Medical Image Reader powered by Artificial Intelligence

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Abstract

Medical imaging produces visual representations of areas inside the human body in order to diagnose medical problems and monitor the treatment. Root causes of almost every disease, illness and medical issue arise inside the body. Hence, since its first discovery in 1895, medical imaging has left a massive impact on public health. When the diagnosis is completed, a radiologist analyzes the results and suggests the most appropriate treatment for the patient. Therefore, the faster and more accurate the diagnostic process is, the better the treatment will be. Our proposed project aims towards an interface model using Deep Learning (DL) techniques so that the diagnosis of a medical issue can become faster, easier and more precise. The goal of this research is to find the best suited models to classify different types of medical images, to extract data from an image in order to detect any existence of a medical issue with the best accuracy possible in a general case.

Objectives

1. Developing a deep-learning model with the best accuracy possible for detecting several diseases by taking medical images as input.
2. To develop a large dataset consisting of as many diseases as possible to reach for building the system by applying different augmentation techniques, image enhancing techniques and collecting raw data.
3. To develop a user-friendly interface for the doctors, radiologists and patients so that user can upload a medical image and a report for that is returned.

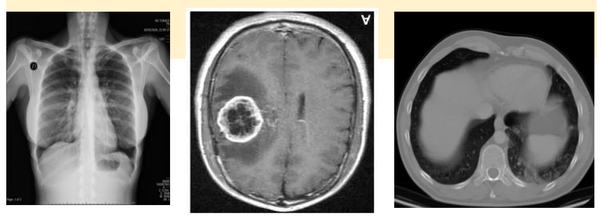


Fig: Sample medical images for input

Related Works

Numerous academics have been considering how OCT can advance neurological research ever since it was introduced and have been fascinated by its ability to portray the retinal tissue accurately layer by layer. According to earlier experiments, Retinal layer atrophy and neurodegenerative diseases may be related. To demonstrate how neurological processes in the brain may also be visible in the retina, these researchers tested a variety of methods in a variety of settings. Reshi et al. [1], proposed an efficient CNN model for COVID -19 disease detection based on X-ray Image Analysis and Classification. Their proposed model has been tested in two scenarios using 100 X-ray images of the original processed dataset. The proposed model consists of 38 layers including 6 are convolutional(Conv2D), 6 max-pooling layers, 6 dropout layers and 8 activation function layers. In paper[2], the researchers proposed five pre-trained models to classify MR images of the brain into normal, cerebrovascular, neoplastic, inflammatory and neurodegenerative classes where t AlexNet model got the lowest accuracy and ResNet-50 got the highest. In a research paper[3], researchers show how machine learning methods can help to enhance the method for detecting Alzheimer's disease. The 12-layer CNN model of this paper outperforms all other CNN models with an accuracy of 97.75% on the OASIS dataset. The experiment published in paper[4], proposed a CADx that uses images to identify and categorize lung anomalies. In a project reported in paper [5], the researchers developed smartphone applications for real-time diagnostics using machine learning algorithms. They proposed that this model can be helpful in COVID-19, diabetes and cardiac patient screening. Rajpurkar et al.
[6] introduced an algorithm called CheXNet which detects Pneumonia from chest X-rays at a better level then practicing radiologists. They used a dataset called ChestX-ray14 dataset containing 112, 280 front-view chest X-ray of 30,805 different patients; all labeled up to 14 different thoracic diseases including Pneumonia.

Methodology

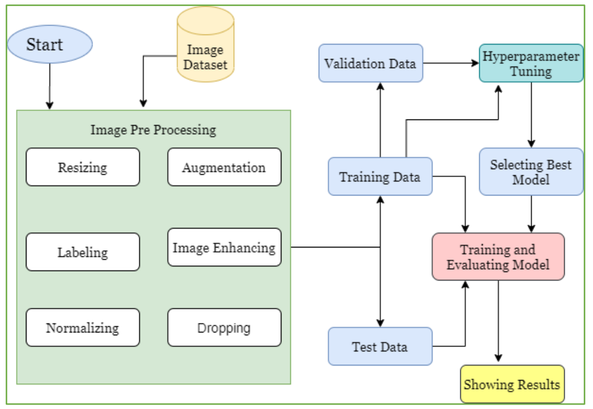
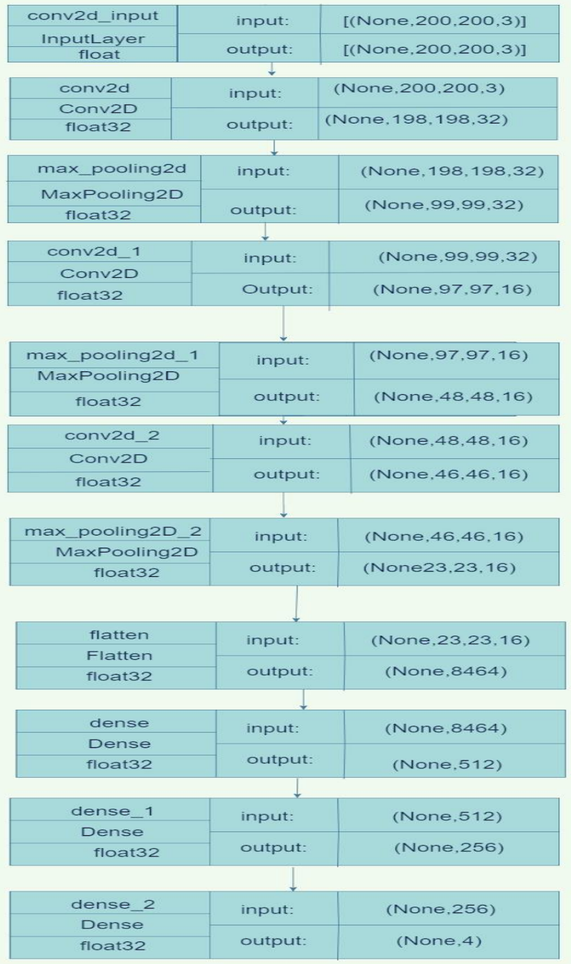


Fig: Working procedure

Preliminary Architecture



Dataset

Size:	1.00 GB (1,083,962,629 bytes)	TRAINING
Size on disk:	1.05 GB (1,133,182,976 bytes)	
Contains:	23,605 Files, 23 Folders	
Size:	303 MB (318,504,603 bytes)	TEST
Size on disk:	316 MB (332,316,672 bytes)	
Contains:	6,606 Files, 22 Folders	

*For our preliminary development, we have taken a smaller dataset which is consisted of 3 types of lung diseases.

Result Analysis

Our proposed CNN model has an accuracy of 97.73% on the training set , 81.39% on the validation set and 85% on the test set containing images of four different classes in the first trial of only 10 epochs. After doing some trial and test on the model, the test accuracy increases to 89.52% on 10 epochs

References

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