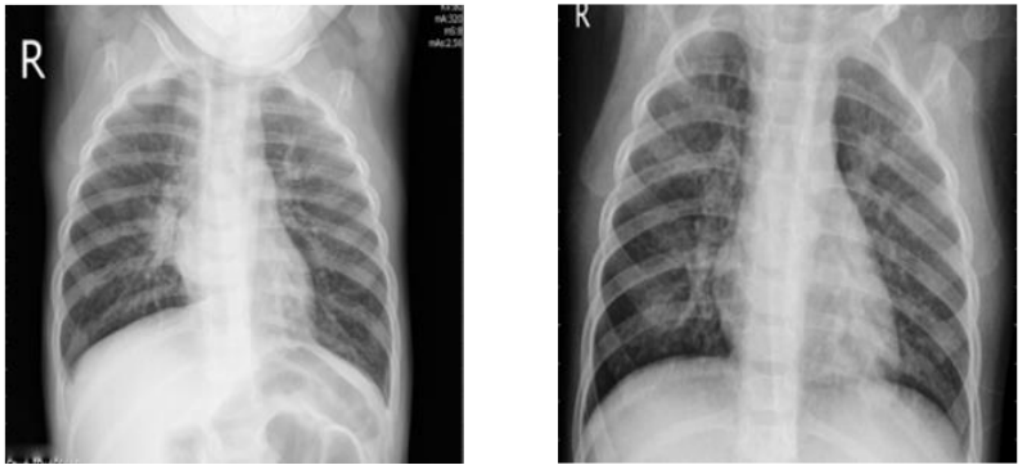


Figure 9: CXR images of a patient with pneumonia

The datasets that were used in this research study were downloaded from the Kaggle dataset repository and modified for further use. There are 1500 images of covid, 1500 images of healthy and 1500 images of pneumonia chest x-ray. First the images are divided into test and train in 20 by 80 ratio. The total number of testing images are 900 and training images are 2880.

Chapter 4

Equation and Mathematical Expression

4.1 : Accuracy measured as follows:

Classification accuracy= (TP+TN)/(TP+FP+FN+TN) (1)

Precision= TP/(TP+FP) (2)

F1 Score= 2×sensitivity×precision /sensitivity+precision

The amount of correct and wrong predictions made by a classifier is referred to as a classification metric.

4.2 Data Summary:

It's a rundown of the strategies and outcomes I advocate. The method is repeated until a preset meeting model is fulfilled, a set number of eras has passed, or the arrangement has remained the same for decades.

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 224, 224, 32)	896
max_pooling2d (MaxPollig2D)	(None, 112,112,32)	0
conv2d (Conv2D)	(None, 112,112,32)	9248
max_pooling2d (MaxPollig2D)	(None, 56,56,32)	0
conv2d (Conv2D)	(None, 56, 56, 64)	18496
max_pooling2d (MaxPollig2D)	(None, 28,28 64)	0
flatten (Flatten)	(None, 50176)	0
dense (Dense)	(None, 128)	6422656
dropout (Dropout)	(None, 128)	0
dense_1 (Dense)	(None, 3)	387

Total params : 6,451,683

Trainable params: 6,451,683

Non -trainable params : 0

The model follows a set of steps. Keras also uses a CNN-based model. We can view the layer kinds and our shape number from here. The total number of params is 6,451,683, of which 6,451,683 are trainable and 0 are non-trainable. It is 0 for Covid positive, 1 for normal, and 2 for Pneumonia

Chapter 5

Experimental Results and Discussion

5.1 Result and Analysis:

The findings described in the preceding paragraphs represent the performance of the end-to-end model workflow. Experiment on original data samples with any image modification are undertaken to measure the model's efficacy in isolation. The COVID-19 (COVID-19, Pneumonia and Normal) database (COVID-19, Pneumonia and Normal) dataset (COVID-19, Pneumonia and Normal) sample 4500 picture total number of iterations, is used for this purpose, with the data for training and testing is separated in an 20/80 ratio. The proposed model is trained on raw RGB photos, with just the input images scaled to the anticipated input size. On the test set, the model's optimal testing accuracy is 90.87 percent.

The accuracy metrics of Convolutional Neural Networks (CNN) are covered in this section. Having successfully trained and evaluated the model, as mentioned previously.

```
- loss: 0.3024 - accuracy: 0.9045 - val_loss: 1.5312 - val_accuracy: 0.5819
- loss: 0.2961 - accuracy: 0.9010 - val_loss: 1.5744 - val_accuracy: 0.5972
- loss: 0.2979 - accuracy: 0.9038 - val_loss: 1.5753 - val_accuracy: 0.5931
- loss: 0.2946 - accuracy: 0.9059 - val_loss: 1.5482 - val_accuracy: 0.5694
- loss: 0.2937 - accuracy: 0.9069 - val_loss: 1.5287 - val_accuracy: 0.5833
- loss: 0.2943 - accuracy: 0.9038 - val_loss: 1.5661 - val_accuracy: 0.5903
- loss: 0.2929 - accuracy: 0.9042 - val_loss: 1.5646 - val_accuracy: 0.5931
- loss: 0.2894 - accuracy: 0.9052 - val_loss: 1.6132 - val_accuracy: 0.5958
- loss: 0.2901 - accuracy: 0.9059 - val_loss: 1.5960 - val_accuracy: 0.5931
- loss: 0.2918 - accuracy: 0.9087 - val_loss: 1.5570 - val_accuracy: 0.5903
```

Figure 11. Test loss, test accuracy, train loss, train accuracy, Validation loss and Validation accuracy obtained after testing.

From the beginning to the end of instruction, my test accuracy climbed to 90.87 percent.

The loss percentage gradually dropped.

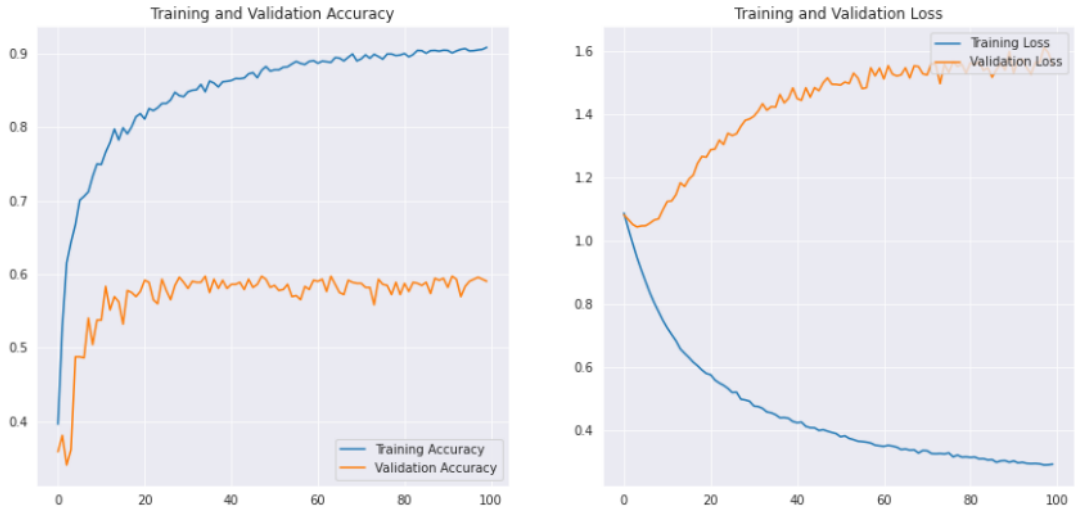


Figure 13. Training and validation graph loss of accuracy, training, and validation.

The loss each step in training is gradually decreasing as seen in Figure 12. The training loss is indicated by the blue line.

The Accuracy of this method is shown in Figure 13 above. Which one produces great result. The training accuracy is indicated by the blue lines. The best training accuracy was 93.19% in this case. This occurs once you've used Dropout, because the behavior after training and testing is drastically different.

The model has also been subjected to the confusion matrix. One of the best accuracy matrices is the confusion matrix. The confusion matrix provides a simpler technique to assess the classification problem's performance. As shown in figure 14, a confusion matrix is a two-dimensional table comprising "True Positives (TP)", "True Negatives (TN)", "False Positives (FP)", and "False Negatives (FN)".

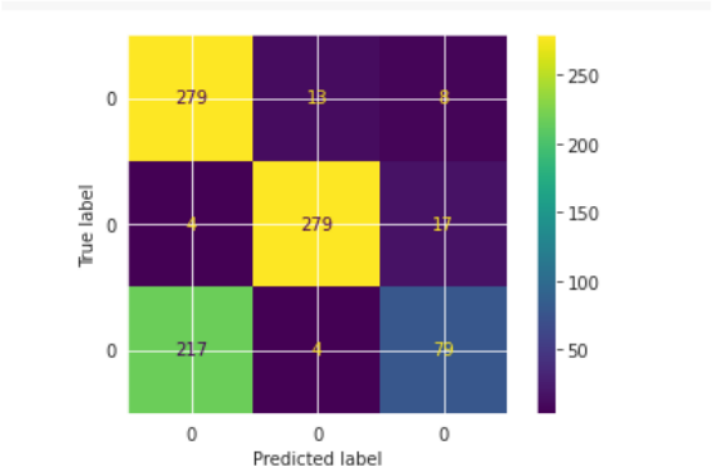


Figure 15. Confusion Matrix

The TP (True Positives) and TN (True Negatives) numbers must be greater because they are the only ones that show correct classification. Because those are erroneous predictions, the remaining FP and FN must be quite minimal.

The model was trained and tested, yielding a training accuracy of 90.87 percent. which has the finest outcomes. I also put the model to the test by providing individual images, and it produced excellent results.

5.2 Summary of Performance:

	precision	recall	f1-score	support
Covid (Class 0)	0.56	0.93	0.70	300
Normal (Class 1)	0.94	0.93	0.94	300
Pneumonia (Class 2)	0.76	0.26	0.39	300
accuracy			0.71	900
macro avg	0.75	0.71	0.67	900
	0.75	0.71	0.67	900

5.3 Discussion:

Convolutional Neural Network or CNN has done a good job in classifying the images. The strategy is simple to implement in any real-world scenario. The model can separately identify Covid, Healthy and Pneumonia chest x ray images. Despite the fact that the suggested CNN model has less trainable parameters, it exhibits good accuracy. When I submit an image for analysis, the model instantly recognizes that the chest x-ray belongs to a covid patient, and the prediction is 0, indicating that the patient belongs to the covid class.

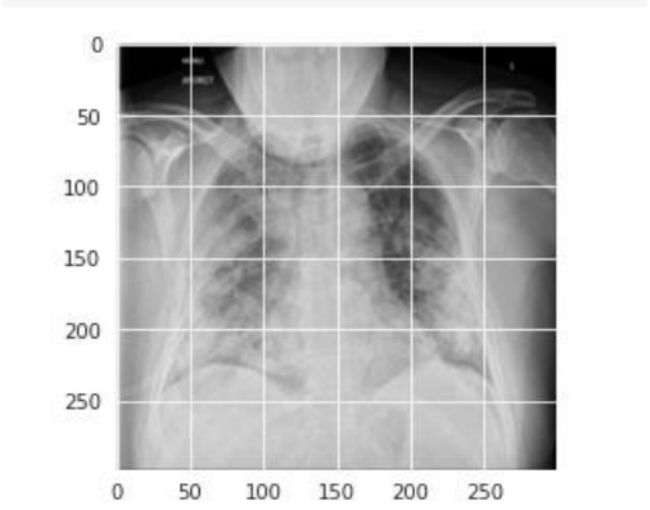


Fig: Chest X-ray of a covid patient

Chapter 6

Conclusion and Implication for Future Remarks

Conclusion and Future Remarks:

The most crucial task of Covid patients is to avoid infecting healthy persons. Assume someone is unaware of their Covid result. In that event, they won't be able to stop Covid from spreading to healthy people, thus everyone should be aware of Covid's beneficial and harmful effects as soon as possible. This study focuses on how to get the system's Covid results as quickly as feasible and at a low cost. The major goal is to use neural networks and artificial intelligence to reduce the corona test's price but also obtain answers as quickly as feasible. The goal of the study was to use detection to detect chest X-ray pictures. The precision of presenting the genuine result is 89.44 evident in this detection model section. That means there could be some incorrect findings out of a hundred. This allows the patient to acquire the Covid result at no cost from the comfort of their own home. They are able to receive treatment at their convenience. This will benefit both patients with Covid and healthy people who are unaffected by the illness. This is how we might save participants through Covid-19. Because those infected with Covid who are quarantined at home do not transfer the disease to others. They also save their health by entering dangerous circumstances and receiving proper treatment. If enacted, the idea is expected to benefit everyone and have a significant impact on lowering the Covid rate. It was also a crucial turning point in Covid-19 testing. However, my long-term goal is to develop the CNN architecture in order to improve accuracy and to compare deep learning models with other models. We may also scale up the online application by supporting users in saving their login information, data, and remark areas for future enhancement.

The Covid detection_181014115

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