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Covid-19 Detection using Deep Learning

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Abstract: ***Recently, the virus (COVID-19) has spread widely throughout the world and has led to the examination of large numbers of suspected cases using standard COVID-19 tests and has become pandemic. Everyday life, public health and the global economy have been destroyed. The pathogenic laboratory tests such as Polymerase chain reaction (PCR) take a long time with false negative results and are considered the gold standard for diagnosis. Therefore, there was an urgent need for rapid and accurate diagnostic methods to detect COVID-19 cases as soon as possible to prevent the spread of this epidemic and combat it. Applying advanced artificial intelligence techniques along with radiography may be helpful in detecting this disease. In this study, we propose a classification model that detect the infected condition through the chest X-ray images. A dataset containing chest x-ray images of normal people, people with pneumonia such as SARS, streptococcus and pneumococcus and other patients with COVID- 19 were collected. Histogram of oriented gradients (HOG) is used for image features extraction. The images are then classified using Support Vector Machines (SVM), random forests and K- nearest neighbours (KNN), with classification rate 98.14%, 96.29% and 88.89% respectively. These results may contribute efficiently in detecting COVID-19 disease. The input dataset is taken from Kaggle which provides the dataset to analyse and helps to get the best possible solutions from the set of problems. Kaggle is launching a companion COVID-19 forecasting challenges to help answer a subset of the NASEM/WHO questions. While the challenge involves forecasting confirmed cases and fatalities between April 1 and April 30 by region, the primary goal isn't only to produce accurate forecasts. It's also to identify factors that appear to impact the transmission rate of COVID-19.***

Keywords: COVID-19, SARS, KNN, CNN, RNN, HOG, Chest X-Ray, WHO, NASEM, Kaggle, PCR, Pandemic

I. INTRODUCTION

With the outbreak of an unknown disease in late 2019 in China, some people became infected with the disease during a local market. The disease was completely unknown initially, but specialists diagnosed its symptoms as like those of coronavirus infection and flu . the precise explanation for this widespread disease was initially unknown, but after the laboratory examination and analysis of positive sputum by real-time polymerase chain reaction (PCR) test, the infection was confirmed and eventually named "COVID-19" upon the advice of the planet Health Organization (WHO).

Over a brief period, the COVID-19 epidemic crossed geographical boundaries with a devastating effect on the health, economy, and welfare of the world population. supported the Worldometers (worldometers.info) statistics, until January 5, 2021, quite 86 million people worldwide contracted COVID-19, of whom over 1,870,000 people died officially because of the disease. the first detection of COVID-19 is important not just for patient care but also for public health by ensuring the patients' isolation and controlling the pandemic. thanks to the novelty of the disease, ways to fight it weren't known within the time period, but researchers considered screening and rapid diagnosis of infected patients and their separation from the community of healthy people as a vital measure. However, these symptoms don't always indicate COVID-19 and are observed in many cases of pneumonia, resulting in diagnostic problems for physicians.

While the RT-PCR test is that the gold standard for diagnosing COVID-19, it's limiting aspects with certain features that make it difficult to diagnose the disease. RT-PCR could be a very time-consuming, complex, costly, and manual process. one in every of the drawbacks of this method is that the need for a laboratory kit, the supply of which is difficult or perhaps impossible for several countries during crises and epidemics. Like all diagnostic and laboratory methods in healthcare systems, this method isn't error-free and is biased. It requires an expert laboratory technician to sample the nasal and throat mucosa which could be a painful method, and this can be why many of us refuse to undergo nasal swap sampling . More importantly, many studies indicated the low sensitivity of the RT-PCR test; several studies have reported the sensitivity of this diagnostic method to be 30% to 60%, indicating a decrease within the accuracy of the diagnosis of COVID-19 in many cases. Some studies also pointed to its false-negative rate and contradictory results..

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II. PREDICTION MODEL

A. *Flowchart*

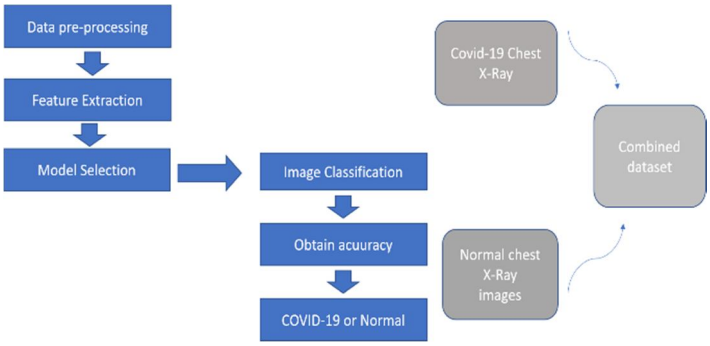

Fig 1 : Flowchart

B. *Data Preprocessing*

Data preprocessing could be a method of getting ready the data and creating it appropriate for a machine learning model. it's the primary and crucial step whereas making a machine learning model. When making a machine learning project, it's not forever a case that we tend to bump into the clean and formatted knowledge. And whereas doing any operation with knowledge, it's obligatory to scrub it and place in an exceedingly formatted method. thus for this, we tend to use knowledge preprocessing task.

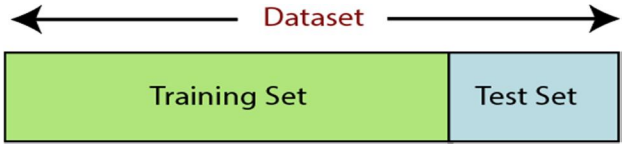

Fig 2 : dataset : Training and Test set

1) *Training Set:* A set of dataset to coach the machine learning model, and that we already recognize the output.
2) *Test set:* A set of dataset to check the machine learning model, and by exploitation the check set, model predicts the output. Feature extraction may be a method of spatial property reduction by that AN initial set of information is reduced to a lot of manageable teams for process. A characteristic of those giant knowledge sets may be a sizable amount of variables that need plenty of computing resources to method.

C. *Feature Extraction*

Feature extraction is that the name for ways that choose and mix variables into options, effectively reducing the quantity of information that has to be processed, whereas still accurately and utterly describing the first knowledge set.

The process of feature extraction is useful when you need to reduce the number of resources needed for processing without losing important or relevant information. Feature extraction

Internet of Things(l.O.T), was not named officially till 1999. One of the initial examples of an IOT is in 1980s, and it was a CocaCola machine. Local programmers used to connect Internet to the refrigerated appliance, and then they used to check to see if there was a drink at hand which is cold, prior to the trip.

Can also reduce the amount of redundant data for a given analysis. Also, the reduction of the data and the machine's efforts in building variable combinations (features) facilitate the speed of learning and generalization steps in the machine learning process.

D. *Model Choice*

Model choice is that the method of choosing one final machine learning model from among a group of candidate machine learning models for a coaching dataset. Model choice could be a method that may be applied each across differing kinds of models (e.g. supplying regression, SVM, KNN, etc.) and across models of an equivalent kind designed with totally different model hyperparameters Model choice is that the method of selecting one amongst the models because the final model that addresses the matter. Firstly, we want to induce over the thought of a "best" model. All models have some prophetical error, given the applied math noise within the information, the unity of the information sample, and also the limitations of every totally different model kind. Therefore, the notion of an ideal or best model isn't helpful. Instead, we have a tendency to should ask for a model that's "good enough."

The project stakeholders might have specific necessities, like maintainability and restricted model complexness. As such, a model that has lower talent however is less complicated and easier to grasp could also be most popular. Alternately, if model talent is prized particularly alternative considerations, then the power of the model to perform well on out-of-sample knowledge are going to be most popular notwithstanding the procedure complexness concerned. Therefore, a "good enough" model might talk over with several things and is restricted to your project, such as:

A model that meets the necessities and constraints of project stakeholders. A model that's sufficiently skillful given the time and resources offered.

A model that's skillful as compared to naive models. A model that's skillful relative to alternative tested models.

E. Image Classification

Image classification is that the task of assignment Associate in Nursing input image one label from a hard and fast set of classes. this is often one in every of the core issues in pc Vision that, despite its simplicity, features a massive sort of sensible applications.

Applications

1) *Stock Photography and Video Websites:* It's provision billions of searches daily available websites. It provides the tools to create visual content determinable by users via search.
2) *Visual seek for Improved Product Discoverability:* Visual Search permits users to look for similar pictures or merchandise employing a reference image they took with their camera or downloaded from net.
3) *Security Trade*

F. Accuracy

Accuracy is one metric for evaluating classification models. Informally, accuracy is that the fraction of predictions our model got right. By Deep learning , output obtained are ninety eight correct Using classic CNN models . North American country got superb accuracy.

VGG-16, a pre trained model from keras on these pictures worked slightly well for image classification with AN accuracy of ninety fifth.

	precision	recall	f1-score	support
Covid	1.00	0.95	0.97	20
Normal	0.95	1.00	0.98	20
accuracy			0.97	40
macro avg	0.98	0.97	0.97	40
weighted avg	0.98	0.97	0.97	40

Fig 3 : Accuracy Report

VGG-16 could be a convolution specification.

It consists of sixteen convolution layers,5 GHB pooling layers and three dense layers,but solely sixteen weight layers.

Pre-Processed our knowledge exploitation Image knowledge Generator from keras process library.

Image size set as 224*224, as it is that the customary input size for a VGG-16 network layer.

G. Result

The dataset of this work has been collected from Kaggle repository , which contains Chest X-Ray scans of Covid-19 affected. This collected dataset is not meant to claim the diagnostic ability of any Deep Learning model but to research about various possible ways of efficiently detecting Coronavirus infections using computer vision techniques. The collected dataset consists of few total chest X-ray images. This data set is further divided into training and validation set of normal.

1) Training Set

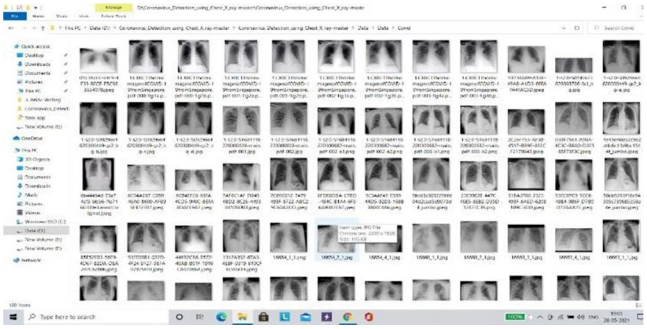

Fig 5 : Covid X-Ray scans dataset from Kaggle

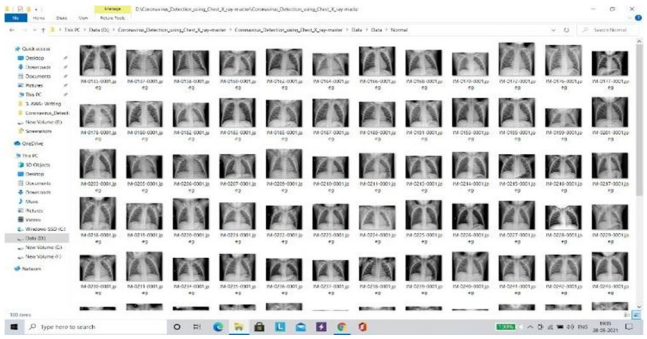

Fig 6 : Normal X-Ray scans from Kaggle

First, gather the X-ray images of the patient's coronavirus- positive results.
This Kaggle link contains X-ray images of patients with pneumonia, COVID-19, and normal health.

a) Make a Dataset with two folders, one of which contains sampled X-Ray images of Normal Patients (from Kaggle).
b) Create a new folder in which to store the X-Ray images of coronavirus patients.
c) Combine the images and assign labels

On the one hand, we will load the data, and on the other hand, we will retrieve the images contained within the Data. Then, set labels based on the image. In the form of As result, we scale the pixel intensities to [0,1] and translate both Data as well as Labels to NumPy array format. The pre-trained model can be used for a variety of tasks in two ways. The pre-trained model is treated as a feature extractor in one approach , and a classifier is trained on top of it to perform classification. In a different approach, the entire network, or a subset of it, is fine-tuned for the new task. As a result, the pre- trained model weights are used as the starting point for the new task and are updated during the training stage. Pre- trained models can be used to solve different types of image classification tasks. To address the issues of insufficient data and preparation time, While creatng A VGG model we use ImageNet data. For each model, the ImageNet weights were downloaded. In the applied layers training process, the extracted features were viewed as size of the input. The procedure begins via the use of one pre-trained models, VGG16 . This models is trained using data from chest x-ray images. The x-ray images are formulated in sizes ranging from 224 to 1024 in order to train the model with minimal calculation. Make a VGG model. In addition, the Top layer was left empty (include top=False). After that, build a convolution layers and place it on top of the VGG model.

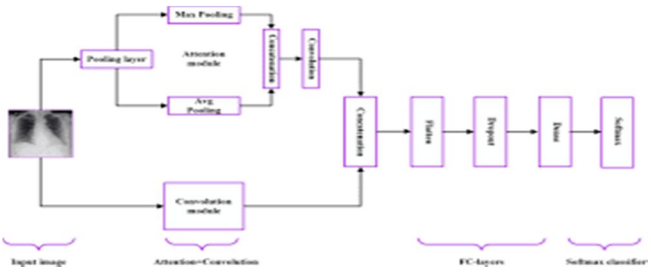

Fig 7:VGG Pre-trained model

III. OUTPUT

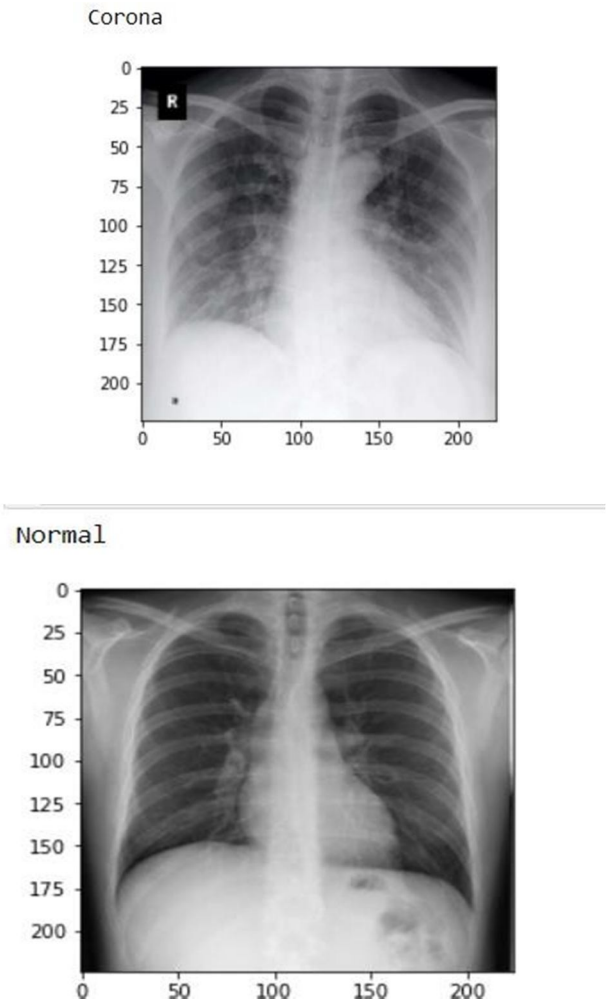

Fig 8 : Output

Detection of this unwellness. The present review provided up-to- date data on metric capacity unit algorithms associate degreed their application as an expression of picture taking imaging analysis of COVID-19. Several studies have shown that the employment of metric capacity unit algorithms will improve the speed of metric options of CT scan pictures and enhance the sensitivity and specificity of picture taking pictures compared to the radiologists' diagnosis; thus, the employment of this cheap and reasonable modality ought to be thought of as a reliable technique for the identification of COVID-19. By reviewing twenty three analysis papers on the appliance of X-ray within the identification of COVID-19 by victimisation metric capacity unit strategies, the present modality are often introduced to the scientific and health profession for the first and fast identification of this unwellness. By rising imaging strategies through computer science technologies, we will notice the most cost effective and safest imaging strategies to forestall the transmission of COVID-19. A review of revealed studies showed that the identification of this unwellness by metric capacity unit algorithms beneath the direction of a specialist LED to improved effectualness and reduced diagnostic errors in varied cases of respiratory disorder, particularly COVID-19.

IV. ACKNOWLEDGMENT

This project is accomplished based on the knowledge on Deep Learning by the authors under the guidance of a Mr.K. Jeevan Reddy.The authors do not claim any right to the algorithms, codes, data, formulas used, approach as their property. They only used their intellect to compile the results and obtain the optimal values for accuracy and also formatting it in the IEEE format.

V. CONCLUSIONS

This systematic review evaluated thirty seven studies so as to help researchers to explore and develop knowledge-based systems supported computer science within the detection and identification of COVID-19. To the simplest of our data, the present review, that reviewed a spread of metric capacity unit strategies to research imaging pictures, is one amongst the foremost comprehensive studies on the identification and

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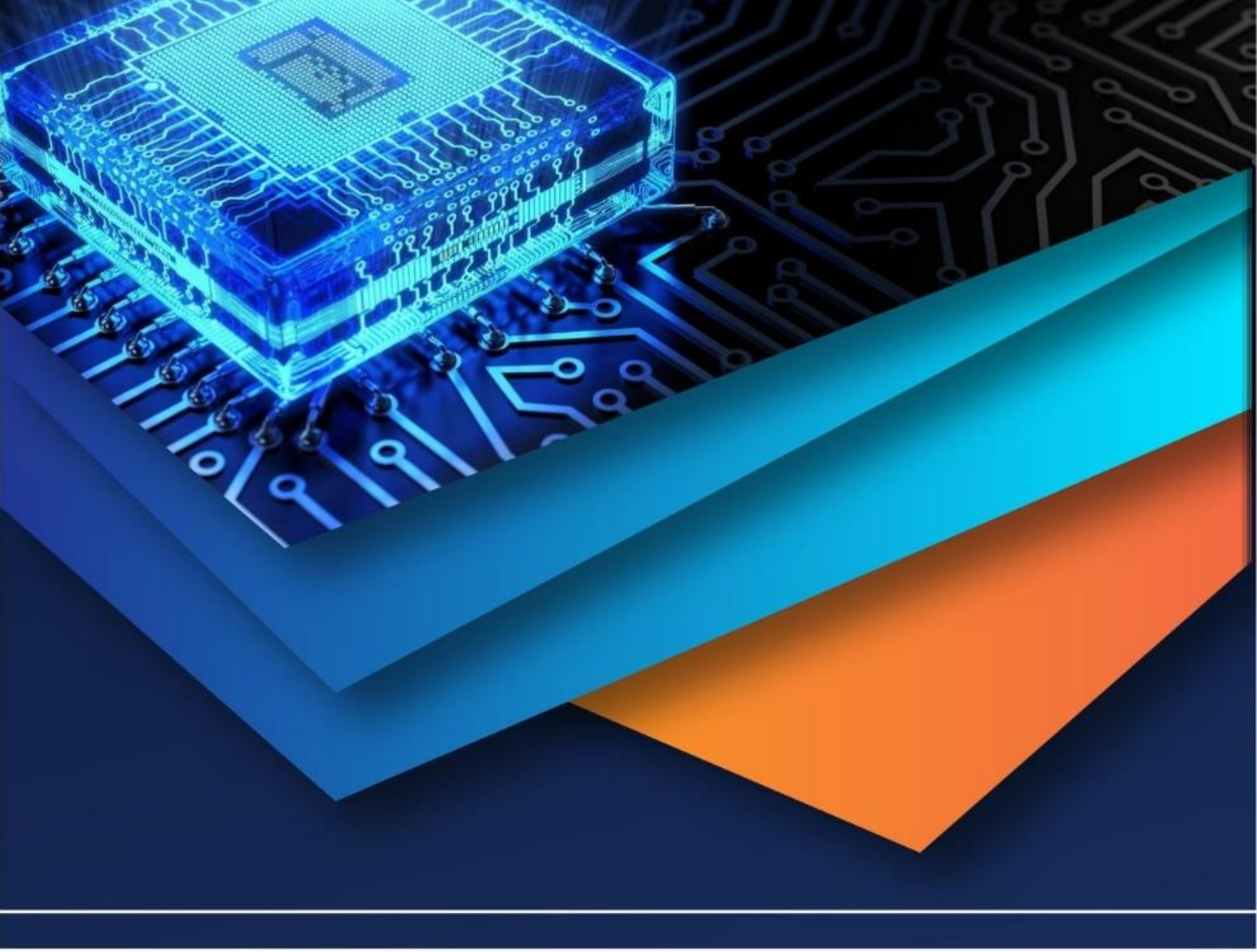

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