Brain Tumor Detection

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***Abstract*—Health care is one of the biggest markets in the world where every country spends considerable amount of its GDP on it. There are mechanisms and systems in place to make sure its citizens get the best service. Every patient deserves the state-of-the-art medical treatment; however, it is not always guaranteed one receives it. As the medical conditions get more critical and severe, the expenses also skyrocket, and it becomes more and more difficult for the patient to afford the treatment. We are trying to solve one such problem which is a severe as well as expensive to detect, treat and cure using Machine learning and Artificial intelligence, Brain Tumor.**

***Keywords*—Brain, Tumor, Health care, Artificial Intelligence, Machine Learning, MRI, Medicine, Model, Filtering, Data, Disease**

I. Introduction

Brain Tumor is a severe condition which needs immediate medical attention. The tumor is classified based on numbers ranging from roman one to four, 1 being minor and 4 being severe. Named with letters N, meaning whether it has reached lymph nodes where four meaning high severity and 1 meaning not yet reached. Another parameter is denoted by letter M which talks about whether the tumor has affected other tissues in the body. There is a considerable gap between the severity of this disease and the medical diagnosis process including the expenses and the resources to diagnose it accurately. We are trying to build and automate this system of diagnosis using machine learning model which will be trained using existing data set of tumorous and non-tumorous MRI scans. This system will be offered for two roles. One being the end user or the probable patient and second being the Insurance companies. This service will be mainly targeted to make patient's lives easier with a free access up to 5 image uploads and further extended to insurance companies which will collaborate with our system to generate real time data of the customers MRI image before evaluating the actual premium amount to be paid.

II. Literature Review

de Andrade et al., has focused on an Interactive Algorithm for Image Smoothing and Segmentation. A non-linear partial differential equation is employed to smooth the image while preserving contours. This approach is purely based on the image processing and detecting the patches[1]. Sharma et al., This approach is based on 3D analyses of the MRI images and they are based on axial, sagittal and coronal images however he does not handle it without processing it further than the MRI[2]. Shen et al., uses fuzzy logic to categorize the images and put them in a cluster but however this approach also does not consider the scenario where there are very slight hinges of tumour in the initial stages[3]. Charles et al., implements multi-agent decision support over a distributed network of local databases which does not consider the actual image independently rather validates it on multiple servers and collaborates the results[4].

III. Gap Analysis

Many resources talk about the processing MRI images as independent image processing techniques but many fail to develop machine learning model which can look at multiple images and learn with experience rather than completely relying on a single source of truth. We look at multiple MRI images and the algorithm is bound to get better and better with more and more usage over the period of time. Currently there is enough data of images available on the crowd sourced platform which is highly unorganised and is left unused. Leveraging the data and bridging the gap would create a robust algorithm to detect brain tumours more efficiently.

IV. Project Description and Justification

We are concentrating on the cost and effectiveness factors of the brain tumour detection. The project starts way before it can actually accept images. The first step in the analysis is collection of data sets of MRI images which already have brain tumours and others without brain tumours. This will be used to train the machine learning model which will learn from the patterns and already market data set. This is a classification model problem which uses IBM Watsons Image visualisation model to run the learning. processing MRI images as independent image processing techniques but many fail to develop machine learning model which can look at multiple images and learn with experience rather than completely relying on a single source of truth. We look at multiple MRI images and the algorithm is bound to get better and better with more and more usage over the period of time. Currently there is enough data of images available on the crowd sourced platform which is highly unorganised and is left unused. Leveraging the data and bridging the gap would create a robust algorithm to detect brain tumours.

V. Goals of the Project

The goal is to provide a handy, quick, reliable tool for MRI brain tumour detection in near real time. The two use cases that we are concentrating are:

For end user who have their MRI scans and suspect their

condition but cannot afford to consult a doctor either due to financial situation or due to appointment issues.

For the insurance companies to verify their customers medical condition without having to visit doctors and pay them high consultation fees.

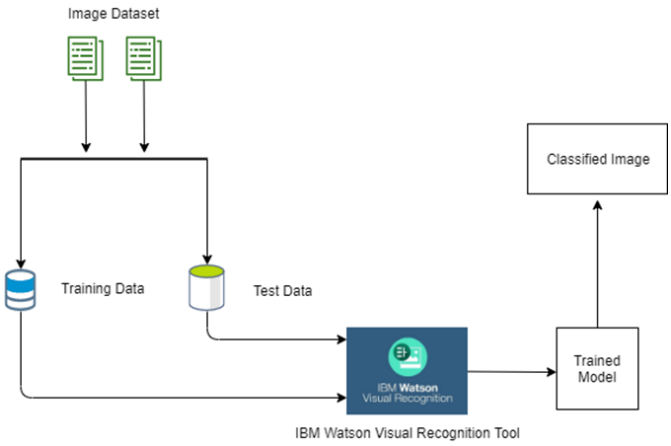
VI. System Architecture

The architecture is distributed a system with a front end web page, server and a machine learning model.

The front end renders the web page to the user to register for the account ant the insurance companies to sign up and have a deal.

Backend server will receive the image from the front end and forward it to the IBM Watson visualisation model to analyse the image on its preloaded machine learning model to verify the brain tumour.

IBM Watson receives the image. Watson is a machine learning tool which can be trained using images and responds to new images based on the already learnt images. The Watson will analyse the image sent by the backend and run the machine learning algorithms on it and respond to the backend with the probability of having brain tumour between 0 and 1.



VII. Results

We have achieved more than 80% success rate with predicting the tumorous images uploaded to our systems. We have successfully tested with more than 150 images and our prediction model is getting better and better with every image that we upload. We have solved the problem of users who cannot afford or don't have access to sophisticated health care and along with giving back to the society we have developed a revenue model through insurance companies signing up with us for service.

Appendix

HTTPS://WWW.IBM.COM/WATSON

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