LIST OF CONTENTS

CHAPTER-I : CREATING A MODEL

CHAPTER-II : WEBSITE DEVELOPMENT

CHAPTER-III : SIMULATION OUTPUT

ABSTRACT

COVID-19, regarded as the deadliest virus of the 21st century, has claimed the lives of millions of people around the globe in less than two years. Since the virus initially affects the lungs of patients, X-ray imaging of the chest is helpful for effective diagnosis. Any method for automatic, reliable, and accurate screening of COVID-19 infection would be beneficial for rapid detection and reducing medical or healthcare professional exposure to the virus. In the past, Convolutional Neural Networks (CNNs) proved to be quite successful in the classification of medical images. In this study, an automatic deep learning classification method for detecting COVID-19 from chest X-ray images is suggested using a CNN.

The detection of severe acute respiratory syndrome coronavirus 2 (SARS CoV-2), which is responsible for coronavirus disease 2019 (COVID-19). Early prediction of patient severity might assist save hospital resources and reduce the number of patients who die indefinitely. Currently, X-ray pictures are utilized to detect COVID-19 patients as early signs. In addition, in countries that are unable to purchase laboratory kits for testing, this becomes even more vital. In this study, we aimed to present the use of deep learning for the high-accuracy detection of COVID.

CHAPTER – I
CREATING A MODEL

INTRODUCTION

The COVID-19 is a deadly disease caused by the newly recognized coronavirus. In December 2019, Severe Acute Respiratory Syndrome Coronavirus (SARS-COV-2) infected the human body for the first time, and it can spread principally among humans through the droplets formed by the infected persons when they speak, cough or sneeze. As the droplets are too heavy to travel far, they cannot spread person-to-person without coming in close contact. Although the exact time is not yet known, a new study has estimated that the COVID19 can be viable in the air for up may not find any symptoms where most of the people had fever and cough as the core symptoms. Other secondary symptoms could be body aches, sore throat, and a headache could be all possible. All over the world, a huge number of people died of this disease in 2020. The respiratory tract and lungs are the media where the virus can spread easily. As a result, inflammation occurs, and air sacs can be filled with fluid and discharge. The process is responsible for creating an obstacle in oxygen intake. Quick and accurate detection of the virus is a major challenge for doctors and health professionals around the world in order to reduce the death rate caused by this virus. The covid-19 illness is a hidden enemy where no one is capable of fighting. Infected patients of Covid-19 are required to be in isolation, do proper screening, and take adequate protection with prevention to protect healthy people. This infection is following a chain process that transfers from one person to another after coming in contact with covid-19 infected persons. Hospital staff, nurses, doctors, and clinical facilities play an essential role in the diagnosis of this epidemic. Many more strategies have been applied to reduce the impact of Covid-19. Medical imaging is also a method of analyzing and predicting the effects of covid-19 on the human body. In this, healthy people and Covid-19 infected patients can be analyzed in parallel with the help of CT (Computerized Tomography) images and chest X-ray images.

LITERATURE SURVEY

Authors Safynaz Abdel-Sattah Sayed, Abeer Mohamed Elkorand Sabah Sayed Mohammad was proposed a system that is “Applying Different Machine Learning Techniques for Prediction of Covid-19 Severity”, in IEEE Access, vol. 9, pp. 135697- 135707,2021. The problem that was addressed in this project is fast and accurate Artificial Intelligence techniques are needed to assist doctors in their decisions to predict the severity and mortality risk of a patient. A deep pre-trained prediction model named CheXNet was built. Also, hybrid handcrafted techniques were applied to extract features, two different methods namely Principal Component Analysis (PCA) and Recursive Feature Elimination (RFE) were integrated to select the most important features [1]. Hierarchical fracture classification of proximal femur X-ray images using a multistage deep learning approach was developed by Leonardo Tanzi, Enrico Vezzetti, Rodrigo Moreno, Alessandro Aprato, Andrea Audisio, Alessandro Masse Applied Intelligence 51(3), 1690-1700, 2021. The daily life of human beings, their health, and the economy of a country are affected due to this deadly viral disease. Covid-19 is a common spreading disease, and till now, not a single country can prepare a vaccine for COVID-19. A clinical study of COVID-19 infected patients has shown that these types of patients are mostly infected from a lung infection after coming in contact with this disease. Chest x-ray (i.e., radiography) and chest CT are a more effective imaging technique for diagnosing lunge related problems. Deep learning is the most successful technique of machine learning, which provides useful analysis to study a large amount of chest x-ray images that can critically impact on screening of Covid-19. In this work, we have taken the PA view of chest x-ray scans for covid-19 affected patients as well as healthy patients. After cleaning up the images and applying data augmentation, we have used deep learningbased CNN models and compared their performance [2].

PROPOSED SYSTEM

In this section, we have proposed a model which detects the COVID-19 with the help of Chest X-ray images. The planned model is used to give accurate diagnostics on two different classification models the (i.e., binary and multi-class). We have considered the patients who confirmed with covid-19 pneumonia and were admitted to the hospital; and divided the patients of CT scan into different groups, and features of the image and its distribution were further analyzed and compared for detecting COVID-19 diseases. In this paper, we proposed a Convolution Neural Network (CNN), which helps in finding the analyses of COVID-19 by using Chest X-ray images. The proposed model shows 98% accuracy.

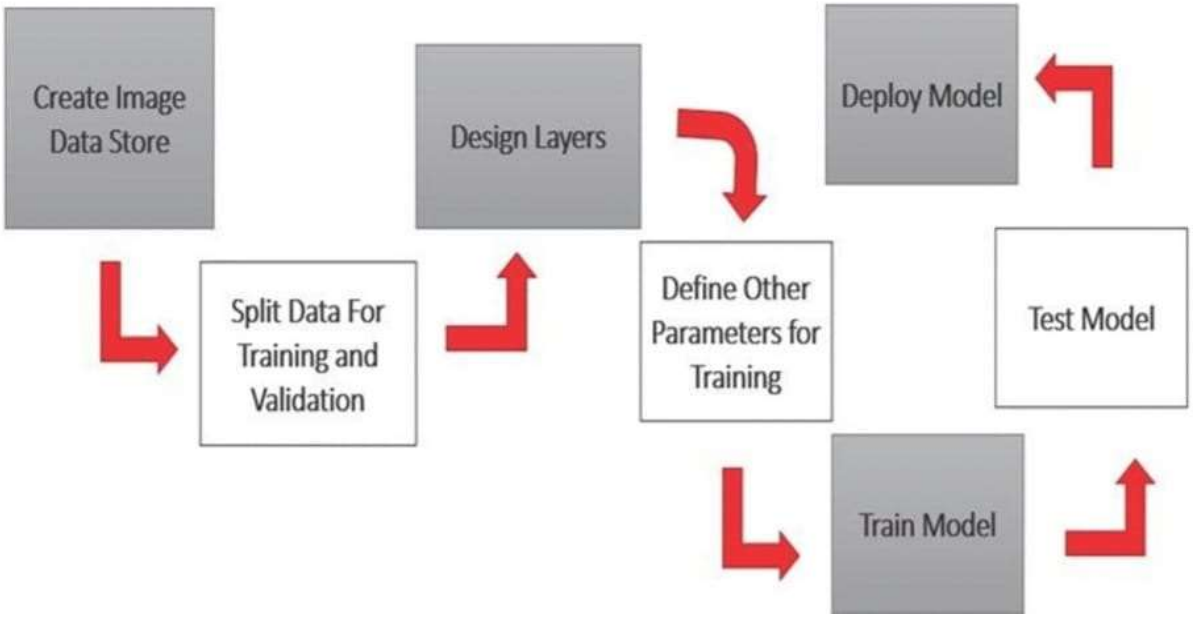


Figure: Process flow of proposed system

For this study the AlexNet is used, which employs an 8-layer CNN. This network showed, for the first time, that the features obtained by learning can transcend manually-designed features, breaking the previous paradigm in computer vision. AlexNet consists of eight layers: five convolutional layers, two fully-connected hidden layers, and one fully-connected output layer. It uses the ReLU as its activation function.

Convolutional Neural Networks (CNNs) had always been the go-to model for object recognition — they're strong models that are easy to control and even easier to train. They don't experience overfitting at any alarming scales when being used on millions of images. Their performance is almost identical to standard feedforward neural networks of the same size. The only problem: they're hard to apply to high resolution images. At the ImageNet scale, there needed to be an innovation that would be optimized for GPUs and cut down on training times while improving performance

WORKING PRINCIPLE

First, we have created an image data store and saved the images in two different sub-folders by class name. In covid sub-folder infected X-ray images will be saved; and in normal sub-folder uninfected X-ray images will be saved. We've split the data for training and testing. To get the accuracy, testing is important.

Next, we modified the CNN network according to our data and defined training parameters, like what will be initial learning rate, maximum number of epochs and batch size, etc. Further, we trained our model and optimized hyper parameters whenever it is required. When the model is trained, we tested the model on testing dataset to check its accuracy.

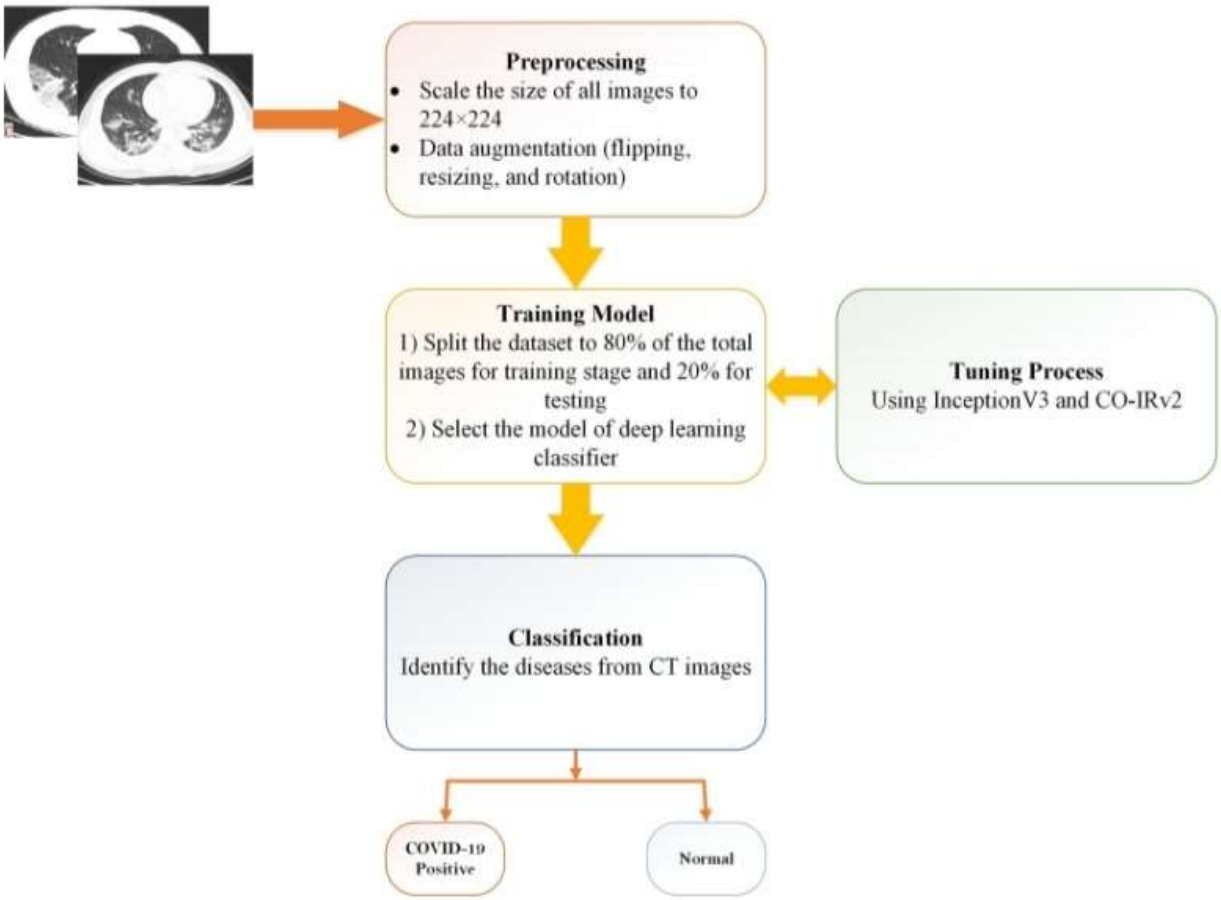


Image Classification Using Convolutional Neural Network (CNN)

In this software we are using pretrained Convolutional Neural Network (CNN) as a feature extractor for training an image category classifier.

A Convolutional Neural Network (CNN) is a powerful machine learning technique from the field of deep learning. CNNs are trained using large collections of diverse images. From these large collections, CNNs can learn rich feature representations for a wide range of images. These feature representations often outperform hand-crafted features such as histogram of oriented gradients (HOG), Local Binary Pattern (LBP), or SURF. An easy way to leverage the power of CNNs, without investing time and effort into training, is to use a pretrained CNN as a feature extractor.

The CNNs are inspired by visual system of human brain. The idea behind the CNNs thus is to make the computers capable of viewing the world as humans view it. This way CNNs can be used in the fields of image recognition and analysis, image classification, and natural language processing. CNN is a type of deep neural networks which contain the convolutional, max pooling, and nonlinear activation layers. The convolutional layer, considered as a main layer of a CNN, performs the operation called “convolution” that gives CNN its name.

Kernels in the convolutional layer are applied to the layer inputs. All the outputs of the convolutional layers are convolved as a feature map. In this study, the Rectified Linear Unit (ReLU) has been used in the activation function with a convolutional layer which is helpful to increase the nonlinearity in input image, as the images are fundamentally nonlinear in nature.

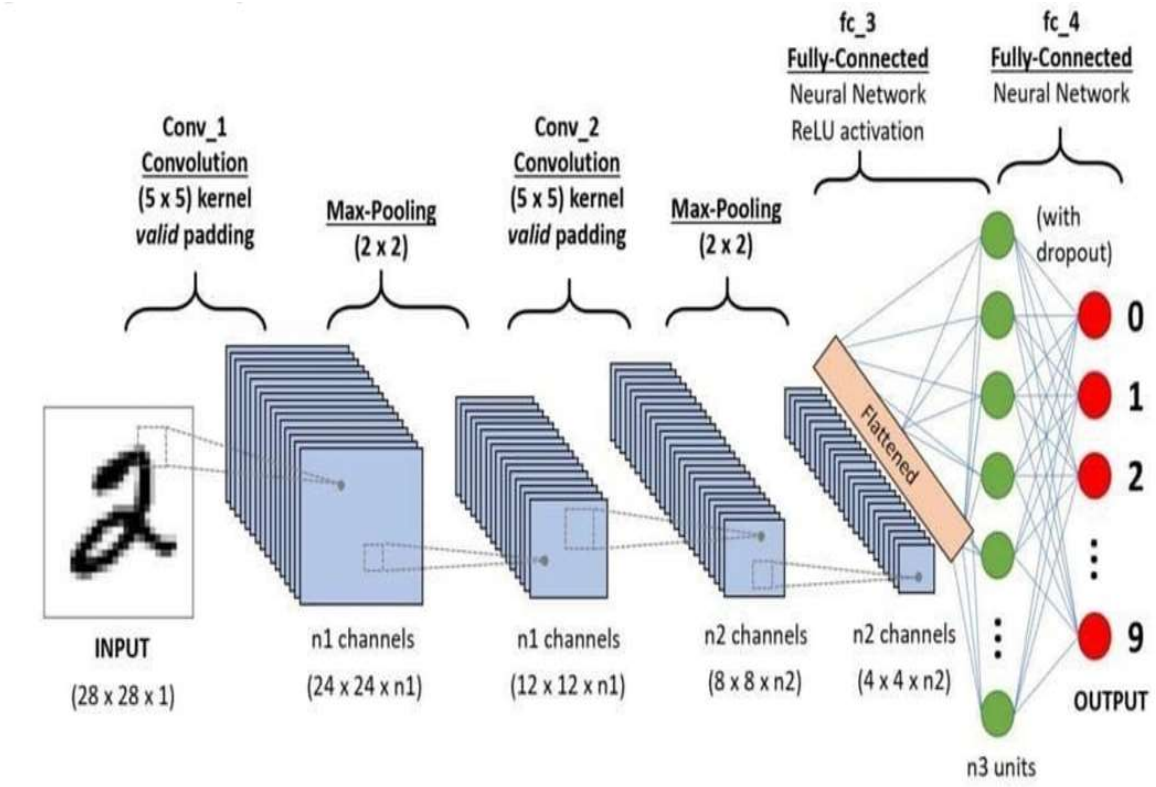
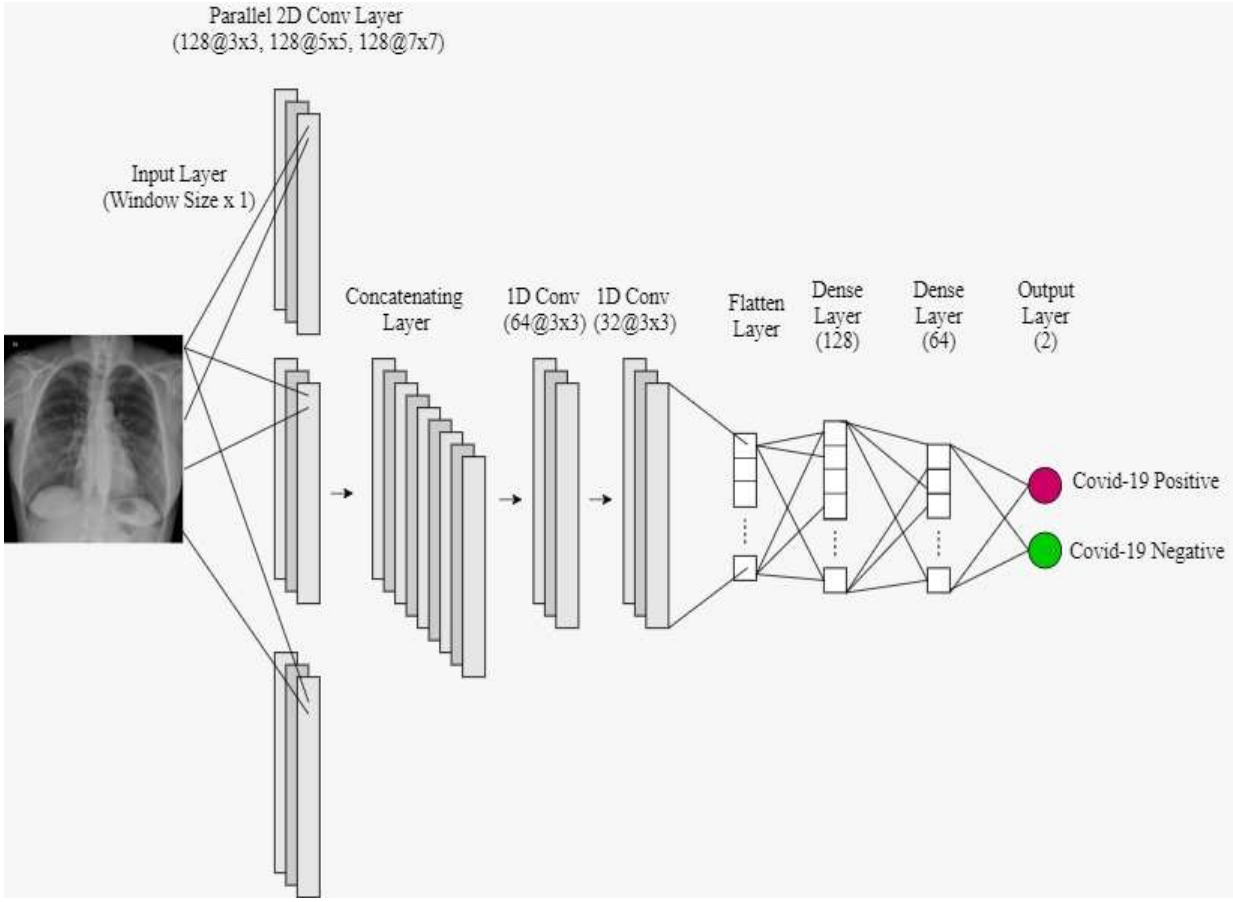


Figure : Convolutional Neural Network Architecture



CODES:

CREATING DATASETS

```
import pandas as pd
import os
import numpy as np
datapath1='covid-chestxray-dataset-master'
dataset_path='dataset'
categories=os.listdir(dataset_path)
print(categories)
dataset=pd.read_csv(os.path.join(datapath1,'metadata.csv'))
findings=dataset['finding']
image_names=dataset['filename']
positives_index=np.concatenate((np.where(findings=='COVID-19')[0],np.where(findings=='SARS')[0]))
positive_image_names=image_names[positives_index]
import cv2
for positive_image_name in positive_image_names:
image=cv2.imread(os.path.join(datapath1,'images',positive_image_name))
   try:
cv2.imwrite(os.path.join(dataset_path,categories[1],positive_image_name),image)
   except Exception as e:
      print(e)
```

```
datapath2='Coronahack-Chest-XRay-Dataset'
dataset=pd.read_csv(os.path.join(datapath2,'Chest_xray_Corona_
Metadata.csv'))
findings=dataset['Label']
image_names=dataset['X_ray_image_name']
negative_index=np.where(findings=='Normal')[0]
negative_image_names=image_names[negative_index]
for negative_image_name in negative_image_names:
image=cv2.imread(os.path.join(datapath2,'images',negative_image
_name))
   try:
cv2.imwrite(os.path.join(dataset_path,categories[0],negative_imag
e_name),image)
   except Exception as e:
      print(e)
negative_image_names.shape
```

DATA PREPROCESSING

```
import cv2,os
data_path='dataset'
categories=os.listdir(data_path)
labels=[i for i in range(len(categories))]
label_dict=dict(zip(categories,labels)) #empty dictionary
print(label_dict)
print(categories)
print(labels)
img_size=100
data=[]
target=[]
for category in categories:
   folder_path=os.path.join(data_path,category)
   img_names=os.listdir(folder_path)
   for img_name in img_names:
      img_path=os.path.join(folder_path,img_name)
      img=cv2.imread(img_path)
      try:
         gray=cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)
         #Coverting the image into gray scale
         resized=cv2.resize(gray,(img_size,img_size))
         #resizing the gray scale into 100x100, since we need a fixed common size for all the images in the dataset
```

```
            data.append(resized)
            target.append(label_dict[category])
            #appending the image and the label(categorized) into the list
(dataset)
        except Exception as e:
            print('Exception:',e)
            #if any exception rasied, the exception will be printed here.
And pass to the next image
import numpy as np
data=np.array(data)/255.0
data=np.reshape(data,(data.shape[0],img_size,img_size,1))
target=np.array(target)
from keras.utils import np_utils
new_target=np_utils.to_categorical(target)
np.save('data',data)
np.save('target',target)
```

TRAINING CNN MODEL

```
import numpy as np
data=np.load('data.npy')
target=np.load('target.npy')
from keras.models import Sequential,Model
from keras.layers import Dense, Dropout, Flatten
from keras.layers import Conv2D,Activation,MaxPooling2D
from keras.utils import normalize
from keras.layers import Concatenate
from keras import Input
from keras.callbacks import ModelCheckpoint
input_shape=data.shape[1:] #50,50,1
inp=Input(shape=input_shape)
convs=[]
parrallel_kernels=[3,5,7]
for  k in
range(len(parrallel_kernels)):
conv=Conv2D(128,parrallel_kernels[k],padding='same',activation='r
elu',input_shape=input_shape,strides=1)(inp)
   convs.append(conv)
out = Concatenate()(convs)
conv_model = Model(inp,out)
model = Sequential()
model.add(conv_model)
```

```
model.add(Conv2D(64,(3,3)))

model.add(Activation('relu'))

model.add(MaxPooling2D(pool_size=(2,2)))

model.add(Conv2D(32,(3,3)))

model.add(Activation('relu'))

model.add(MaxPooling2D(pool_size=(2,2)))

model.add(Flatten())

model.add(Dropout(0.5))

model.add(Dense(128,activation='relu'))

model.add(Dropout(0.5))

model.add(Dense(64,activation='relu'))

model.add(Dropout(0.5))

model.add(Dense(2,input_dim=128,activation='softmax'))

model.compile(loss='sparse_categorical_crossentropy',optimizer='adam',metrics=['accuracy'])

model.summary()

from sklearn.model_selection import train_test_split

train_data,test_data,train_target,test_target=train_test_split(data, target,test_size=0.1)

checkpoint=ModelCheckpoint('model-{epoch:03d}.model',monitor='val_loss',verbose=0,save_best_only=True,mode='auto')

history=model.fit(train_data,train_target,epochs=25,callbacks=[checkpoint],validation_split=0.1)

from matplotlib import pyplot as plt
```

```
plt.plot(history.history['loss'],'r',label='training loss')
plt.plot(history.history['val_loss'],label='validation loss')
plt.xlabel('# epochs')
plt.ylabel('loss')
plt.legend()
plt.show()
plt.plot(history.history['accuracy'],'r',label='training accuracy')
plt.plot(history.history['val_accuracy'],label='validation accuracy')
plt.xlabel('# epochs')
```

TRAINING OF A MODEL

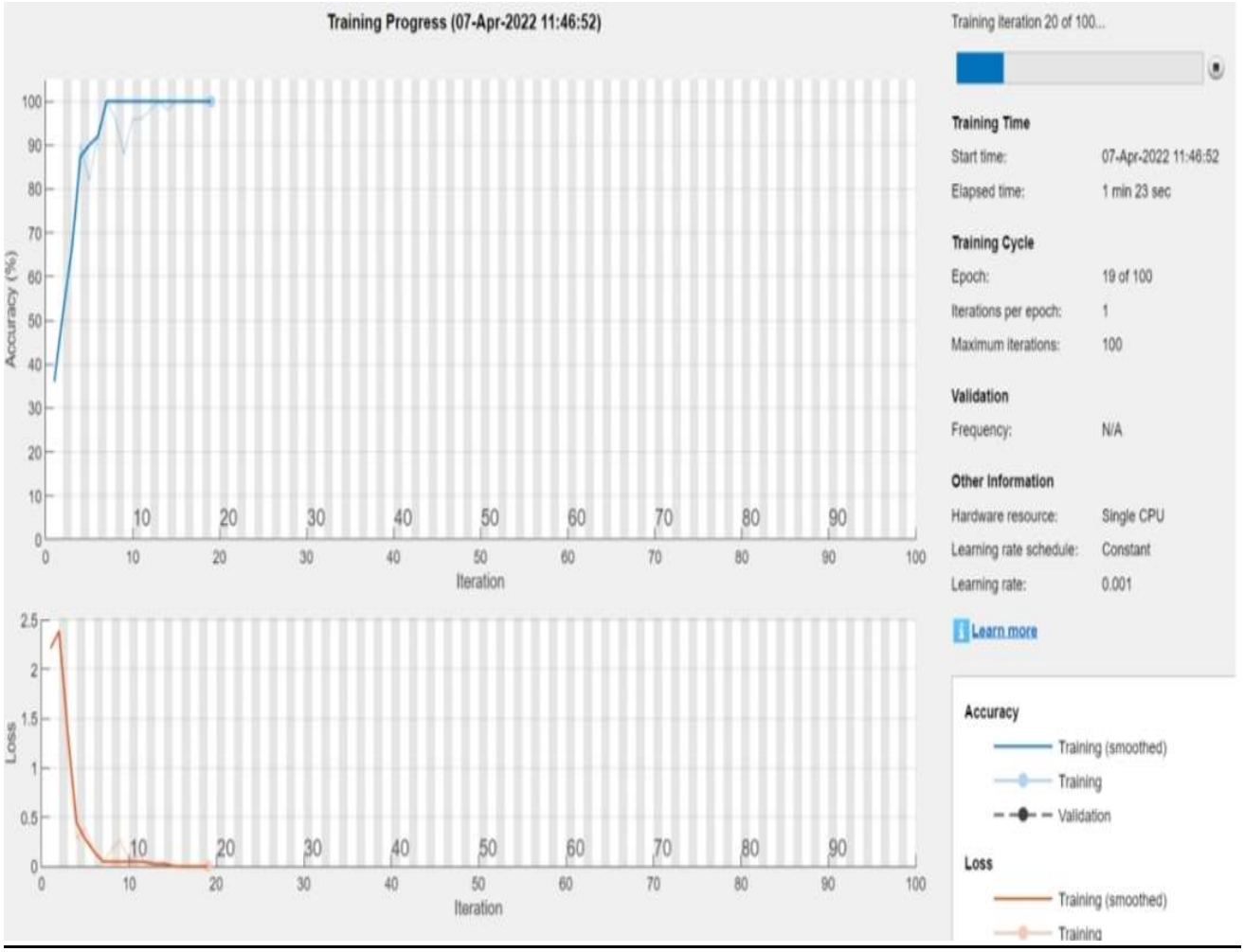
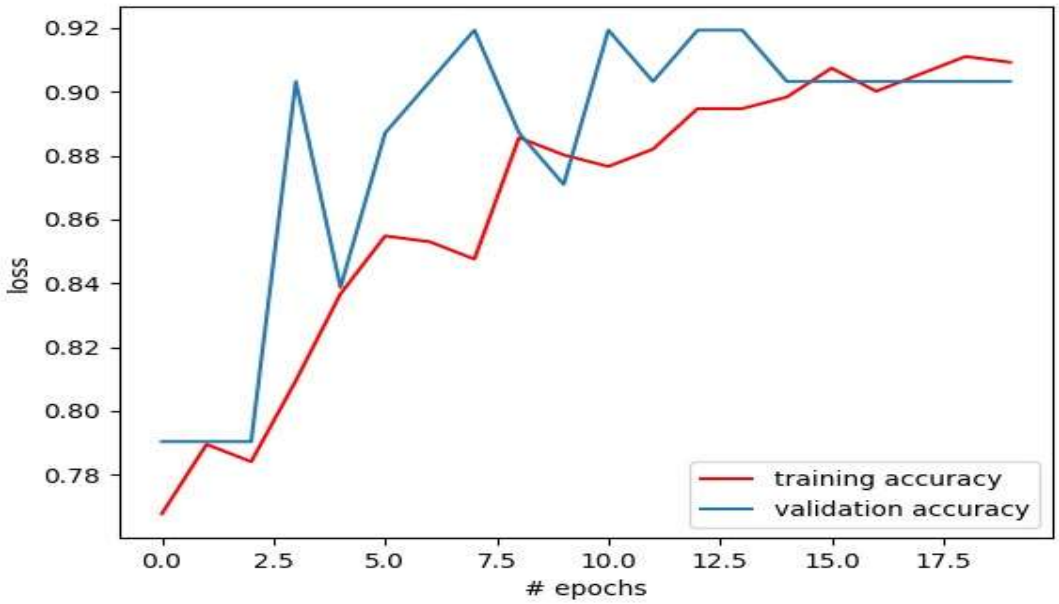
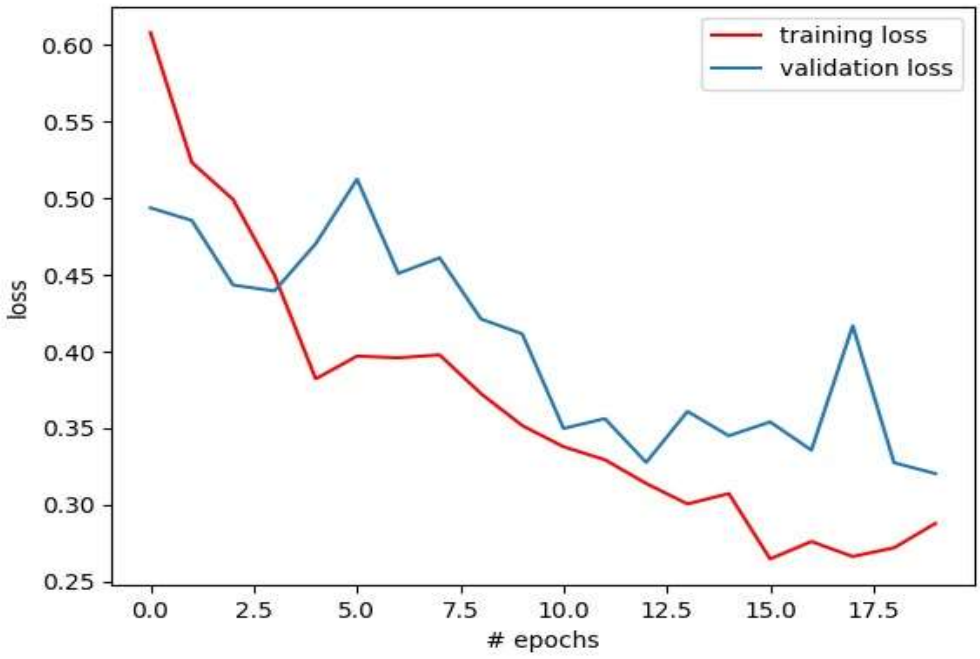


Figure: Graph showing accuracy and loss while training the model

A model's loss value indicates how well or badly it performs after each iteration, depending on the model. Less loss means higher performance, unless a model has been over-fitted to its training data. The loss experienced by the models throughout the training and testing processes is shown and quantified . On average, the rate of loss decreased as the number of epochs increased. The Google Net has a loss rate of 23% and 20% for the training and validation datasets, respectively. AlexNet demonstrates losses of 23% and 31% from training and validation data, respectively. Dense Net exhibits a loss rate of 33% and 20% from the training and validation sets, respectively.

OUTPUT:


0.92
0.90
0.88
0.86
0.84
0.82
0.80
0.78
loss
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
epochs
training accuracy
validation accuracy


0.60
0.55
0.50
0.45
0.40
0.35
0.30
0.25
loss
0.0
2.5
5.0
7.5
10.0
12.5
15.0
17.5
epochs
training loss
validation loss

CHAPTER-II

WEBSITE DEVELOPMENT

HTML - Hypertext Markup Language

HTML, short for Hypertext Markup Language, is the core language of the World Wide Web. It defines the content and basic structure of web pages and web applications.

“Hypertext” is text on a web page that contains references to another web page. You probably know these as hyperlinks. We use hyperlinks to jump to another section of the same page, a different page on the current website, or a completely new website. Hyperlinks can also open a PDF, email, or multimedia, like a video or audio file.

What is HTML used for?

HTML is primarily used for creating web pages. HTML is free to use and ensures your text, images, and other elements are displayed as intended.

With HTML, not only can you add headings, paragraphs, lists, and other elements to your page — you can also embed images, videos, audio files, and other multimedia. And, you can link to other web pages on the same website or from another site. This allows visitors to easily navigate your website and jump between websites.

HTML is used to create things other than web pages, too. You can use it to:

- **make tables for organizing data**
- **create forms** for collecting user information, processing transactions, making reservations, or placing an order
- **create emails with HTML**

Whether you want to create web pages, tables, forms, or emails, you'll need to know how to write HTML

CSS-CASCADING STYLE SHEETS

CSS stands for Cascading Style Sheets language and is used to stylize elements written in a markup language such as HTML. It separates the content from the visual representation of the site. The relation between HTML and CSS is strongly tied together since HTML is the very foundation of a site and CSS is all of the aesthetics of an entire website.

How Does CSS Work?

CSS 3 brings style to your web pages by interacting with HTML elements using syntax. Elements are the individual HTML components of a web page — for instance a paragraph — which in HTML might look like this

- CSS was created to work in conjunction with other markup languages like HTML. It is used to stylize a page.
- There are three styles of implementing CSS, and you can use the External style to accord multiple pages at once.
- You won't go far without seeing some kind of CSS implementation nowadays since it's as much of a requirement as the markup language itself.

JAVA SCRIPT

JavaScript is a scripting language for creating dynamic web page content. It creates elements for improving site visitors' interaction with web pages, such as dropdown menus, animated graphics, and dynamic background colors.

How Does JavaScript Work?

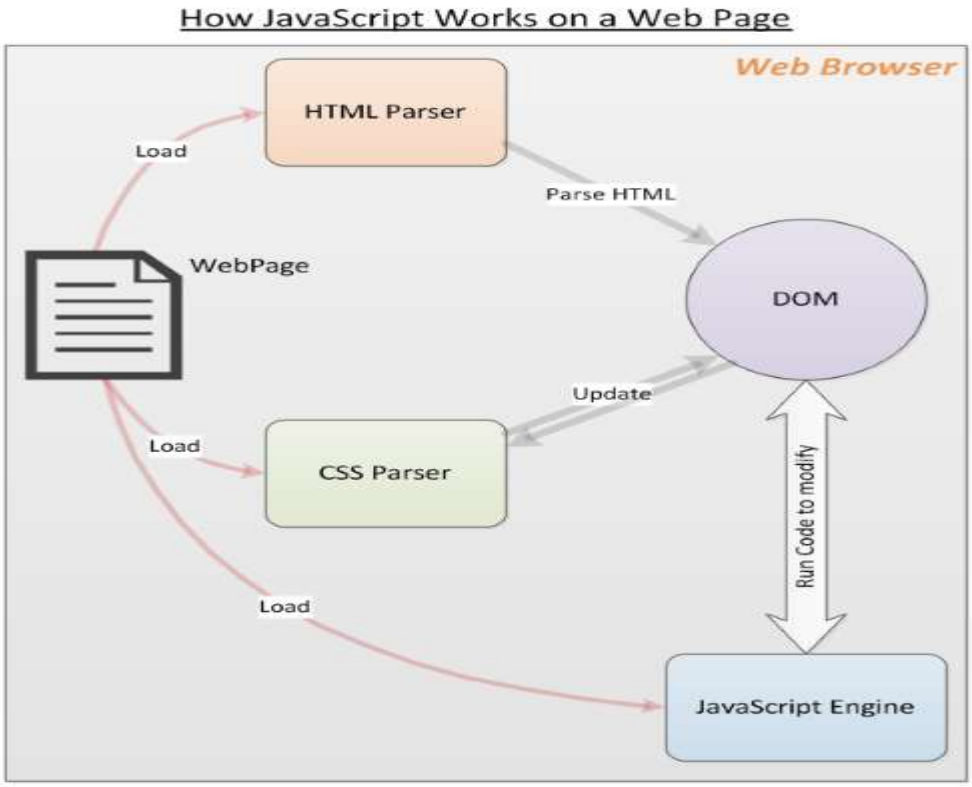
Before writing JavaScript it's important to know how it works under the hood. There are two important pieces to learn about: How the web browser works, and the Document Object Model (DOM).

The web browser loads a web page, parses the HTML, and creates what is known as a Document Object Model (DOM) from the contents. The DOM presents a live view of the web page to your JavaScript code.

The browser will then grab everything linked to the HTML, like images and CSS files. The CSS information comes from the CSS parser.

The HTML and CSS are put together by the DOM to create the web page first. Then, the browsers' JavaScript engine loads JavaScript files and inline code but does not run the code immediately. It waits for the HTML and CSS to finish loading.

Once this is done, the JavaScript is executed in the order the code is written. This results in the DOM being updated by JavaScript code and rendered by the browser.



DESIGNING WEBSITE USING FLASK

Flask is a small and lightweight Python web framework that provides useful tools and features that make creating web applications in Python easier. It gives developers flexibility and is a more accessible framework for new developers since you can build a web application quickly using only a single Python file. Flask is also extensible and doesn't force a particular directory structure or require complicated boilerplate code before getting started.

Flask uses the Jinja template engine to dynamically build HTML pages using familiar Python concepts such as variables, loops, lists, and so on. You'll use these templates as part of this project.

Step 1 — Installing Flask

In this step, you'll activate your Python environment and install Flask using the `pip` package installer.

If you haven't already activated your programming environment, make sure you're in your project directory (`flask_blog`) and use the following command to activate the environment.

Step 2 — Creating a Base Application

Now that you have your programming environment set up, you'll start using Flask. In this step, you'll make a small web application inside a Python file and run it to start the server, which will display some information on the browser.

In your `flask_blog` directory, open a file named `hello.py` for editing, use `nano` or your favorite text editor:

CODE:

```
from flask import Flask, render_template, request,jsonify

from keras.models import load_model

import pickle

import cv2

import numpy as np

import base64

from PIL import Image

import io

import re

img_size=100

# app = Flask(__name__,template_folder='templates',
static_folder='static')
```

```
model= load_model("mymodel2.h5")
print("Model loaded")
label_dict={0:'Covid19 Negative', 1:'Covid19 Positive'}
def preprocess(img):
    img=np.array(img)
    if(img.ndim==3):
        gray=cv2.cvtColor(img,cv2.COLOR_BGR2GRAY)
    else:
        gray=img
    gray=gray/255
    resized=cv2.resize(gray,(img_size,img_size))
    reshaped=resized.reshape(1,img_size,img_size)
    return reshaped
app = Flask(_name_,template_folder='../docs', static_folder='static')
@app.route("/")
def index():
    return render_template("index.html")
@app.route("/About_us.html")
def about():
    return render_template("About_us.html")
@app.route("/Corona Virus.html")
```

```
def Corona():
    return render_template("Corona Virus.html")
@app.route("/Deep Learning.html")
def Deeplearning():
    return render_template("Deep Learning.html")
    # return ("home.css")
@app.route("/predict", methods=["POST"])
def predict():
    print('HERE')
    message = request.get_json(force=True)
    encoded = message['image']
    decoded = base64.b64decode(encoded)
    dataBytesIO=io.BytesIO(decoded)
    dataBytesIO.seek(0)
    image = Image.open(dataBytesIO)
    test_image=preprocess(image)
    prediction = model.predict(test_image)
    result=np.argmax(prediction,axis=1)[0]
    accuracy=float(np.max(prediction,axis=1)[0])
    label=label_dict[result]
    print(prediction,result,accuracy)
```

```
        response = {'prediction': {'result': label,'accuracy': accuracy}}
        return jsonify(response)
if _name=="main_":
        app.run(port=5000 ,debug=True)
```

Step 3 — Using HTML templates

Currently your application only displays a simple message without any HTML. Web applications mainly use HTML to display information for the visitor, so you'll now work on incorporating HTML files in your app, which can be displayed on the web browser.

Flask provides a `render_template()` helper function that allows use of the Jinja template engine. This will make managing HTML much easier by writing your HTML code in `.html` files as well as using logic in your HTML code. You'll use these HTML files, (*templates*) to build all of your application pages, such as the main page where you'll display the current blog posts, the page of the blog post, the page where the user can add a new post, and so on.

CODE:

```
<html>
   <head>
        <meta charset="UTF-8">
        <meta name="viewport" content="width=device-width, initial-scale=1.0">
        <link rel="stylesheet" href="https://cdnjs.cloudflare.com/ajax/libs/font-awesome/5.15.1/css/all.min.css">
        <link rel="shortcut icon" href="#">
        <title>
```

```
        COVID-19 TESTING
    </title>
    <style>
        :root {
  --color-primary:aqua;
  --color-white: #e9e9e9;
  --color-black: #141d28;
  --color-black-1: #212b38;}
* {
  margin: 0;
  padding: 0;
  box-sizing: border-box;}
body {
  font-family: sans-serif;
  margin-top: 60px; }
.logo {
  color: var(--color-white);
  font-size: 25px;
  flex-shrink: 0;
  margin-left: 10px }

.logo span {
  color: var(--color-primary); }

.menu-bar {
```

```
  background-color: var(--color-black);
  height: 60px;
  width: 100%;
  position:fixed;
  left: 0;
  top: 0;
  display: flex;
  justify-content: space-between;
  align-items: center;}
.menu-bar ul {
  list-style: none;
  display: flex;}
.menu-bar ul li {
  /* width: 120px; */
  padding: 10px 30px;
  /* text-align: center; */
  color: var(--color-white);
  position: relative;}
.menu-bar ul li a {
  font-size: 17px;
  color: var(--color-white);
  text-decoration: none;
  transition: all 0.3s;}

.menu-bar ul li a:hover {
```

```
  color: var(--color-primary);}
.fas {
  float: right;
  margin-left: 10px;
  padding-top: 3px;}
.ham
{
  display: none;
  cursor: pointer;}
#mobile-heads
{
  display: none;
}
@media (max-width: 900px) {
  .logo
  {
    font-size: 25px;
  }
  .heads
  {
    display: none;
  }
  .ham
  {
    display: inline;
```

```
  margin-right: 15px;
}
.bar {
  display: block;
  width: 30px;
  height: 5px;
  background-color: white;
  margin-top: 6px;
}
#mobile-heads
{
  display: block;
  position: fixed;
  background-color: var(--color-black);
  height: 100%;
  width: 35%;
  right: -35%;
  top: 0;
  overflow-x: hidden;
  overflow-y: auto;
}
#mobile-heads.active
{
  right: 0;
  transition: 0.5s;
```

```
    }
    #mobile-heads.inactive
    {
      right: -35%;
      transition: 0.5s;
    }
    .menu
    {
      margin-top: 25px;
      list-style: none;
      display: block;
    }
    .menu-head
    {
      margin-left: 10px;
      color: rgb(62, 241, 247);
      text-decoration: none;
    }
  }


      </style>
    </head>
    <body                style="background-repeat:no-repeat;background-
size:150%,125%;background-image:
url(https://image.freepik.com/free-vector/realistic-coronavirus-
background_23-2148497717.jpg)">
```

```
<div class="menu-bar">
<h1class="logo">COVID-<span>DETECTION</span></h1>
<div class="heads", id="heads">
<ul>
<li><ahref="CoronaVirus.html">Corona Virus</a></li>
<li><ahref="DeepLearning.html">Deep Learning</a></li>
<li><ahref="About_us.html">About Us</a></li>
</ul>
</div>
<div class="ham" onclick="displaymenu()" id="ham">
<div class="bar"></div>
<div class="bar"></div>
<div class="bar"></div>
</div>
</div>
<div id="mobile-heads" class="inactive">
<ul class="menu">
<li>
<ahref="CoronaVirus.html"class="menu-head">Corona Virus</a>
</li>
<li >
<ahref="DeepLearning.html"class="menu-head">Deep Learning</a></li>
<li>
```

```
                <ahref="About_us.html"class="menu-head">About
Us</a>
            </li>
          </ul>
        </div>
        <br>
        <center><h1>COVID-19 TESTING USING XRAY
IMAGES</h1></center><br>
        <center><h4>Enter the x-ray image in jpg format</h4><br>
          <input id="image-selector" type="file"></body><br><br>
          <button id="predict-button" >Predict</button><br><br>
          <div>
          <p>PREDICTION :  <span id="result">.....</span></p><br>
          <p>PROBABILITY :                    <span
id="probability">.....</span></p><br>
          </div>
          <img id="selected-image" width="400px" src=""/>
          <br>
          <br>
          <Center><h4>Thank you for your visit to our
website</h4></Center><br><br>
        </center>
    </body>
<scriptsrc="https://code.jquery.com/jquery3.3.1.min.js"></script>
<script>
    let base64Image;
```

```
        $("#image-selector").change(function(){
        let reader = new FileReader();
        reader.onload = function(e){
            let dataURL = reader.result;
            $('#selected-image').attr("src",dataURL);
            base64Image =
dataURL.replace(/^data:image\/(png|jpg|jpeg);base64,/,"");
            console.log(base64Image);
        }
        reader.readAsDataURL($("#image-selector")[0].files[0]);
        $("#result").text("");
        $("#probability").text("");
    });
    $("#predict-button").click(function(){
            let message = {
                image: base64Image
            }
            console.log(message);
            $.post("http://127.0.0.1:5000/predict",
JSON.stringify(message), function(response){
                $("#result").text(response.prediction.result);

$("#probability").text(response.prediction.accuracy.toFixed(2));
                console.log(response);
            })
    })
```

```
</script>
<script>
   function displaymenu()
    {
      document.getElementById("mobile-heads").className = "active"
    }
    document.onclick = function fun(e){
      if(e.target.id != 'mobile-heads' && e.target.id!='ham' && e.target.className != 'menu-head' && e.target.className != 'bar')
      {
       document.getElementById('mobile-heads').className ='inactive';
      }
    }
</script>
</html>
```

In the menu-bar we have corona virus ,The code for this is below:

Code:

```
<html>
  <head>
    <meta charset="UTF-8">
    <meta name="viewport" content="width=device-width, initial-scale=1.0">
```

```
    <link                                                rel="stylesheet"
href="https://cdnjs.cloudflare.com/ajax/libs/font-
awesome/5.15.1/css/all.min.css">
    <style>
      * {
        font-family: Helvetica,Arial,sans-serif
      }
      .row {
        position: relative;
        margin: auto;
        max-width: 960px
      }
      .row:after {
        clear: both;
        content: '.';
        display: block;
        height: 0;
        visibility: hidden
      }
      .row-extend {
        background: #f5f4ef;
        margin-top: 24px;
        padding: 45px 0
      }
    </style>
    <title>
```

```
        Corona Virus
    </title>
</head>
<body class="body">
    <center><h1>Corona Virus</h1></center>
    <div class="row">
    <h2><strong>Overview</strong></h2>
    <p>
        Coronaviruses are a family of viruses that can cause illnesses such as the common cold, severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS).

        In 2019, a new coronavirus was identified as the cause of a disease outbreak that originated in China.

    </p>
    <imgsrc="/-/media/kcms/gbs/patient-consumer/images/2020/02/12/16/17/coronovirus-8col.jpg">
    <p>
        The virus is known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The disease it causes is called coronavirus disease 2019

        <abbr title="Coronavirus disease">COVID-19</abbr>. In March 2020, the World Health Organization <abbr title="World Health Organization">WHO</abbr> declared the

        COVID_19 outbreak pandemic.

    </p>
    <p>
        Public health groups, including the U.S. Centers for Disease Control and Prevention (CDC) and <abbr title="World Health
```

Organization">WHO</abbr> , are monitoring the <abbr title="Coronavirus disease">COVID-19</abbr> pandemic and posting updates on their websites.

These groups have also issued recommendations for preventing and treating the virus that causes <abbr title="Coronavirus disease">COVID-19</abbr>.

<h2>Symptoms</h2>

Signs and symptoms of coronavirus disease 2019 (COVID-19) may appear 2 to 14 days after exposure. This time after exposure and before having symptoms is called the incubation period. You can still spread <abbr title="Coronavirus disease">COVID-19</abbr> before you have symptoms (presymptomatic transmission).

Common signs and symptoms can include:

Fever

Cough

Tiredness

Early symptoms of <abbr title="Coronavirus disease">COVID-19</abbr> may include a loss of taste or smell.

Other symptoms can include:

Shortness of breath or difficulty breathing

Muscle aches

Chills

Sore throat

Runny nose

Headache

Chest pain

Pink eye (conjunctivitis)

Nausea

Vomiting

Diarrhea

Rash

This list isn't complete. Children have similar symptoms to adults and generally have mild illness.

The severity of COVID-19 symptoms can range from very mild to severe. Some people may have only a few symptoms. Some people may have no symptoms at all, but can still spread it (asymptomatic transmission). Some people may experience worsened symptoms, such as worsened shortness of breath and pneumonia, about a week after symptoms start.

Some people experience COVID-19 symptoms for more than four weeks after they're diagnosed. These health issues are sometimes called post-COVID-19 conditions. Some children experience multisystem inflammatory syndrome, a syndrome that can affect some organs and tissues, several weeks after having COVID-19. Rarely, some adults experience the syndrome too.

People who are older have a higher risk of serious illness from COVID-19, and the risk increases with age. People who have existing medical conditions also may have a higher risk of serious illness. Certain medical conditions that may increase the risk of serious illness from COVID-19 include:

</p>

Serious heart diseases, such as heart failure, coronary artery disease or cardiomyopathy

Cancer

Chronic obstructive pulmonary disease (COPD)

Type 1 or type 2 diabetes

Overweight, obesity or severe obesity

High blood pressure

Smoking

Chronic kidney disease

Sickle cell disease or thalassemia

Weakened immune system from solid organ transplants or bone marrow transplants

Pregnancy

Asthma

Chronic lung diseases such as cystic fibrosis or pulmonary hypertension

Liver disease

Dementia

Down syndrome

Weakened immune system from bone marrow transplant, HIV or some medications

Brain and nervous system conditions, such as strokes

Substance use disorders

This list is not complete. Other medical conditions may increase your risk of serious illness from COVID-19.

When to see a doctor

If you have COVID-19 signs or symptoms or you've been in contact with someone diagnosed with COVID-19, contact your health care provider right away for medical advice. Your health care provider will likely recommend that you get tested for COVID-19. If you have emergency COVID-19 symptoms, such as trouble breathing, seek care immediately. If you need to go to a hospital, call ahead so that health care providers can take steps to ensure that others aren't exposed.

If you have emergency COVID-19 signs and symptoms, seek care immediately. Emergency signs and symptoms can include:

 Trouble breathing

Persistent chest pain or pressure

Inability to stay awake

New confusion

Pale, gray or blue-colored skin, lips or nail beds — depending on skin tone

This list isn't complete. Let your health care provider know if you are an older adult or have chronic medical conditions, such as heart disease or lung disease, as you may have a greater risk of becoming seriously ill with COVID-19.

<h2>Causes</h2>

Infection with severe acute respiratory syndrome coronavirus 2, or SARS-CoV-2, causes coronavirus disease 2019 (COVID-19).

The virus that causes COVID-19 spreads easily among people. Data has shown that the COVID-19 virus spreads mainly from person to person among those in close contact. The virus spreads by respiratory droplets released when someone with the virus coughs, sneezes, breathes, sings or talks. These droplets can be inhaled or land in the mouth, nose or eyes of a person nearby.

Sometimes the COVID-19 virus can spread when a person is exposed to very small droplets or aerosols that stay in the air for several minutes or hours — called airborne transmission.

The virus can also spread if you touch a surface with the virus on it and then touch your mouth, nose or eyes. But the risk is low.

The COVID-19 virus can spread from someone who is infected but has no symptoms. This is called asymptomatic transmission. The COVID-19 virus can also spread from someone who is infected but hasn't developed symptoms yet. This is called presymptomatic transmission.

It's possible to get COVID-19 more than once.

When a virus has one or more new mutations it's called a variant of the original virus. The omicron (B.1.1.529) variant spreads more easily than the original virus that causes COVID-19 and the delta variant. However, omicron appears to cause less severe disease. People who are fully vaccinated can get breakthrough infections and spread the virus to others. But the COVID-19 vaccines are effective at preventing severe illness. This variant also reduces the effectiveness of some monoclonal antibody treatments. Omicron has a few major offshoots (sublineages), including BA.5 and BA.2.12.1. BA.5 made up about 88% of COVID-19 infections that had genetic sequencing in the U.S. in August, 2022, according to the CDC.

In April, the CDC downgraded the delta variant from a variant of concern to a variant being monitored. This means that the delta variant isn't currently considered a major public health threat in the U.S.

<h2>Risk factors</h2>

Risk factors for COVID-19 appear to include:

Close contact with someone who has COVID-19, especially someone with symptoms

Being coughed or sneezed on by an infected person

Being near an infected person when in an indoor space with poor air flow

<h2>Complications</h2>

Although most people with COVID-19 have mild to moderate symptoms, the disease can cause severe medical complications and lead to death in some people. Older adults or people with existing medical conditions are at greater risk of becoming seriously ill with COVID-19.

Complications can include:

Pneumonia and trouble breathing

Organ failure in several organs

Heart problems

A severe lung condition that causes a low amount of oxygen to go through your bloodstream to your organs (acute respiratory distress syndrome)

Blood clots

Acute kidney injury

Additional viral and bacterial infections

<h2>Prevention</h2>

The U.S. Food and Drug Administration (FDA) has given emergency use authorization to some COVID-19 vaccines in the United States. The FDA has approved the Pfizer-BioNTech COVID-19 vaccine, now called Comirnaty, to prevent COVID-19 in people age 12 and older. The FDA has given emergency use authorization to Pfizer-BioNTech COVID-19 vaccines for ages 6 months through 11 years.

The FDA has approved the Moderna vaccine, now called Spikevax, to prevent COVID-19 in people age 18 and older. The FDA has also authorized the Moderna COVID-19 vaccine in children ages 6 months through 17 years old. The FDA has also authorized the Novavax COVID-19, adjuvanted vaccine to prevent COVID-19 in people age 12 and older.

Due to the risk of a potentially life-threatening blood-clotting problem, the FDA is restricting use of the Janssen/Johnson & Johnson vaccine to certain people age 18 and older. Examples include people who had a severe allergic reaction after getting an mRNA COVID-19 vaccine and people who can't get an mRNA COVID-19 vaccine due to limited access or personal or religious concerns. If you get this vaccine, be sure to understand the risks and symptoms of the blood-clotting problem.

A vaccine can prevent you from getting the COVID-19 virus or prevent you from becoming seriously ill if you get the COVID-19 virus. In addition, COVID-19 vaccination might offer better protection than getting sick with COVID-19. A recent study showed that unvaccinated people who already had COVID-19 are more than twice as likely as fully vaccinated people to get reinfected with COVID-19.

After getting vaccinated, you can more safely return to many activities you may not have been able to do because of the pandemic. However, if you are in an area with a high number of people with COVID-19 in the hospital and new COVID-19 cases, the CDC recommends wearing a mask indoors in public. You're considered fully vaccinated two weeks after you get a second dose of an mRNA

COVID-19 vaccine, after two doses of the Novavax vaccine, or two weeks after you get a single dose of the Janssen/Johnson & Johnson COVID-19 vaccine. You are considered up to date with your vaccines if you have gotten all recommended COVID-19 vaccines, including booster doses, when you become eligible.

An additional primary dose of a COVID-19 vaccine is recommended for people who are vaccinated and might not have had a strong enough immune response.

In contrast, a booster dose is recommended for people who are vaccinated and whose immune response weakened over time. Research suggests that getting a booster dose can decrease your risk of infection and severe illness with COVID-19.

People who have a moderately or severely weakened immune system should get an additional primary shot and a booster shot.

The CDC recommends additional doses and booster doses of COVID-19 vaccines in specific instances:

Additional primary shot. The CDC recommends an additional primary shot of an mRNA COVID-19 vaccine for some people with weakened immune systems, such as those who have had an organ transplant. People with weakened immune systems might not develop enough immunity after vaccination with two doses of an mRNA COVID-19 vaccine or one dose of the Janssen/Johnson & Johnson COVID-19 vaccine. An additional shot using an mRNA COVID-19 vaccine might improve their protection against COVID-19. This recommendation for an additional mRNA COVID-19 shot is for people ages 6 months and older.

The additional primary shot should be given at least four weeks after a second dose of an mRNA COVID-19 vaccine or one dose of the

Janssen/Johnson & Johnson COVID-19 vaccine. The additional primary shot should be the same brand as the other two mRNA COVID-19 vaccine doses that were given. If the brand given isn't known, either brand of mRNA COVID-19 vaccine can be given as a third dose.

Booster dose. These recommendations differ by age, what vaccines you have been given and the state of your immune system. But in general, people can get the booster shot at least two months after their last shot. People who recently had a positive COVID-19 test may think about waiting three months after their symptoms started to get the booster.

Kids ages 6 months through 5 years who got the Moderna COVID-19 vaccine can get an updated, called bivalent, Moderna COVID-19 vaccine booster. The booster is based on the original virus strain and two omicron strains.

Kids age 5 who got the Pfizer-BioNTech COVID-19 vaccine can only get the updated Pfizer-BioNTech COVID-19 bivalent vaccine booster.

People age 6 and older can choose between the updated Pfizer-BioNTech and the updated Moderna COVID-19 bivalent vaccine boosters.

If you are age 18 or older, and got the Janssen COVID-19 vaccine, you can get either of the mRNA vaccine bivalent boosters at least two months after your shot. People 18 and older may also get a Novavax booster based on the original virus strain as a first booster at least six months after their last shot.

Pregnant people can also get a COVID-19 booster dose.

People age 5 and older who have a weakened immune system and have had all recommended doses of the Moderna, Pfizer-BioNTech or Novavax COVID-19 vaccines can get a booster dose of the updated Pfizer-BioNTech or Moderna COVID-19 bivalent vaccines.

The FDA has also authorized the monoclonal antibodies tixagevimab and cilgavimab (Evusheld) to prevent COVID-19 in some people with weakened immune systems or a history of severe reactions to a COVID-19 vaccine. But Evusheld may provide less or no protection against certain omicron strains of the virus.

There are many steps you can take to reduce your risk of infection from the COVID-19 virus and reduce the risk of spreading it to others. WHO and CDC recommend following these precautions:

Get vaccinated. COVID-19 vaccines reduce the risk of getting and spreading COVID-19.

Avoid close contact with anyone who is sick or has symptoms.

Keep distance between yourself and others when you're in indoor public spaces. This is especially important if you have a higher risk of serious illness. Keep in mind some people may have COVID-19 and spread it to others, even if they don't have symptoms or don't know they have COVID-19.

Avoid crowds and indoor places that have poor air flow (ventilation).

Wash your hands often with soap and water for at least 20 seconds, or use an alcohol-based hand sanitizer that contains at least 60% alcohol.

Wear a face mask in indoor public spaces if you're in an area with a high number of people with COVID-19 in the hospital and new COVID-19 cases, whether or not you're vaccinated. The CDC recommends wearing the most protective mask possible that you'll wear regularly, fits well and is comfortable.

Improve the air flow indoors. Open windows. Turn on fans to direct air out of windows. If you can't open windows, consider using air filters. And turn on exhaust fans in your bathroom and kitchen. You might also consider a portable air cleaner.

Cover your mouth and nose with your elbow or a tissue when you cough or sneeze. Throw away the used tissue. Wash your hands right away.

Avoid touching your eyes, nose and mouth.

Avoid sharing dishes, glasses, towels, bedding and other household items if you're sick.

Clean and disinfect high-touch surfaces, such as doorknobs, light switches, electronics and counters, regularly.

Stay home from work, school and public areas and stay home in isolation if you're sick, unless you're going to get medical care. Avoid public transportation, taxis and ride-hailing services if you're sick.

If you have a chronic medical condition and may have a higher risk of serious illness, check with your doctor about other ways to protect yourself.

<h3>Travel</h3>

If you're planning to travel, first check the CDC and WHO websites for updates and advice. The CDC recommends that you wear a mask on planes, buses, trains and other indoor public transportation traveling to, within or out of the U.S., as well as in places such as airports and train stations. Use appropriate hand hygiene when in public. You may also want to talk with your health care provider if you have health conditions that make you more susceptible to respiratory infections and complications.

</p>

</body>

</html>

CHAPTER-III

SIMULATION OUTPUT

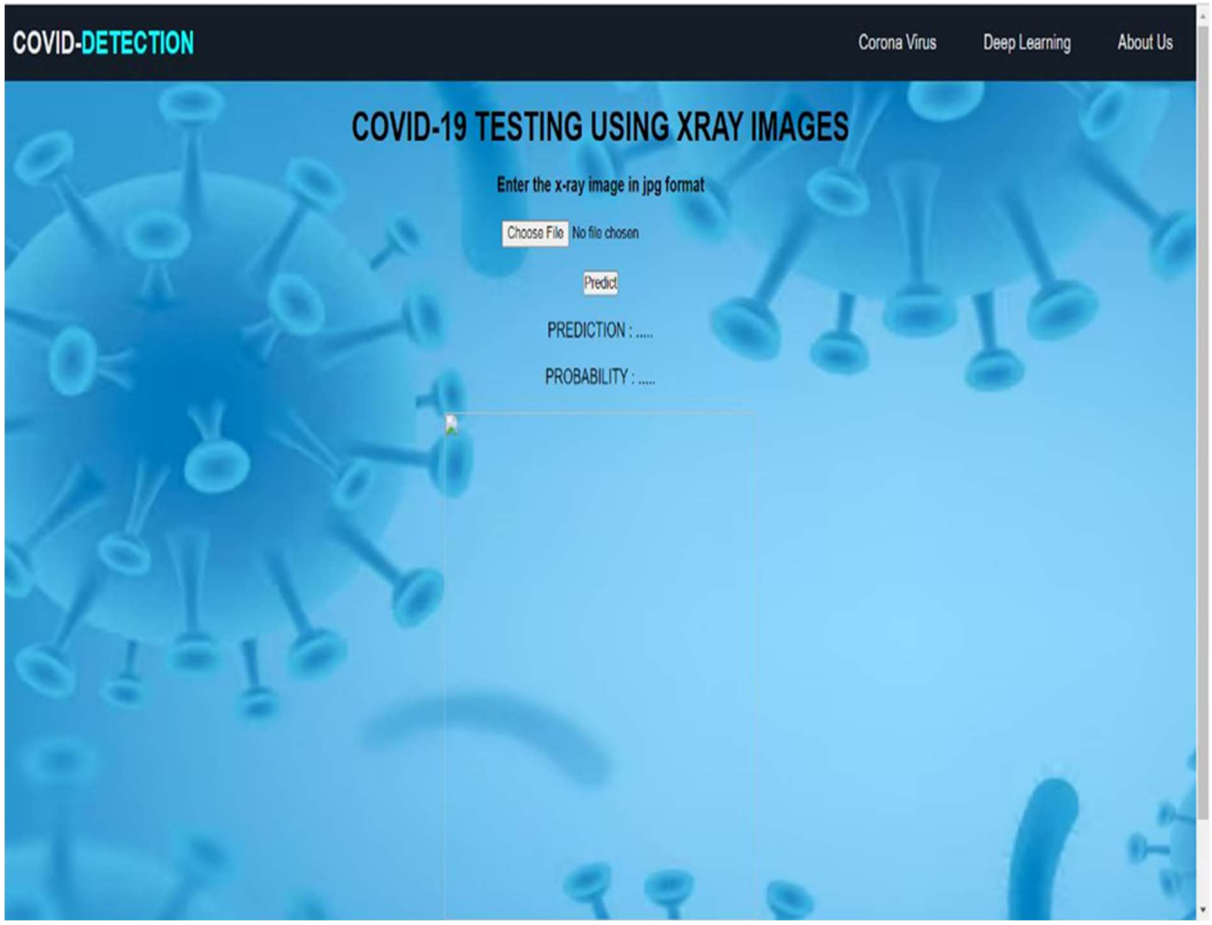
RESULT:

As we obtained the web page of Covid-19 Testing Using X-RAY Images . The format it shows :

Here, we have to select the file or X-ray image in the menu-bar .

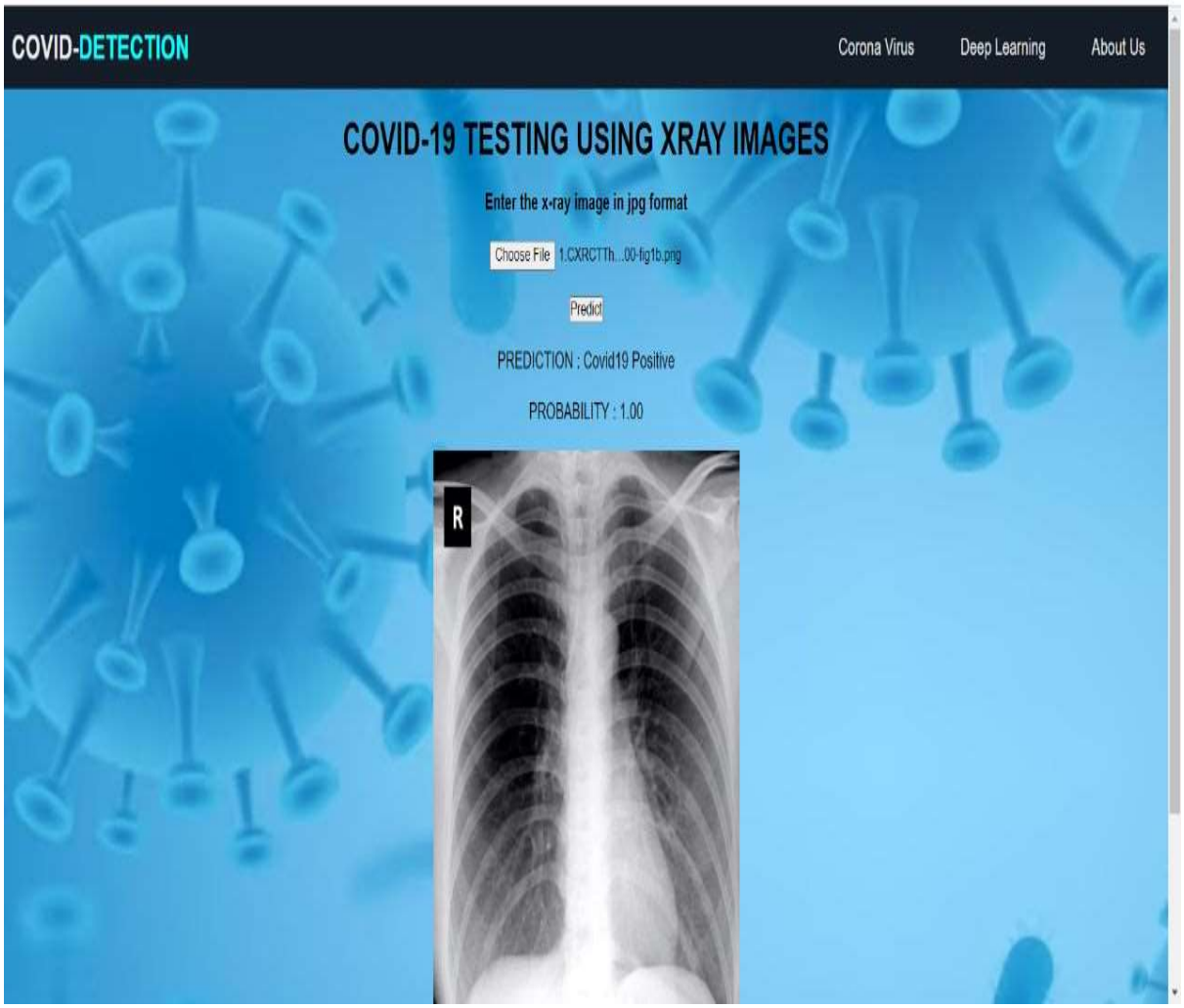
The prediction and probability of the given x-ray image is calculated .

Also, the Top of the web page shows the information the about corona virus , deep learning techniques used for the detection of corona-virus from x-ray images .



The output we obtained is the Prediction of Covid, whether is it positive or negative is determined.

The probability of the covid severity is also calculated from the x-ray images.



Advantages:

1.High accuracy: Deep learning models, such as convolutional neural networks (CNNs), have shown high accuracy in detecting COVID-19 from medical images, such as chest X-rays and CT scans. These models can learn complex patterns and features from large datasets, which can help improve the accuracy of COVID-19 detection.

2.Non-invasive: Deep learning typically uses any invasive procedures or sample collection from patients. This can reduce the risk of infection transmission and minimize patient discomfort.

3.Scalability: Deep learning models can be easily scaled up to handle large volumes of data, making them suitable for handling the large datasets of medical images required for COVID-19 detection. As more data becomes available, deep learning models can be trained to continuously improve their performance.

Disadvantages:

1.Data limitations: Deep learning models for COVID-19 detection rely heavily on the availability of large and diverse datasets of medical images. However, during a pandemic, obtaining such datasets may be challenging due to issues such as data privacy, data quality, and data scarcity. Limited data can potentially lead to overfitting and reduced model performance

2.Generalization challenges: Deep learning models trained on one dataset or population may not generalize well to different

populations or settings. COVID-19 detection models trained on data from one geographic region or ethnic group may not perform as well in a different region or among a different ethnic group, due to differences in disease prevalence, imaging protocols, and population characteristics.

3.Resource requirements: Training and deploying deep learning models for COVID-19 detection may require significant computational resources, including powerful GPUs and large storage capacities. This can be a limitation for some healthcare facilities with limited resources and infrastructure.

CONCLUSION

COVID-19 pandemic is a growing manifold daily. With the ever-increasing number of cases, bulk testing of cases swiftly may be required. In this work, we experimented with multiple CNN models in an attempt to classify the Covid-19 affected patients using their chest X-rays cans.

Further, we concluded that out of these three models, the AlexNet has the best performance and is suited to be used. We have successfully classified covid-19 scans, and it depicts the possible scope of applying such techniques in the near future to automate diagnosis tasks. The high accuracy obtained may be a cause of concern since it may be a result of overfitting. This can be verified by testing it against new data that is made public shortly.

In the future, the large dataset for chest X-rays can be considered to validate our proposed model on it. It is also advised to consult medical professionals for any practical use case of this project. We do not intend to develop a perfect detection mechanism but only research about possible economically feasible ways to combat this disease. Such methods may be pursued for further research to prove their real case implementation.

REFERENCES:

[1]. F. Sayed, A. M. Elkorany and S. Sayed Mohammad, "Applying Different Machine Learning Techniques for Prediction of COVID19 Severity," in IEEE Access, vol. 9, pp. 135697-135707, 2021, doi:10.1109/ACCESS.2021.3116067.
https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8545185/

[2]. J. Ren, R. Ren, M. Green and X. Huang, "Defect Detection from X-Ray Images Using a Three-Stage Deep Learning Algorithm," 2019 IEEE Canadian Conference of Electrical and Computer Engineering (CCECE),2019,pp.1-4,doi:10.1109/CCECE.2019.8861944

[3]. C. Liu et al., "TX-CNN: Detecting tuberculosis in chest X-ray images using convolutional neural network," 2017 IEEE International Conference on Image Processing (ICIP), 2017, pp. 2314-2318, doi: 10.1109/ICIP.2017.8296695.

[4]. Tanzi L, Vezzetti E, Moreno R, Aprato A, Audisio A, Massè A. Hierarchical fracture classification of proximal femur X-Ray images using a multistage Deep Learning approach. Eur J Radiol. 2020 Dec; 133:109373. doi:10.1016/j.ejrad.2020.109373. EPub 2020 Oct 23. PMID:33126175.https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7544769/#ffn_sectitle

[5]. Khalifa, N.E.M.; Taha, M.H.N.; Manogaran, G.; Loey, M. A deep learning model and machine learning methods for the classification of potential coronavirus treatments on a single human cell. J. Nanoparticle Res.2020,22,1–13.