

COVID-19 DETECTION USING X-RAY IMAGES BY USING CONVOLUTION NEURAL NETWORK

Submitted in partial fulfillment of the requirements for the reward of
Bachelor of Engineering degree in Computer Science and Engineering

By

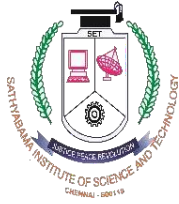
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BONAFIDE CERTIFICATE

This is to certify that this Professional Training Report is the bonafide work of
**SATTI BHARATH VINAY REDDY (38110509) , RELLU SATYA RANGA VARA
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DETECTION USING X-RAYS BY USING CONVOLUTION NEURAL
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DECLARATION

I, SATTI BHARATH VINAY REDDY (38110509), RELLU SATYA RANGA VARA PRASAD(38110510) hereby declare that the Professional Training Report on **“COVID-19 DETECTION USING X-RAYS BY USING CONVOLUTION NEURAL NETWORK”** done by me under the guidance of **DR. S. L. JANYSHABU, M.E., Ph.d.**, at Sathyabama university is submitted in partial fulfillment of the requirements for the award of Bachelor of Engineering degree in computer science and engineering.

DATE:

PLACE:

SIGNATURE OF THE CANDIDATE

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ABSTRACT

Coronavirus disease 2019 also known as COVID-19 has become a pandemic. The disease is caused by a beta coronavirus called Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). The severity of the disease can be understood by the massive number of deaths and affected patients globally. If the diagnosis is fast-paced, the disease can be controlled in a better manner. Laboratory tests are available for diagnosis, but they are bounded by available testing kits and time. The use of radiological examinations that comprise Computed Tomography (CT) can be used for the diagnosis of the disease. Specifically, chest X-Ray images can be analysed to identify the presence of COVID-19 in a patient. In this paper, an automated method for the diagnosis of COVID-19 from the chest X-Ray images is proposed. The method presents an improved depth wise convolution neural network for analysing the chest X-Ray images. Wavelet decomposition is applied to integrate multiresolution analysis in the network. The frequency sub-bands obtained from the input images are fed in the network for identifying the disease. The network is designed to predict the class of the input image as normal, viral pneumonia, and COVID-19. A comparative study with the existing methods is also performed. The metrics like accuracy, sensitivity, and F1-measure are calculated for performance evaluation. The performance of the proposed method is better than the existing methodologies and thus can be used for the effective diagnosis of the disease.

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CHAPTER 1

INTRODUCTION

1.1 BACKGROUND AND BASICS

A pandemic is an outbreak of a disease globally affecting many populations. The world has witnessed many pandemics in the 20th century. The latest coronavirus disease known as COVID-19 has appeared and spread extremely fast. COVID-19 infection are observed to have serious pneumonia with abnormal observations on chest Computed Tomography (CT) examination. The unavailability of medicine for this disease requires efficient diagnosis methods for controlling the disease. A deep learning-based model is applied on CT images for detection of COVID-19. Some researchers have also developed public datasets comprising of chest X-Ray images of COVID-19 patients. A method named COVID-Net is developed and applied on these public datasets for diagnosis of COVID-19. The use of deep learning for diagnosis from the chest X-Ray images provides good results. Deep learning models are being widely used for medical image processing. The detection of pneumonia is done using convolution neural networks. In this paper, an automated method for the diagnosis of COVID-19 from a deep network is proposed. The proposed network utilizes the feature generated by multiresolution analysis. The combination of wavelet transforms along with the deep network brings multiple advantages. The wavelet decomposition is fed into the network. The network used is not the traditional Convolutional Neural Network (CNN). A depthwise separable network is utilized in this work.

1.2 EXISTING SYSTEM

The person administering the test will twirl a long stick with a soft brush on the end, similar to a pipe cleaner, up your nose for a few seconds. There will be a collection of secretions collected by the soft bristles for study. To get a good specimen, the swab must go back a long way, so cells and fluids must be extracted from the whole passageway that links the base of the nose to the back of the neck. However, since the body isn't used to having an object in that place, it produces a slew of strange sensations. For one thing, it activates the lachrymal reflex, which means it will bring tears to your eyes if it's done correctly. I wouldn't go so far as to say it hurt, but it is uncomfortable. Since the swab will also touch the back of the throat, it may also trigger a gag reflex.

1.3 PROPOSED SYSTEM

We have proposed an automatic prediction of covid-19 using a deep convolutional neural networks and Chest X-ray images. The proposed models will have end-to- end structure without manual feature extraction and selection methods. Chest Xray is the best tool for the detection of covid-19. The method presents an improved depth wise convolution neural network for analysing the chest X-Ray images. Wavelet decomposition is applied to integrate multiresolution analysis in the network. The frequency sub-bands obtained from the input images are fed in the network for identifying the disease. The network is designed to predict the class of the input image as normal, viral pneumonia, and COVID-19. A comparative study with the existing methods is also performed. The metrics like accuracy, sensitivity, and F1-measure are calculated for performance evaluation. The performance of the proposed method is better than the existing methodologies and thus can be used for the effective diagnosis of the disease.

1.4 ADVANTAGES OF PROPOSED SYSTEM

1. Pneumonia Deetection
2. Lung Disease Detection

CHAPTER 2

LITERATURE SURVEY

- Narinder Singh Punj et al.[2]The flare-up of intense respiratory condition, known as COVID-2019 (SARS-CoV-2), has compromised the whole world. The world is giving a valiant effort to battle the spread of this dangerous infection in framework, finance, news markets, insurance, medical care and numerous different apparatuses. Craftsmanship scientists have zeroed in on their insight into numerical advancement to break down the condition of the scourge, utilizing information from the nation over.
- Palash Ghosh et al.[3]The sickness has spread to 212 nations and areas and has tainted (affirmed) multiple million individuals. In India, the infection was first given an account of January 30, 2020 to an understudy getting back from Wuhan in Kerala. Across India (as of May 3, 2020), the quantity of individuals tainted is north of 37,000. Most investigations and diaries center around the quantity of tainted individuals the nation over.
- Sina Ardabili et al[4].In the normal instances of foreseeing the worldwide COVID-19 plague, the epidemiological and measurable epidemiological model has been important to the specialists and notable in the media. Because of the great degree of vulnerability and absence of significant data, the standard models are not satisfactory over the long haul.
- Fotio Petropoulos, et al[5].Nonetheless, prediction requires adequate data. Simultaneously, what's to come isn't so unsurprising as it used to be. What's more, the speculation depends on the believability of the news media and the anticipated changes. Mental factors additionally assume a significant part in how individuals see and react with the impacts of the sickness and what it can mean for them.

- Arti. M. K, K. Bhatnagar et al[6].Nonetheless, prediction requires adequate data. Simultaneously, it is obscure right now what he will do subsequent to leaving the post. Moreover, the theory depends on the believability of the news media and the anticipated changes. Mental factors likewise assume a significant part in how individuals see and react to the danger of illness, and they dread that it could influence them.
- H.Shekhar et al[7] .The information from March 15, 2020 to April 30, 2020 is utilized to approve the model, and t he interior speed is steady. In some Indian nations, for example, Maharashtra, Gujarat and Delhi, individuals are tainted every day. The underlying disease is supposed to be on the ascent and is relied upon to keep on developing. Unexpected blasts are characterized by contrasts in the way of life of these three nations.
- Yan, L., Zhang et al [8].The abrupt ascent in COVID-19 is putting a strain on worldwide wellbeing administrations. At this stage, it is critical to analyze the illness rapidly, precisely and early. To help independent direction and arranging in wellbeing programs, the review utilized blood tests from 485 tainted patients in Wuhan, China, to identify indications of death from the sickness.
- L. Li, Z. Yang et al [9].As indicated by the authority data transmission framework, this report inspects how the 2019 Coronavirus (COVID-19) is communicated. The mistake between the model and the information bend is tiny. At that point, he anticipated the plague and comprehended it prior to settling on a choice and dissecting the nations that aidedsettleonthechoice.

CHAPTER 3

METHODOLOGY

3.1 System Requirement Specification

3.1.1 HARDWARE REQUIREMENTS:

System	- Windows7/10
Speed	- 2.4GHZ
Hard disk	- 40GB
Monitor	- 15VGA Color
Ram	- 4GB

3.1.2 SOFTWARE REQUIREMENTS:

Coding Language	- PYTHON
IDE	- PYCHARM

3.2 SOFTWARE ENVIRONMENT

Python:

Python is a high-level, interpreted, interactive and object-oriented scripting language. Python is designed to be highly readable. It uses English keywords frequently where as other languages use punctuation, and it has fewer syntactical constructions than other languages.

- **Python is Interpreted** – Python is processed at runtime by the interpreter. You do not need to compile your program before executing it. This is similar to PERL and PHP.
- **Python is Interactive** – You can actually sit at a Python prompt and interact with the interpreter directly to write your programs.
- **Python is Object-Oriented** – Python supports Object-Oriented style or technique of programming that encapsulates code within objects.
- **Python is a Beginner's Language** – Python is a great language for the beginner-level programmers and supports the development of a wide range of applications from simple text processing to WWW browsers to games.

History of Python

Python was developed by Guido van Rossum in the late eighties and early nineties at the National Research Institute for Mathematics and Computer Science in the Netherlands.

Python is derived from many other languages, including ABC, Modula-3, C, C++, Algol-68, SmallTalk, and Unix shell and other scripting languages.

Python is copyrighted. Like Perl, Python source code is now available under the GNU General Public License (GPL).

Python is now maintained by a core development team at the institute, although Guido van Rossum still holds a vital role in directing its progress.

Python Features

Python's features include –

- **Easy-to-learn** – Python has few keywords, simple structure, and a clearly defined syntax. This allows the student to pick up the language quickly.
- **Easy-to-read** – Python code is more clearly defined and visible to the eyes.
- **Easy-to-maintain** – Python's source code is fairly easy-to-maintain.
- **A broad standard library** – Python's bulk of the library is very portable and cross-platform compatible on UNIX, Windows, and Macintosh.
- **Interactive Mode** – Python has support for an interactive mode which allows interactive testing and debugging of snippets of code.
- **Portable** – Python can run on a wide variety of hardware platforms and has the same interface on all platforms.
- **Extendable** – You can add low-level modules to the Python interpreter. These modules enable programmers to add to or customize their tools to be more efficient.
- **Databases** – Python provides interfaces to all major commercial databases.
- **GUI Programming** – Python supports GUI applications that can be created and ported to many system calls, libraries and windows systems, such as Windows MFC, Macintosh, and the X Window system of Unix.
- **Scalable** – Python provides a better structure and support for large programs than shell scripting.

Getting Python

The most up-to-date and current source code, binaries, documentation, news, etc., is available on the official website of Python <https://www.python.org>.

Windows Installation

Here are the steps to install Python on Windows machine.

- Open a Web browser and go to <https://www.python.org/downloads/>.
- Follow the link for the Windows installer python-XYZ.msifile where XYZ is the version you need to install.
- To use this installer python-XYZ.msi, the Windows system must support Microsoft Installer 2.0. Save the installer file to your local machine and then run it to find out if your machine supports MSI.
- Run the downloaded file. This brings up the Python install wizard, which is really easy to use. Just accept the default settings, wait until the install is finished, and you are done.

The Python language has many similarities to Perl, C, and Java. However, there are some definite differences between the languages.

First Python Program

Let us execute programs in different modes of programming.

Interactive Mode Programming

Invoking the interpreter without passing a script file as a parameter brings up the following prompt –

```
$ python

Python2.4.3(#1,Nov112010,13:34:43)

[GCC 4.1.220080704(RedHat4.1.2-48)] on linux2

Type "help", "copyright", "credits" or "license" for more information.

>>>
```

Type the following text at the Python prompt and press the Enter –

```
>>>print"Hello, Python!"
```

If you are running new version of Python, then you would need to use print statement with parenthesis as in **print ("Hello, Python!");**. However in Python version 2.4.3, this produces the following result –

```
Hello, Python!
```

Script Mode Programming

Invoking the interpreter with a script parameter begins execution of the script and continues until the script is finished. When the script is finished, the interpreter is no longer active.

Let us write a simple Python program in a script. Python files have extension **.py**. Type the following source code in a test.py file –

```
print"Hello, Python!"
```

We assume that you have Python interpreter set in PATH variable. Now, try to run this program as follows –

```
$ python test.py
```

This produces the following result –

```
Hello, Python!
```

Flask Framework:

Flask is a web application framework written in Python. Armin Ronacher, who leads an international group of Python enthusiasts named Pocco, develops it. Flask is based on Werkzeug WSGI toolkit and Jinja2 template engine. Both are Pocco projects.

Http protocol is the foundation of data communication in world wide web. Different methods of data retrieval from specified URL are defined in this protocol.

The following table summarizes different http methods –

Sr.No	Methods & Description

1	GET Sends data in unencrypted form to the server. Most common method.
2	HEAD Same as GET, but without response body
3	POST Used to send HTML form data to server. Data received by POST method is not cached by server.
4	PUT Replaces all current representations of the target resource with the uploaded content.
5	DELETE Removes all current representations of the target resource given by a URL

By default, the Flask route responds to the **GET** requests. However, this preference can be altered by providing methods argument to **route()** decorator.

In order to demonstrate the use of **POST** method in URL routing, first let us create an HTML form and use the **POST** method to send form data to a URL.

Save the following script as login.html

```
<html>

<body>

<form action="http://localhost:5000/login" method="post">

<p>Enter Name:</p>

<p><input type="text" name="nm"/></p>

<p><input type="submit" value="submit"/></p>
```

```
</form>

</body>

</html>
```

Now enter the following script in Python shell.

```
from flask import Flask, redirect, url_for, request

app = Flask(__name__)

@app.route('/success/<name>')

def success(name):

    return 'welcome %s' % name

@app.route('/login', methods=['POST', 'GET'])

def login():

    if request.method == 'POST':

        user = request.form['nm']

        return redirect(url_for('success', name = user))

    else:

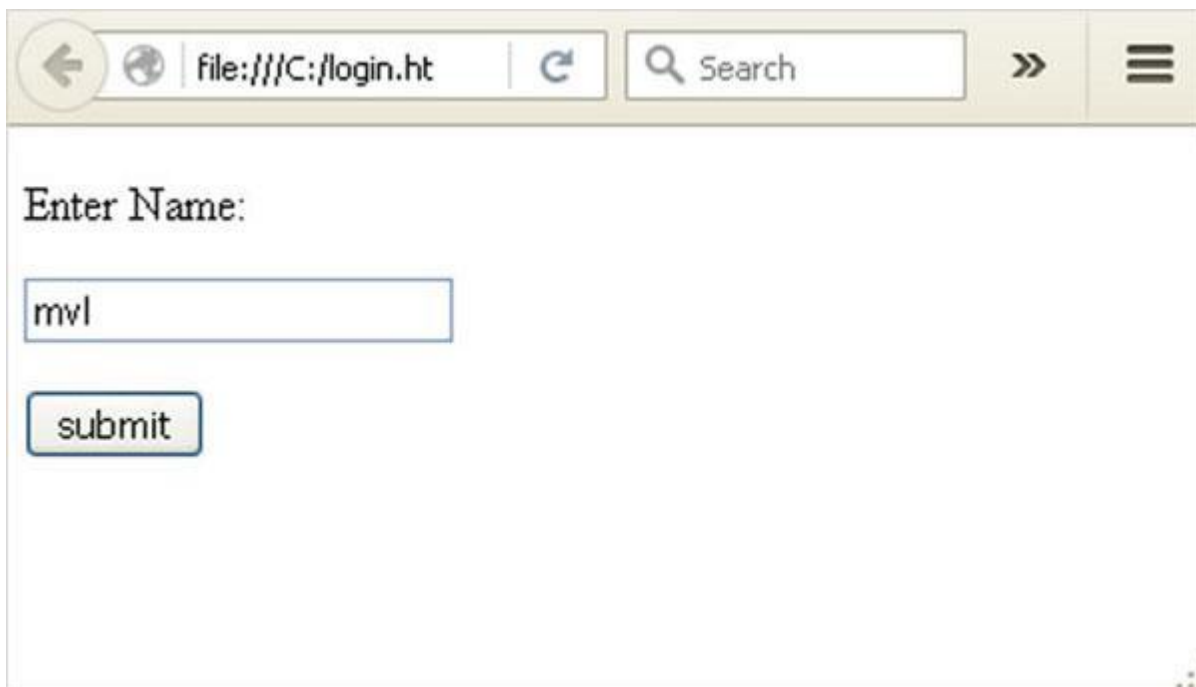
        user = request.args.get('nm')

        return redirect(url_for('success', name = user))

if __name__ == '__main__':

    app.run(debug = True)
```

After the development server starts running, open **login.html** in the browser, enter name in the text field and click **Submit**.



Enter Name:

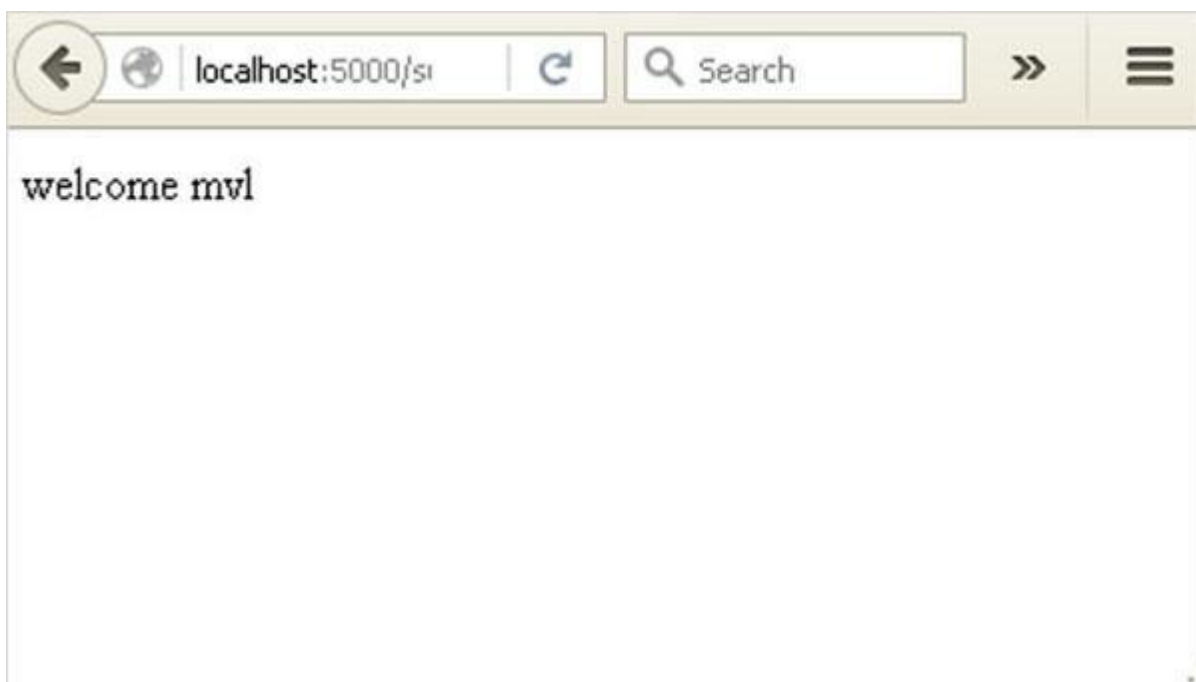
Form data is POSTed to the URL in action clause of form tag.

http://localhost/login is mapped to the **login()** function. Since the server has received data by **POST** method, value of 'nm' parameter obtained from the form data is obtained by

-

```
user = request.form['nm']
```

It is passed to '**success**' URL as variable part. The browser displays a **welcome** message in the window.



welcome mvl

Change the method parameter to '**GET**' in **login.html** and open it again in the browser. The data received on server is by the **GET** method. The value of 'nm' parameter is now obtained by –

```
User = request.args.get('nm')
```

Here, **args** is dictionary object containing a list of pairs of form parameter and its corresponding value. The value corresponding to 'nm' parameter is passed on to '/success' URL as before.

Python Install

Many PCs and Macs will have python already installed.

To check if you have python installed on a Windows PC, search in the start bar for Python or run the following on the Command Line (cmd.exe):

```
C:\Users\Your Name>python --version
```

To check if you have python installed on a Linux or Mac, then on linux open the command line or on Mac open the Terminal and type:

```
python --version
```

If you find that you do not have python installed on your computer, then you can download it for free from the following website: <https://www.python.org/>

Python Quickstart

Python is an interpreted programming language, this means that as a developer you write Python (.py) files in a text editor and then put those files into the python interpreter to be executed.

The way to run a python file is like this on the command line:

```
C:\Users\Your Name>python helloworld.py
```

Where "helloworld.py" is the name of your python file.

Let's write our first Python file, called helloworld.py, which can be done in any text editor. helloworld.py

```
print("Hello, World!")
```

Simple as that. Save your file. Open your command line, navigate to the directory where you saved your file, and run:

```
C:\Users\Your Name>python helloworld.py
```

The output should read:

```
Hello, World!
```

Congratulations, you have written and executed your first Python program.

The Python Command Line

To test a short amount of code in python sometimes it is quickest and easiest not to write the code in a file. This is made possible because Python can be run as a command line itself.

Type the following on the Windows, Mac or Linux command line:

```
C:\Users\Your Name>python
```

From there you can write any python, including our hello world example from earlier in the tutorial:

```
C:\Users\Your Name>python
```

```
Python 3.6.4 (v3.6.4:d48eceb, Dec 19 2017, 06:04:45) [MSC v.1900 32 bit (Intel)] on win32
```

```
Type "help", "copyright", "credits" or "license" for more information.
```

```
>>> print("Hello, World!")
```

Which will write "Hello, World!" in the command line:

```
C:\Users\Your Name>python
```

```
Python 3.6.4 (v3.6.4:d48eceb, Dec 19 2017, 06:04:45) [MSC v.1900 32 bit (Intel)] on win32
```

```
Type "help", "copyright", "credits" or "license" for more information.
```

```
>>> print("Hello, World!")
```

```
Hello, World!
```

Whenever you are done in the python command line, you can simply type the following to quit the python command line interface:

```
exit()
```

Execute Python Syntax

As we learned in the previous page, Python syntax can be executed by writing directly in the Command Line:

```
>>> print("Hello, World!")
```

```
Hello, World!
```

Or by creating a python file on the server, using the .py file extension, and running it in the Command Line:

```
C:\Users\Your Name>python myfile.py
```

Python Indentations

Where in other programming languages the indentation in code is for readability only, in Python the indentation is very important.

Python uses indentation to indicate a block of code.

Example

```
if 5 > 2:
```

```
    print("Five is greater than two!")
```

Python will give you an error if you skip the indentation:

Example

```
if 5 > 2:
```

```
print("Five is greater than two!")
```

Comments

Python has commenting capability for the purpose of in-code documentation.

Comments start with a #, and Python will render the rest of the line as a comment:

Example

Comments in Python:

```
#This is a comment.
```

```
print("Hello, World!")
```

Docstrings

Python also has extended documentation capability, called docstrings.

Docstrings can be one line, or multiline.

Python uses triple quotes at the beginning and end of the docstring:

Example

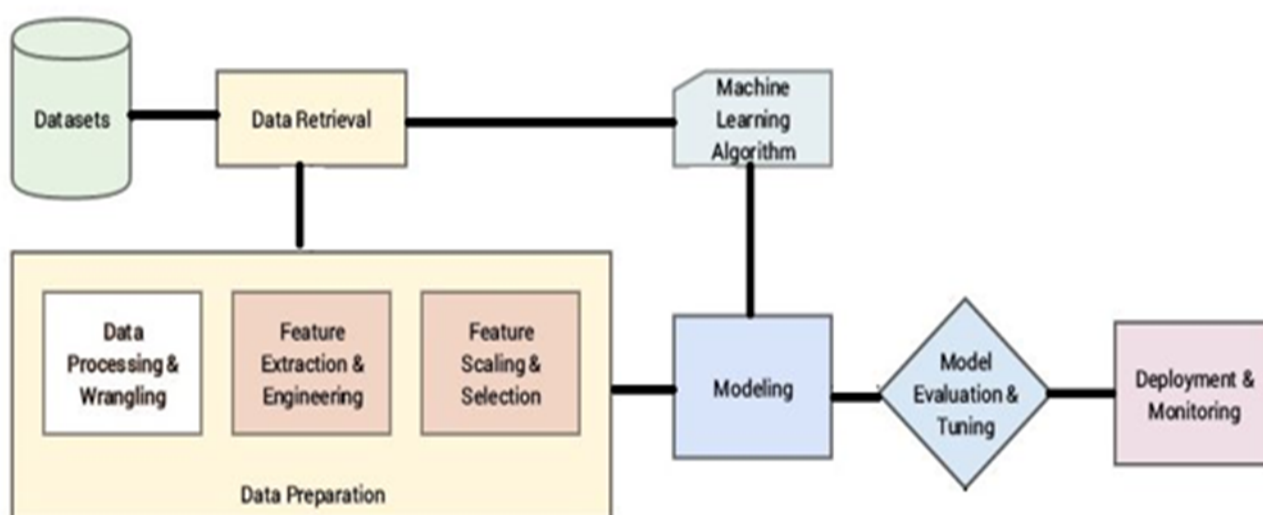
Docstrings are also comments:

```
"""This is a
```

```
multilinedocstring."""
```

```
print("Hello, World!")
```

3.3 ARCHITECTURE



3.3.1 ARCHITETURE FIGURE

3.4 MODULES

- Data collection Module
- Data Pre-Processing Module
- Training the CNN Module
- Prediction Module

MODULE DESCRIPTION

Data collection Module

This experiment leveraging the data from Covid Chest XRay Dataset and Pneumonia dataset by Praveen from GitHub and Kaggle respectively. Using these two datasets, we have created a customized dataset as normal, viral pneumonia, and COVID-19. The COVID-19 dataset comprises of the chest X-Ray images. These images are used for the detection. The images are of different sizes, thus they are resized.

Data Pre-Processing Module

The input images are normalized prior to any further processing. Normalized images are enhanced images with no errors due to lightening conditions. This segment mentioned the technique of preparing the raw data to make these suitable for building and training machine learning models. We used 3 repositories for data set preparation. 2 sets from GitHub and another from kaggle. 2 directories make for COVID19 and normal data set. Data set image will be classified to normal and COVID-19.

Training the CNN Module

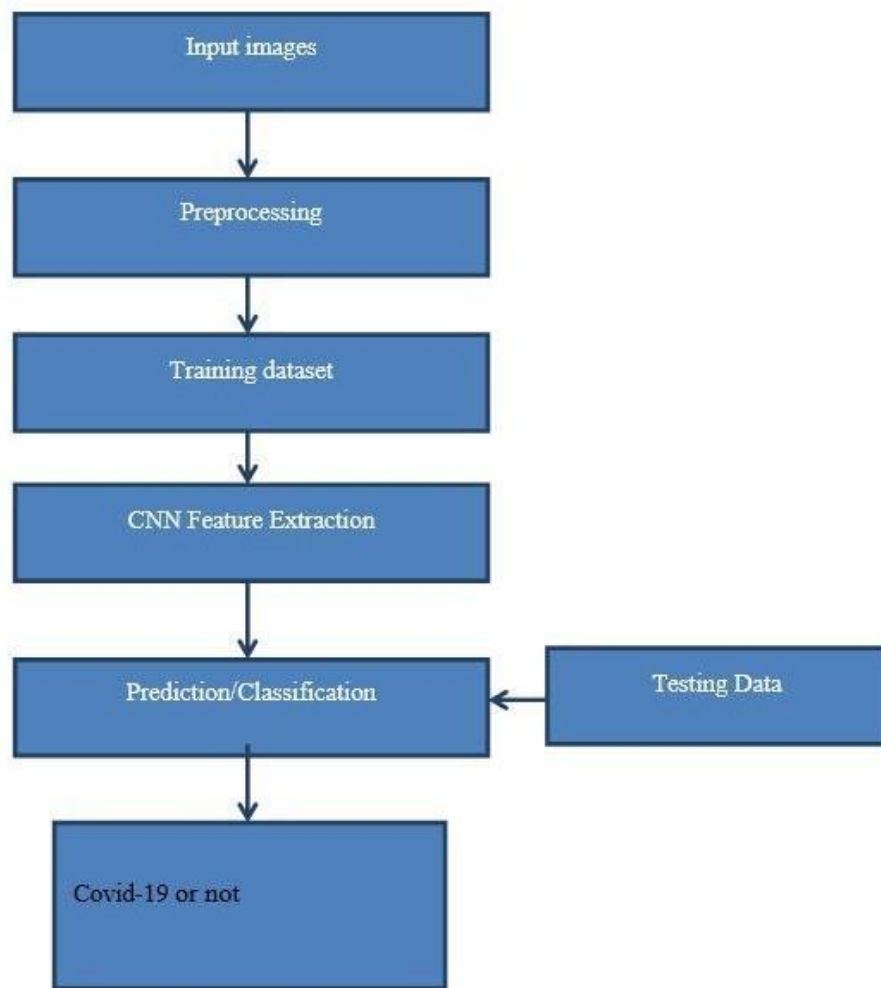
Before we thought of training the CNN, we will load the data and target. Before training the model, we will set up data generators to read images from source folders instead of labeling the image one by one. Basically, Image DataGenerator will label the images based on the directory the image is contained. It points to the sub-directory of the data. Grayscale normalization should be done in order for CNN to converge faster by using rescale parameter.

Prediction Module

Finally, any given input chest X-Ray image is classified into one of three classes, i.e., normal, COVID-19, or viral pneumonia.

3.5 DATA FLOW DIAGRAM

1. The DFD is also called as bubble chart. It is a simple graphical formalism that can be used to represent a system in terms of input data to the system, various processing carried out on this data, and the output data is generated by this system.
2. The data flow diagram (DFD) is one of the most important modeling tools. It is used to model the system components. These components are the system process, the data used by the process, an external entity that interacts with the system and the information flows in the system.
3. DFD shows how the information moves through the system and how it is modified by a series of transformations. It is a graphical technique that depicts information flow and the transformations that are applied as data moves from input to output.
4. DFD is also known as bubble chart. A DFD may be used to represent a system at any level of abstraction. DFD may be partitioned into levels that represent increasing information flow and functional detail.



3.5.1 DATAFLOW DIAGRAM

3.6 UML DIAGRAMS

UML stands for Unified Modeling Language. UML is a standardized general-purpose modeling language in the field of object-oriented software engineering. The standard is managed, and was created by, the Object Management Group.

The goal is for UML to become a common language for creating models of object oriented computer software. In its current form UML is comprised of two major components: a Meta-model and a notation. In the future, some form of method or process may also be added to; or associated with, UML.

The Unified Modeling Language is a standard language for specifying, Visualization, Constructing and documenting the artifacts of software system, as well as for business modeling and other non-software systems.

The UML represents a collection of best engineering practices that have proven successful in the modeling of large and complex systems.

The UML is a very important part of developing objects oriented software and the software development process. The UML uses mostly graphical notations to express the design of software projects.

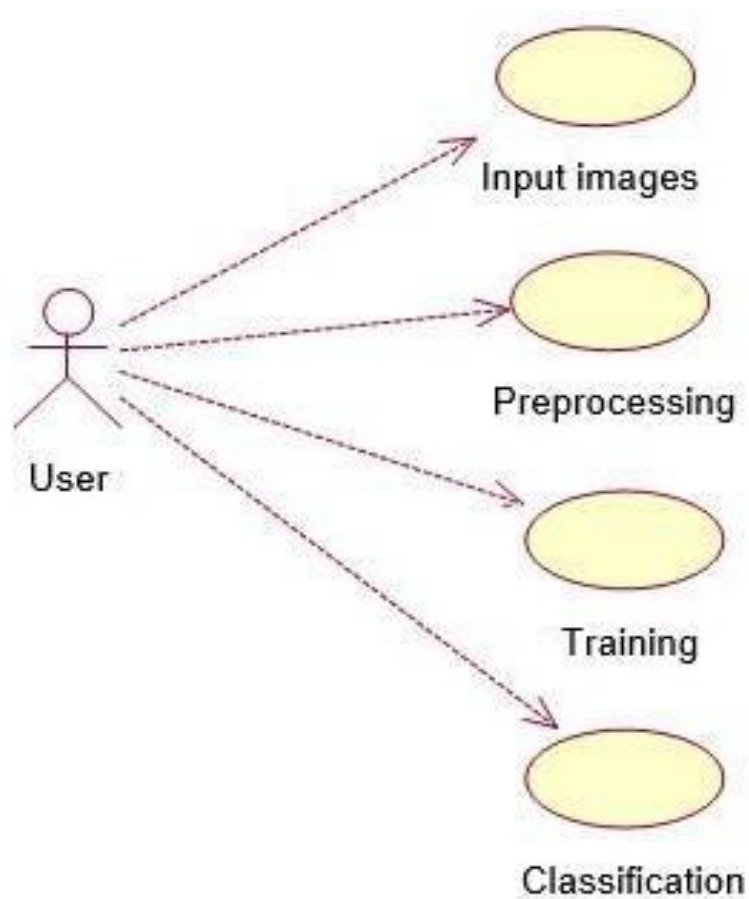
GOALS:

The Primary goals in the design of the UML are as follows:

1. Provide users a ready-to-use, expressive visual modeling Language so that they can develop and exchange meaningful models.
2. Provide extendibility and specialization mechanisms to extend the core concepts.
3. Be independent of particular programming languages and development process.
4. Provide a formal basis for understanding the modeling language.
5. Encourage the growth of OO tools market.
6. Support higher level development concepts such as collaborations, frameworks, patterns and components.
7. Integrate best practices.

USE CASE DIAGRAM:

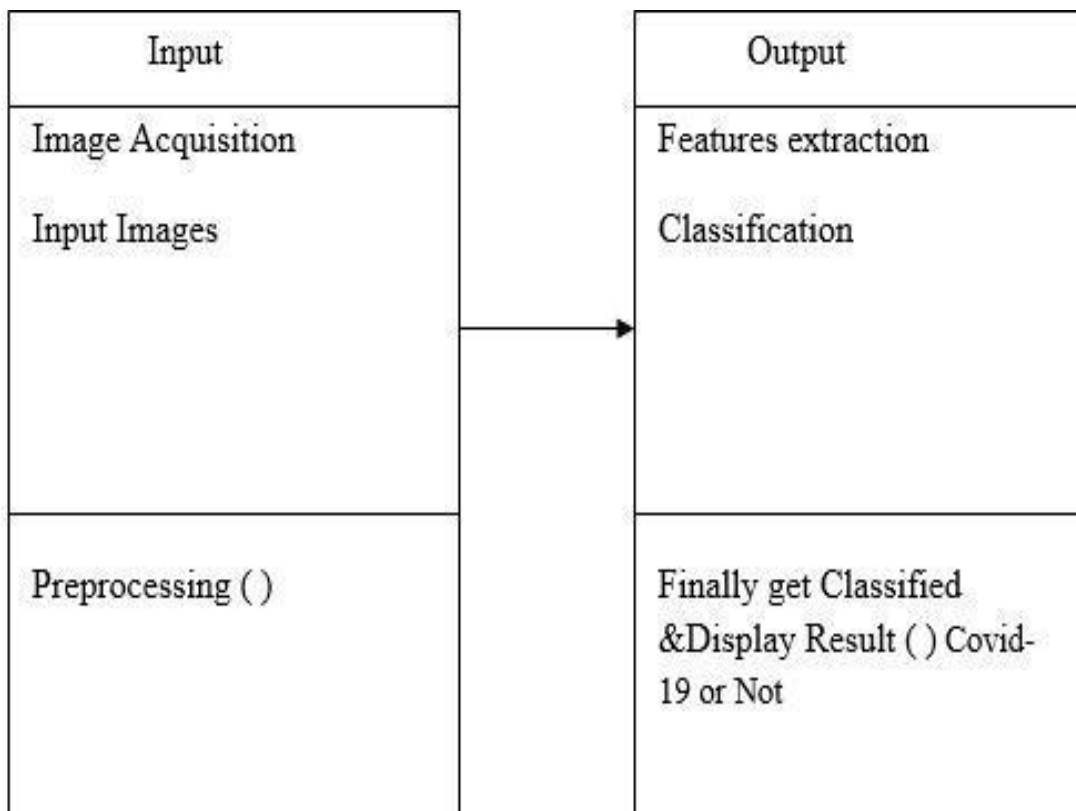
A use case diagram in the Unified Modeling Language (UML) is a type of behavioral diagram defined by and created from a Use-case analysis. Its purpose is to present a graphical overview of the functionality provided by a system in terms of actors, their goals (represented as use cases), and any dependencies between those use cases. The main purpose of a use case diagram is to show what system functions are performed for which actor. Roles of the actors in the system can be depicted.



3.6.1 USECASE DIAGRAM

CLASS DIAGRAM:

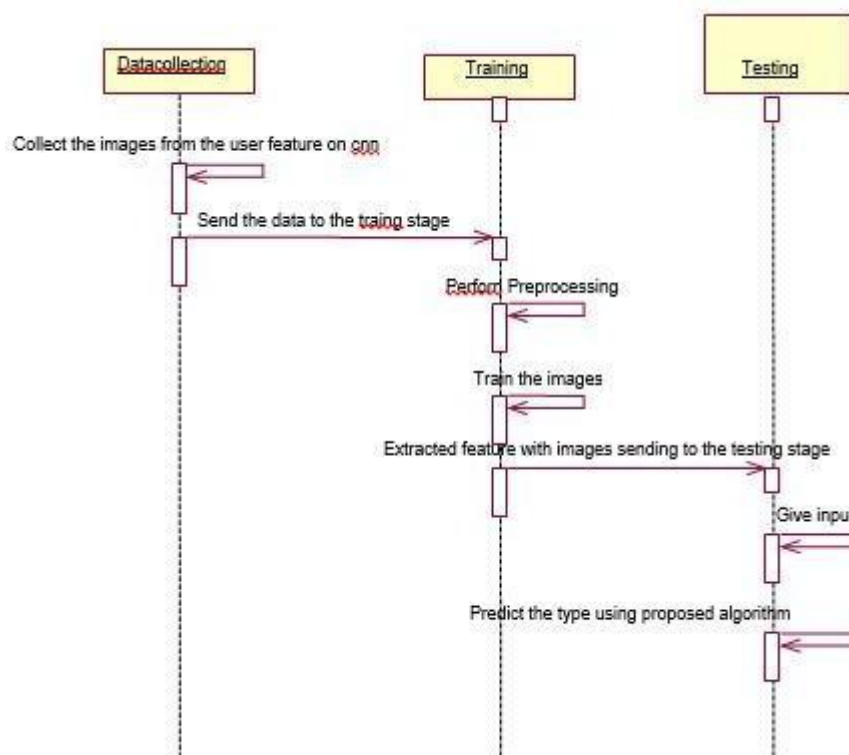
In software engineering, a class diagram in the Unified Modeling Language (UML) is a type of static structure diagram that describes the structure of a system by showing the system's classes, their attributes, operations (or methods), and the relationships among the classes. It explains which class contains information



3.6.2 CLASS DIAGRAM

SEQUENCE DIAGRAM:

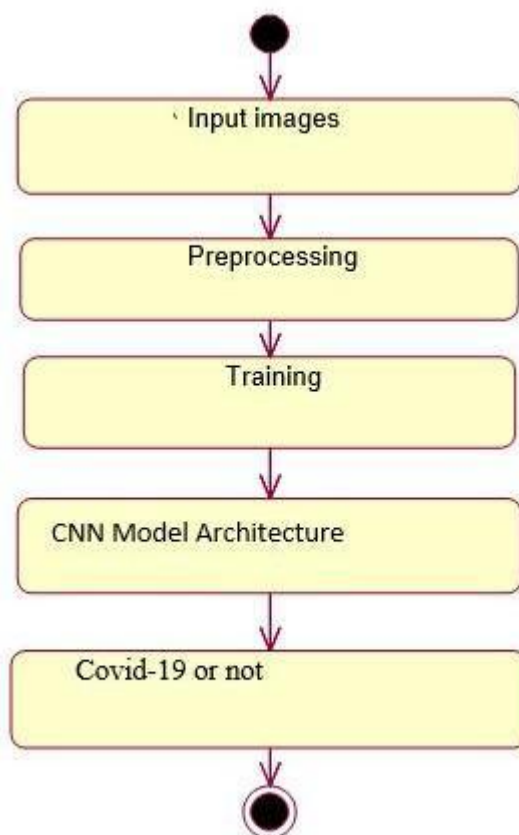
A sequence diagram in Unified Modeling Language (UML) is a kind of interaction diagram that shows how processes operate with one another and in what order. It is a construct of a Message Sequence Chart. Sequence diagrams are sometimes called event diagrams, event scenarios, and timing diagrams.



3.6.3 SEQUENCE DIAGRAM

ACTIVITY DIAGRAM:

Activity diagrams are graphical representations of workflows of stepwise activities and actions with support for choice, iteration and concurrency. In the Unified Modeling Language, activity diagrams can be used to describe the business and operational step-by-step workflows of components in a system. An activity diagram shows the overall flow of control.



3.6.4 ACTIVITY DIAGRAM

3.7 FEASIBILITY STUDY

The feasibility of the project is analyzed in this phase and business proposal is put forth with a very general plan for the project and some cost estimates. During system analysis the feasibility study of the proposed system is to be carried out. This is to ensure that the proposed system is not a burden to the company. For feasibility analysis, some understanding of the major requirements for the system is essential.

The feasibility study investigates the problem and the information needs of the stakeholders. It seeks to determine the resources required to provide an information systems solution, the cost and benefits of such a solution, and the feasibility of such a solution.

The goal of the feasibility study is to consider alternative information systems solutions, evaluate their feasibility, and propose the alternative most suitable to the organization. The feasibility of a proposed solution is evaluated in terms of its components.

ECONOMICAL FEASIBILITY

This study is carried out to check the economic impact that the system will have on the organization. The amount of fund that the company can pour into the research and development of the system is limited. The expenditures must justified. Thus the developed system as well within the budget and this was achieved because most of the technologies used are freely available. Only the customized products had to be purchased.

TECHNICAL FEASIBILITY

This study is carried out to check the technical feasibility, that is, the technical requirements of the system. Any system developed must not have a high demand on the available technical resources. This will lead to high demands on the available technical resources. This will lead to high demands being placed on the client. The developed system must have a modest requirement, as only minimal or null changes are required for implementing this system.

SOCIAL FEASIBILITY

The aspect of study is to check the level of acceptance of the system by the user. This includes the process of training the user to use the system efficiently. The user must not feel threatened by the system, instead must accept it as a necessity.

3.8 SYSTEM DESIGN AND TESTING PLAN

INPUT DESIGN

The input design is the link between the information system and the user. It comprises the developing specification and procedures for data preparation and those steps are necessary to put transaction data in to a usable form for processing can be achieved by inspecting the computer to read data from a written or printed document or it can occur by having people keying the data directly into the system. The design of input focuses on controlling the amount of input required, controlling the errors, avoiding delay, avoiding extra steps and keeping the process simple. The input is designed in such a way so that it provides security and ease of use with retaining the privacy. Input Design considered the following things:

- What data should be given as input?

- How the data should be arranged or coded?

- The dialog to guide the operating personnel in providing input.

- Methods for preparing input validations and steps to follow when error occur.

OUTPUT DESIGN

A quality output is one, which meets the requirements of the end user and presents the information clearly. In any system results of processing are communicated to the users and to other system through outputs. In output design it is determined how the information is to be displaced for immediate need and also the hard copy output. It is the most important and direct source information to the user. Efficient and intelligent output design improves the system's relationship to help user decision-making.

The output form of an information system should accomplish one or more of the following objectives.

- Convey information about past activities, current status or projections of the Future.

- Signal important events, opportunities, problems, or warnings.

- Trigger an action.

- Confirm an action.

Test plan

Software testing is the process of evaluation a software item to detect differences between given input and expected output. Also to assess the feature of a software item. Testing assesses the quality of the product. Software testing is a process that should be done during the development process. In other words software testing is a verification and validation process.

Verification

Verification is the process to make sure the product satisfies the conditions imposed at the start of the development phase. In other words, to make sure the product behaves the way we want it to.

Validation

Validation is the process to make sure the product satisfies the specified requirements at the end of the development phase. In other words, to make sure the product is built as per customer requirements.

Basics of software testing

There are two basics of software testing: black box testing and white box testing.

Black box Testing

Black box testing is a testing technique that ignores the internal mechanism of the system

and focuses on the output generated against any input and execution of the system. It is also called functional testing.

White box Testing

White box testing is a testing technique that takes into account the internal mechanism of a system. It is also called structural testing and glass box testing. Black box testing is often used for validation and white box testing is often used for verification.

Types of testing:

There are many types of testing like

- Unit Testing
- Integration Testing
- Functional Testing
- System Testing
- Stress Testing
- Performance Testing
- Usability Testing
- Acceptance Testing
- Regression Testing
- Beta Testing

Unit Testing

Unit testing is the testing of an individual unit or group of related units. It falls under the class of white box testing. It is often done by the programmer to test that the unit he/she has implemented is producing expected output against given input.

Integration Testing

Integration testing is testing in which a group of components are combined to produce output. Also, the interaction between software and hardware is tested in integration testing

if software and hardware components have any relation. It may fall under both white box testing and black box testing.

Functional Testing

Functional testing is the testing to ensure that the specified functionality required in the system requirements works. It falls under the class of black box testing.

System Testing

System testing is the testing to ensure that by putting the software in different environments (e.g., Operating Systems) it still works. System testing is done with full system implementation and environment. It falls under the class of black box testing.

Stress Testing

Stress testing is the testing to evaluate how system behaves under unfavorable conditions. Testing is conducted at beyond limits of the specifications. It falls under the class of black box testing.

Performance Testing

Performance testing is the testing to assess the speed and effectiveness of the system and to make sure it is generating results within a specified time as in performance requirements. It falls under the class of black box testing.

Usability Testing

Usability testing is performed to the perspective of the client, to evaluate how the GUI is user-friendly? How easily can the client learn? After learning how to use, how proficiently can the client perform? How pleasing is it to use its design? This falls under the class of black box testing.

Acceptance Testing

Acceptance testing is often done by the customer to ensure that the delivered product meets the requirements and works as the customer expected. It falls under the class of

black box testing.

Regression Testing

Regression testing is the testing after modification of a system, component, or a group of related units to ensure that the modification is working correctly and is not damaging or imposing other modules to produce unexpected results. It falls under the class of black box testing.

CHAPTER 4

RESULTS AND DISCUSSION

with the creation and trained the model by using google net and the data set is divided in to 70% training and 30% testing the images are resized and we acquired the best accuracy by training the model. To increase the performance of the model we looked for

hyperparameter values during the training process. pytorch provides torch vision models pre-training once the model detects the objects ,textures on the data set, you can apply this to own images and recognition problem. We get accuracy of 90%.

CHAPTER 5

CONCLUSION

The conclusion of the paper is that CNN model Architecture which is used in our proposed system to predict the pancreatic cancer performs well. The system classifies the image to normal and Covid-19 one. The accuracy of model is 100%. This system provided a proof of concept that CNN can accurately distinguish pancreatic cancer on CT images. The CNN model holds promise as a computer-aided diagnostic tool to assist radiologists and clinicians in diagnosing covid-19.

FUTURE WORK

To find to the right solution, we have distinguished two potential central issues and recognized the initial segment of the meaning of pneumonia, particularly dementia and working in glass. The subsequent advance is to extend the COVID archive to resolve the issues of information reconciliation and the utilization of various business sectors.

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APPENDICES:

SOURCE CODE:

```
#!/usr/bin/env
```

```
python import os
```

```
import sys
```

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

```
from io import BytesIO
```

```
from PIL import Image, ImageOps
```

```
import base64
```

```
import urllib
```

```
import numpy as
```

```
np import
```

```
scipy.misc
```

```
from tensorflow.keras.preprocessing import
```

```
image from tensorflow.keras.models import
```

```
load_model import os
```

```
import tensorflow as
```

```
tf import numpy as
```

```
np
```

```
from tensorflow import
```

```
keras #from skimage import
```

```
io
```

```
from tensorflow.keras.preprocessing import image
```

```
# Flask utils
```

```
from flask import Flask, redirect, url_for, request, render_template
```

```
from werkzeug.utils import secure_filename
```

```
from gevent.pywsgi import WSGIServer
```

```
from tensorflow.keras.models import
```

```
load_model import efficientnet.keras as efn
```

```
import efficientnet.tfkeras
```

```
from tensorflow.keras.models import load_model
```

```
app = Flask(__name__)
```

```
# Load your trained model
```

```
@app.route("/")  
  
@app.route("/first"  
) def first():  
  
    return render_template('first.html')
```

```
@app.route("/login"  
) def login():  
  
    return render_template('login.html')  
  
@app.route("/chart")  
  
def chart():  
  
    return render_template('chart.html')
```

```
@app.route("/performance"  
) def performance():  
  
    return render_template('performance.html')
```

```
@app.route("/index",methods=['GET'])  
  
def index():  
  
    return render_template('index.html')
```

```

@app.route("/upload", methods=['POST'])

def upload_file():

    print("Hello

    ") try:

        img
        =
Image.open(BytesIO(request.files['imagefile'].read())).convert('RGB')

        img = ImageOps.fit(img, (224, 224), Image.ANTIALIAS)

    except:

        error_msg = "Please choose an image file!"

        return render_template('index.html', **locals())


# Call Function to
predict args = {'input' :
img}

out_pred, out_prob =
predict(args) out_prob =
out_prob * 100

print(out_pred,
out_prob) danger =
"danger"

```

```

if out_pred=="You Are Safe, But Do keep precaution":
    danger = "success"
print(danger)
img_io =
BytesIO()
img.save(img_io, 'PNG')

png_output =
base64.b64encode(img_io.getvalue())
processed_file = urllib.parse.quote(png_output)

return render_template('result.html',**locals())
def predict(args):
    img = np.array(args['input']) / 255.0
    img = np.expand_dims(img, axis =
0)

    model = 'save.h5'
    # Load weights into the new
    model model =
load_model(model)

pred = model.predict(img)

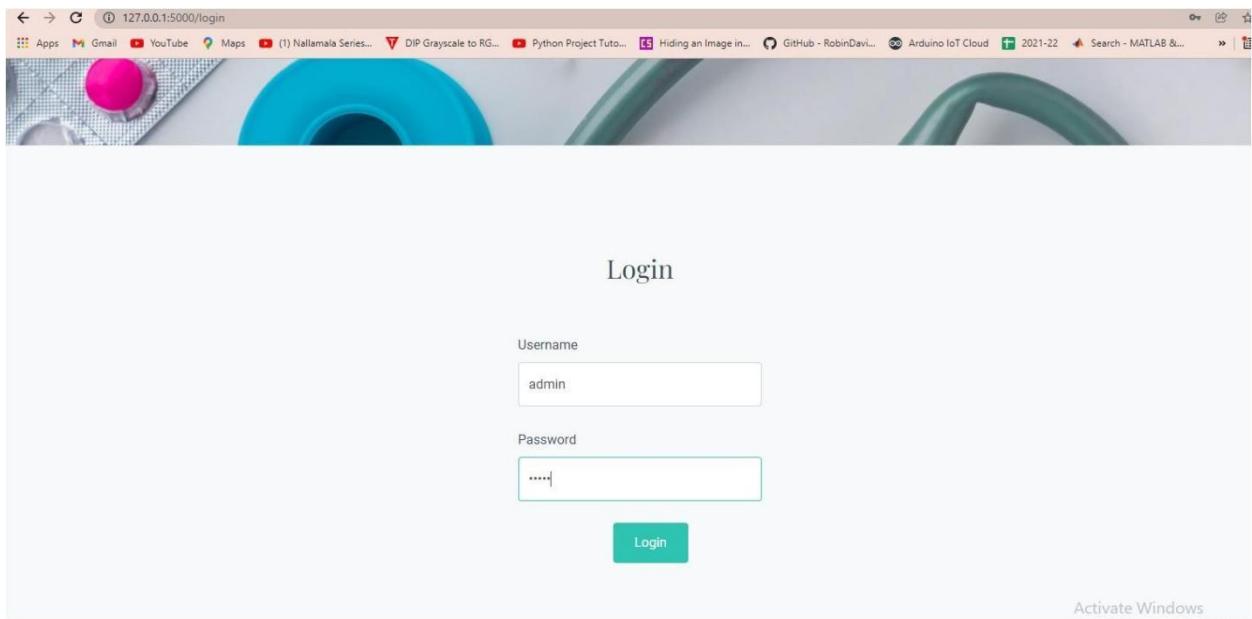
```

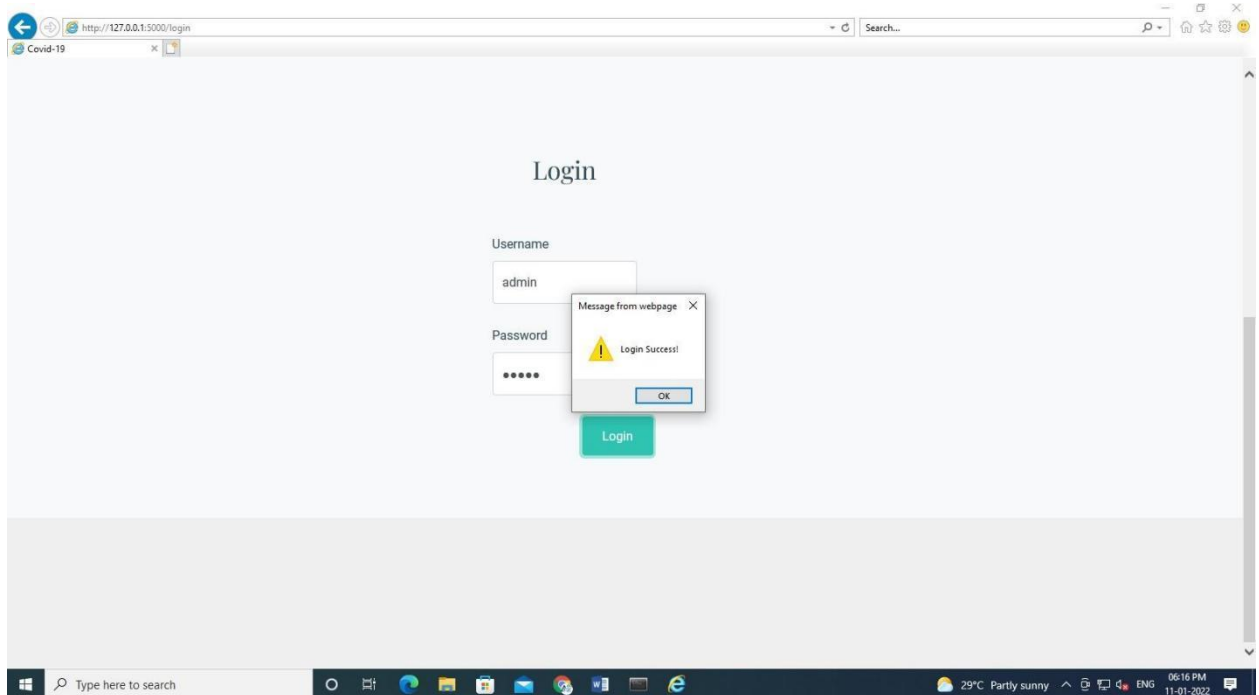
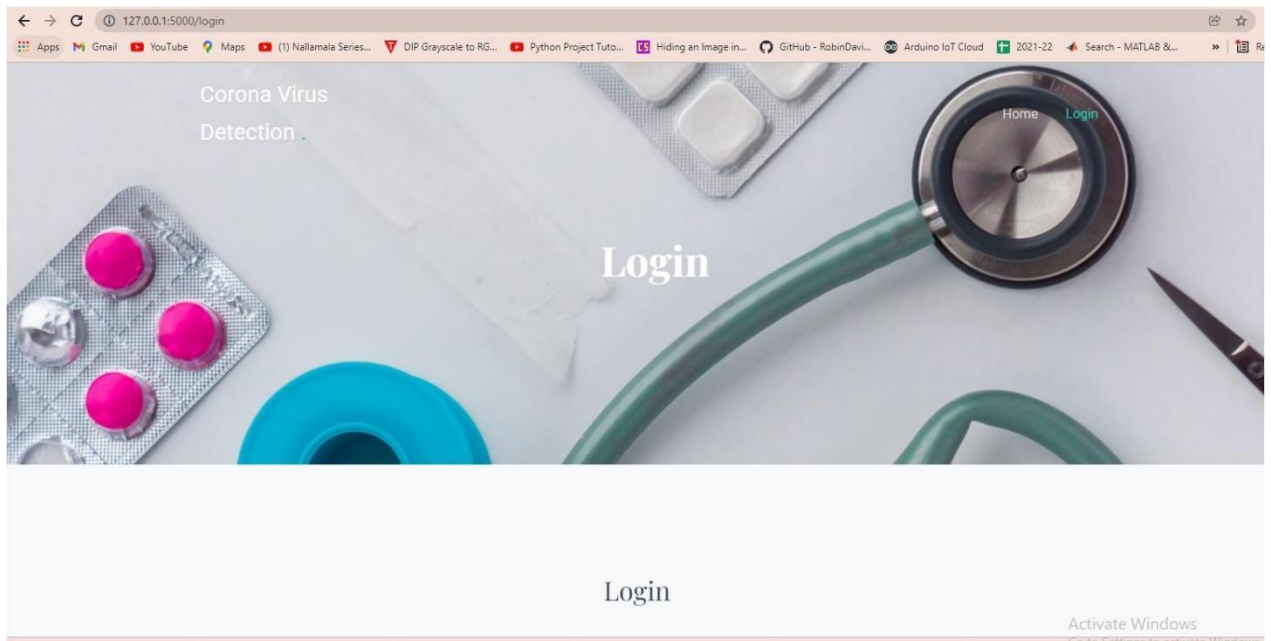
```
if np.argmax(pred, axis=1)[0] ==  
    0: out_pred = "Normal"  
elif np.argmax(pred, axis=1)[0] ==1:  
    out_pred = "CORONA-VIRUS AFFECTED"
```

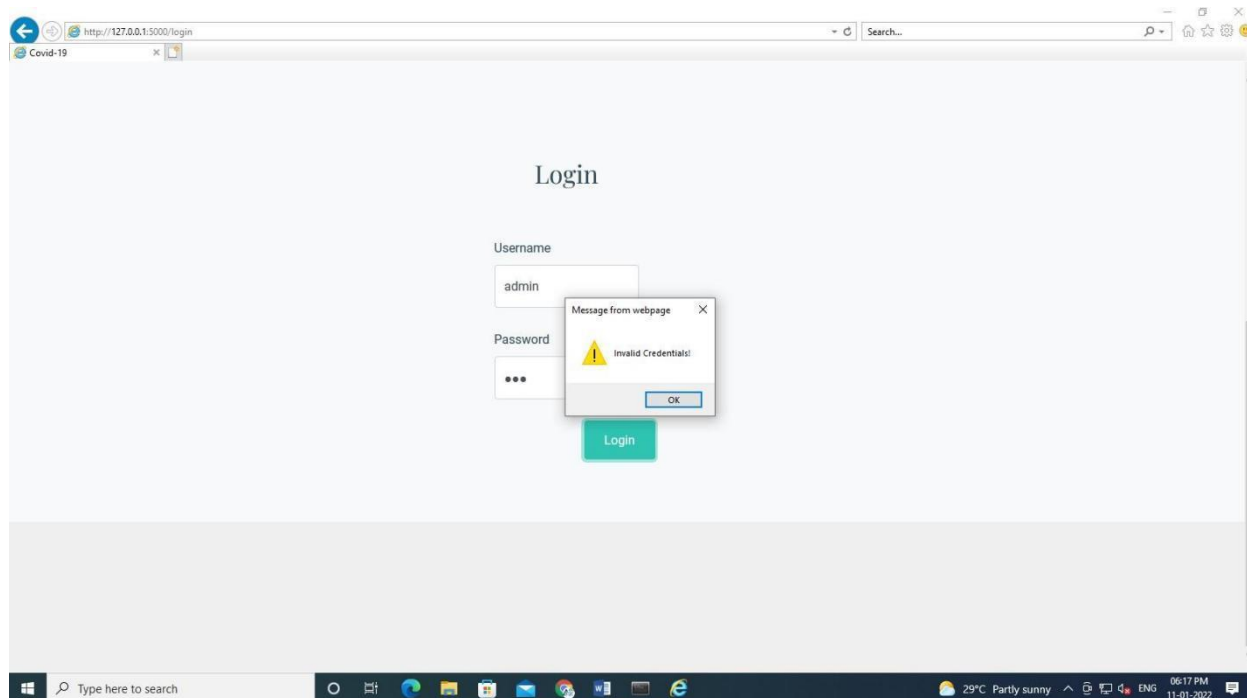
```
return out_pred, float(np.max(pred))
```

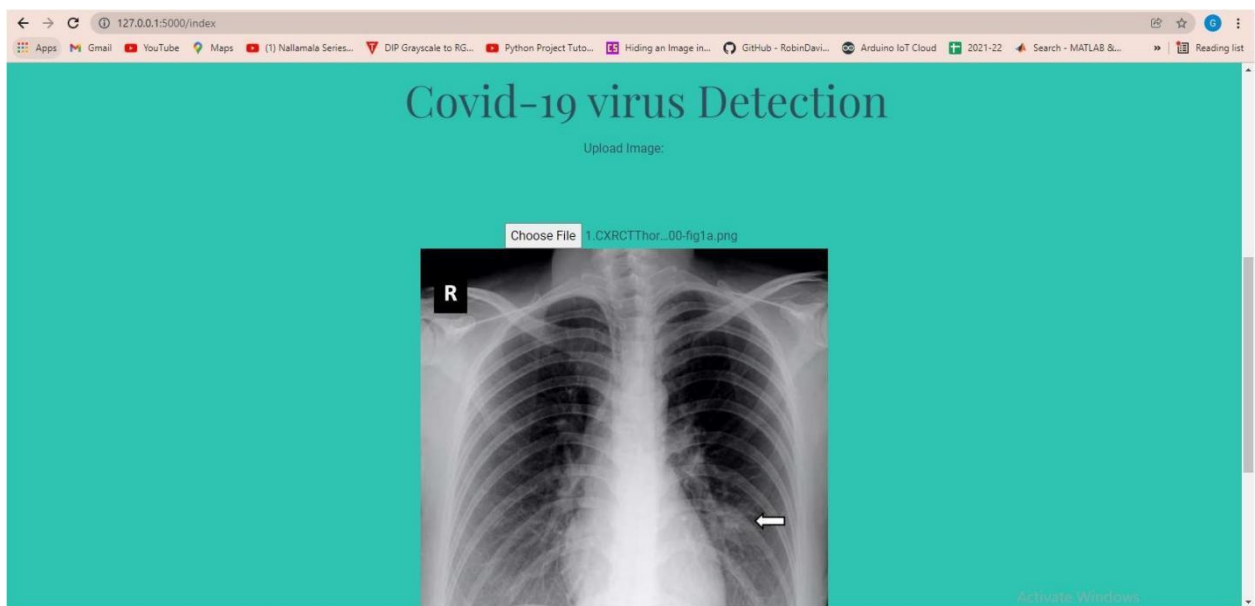
```
if __name__ == '__main__':  
    app.run(debug=True)
```

SCREEN SHOTS:









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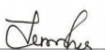
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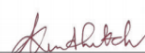
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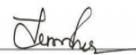
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