COVID-19 Detection using Chest X-ray Images

Big Data Analytics and Applications, Fall 2021

October 1, 2021

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Scope/Domain for the Project

This project is focused on the detection of Coronaviruses through X-ray images of the lungs in the health sector. Our project proposal employs principles of deep learning to train the images of the lungs classified as normal, pneumonia, and COVID-19 positive, extract features from these images and create an efficient model which can be used by medical professionals to detect COVID-19 in patients by simply scanning the X-rays of the chest and using our trained model to classify it correctly.

Objective

Our project aims to develop an image classification model using deep learning that takes X-ray images of the lungs as input and tries to correctly predict whether they indicate normal health, pneumonia, or COVID-19 positivity. For this, we use the COVID-19 radiography database to train our model which we will develop along the course of this project.

Problem Statement

As we all know that we are in midst of a pandemic that has taken millions of lives all over the world, and even with the vaccines out in the market and being administered to the public in the fastest way possible the cases of COVID-19 keep soaring as the virus keeps altering itself to adapt to the vaccines and target people more easily. This causes people to take tests for COVID-19 which comes in two forms either RT-PCR or quick antigen-testing, but there are many who usually go in for chest X-ray scans first before taking the test.

In that sense, what our project attempts to do is create a training model from X-ray images that have been classified as normal, COVID-19 positive, or pneumonia. In the next step, we scan these images and predict the results, which are used to treat the patient immediately without having to take the test which takes about four to 48 hours to correctly interpret. Even though we cannot guarantee 100 percent accuracy with our technique, a faster analysis coupled with a medical professional's diagnosis can lead to quick assessment and speedy treatment solutions which can save a person's life in dire circumstances.

End-users of the application

We believe that the target users of this project as medical staff professionals such as X-ray technicians, nurses, interns, medical residents, and finally doctors. Using deep learning technology, medical practitioners will be able to confirm their diagnosis immediately, begin treatment of patients without delay, and handle a high volume of patients efficiently.

Our Competitors

There are some existing works in this area that have already been developed. Few of them are listed here.

I. Can AI help in screening Viral and COVID-19 pneumonia?

This project aimed to develop AI-based approaches to detect and predict infections as well as to predict their severity and prognosis. To achieve a high degree of prediction accuracy, the authors of this study used DenseNet and ResNet machine learning models.

Source: https://ieeexplore.ieee.org/document/9144185

II. Exploring the Effect of Image Enhancement Techniques on COVID-19 Detection using Chest X-ray Images

In this project, novel coronavirus pneumonia was detected using transfer learning with CheXNet by using Grad-CAM visualizations. They built models with convolution neural networks and a fully connected layer based on the cheXNet algorithm.

Source: https://doi.org/10.1016/j.compbiomed.2021.104319

The novelty of our solution

The work we produce can aid in combating COVID-19, and we believe this scholarly research is useful and impactful. This solution has the noble purpose of saving mankind. We would extend the software to ensure the highest level of accuracy possible and create an application that is easy to use for medical staff professionals who have little experience handling technology. This solution will not only allow users to generate results with little manual effort from medical staff but will be able to handle the large quantity of data created by the emerging pandemic.

About Dataset

The University of Dhaka, Bangladesh, Qatar University, and their collaborators from Pakistan and Malaysia, in collaboration with doctors, have created a database of chest X-ray images for COVID-19 positive cases as well as normal, opacity, and viral pneumonia images.

As of the date of writing, there are 3615 COVID-19, 10192 Normal, 6012 Lung opacity, and 1345 Viral Pneumonia CXR images collected from different sources.

Source: https://www.kaggle.com/tawsifurrahman/covid19-radiography-database