MINI PROJECT PRESENTATION

COVID-19 Detection Using CNN

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Problem Statement:

Image classification using CNN

Using a Convolutional Neural Network, we analyse images (X-Rays of Chests) and identify whether the patient is COVID-19 positive or not.

Introduction

- A Neural Network is also called an Artificial Neural Network. It is named after its artificial representation of the working of a human being's nervous system.

- A Neural Network is divided into layers, which are of three types:-
  a. Input layer: The training observations are fed through these neurons.
  b. Hidden layers: These are the intermediate layers between input and output which help the Neural Network learn the complicated relationships involved in data.
  c. Output layers: The final output is extracted from the previous two layers. For example: In the case of a classification problem with 5 classes, the output layer will have 5 neurons.

- The human brain is a very powerful machine. We see an image and process it in our brains without knowing how processing is done. This processing is simply just extracting the features of an image. A CNN mimics this processing for image classification. We input an image, define a weight matrix, and the input is convolved to extract features from the image without losing information about its spatial arrangement.

Literature Survey

The following is a table consisting of the various sources of information used/referenced in our project.

Author(s)	Title	Type	Link
Analytics Vidhya Community	Convolutional Neural Networks (CNN) from Scratch	Course	https://courses.analyticsvidhya.com/courses/convolutional-neural-networks-cnn-from-scratch
Agata Giełczyk Anna Marciniak Martyna Tarczewska Zbigniew Lutowski	Pre-processing methods in chest X-ray image classification	Research Paper	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0265949
Purva Huilgol	Top 4 Pre-Trained Models for Image Classification with Python Code	Blog/Article	https://www.analyticsvidhya.com/blog/2020/08/top-4-pre-trained-models-for-image-classification-with-python-code/
Manasij Haldar	COVID-19 Detection 2 (A part of Covid19_Lungs_BinaryClassification)	Kaggle Project/Dataset	https://www.kaggle.com/code/therockomanz/covid-19-detection-2/notebook

Scope of Project

The idea of implementating modern technologies such as AI and ML in healthcare industries is rapidly growing in popularity.

Basic idea

The goal of this project is to classify Chest X-Ray images as normal(healthy) or Covid cases using a Convolutional Neural Networks. CNN is a type of Deep learning algorithm that performs very well in image classification tasks.

Simple training model

The VGG-16 training model allows us to train the algorithm with a simpler and easier-to-implement code compared to other training models while giving us approx. 99% accuracy.

Future scope

This algorithm can be improved in the future by adding a severity score to the COVID-19 positive cases, by analysing the images for other conditions like pneumonia, etc.
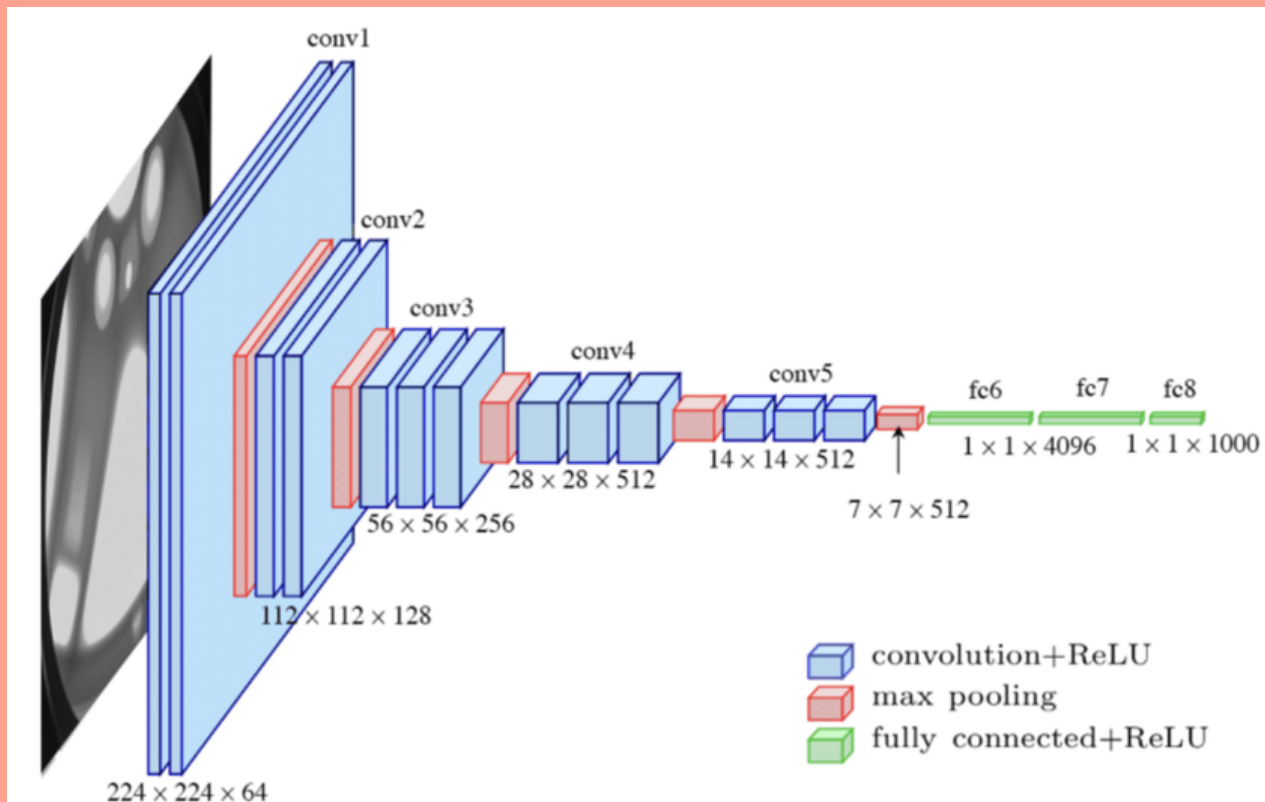
Technical Compatibility

Can be run on any machine through the front-end web service (built using Flask)

The backend code uses modules from Python such as Keras, TensorFlow, NumPy, Matplotlib and OS. The front end is built as a web service using Flask.
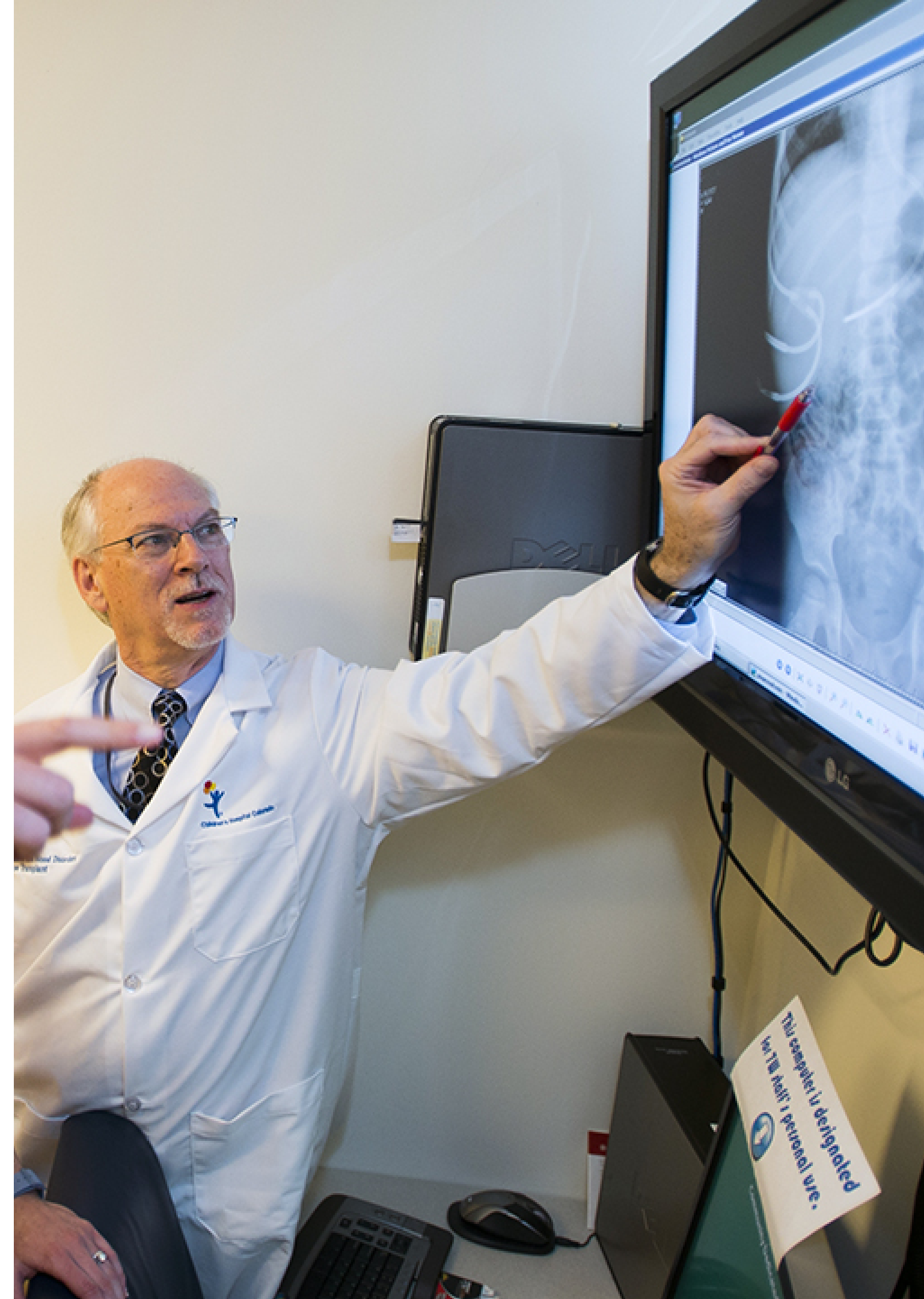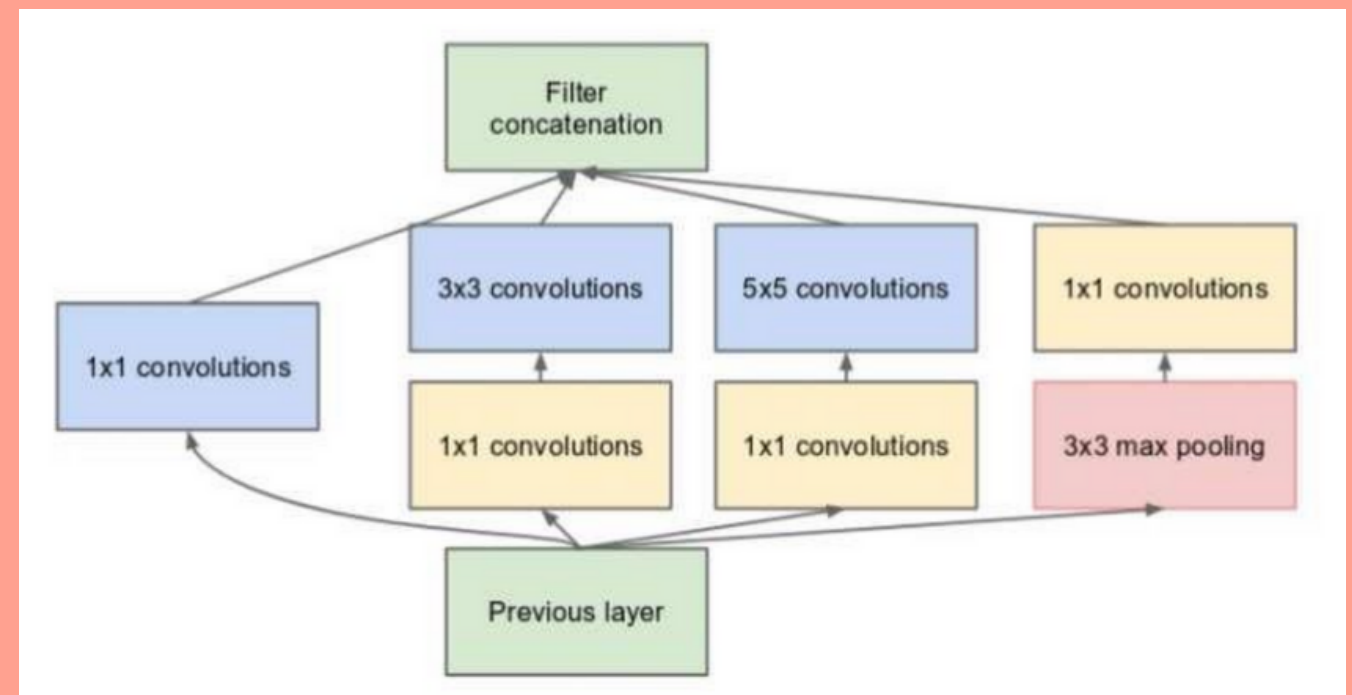
Technical Compatibility (contd.)

An Inception Module is an image model block that aims to approximate an optimal local sparse structure in a CNN
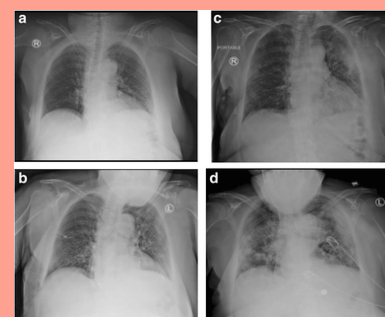

In VGG16 there are 13 convolutional layers, 5 Max Pooling layers, and 3 Dense layers which sum up to 21 layers. But it has only 16 weight layers i.e., learnable parameters layers, hence the name VGG16
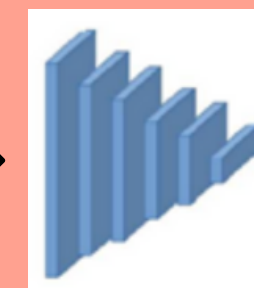

Original Image

CNN

Preprocessing

Result: Positive/Negative

Social Aspects

- Our project provides doctors with a faster, more efficient method of detecting COVID-19. It is a viable alternative for RT-PCR testing providing the same accuracy rate and being cheaper than an RT-PCR test.
- Where RT-PCR tests take 24-72 hours to provide a result, our algorithm can give a result within minutes (including the time to take an X-Ray).
- It also reduces the workload of doctors and lab scientists, who are already overworked and stressed due to the past 3 years of the pandemic.

THANK YOU

Project made by - Akanksha Prasad, Harshal Jagtap, Aarya Kulkarni & Aarya Ranjit