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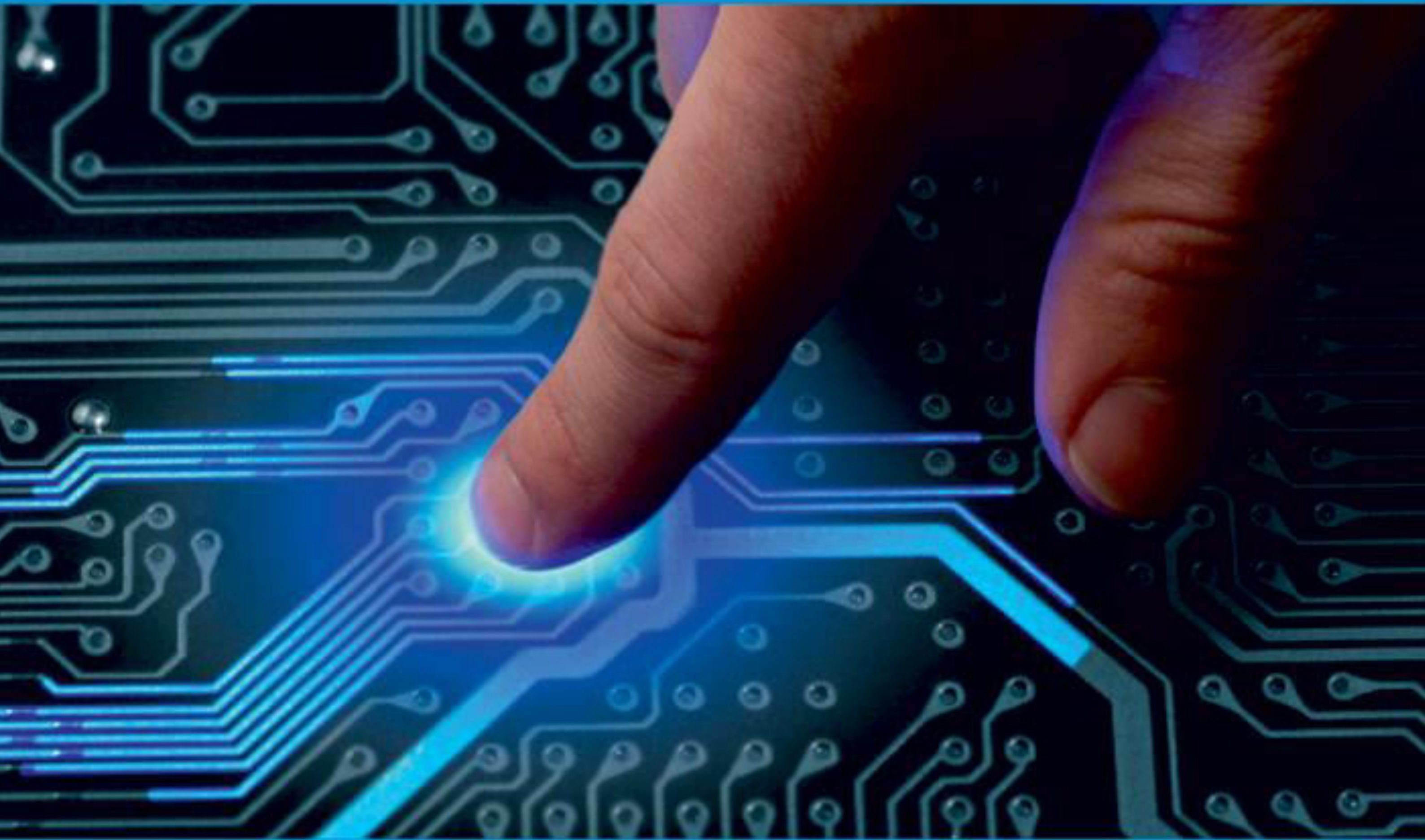

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Prediction of Covid-19 Using Genetic Deep Learning in KERAS

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ABSTRACT:-Coronavirus illness is rapidly spreading. COVID-19 causes server pneumonia and is expected to have a significant impact on the healthcare sector. An urgent requirement for early diagnosis is necessary for exact treatment, reducing the strain on the health-care system. Computed Tomography (CT) scans and chest X-rays are two examples of routine image diagnostics (CXR). Despite the fact that a CT scan is considered the gold standard in diagnosis, CXR is the most commonly utilised since it is more widely available, quicker, and less expensive. Using CXR pictures, this study attempts to give a method for detecting pneumonia caused by COVID-19 and healthy lungs (normal individual). Deep learning is one of the notable approaches for extracting a high-dimensional feature from medical pictures. The cutting-edge methodologies employed in this study include Genetic Deep Learning Convolutional Neural Networks (GDCNN). It is trained from the ground up to extract features for identifying COVID-19 and normal photos. For identifying pneumonia, normal, and other pneumonia illnesses, a dataset of over 5000 CXR image samples is employed. Training a GDCNN from scratch demonstrates that the proposed method outperforms previous transfer learning techniques. In COVID-19 prediction, classification accuracy of 98.84 percent, precision of 93 percent, sensitivity of 100 percent, and specificity of 97.40 percent are attained. This study's top classification accuracy indicates the best nominal rate in the identification of COVID-19 illness prediction in an imbalanced setting. The innovative classification model suggested outperforms current models such as ReseNet18, ReseNet50, Squeezenet, DenseNet-121, and Visual Geometry Group (VGG16).

KEYWORDS: Genetic Deep Learning Convolutional Neural Network (GDCNN), Computed Tomography (CT), Chest X-Ray (CXR), Artificial Intelligence (AI).

1. INTRODUCTION

A novel Coronavirus known as Severe Acute Respiratory Syndrome has been formally designated. Coronavirus-2 (SARS-COV-2) is to blame for Coronavirus Disease 2019. (COVID-19). COVID-19 symptoms include cough, fever, respiratory system sickness, and, in certain cases, pneumonia. Pneumonia is generally defined as an illness that causes inflammation of the air sacs present in the lungs for oxygen transport. Fungi, bacteria, and other viruses can also cause pneumonia. The cause of the severity is chronic illnesses such as bronchitis or asthma, an impaired or weak immune system, smoking, and ageing persons. Infected persons are treated based on the infected organism; nevertheless, cough medication, pain relievers, fever reducers, and antibiotics are provided to patients based on their symptoms. If the patient is badly afflicted, they must be hospitalised and treated in the Intensive Care Unit (ICU) if a ventilator is required for breathing.

COVID-19 has become a pandemic due to its severity and rapid spread. The greater effect in the health care area is mostly due to the increasing number of persons impacted on a daily basis, as well as the requirement to provide mechanical ventilation for critical patients admitted to ICU. As a result, the number of ICU beds must be significantly raised. In the aforementioned case, early identification is critical for effective treatment, which lessens the strain on the health-care system.

AI represents a significant advance in the diagnosis of COVID-19 and other kinds of pneumonia. Pneumonia is diagnosed using basic imaging techniques such as a computed tomography (CT) scan and a chest X-ray (CXR). CXR is the major source for assessing pneumonia since it leads to misdiagnosis and lacks accuracy. However, CXR is employed because it is less expensive, exposes patients to less radiation, is quicker, and is widely available in all health care systems. Identification of pneumonia is a difficult assignment since the reviewer must look at the white patches in

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the lungs and most of the air sacs are filled with water or pus, making it difficult to distinguish between bronchitis and TB. This section describes the classification merging in our work. Furthermore, the background of data imbalances is examined.

II. RELATED WORK

An in-depth examination of several picture categorization approaches is carried out. Furthermore, the existing DCNN models utilised for COVID-19 prediction utilising CT and CXR images were addressed. The study is presented in terms of prediction model accuracy. A thorough investigation is carried out on the automation of the DCNN architecture for image searching and classification.

Nanni et al. (2010) evaluated handmade texture descriptors obtained from Local Binary Pattern (LBP) utilised in medical applications. Elongated Quinary Pattern (EQP), Local Ternary Pattern (EQP), and Elliptical Binary Pattern (EQP) are three distinct LBP evaluators (EBP). These descriptors are used in a variety of medical applications, such as the categorization of cell phenotypic images using a 2D-hela dataset. Pain expression detection using a COPE database face picture and the Papanicolaou test for cervical cancer diagnosis. Data is gathered from Herlev University, which contains 917 photographs captured using a microscope and a digital camera. Support Vector Machine (SVM) is used to validate the EQP descriptor and outperforms all other methods. In 2010, Parveen et al. performed a texture analysis on pictures utilised in radiation applications. Based on radiation medical pictures, the mathematical approach

III. METHODOLOGY

a. Proposed Method:-

An autonomous and continuous learning approach for creating a DCNN architecture on the fly is proposed. The operation of dividing DCNN into multiple weighted fully connected and meta convolutional blocks is included in the process. Each block has operations such as pooling, convolution, batch normalisation, dropout, completely connection, and activation. As a result, the DCNN architecture is converted into a normal integer code. To develop the population for the DCNN architecture, genetic operations like as selection, crossover, and mutation are used. Individual populations are growing and progressing as a result of the suggested genetic DCNN design. Furthermore, encoding is carried out using a suitable DCNN architecture. The population is randomly initialised using a random function, and the fitness of each individual is computed depending on the performance of genetic DCNN encoding utilised for specific image detection challenges. A new generation is conducted on the basis of the current generation, employing genetic operations such as selection, crossover operator, and mutation to improve overall fitness values. The evolution is carried out iteratively, generation after generation, until the conditions are met or a specific generation number is reached.

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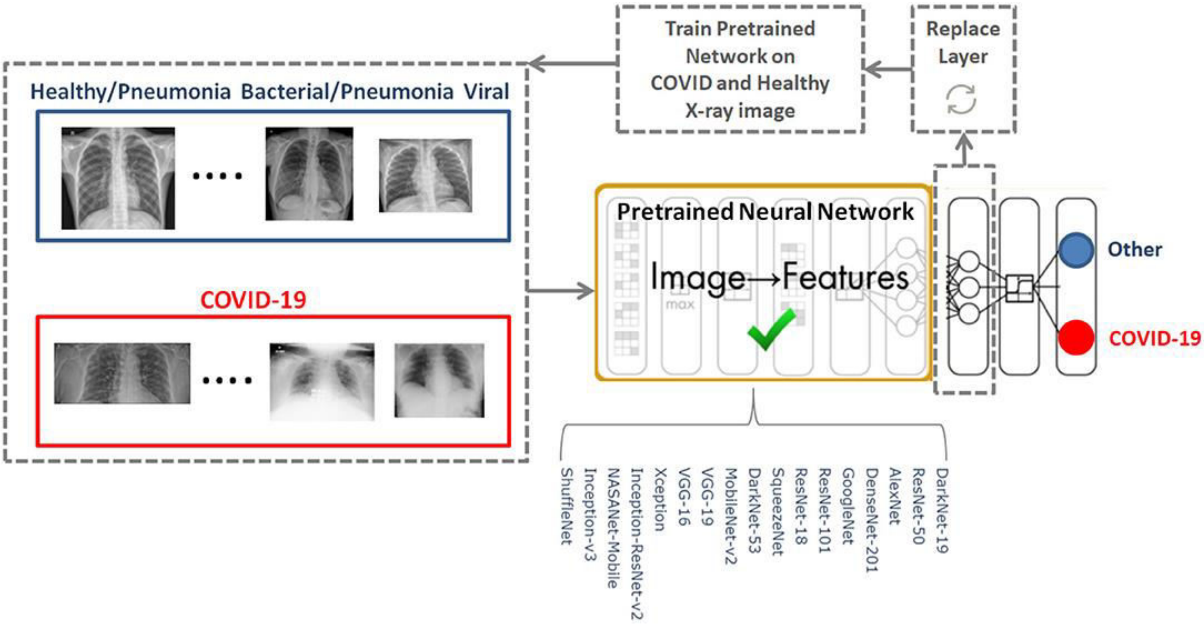

Fig 1: Architecture Diagram

This system will be Useful for Monitor Many Geographical Locations i.e. Offices, Schools, Libraries, Templates, etc. The architecture of the system is as shown in Figure.1.

b. Proposed Algorithm:-

Algorithm 1 Genetic Deep Learning Convolution Neural Network_

Algorithm Input: 500 chest x-ray images (collection of images, training and test data).

Output: Accuracy, sample loss, val_loss, val_acc.

Step 1: Initialization Input the 5000 chest x-ray images (training and test data)

Step 2: Create random operation Batch Normalization process

Step 3: Feed population to Convolution neural network Activation, conv2D (512, (3 x 3), padding = same, usebias = false) maxpooling (pool size = (3,3)) Dropout)

Step 4: Train GDCNN and get its fitness modelfit:generator(datagen.flow(x train, y train, batch size = batch = size), steps per epoch = x train, shape[0](batch size, epoch = epochs, validation data epochs, validation data = (x test, y test), shuffle = true, callbacks = [plot]

Step 5: selection, crossover, mutation Activation, conv2D (512, (3 x 3), padding = same, use bias = false) maxpooling (pool size = (3,3) Dropout)

Step 6: New populations train GDCNN and get its fitness Evaluate solution based on fitness value.

Step 7: Check optimal solution based of fitness function If (optimal solution == fitness value) Optimal solution obtained

Step 8: Fitness value (optimal solution) Return optimal solution

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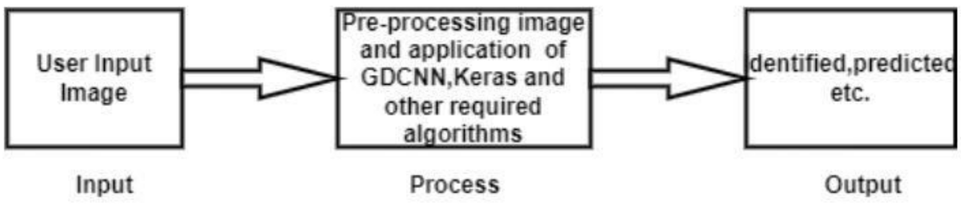
Mathematical Model:



- Set Theory:

S = s, I, O, F, e, V

Where

s = Start of program

I = I1, I2

I1 = image of the CXR

I2 = location if required

O = O1, O2

O1 = Detection of COVID-19 affected if any.

O2 = Solution if disease detected and yield prediction.

F = F1

F1 = COVID-19 prediction detection

E = end of program

V = Failures and success conditions

Success if:

- Prediction detected accurately.
- COVID-19 positive detected accurately if there's any of it.
- Accurate yield prediction.

Failure if:

- More time consumption by the system.
- Hardware failure.
- Software failure.
- Improper network connection.

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IV. EXPERIMENTAL SETUP

To system needs a computer and we required OS to be installed (i.e. Windows, Ubuntu). The computer this software going to be installed on a need to have Python 3.9 or above, Windows 7. On that windows platform Python 3.9 will be installed and that will be the platform on which the particular software will be run. As well as we required MySQL for the database and python installer. This system works as a website and it is required a web browser to run the system build.

V. RESULT

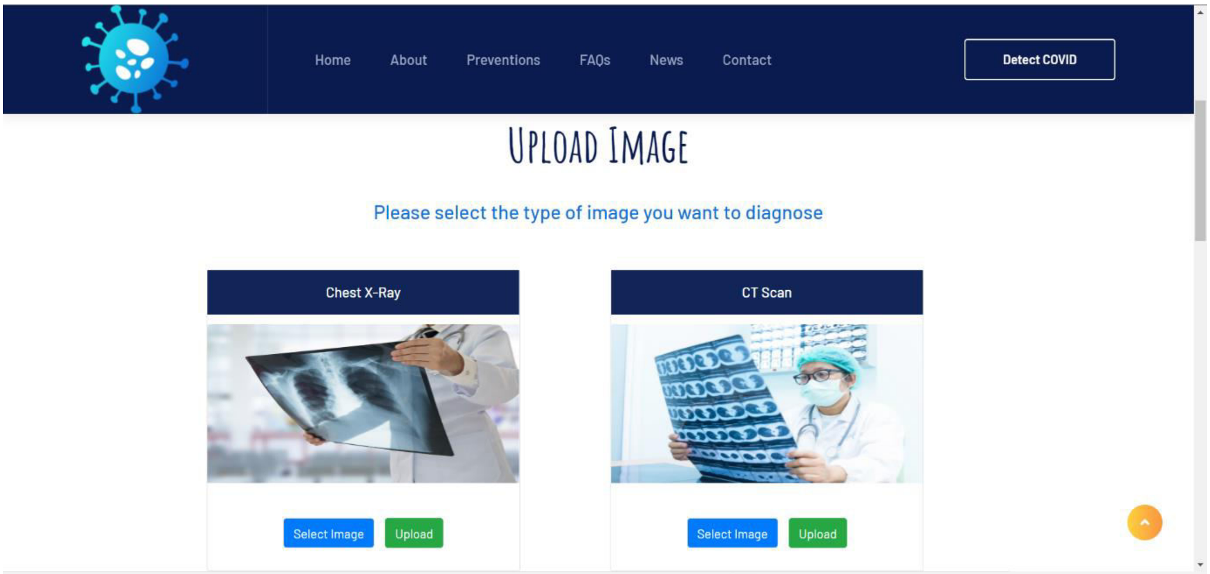

Figure 2: Upload file page

Figure 2 shows the upload file window. Users can upload X-ray or CT-Scan image. The user must select a file from the device and then click on the upload button.

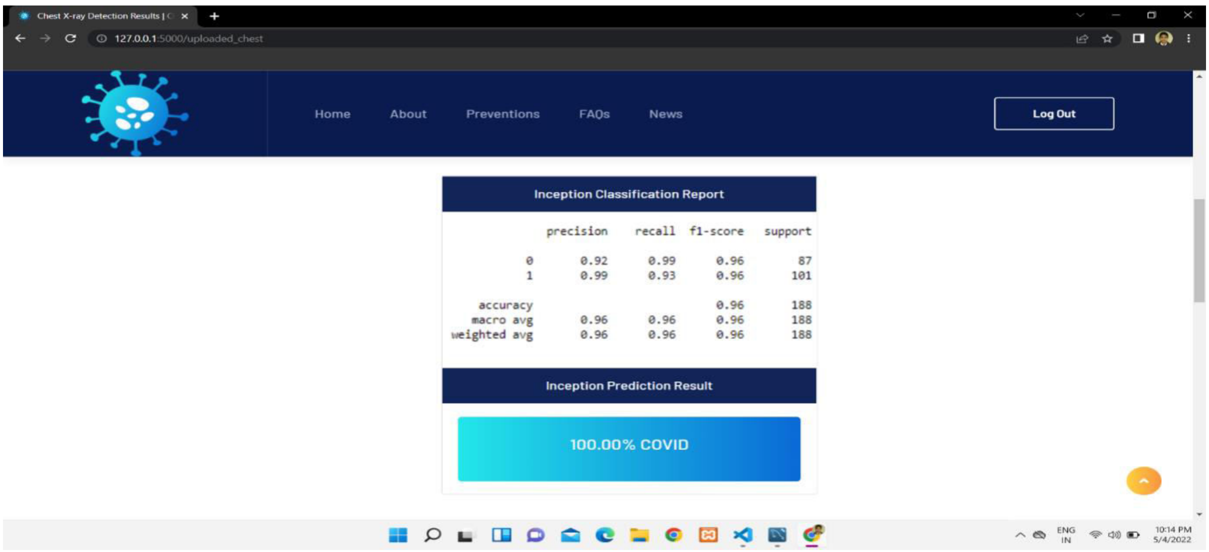

Figure 3: Result of Detection

Figure 3 shows the output in which shows the predicted result for COVID-19.

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VI. CONCLUSION AND FUTURE WORK

The GDCNN approach is presented for categorising COVID-19 and normal people using CXR image data. More than 5000 picture samples of pneumonia, healthy lung images, and various pneumonia illnesses are gathered from the publicly available collection. The suggested technique achieves an F1-score of 0.96337 and a val-accuracy of 0.99 (99.00.05). The primary goal of the study is to improve the accuracy of COVID-19 prediction in the early stages of diagnosis and to aid patients in need of therapy sooner. Because the GDCNN tool is housed in the cloud computing environment, the organisation may utilise this model for early COVID-19 prediction. This technique can help the health-care system detect illnesses early.

In the future, we intend to apply this strategy to a large-scale database to improve the accuracy of hierarchical categorization.

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