PANDEMIC PREDICTION USING MACHINE LEARNING(GUI Application)

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ABSTRACT

In covid-19 pandemic situation the RT-PCR test was made most compulsory for travelling, for going to public placed like gardens, gyms, school and colleges also in wedding. And after the test was done the result didn't come fast, we had done to wait atleast one complete day for the result. Therefore we though of giving some solution to this problem. So, we made our application called "Pandemic prediction using machine learning". In our project we get the result or output within few second which definitely stopped time consumption. Occurances of the covid-19 pandemic in 2020 has shaken up the modern world. It has caused societies to close, Crowded streets to become deserted and popular meeting places to die down. Currently, people all over the world are doing their best to overcome the pandemic impact on the social, medical, economic and industrial aspect of the society. Currently the main screening method for detecting covid-19 infections is reverse transcriptase-polymerase chain reaction(RT-PCR) testing.

Keywords: CNN, LSTM, VGG16, X-Ray, Tensorflow, Keras.

I. INTRODUCTION

1.1 Overview

The occurrence of the COVID-19 pandemic in 2020 has shaken up the modern world. It has caused societies to close, crowded streets to become deserted and popular meeting places to die down. Currently, people all over the world are doing their best to overcome the pandemic's impact on the social, medi- cal, economic, and industrial aspects of society. Currently, the main screen- ing method for detecting COVID-19 infections is reverse transcriptase- poly- merase chain reaction (RT-PCR) testing. In addition, patients suffering from COVID-19 can also present with abnormalities on chest X-ray images that are characteristic ofinfection This imaging modality is highly available and accessible in many clinical locations, and it is considered standard equipment in most healthcare systems. Moreover, CXR imaging is more widely available than CT imaging, especially in developing countries due to high equipmentand maintenance costs.However, X-ray analysis can be time-consuming and requires highly educated specialists to interpret. But, the use of machine learning (ML)-based methods can improve efficiency, support medics in the diagnosis of COVID-19, speed up the time to diagnosis, and lighten the al- ready burdened health care system.

1.2 Motivation

The proposed system is to develop a system that will be able to identify patient's Covid-19 based on X-ray. Early Covid-19 prediction plays an important role for improving healthcare quality and can help individuals avoid dangerous health situations before it is too late.

1.3 Objectives

Our main objective of project is to:

1. The have to minimize the distance between hospital and persons.
2. To save time and money
3. Research in this self-checkups healthcare has been extended to support mo-bile healthcare in order to improve information delivery, facilitatepatient health monitoring andn enable early disease detection. Not only could this be done through Smartphone regardless of time and place but also far greater than that this early alert could save manylives.
4. Discovering the potential alert of any possible medical condition based on commonly recognized symptoms would be advantageous to all.
5. Early diseases prediction plays an important role for improving healthcare quality and can help individuals avoid dangerous health situationbefore it is too late.

2. METHODOLOGY

We are using CNN to predict patient is covid-19 positive or negative and LSTM to predicton of the upcoming pandemics.

2.1 CNN

CNN is used for extracting features from the image. CNN- Convolutional Neural networks are specialized deep neural networks which can process the data that has input shape like a 2D matrix. Images are easily represented as a 2D matrix and CNN is very useful in working with images. CNN is basically used for image classifications and identifying if an image is a bird, a plane or Superman, etc. It scans images from left to right and top to bottom to pull out important features from the image and combines the feature to classify images. It can handle the images that have been translated, rotated, scaled and changes in perspective.

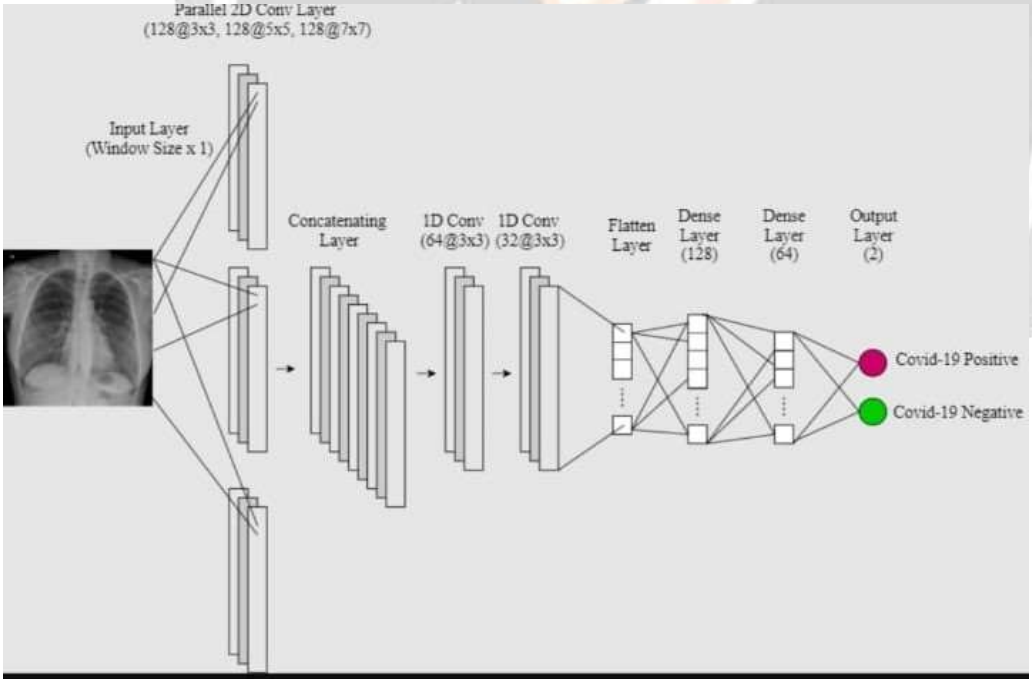

Fig. CNN Architecture

2.2 LSTM

LSTM stands for Long short-term memory; they are a type of RNN (recurrent neural network) which is well suited for sequence prediction problems. Based on the previous text, we can predict what the next word will be. It has proven itself effective from the traditional RNN by overcoming the limitations of RNN which had short term memory. LSTM can carry out relevant information throughout the processing of inputs and with a forget gate, it discards non-relevant information. LSTM will use the information from CNN to help generate a description of the image.

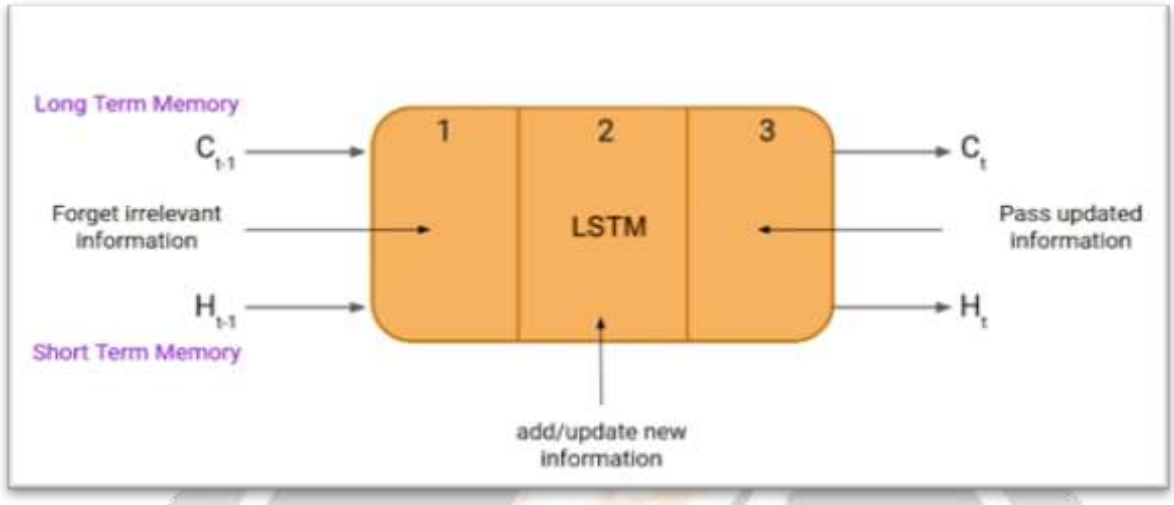

Fig. LSTM Gates

Forget Gate: -

In a cell of the LSTM network, the first step is to decide whether we should keep the information from the previous timestamp or forget it. So forgot get is used for that purpose.

Forget Gate:

- $f_t = \sigma (x_t * U_f + H_{t-1} * W_f)$

Later, a sigmoid function is applied over it. That will make ft a number between 0 and 1. This ft is later multiplied with the cell state of the previous timestamp as shown below.

$C_{t-1} * f_t = 0$ ...if $f_t = 0$ (forget everything)

$C_{t-1} * f_t = C_{t-1}$ ...if $f_t = 1$ (forget nothing)

If ft is 0 then the network will forget everything and if the value of ft is 1 it will forget nothing.

Input Gate: -

Input gate is used to quantify the importance of the new information carried by the input. Here is the equation of the input gate.

Input Gate:

- $i_t = \sigma(x_t * U_i + H_{t-1} * W_i)$

Again, we have applied sigmoid function over it. As a result, the value of I at timestamp t will be between 0 and 1.

New Information: -

- $N_t = \tanh(x_t * U_c + H_{t-1} * W_c)$ (new information)

Now the new information that needed to be passed to the cell state is a function of a hidden state at the previous timestamp t-1 and input x at timestamp t. The activation function here is tanh. Due to the tanh function, the value of new information will between -1 and 1. If the value is of Nt is negative the information is subtracted from the cell state and if the value is positive the information is added to the cell state at the current timestamp.

However, the Nt won't be added directly to the cell state. Here comes the updated equation

$C_t = f_t * C_{t-1} + i_t * N_t$ (updating cell state)

Output Gate: -

The output gate determines the value of the next hidden state. This state contains information on previous inputs. First, the values of the current state and previous hidden state are passed into the third sigmoid function. Then the new cell state generated from the cell state is passed through the tanh function. Both these outputs are multiplied point-by-point. Based upon the final value, the network decides which information the hidden state should carry. This hidden state is used for prediction.

Output Gate:

- $o_t = \sigma(x_t * U_o + H_{t-1} * W_o)$

$H_t = o_t * \tanh(C_t)$

3. SYSTEM ARCHITECTURE

The purpose of making this project called "Pandemic Prediction Using Machine Learning" is to predict the accurate Covid-19 of the patient using all their X-ray information. Using this information, there we will compare with our previous datasets of the patients and predicts the Covid-19 of the patient he/she is been through. If this Prediction is done at the early stages of the Covid-19 with the help of this project and all other necessary, measure the disease can be cured and ingeneral this prediction system can also be very useful in health industry. Also it is used for predict Covid-19 and Show the availability of vacant beds and tracking covid cases.

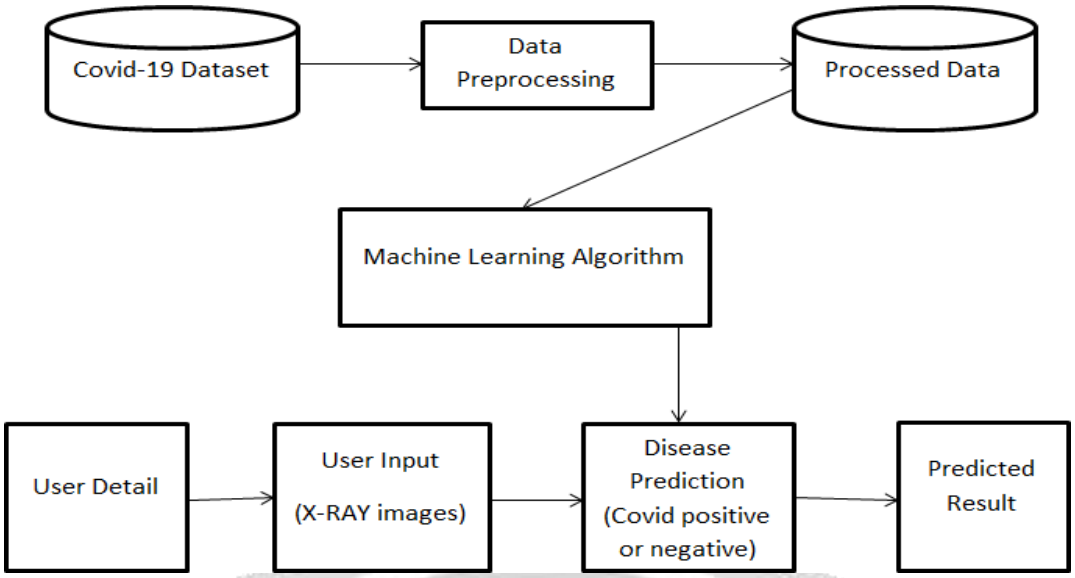

Fig: System Architecture

4. LITERATURE SURVEY: -

Technology used	**Algorithm/Library Used**	**Advantages**	**Disadvantages**
Machine Learning[2] [ICICT 2021]	Convolutional Neural Network(CNN)	1.Automatically detects the important features without any human supervisor 2.Computationaly efficient	1.CNN do not encode position and orientation of object 2.Lots of training data is required
Tensorflow[1][4]	Convolutional Neural Network(CNN)	1.Open source platform 2.scalable 3.Compitable	1.Inconsist 2.Architecture Limitation 3.GPU support
Machine Learning[1][4]	Keras	1.Easy to use 2.Provide inbuilt things	1.Problem in low-level API. 2.Slow on GPU
Machine Learning[1][4]	OpenCV	1.Reliability 2.Accuracy 3.Process in a simpler and faster way	1.Failing in image processing

5. RESULTS AND DISCUSSION

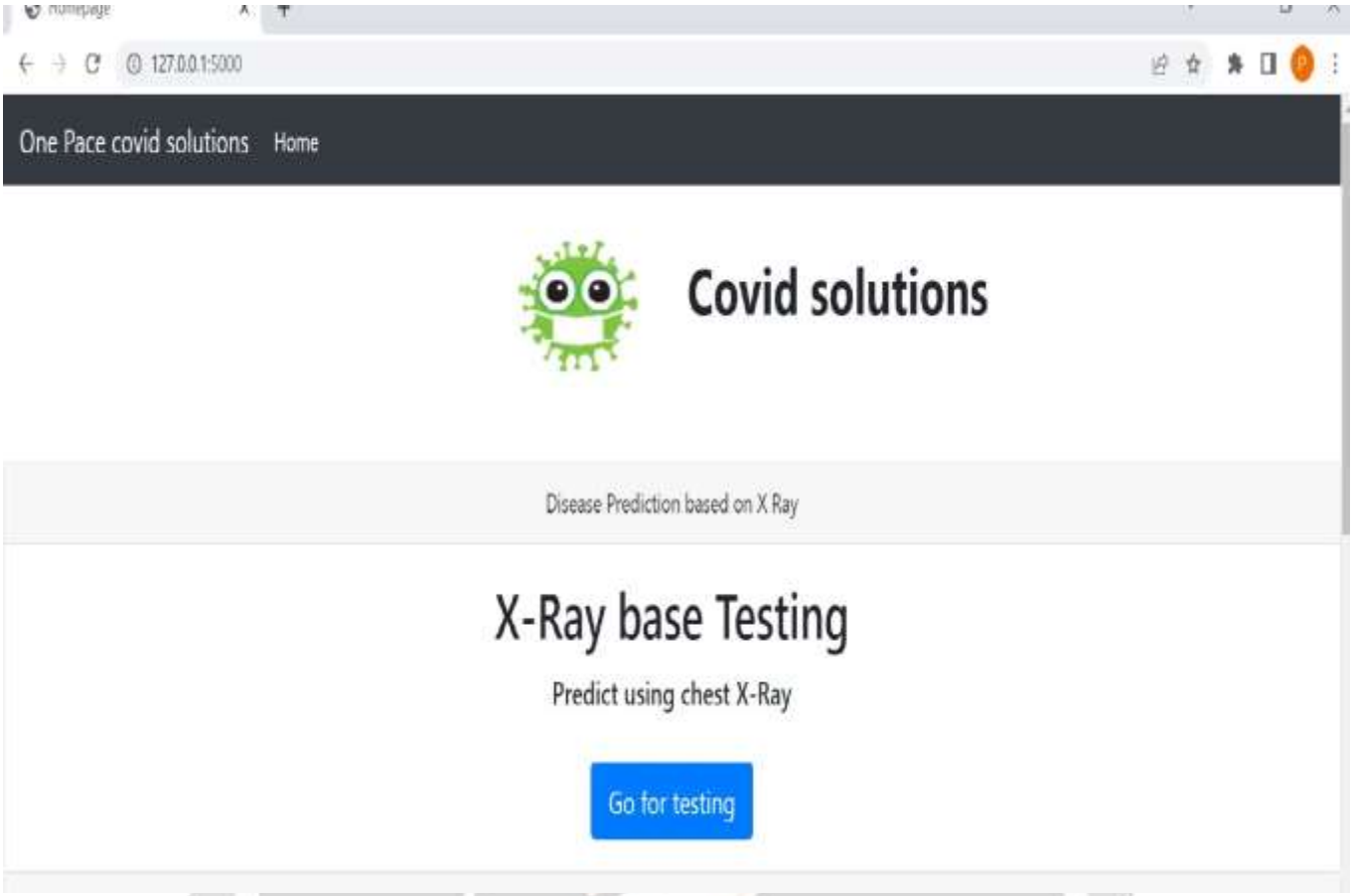

Fig-1:Main Form

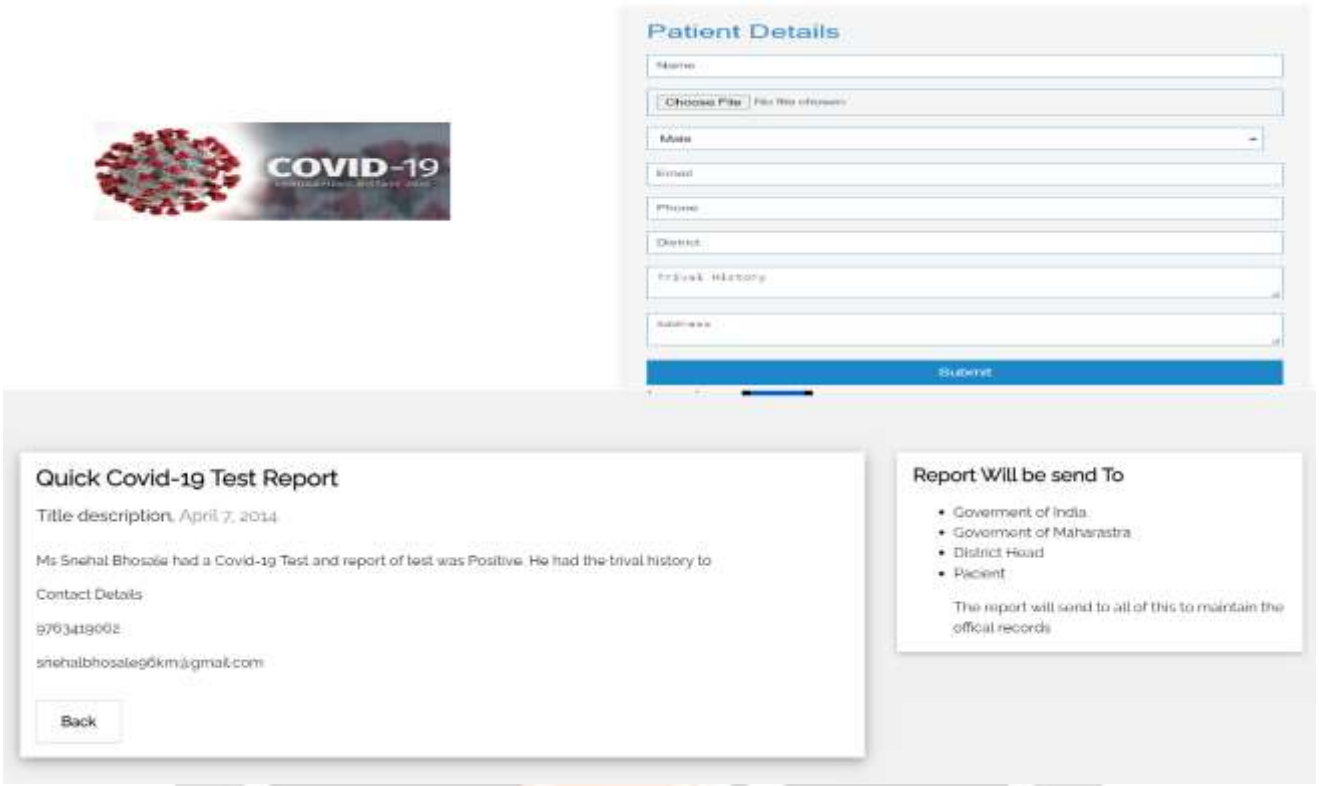

Fig-2: Checking Report

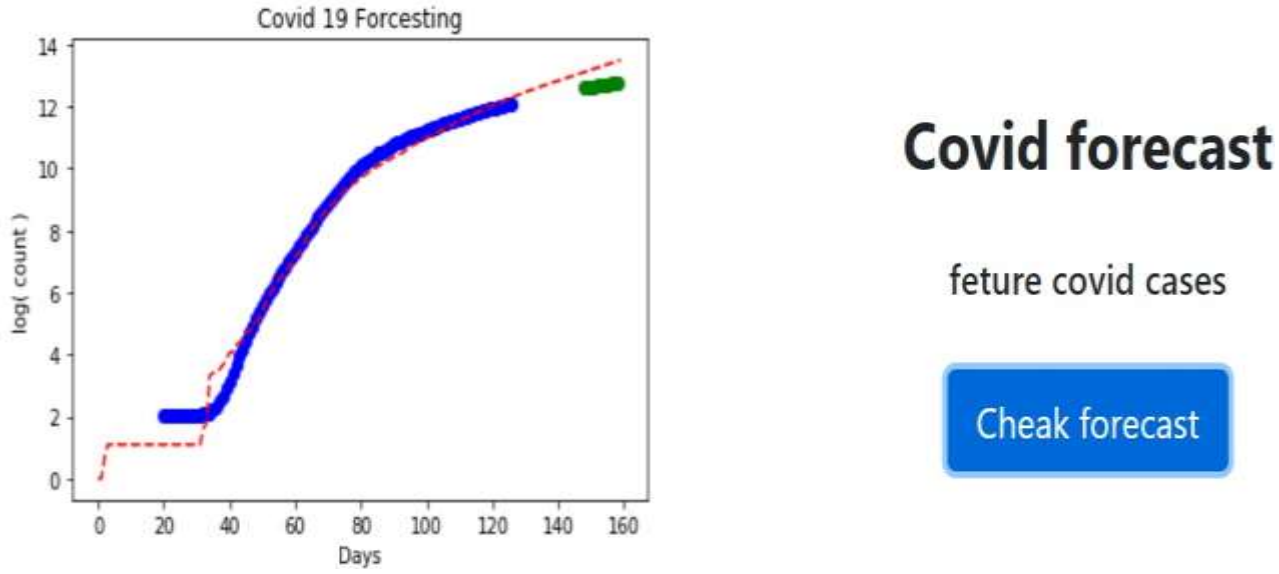

Fig-3: Covid Forecast

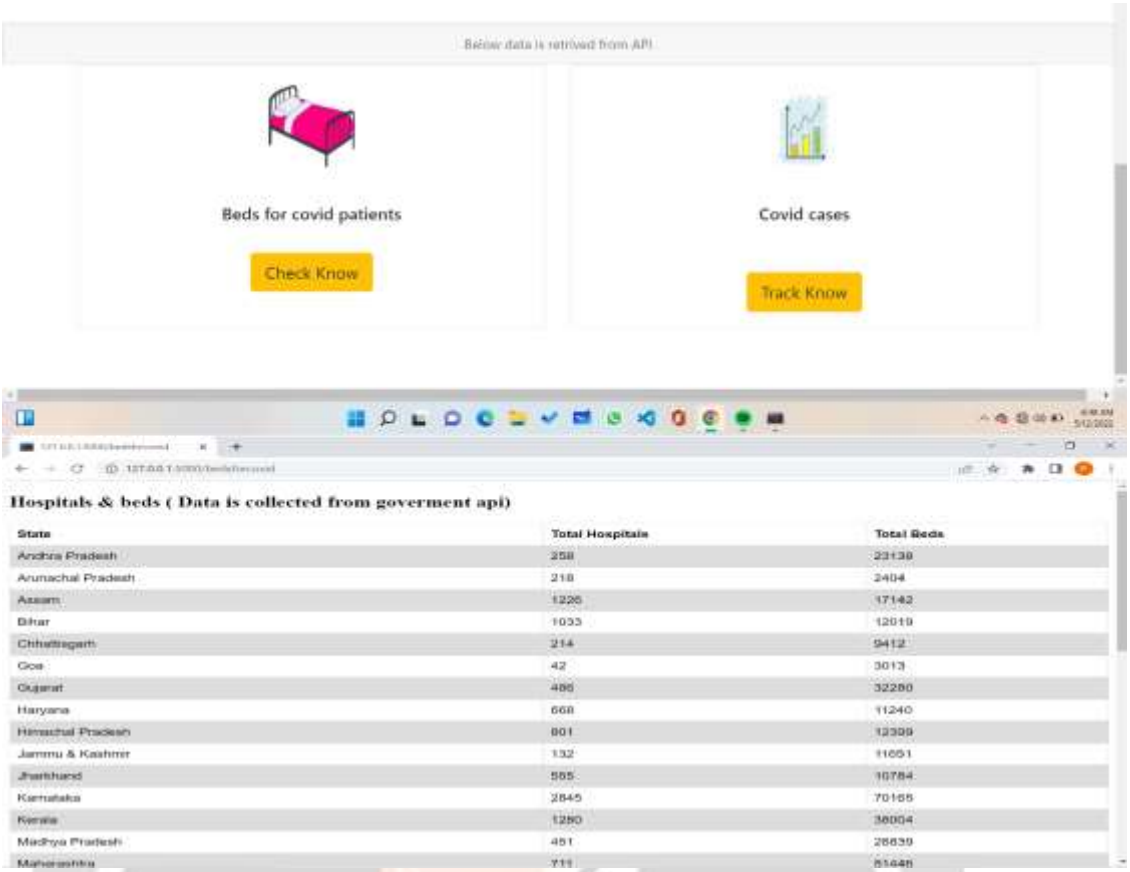

Fig-4:Checking Beds Avalibility

Case Count (Data is collected from goverment api)

Location	Confirmed Cases	Discharged	Deaths	TotalConfirmed
Andaman and Nicobar Islands	10039	9907	129	10039
Andhra Pradesh	2319756	2304978	14730	2319756
Arunachal Pradesh	64502	64201	296	64502
Assam	724220	716229	7986	724220
Bihar	830644	818329	12256	830644
Chandigarh	92190	90932	1165	92190
Chhattisgarh	1152327	1138260	14034	1152327
Dadra and Nagar Haveli and Daman and Diu	11441	11437	4	11441
Delhi	1897140	1865755	26184	1897141
Goa	245524	241626	3832	245525
Gujarat	1224593	1213467	10944	1224594
Haryana	997745	984985	10621	997759
Himachal Pradesh	284896	280705	4136	284896
Jammu and Kashmir	454125	449317	4751	454125
Jharkhand	435272	429922	5318	435272

Fig-5:Tracking Covid Cases

6. CONCLUSION

This project will be very useful for the patient. This project is more impor- tant for the health care sector, because they are the one that daily uses these systems to check the Covid-19 patients based on their X-ray information.

This system will fulfil the satisfaction of patient. This project will provide user interface which will be more user friendly. This avoids wastage of pa- tient's effort and time. We think that this machine learning model has high potential for awareness in the future

7. REFERENCES

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