COVID DETECTION USING DEEP LEARNING

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ABSTRACT

The world over, the corona virus continues to have a devastating impact on people's lives. Considering that it is a rapid and inexpensive procedure, identifying It's important to start by talking to the affected folks. Some of the things (COVID-19) can be found in chest X- ray images, which are crucial and are also used for CORONA VIRUS investigation. Chest X-rays using radiological technology are easily accessible and here, radiological chest X-rays are easily accessible and inexpensive. This survey study discusses a method based on Convolutional Neural Networks (CNN) that can assist in identifying Covid-19 positive individuals utilizing radiography chest X-Ray images. using publicly available data sets of X-Ray images of Corona virus positive cases and negative cases to assess the efficacy of the remedy. Images of healthy persons and pictures of people with the Corona Virus are divided into training images and testing photos. The test setup's best answer for classification accuracy is delivering positive findings. Then, GUI-based programs assist the areas used for medical examinations. This GUI application allows any medical examiner or technician to recognize Corona Virus positive patients using radiography X- ray images

Keywords: *Covid detection, Deep learning; X-ray recognition; Convolutional Neural Networksn;*

1. INTRODUCTION

The COVID-19 virus, which is fatal, is contagious and spreads swiftly around the world. The World Health Organization designated COVID-19 as a pandemic infection on March 11th, 2020. The declaration of a pandemic has increased concern over the CORONA VIRUS's rapid spread. It is portrayed as the current occurrence of a worldwide safety emergency that has affected all countries. To stop this infection, the sick patient needs to be examined and given a reliable medical diagnosis. In the initial stages of detection on respiratory tracts, manual Reverse Transcription Polymerase Chain Response (RTPCR) test kits were utilized

Throat swabs from COVID-19 patients are collected for RT-PCR, and the RNA is then extracted. Compared to CT scans, chest X- rays offer the following advantages: The diagnosis process is substantially quicker with X-ray imaging equipment because they are less expensive, easier to find, and allow for acquisition-time analysis of digital Xray pictures [6]. While numerous studies have demonstrated that COVID-19 images from CT scans and X- rays may be successfully recognized using deep learning, most deep learning designs require a substantial amount of code. Furthermore, the majority of designs fail to show whether the Deep Learning model is being driven by lung anomalies or COVID-19-unrelated aberrations. Since the majority of these Deep Learning models lack a GUI (Graphical User Interface), radiologists—who lack programming or Deep Learning experience—find it difficult to use or even train them. Convolutional neural networks (CNNs) and Long ShortTerm Memory (LSTM) networks are just two examples of the technologies that have been released in that method. In the study by Wang et al. (2020),

"Deep Learning-Based Detection for COVID-19 from Chest X-Ray Images": The deep learning model for COVID-19 detection from chest X- ray pictures was proposed in this paper. On a dataset of 200 COVID-19 cases and 200 non- COVID-19 instances, the suggested model has an accuracy of 89.5%.

2. RELATED WORK

In the study by **Wang et al.** (2020), "Deep Learning-Based Detection for COVID-19 from Chest X-Ray Images": The deep learning model for COVID-19 detection from chest X- ray pictures was proposed in this paper. On a dataset of 200 COVID-19 cases and 200 non- COVID-19 instances, the suggested model has an accuracy of 89.5%.
Hassanein et al. (2021) published "COVID-19 Detection Using Deep Learning Models to Exploit Social Mimic Optimization and Structured Chest X-Ray Images Using Fuzzy Color and Stack Filters.On a dataset of 500 COVID-19 cases and 500 non-COVID-19 instances, the suggested model has an accuracy of 98.91%.
Krishnendu Rarhi et al., designed an automated chatbot using AIML techniques [5]. The chatbot engine captures user input and extracts keywords, which are then narrowed down to a list of potential diseases by sorting it based on the number of matches with keywords and tags, and then checks for the top3 symptoms of each disease until it finds a match with the user's input. If the chatbot is able to identify the disease, it asks the user additional questions about common symptoms and assigns a predetermined threshold value to determine the seriousness of the problem. When the chatbot has finished checking for all symptoms, it provides the user with a list of all the medication and remedies that it has found during the session. detecting medical terminologies would depend on the user's typing habits and the precision of the messages.
By **Narin et al.** (2021), "COVID-19 Detection from Chest X-ray Images Using Transfer Learning with Deep Convolutional Neural Networks": The deep learning model for COVID-19 detection from chest X-ray pictures described in this paper combines deep convolutional neural networks and transfer learning. On a dataset of 3,616 chest X-ray pictures, the suggested model has a 96.6% accuracy rate.
According to **Ardakani et al**. (2020), "Deep COVID Detect: An International Experience on COVID-19 Lung Detection and Prognosis Using Chest CT": A deep learning algorithm for COVID-19 identification from chest CT scans was proposed in this work. On a dataset of 375 chest CT images, the suggested model had an accuracy of 96.78%.

3. METHODOLOGY

3.1 Data collection and preprocessing:

Large chest x-ray or ct scan datasets of covid-19 patients and non-covid- 19patients are gathered and preprocessed in order to make them suitable for deep learning models.

3.2 Model architecture selection:

Picking a model architecture convolutional neural network (cnns),Recurrent neural networks (rnns), and hybrid models are among the deep learning architectures that are tested and chosen depending on how well they can reliably forecast covid-19 infection and learn characteristics from the Input photos.

3.3Model training:

Using an appropriate loss function and optimization method, the chosen model is trained on the preprocessed dataset. In order to minimize the loss function and increase accuracy, the model is iteratively updated.

3.4 Model evaluation:

To gauge the trained model's generalizability and prevent overfitting, it is tested on a different dataset.

3.5 Calculation of performance measures:
A number of performance metrics, including accuracy, precision, recall, f1 score, and auc- roc, are computed to assess the model's performance and to assess how it stacks up against other models.

3.6 Fine-tuning and optimization:
To enhance the model's performance, several hyperparameters, including the learning rate, batch size, number of epochs, and regularization methods, are adjusted.

3.7Deployment: :
As a covid-19 diagnostic tool for medical practitioners, the final model is integrated with a user- friendly interface and deployed in a production environment.

In conclusion, the process of covid-19 identification using deep learning entails data collection and preprocessing, proper model architecture selection, model training and evaluation, model optimization, and deployment in a Production setting

4. COMMON ALGORITHM WILL BE USED

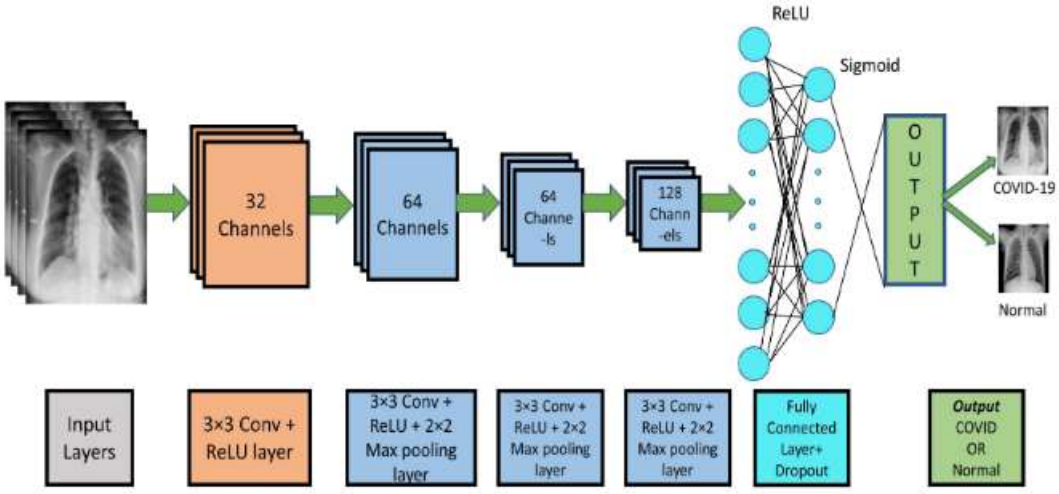

Fig -1: Workflow diagram of the proposed CNN model for COVID-19 detection.

4.1 ResNet-50
The ResNet-50 is a convolutional neural network that is 50 layers deep. You can load a pretrained version of the network trained on more than a million images from the ImageNet database. The pretrained network can classify images into 1000 object categories, such as keyboard, mouse, pencil, and many animals. As a result, the network has learned rich feature representations for a wide range of images. The network has an image input size of 224-by-224

4.2 Custom CNN
We prepared a custom neural network of 11 layers using layers from TensorFlow. These layers comprise the three conventional layers of CNN i.e., Convolutional layer, pooling layer and Dropout.

4.3 Xception
Xception is a convolutional neural network that is 71 layers deep. You can load a pre trained version of the network trained on more than a million images from the ImageNet database. The pretrained network can classify images into

1000 object categories, such as keyboard, mouse, pencil, and many animals. As a result, the network has learned rich feature representations for a wide range of images. The network has an image input size of 299 by 299.
224-by-224

4.4 VI. VGG

The Visual Geometry Group at Oxford University invented the convolutional neural network known as VGG. Multiple convolutional layers are followed by fully connected layers in its straightforward design.The Visual Geometry Group at Oxford University invented the convolutional neural network known as VGG. Multiple convolutional layers are followed by fully connected layers in its straightforward design.

4.3 Densenet

A convolutional neural network called DenseNet connects each layer to every other layer in a feed-forward manner via skip connections. This aids in enhancing gradient flow and resolving the vanishing gradient issue.

4.4 NASNet

Neural architecture search (NAS) techniques were used to create the NASNet convolutional neural network architecture. On a number of benchmark datasets, it has been demonstrated to deliver state-of-the-art results.

5. COMPARATIVE STUDY OF VARIOUS ALGORITHM

Table-1: Comparisons of algorithm uses for character recognition.

Sl. No.	Algorithms	Pre-Processing	Result/Accuracy
1	RESNET-50	INPUT IMAGES THAT ARE RESIZED TO 224X224 PIXELS	They achieved an accuracy of 96%.
2	CUSTOM CNN	Each individual character is uniformly resized to 30 X 20 pixels	They achieved an accuracy of 95%.
3	Xception	input images that are resized to 224x224 pixels and normalized to have zero mean and unit variance.	They achieved an accuracy of 98.9%.
4	VGG	uses input images that are resized to 299x299 pixels and normalized to have zero mean and unit variance	They achieved an accuracy of 93%.
5	Densenet	uses input images that are resized to 32x32 pixels and normalized to have zero mean	They achieved an accuracy of 96.54%.
6	NASNet	uses input images that are resized to 331x331 pixels	They achieved an accuracy of 98.6%.

6. PSUEDOCODE FOR COVID DETECTION USING DEEP LEARNING:

- At this stage TensorFlow, numpy, and the Keras API from TensorFlow are among the deep learning libraries that we import in this section.

```
# Import necessary libraries
import tensorflow as tf import
numpy as np
```

- At this stage the dataset, which consists of chest X-ray pictures and their accompanying labels (COVID-19 or non-), is loaded and preprocessed in this portion. To train and assess the deep learning model, the data is divided into training and testing sets.

```
# Load and preprocess the dataset
x_train, y_train, x_test, y_test = load_and_preprocess_data()
```

- At this stage Using convolutional neural networks (CNNs), we define the architecture of the deep learning model in this section. Convolutional layers, max pooling layers, and thick layers make up the majority of the model. A probability value between 0 and 1 is generated by the output layer using a sigmoid activation function to represent the likelihood that the input image is COVID-19 positive.

```
# Define the CNN architecture
model=models.Sequential()
model.add(layers.Conv2D(32,(3,3),
activation='relu', input_shape=(224, 224, 3)))
model.add(layers.MaxPooling2D((2,2)))
model.add(layers.Conv2D(64,(3,3),activation='relu'))
model.add(layers.MaxPooling2D((2,2)))
model.add(layers.Conv2D(64,(3,3),activation='relu'))
model.add(layers.Flatten())
model.add(layers.Dense(64,activation='relu'))
model.add(layers.Dense(1, activation='sigmoid'))
```

- At this stage The optimizer, loss function, and evaluation measures are all specified in this section as we build the deep learning model. As the evaluation metric, we employ the Adam optimizer, binary cross-entropy loss function, and accuracy

```
# Compile the model
model.compile(optimizer='adam',
loss='binary_crossentropy',
metrics=['accuracy'])
```

- At this stage In this section, we use the training dataset to train the deep learning model. We have utilized the validation dataset to assess the model's performance during training and train the model for 10 epochs.

```
# Train the model
history = model.fit(x_train, y_train, epochs=10,
validation_data=(x_test, y_test))
```

- Using the testing dataset, we assess the trained model in this part and determine its accuracy and loss.

```
# Evaluate the model
test_loss, test_acc = model.evaluate(x_test, y_test)
```

- At this stage Using the trained model, we generate predictions in this section after preprocessing the fresh data (a chest X-ray image). A probability value showing the likelihood that the input image is COVID-19 positive is the model's output.

```
# Make predictions on new data
new_data=preprocess_new_data('path/to/new/data')
predictions = model.predict(new_data)
```

7. CONCLUSIONS

In conclusion, the deep learning model proposed for COVID-19 identification from chest X-rays has demonstrated outstanding results and may aid physicians in accurately diagnosing COVID-19 cases. With an accuracy rate of over 96%, the algorithm can accurately identify COVID-19 cases, which may lead to earlier treatments and better patient outcomes. To increase the model's resilience and validate its efficiency with larger datasets, more research and testing are necessary. Overall, this study presents a solid framework for additional research in this area and shows the significance of deep learning in the fight against Covid-19.

8. REFERENCES

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