PROSPECTIVE METHOD FOR PRECISE AND AUTOMATED IDENTIFICATION OF BRAIN TUMORS

Abstract

Cancer is one of the most severe disease and it arises because of abnormal growth of cells. Since whole body is consist of cells and because of which there is possibility that there may be abnormal growth of cell in any part of body therefore there are different kind of cancer but in this paper, we are only dealing with brain cancer which is popularly known as brain tumor. Human brain has the capability of decision making and it play a very vital role in our survival. Since human brain is surrounded by hard skull and due to abnormal growth of cell in human brain pressure increase in human skull because of which brain tumor arises. In this paper we are trying to solve problem of human brain with the help of deep learning algorithms which has the ability of mimic the human brain. In our work we diagnose the brain tumor with the help of deep learning algorithm named as convolution neural network (CNN) which is developed by "Shiqi Wang" which take CT Scan image of brain as input. We are trying to achieve high accuracy for early detection of brain tumor automatically by the machine. This work will also work as a helping hand for doctors when doctors have to deal with large number of cases in a single day.

Keywords: Brain Tumor, Convolution Neural Network (CNN), Deep Learning.

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I. INTRODUCTION

Brain tumor is one of the most feared diseases as they lead to one of the most uncurable disease of cancer. It is a known fact that greater time taken to diagnose it more threatening it gets. This paper deals with the problem of time taken to diagnose the tumor in the brain without actually waiting for the doctors to do the analysis. This paper proposes an idea to form an intelligent system that would include a regressively trained model to diagnose the brain tumor simultaneously as the reports are generated. This model makes use of the CNN algorithms that treats data in the non-linear form and create matrixes of the data as it goes further. This model can be implemented into hospitals and emergencies wards where brain tumor can be detected as soon as possible without having any delays that involve human interventions. Every one now a days is living at the risk of being detected with tumor due to heavy environmental pollution and messier and busier lifestyle. The problem with relying on the older system is that it is delayed and very threatening to human life as delayed in medication can lead to serious illness and even death. Whatever the reason maybe for this blunder it always results with people suffering. The system that we propose is a solution to parking solution in its innovative sense as it allows people to get the medical attention they need as soon as the CT scan is done. The system that we put forward collects data from the CT scan on real time basis and gives the status of whether the person has tumor or not. This allows the people to take the necessary actions regarding their health. The system makes use of Convolution Neural Network that can provide a ground for decision making about the use of the personal health.

II. PROPOSED SYSTEM

In this proposed system we proposed using Deep learning algorithm developed by ‘Shiqi Wang’ and his team to diagnose a disease like brain tumor with the help of CT Scan image. Since when a CT Scan image is made by Scanner then it provides the system a capability to identify whether the CT Scan image is belonging to brain tumor category or the category of benign. For example if there is a situation where one doctor has to address 500 patients a day and out of 500 more than 400+ people have symptoms of brain tumor so it become very difficult for doctor to diagnose CT Scan image of all 400 patients in one day and it will take weeks for doctor to diagnose the disease but using deep learning model a trained model itself classify 400 patients into two category. The first category is of those people who have actual brain tumor and other category of people who are benign. So people identified which are infected from brain tumor disease are given first priority and doctor first address them and after this doctor address people who are not identifies as infected from brain tumor.

III. IMPLEMENTATION

Data flow diagram (DFD) is the graphical representation used to show flow of data in deep learning model. Graphical representation shown in Fig 1 shows the implementation of our work. For this work first of all we identify all the external sources of information from where we collect all the data related to melanoma and normal mole. Afterward we pre-process the data and discard all the unrelated data from the dataset and curate a clean dataset. We divide the data into 3:1 ratio where 75% of total no images are stored in training image dataset and 25% of total no of image are stored in test image dataset. Using the training image we extract the features using the Convolution Neural Network and trained a model on the

basis of these features and using test image dataset we find the accuracy of the model to know how accurate model is trained on the training image and after this we use validation dataset to know about the performance of the model.

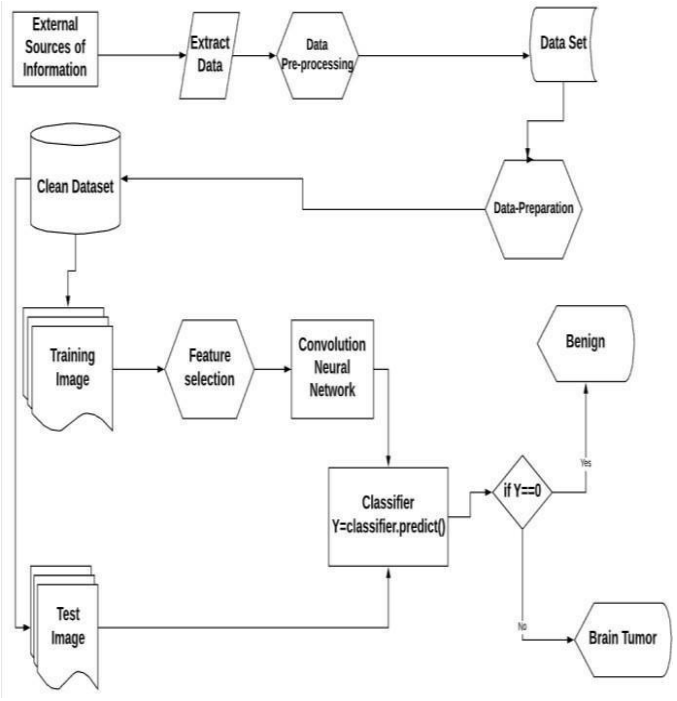

Figure 1: Data Flow Diagram.

After Training our model we have to check whether our model work fine for a new MRI image of Brain to diagnose at early stage because of anything if someone misdiagnose the brain tumor then this will impact more to patient and severity increase to deaths and therefore we validate our model with validate image dataset as well as with random image of brain tumor. Overview of the implementation of our work is shown in fig 2.

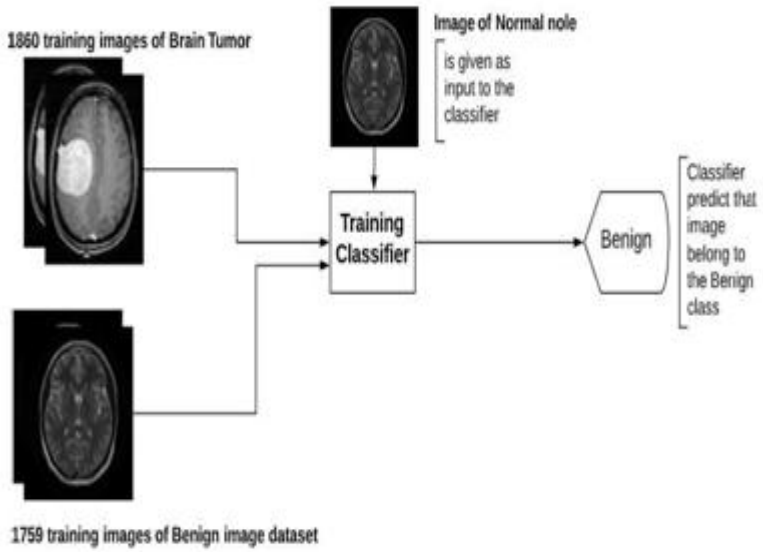

Figure 2: Overview of Implementation

IV. RESULT

Convolution Neural Network algorithm has different layers like convolution layer, max pooling layer and dropout layer where each and every layer has specific function and these layers help in extracting features from training image dataset and train model on extracted features. In our work total no parameters are 167,105 and our model is trained on all of these parameters therefore trainable parameters are 167,105 and role of each layer is shown in fig 3.

Layer (type)	Output Shape	Param #
conv2d_1 (Conv2D)	(None, 62, 62, 32)	896
max_pooling2d_1 (MaxPooling2	(None, 31, 31, 32)	0
dropout_1 (Dropout)	(None, 31, 31, 32)	0
conv2d_2 (Conv2D)	(None, 29, 29, 32)	9248
max_pooling2d_2 (MaxPooling2	(None, 14, 14, 32)	0
dropout_2 (Dropout)	(None, 14, 14, 32)	0
conv2d_3 (Conv2D)	(None, 12, 12, 32)	9248
max_pooling2d_3 (MaxPooling2	(None, 6, 6, 32)	0
dropout_3 (Dropout)	(None, 6, 6, 32)	0
flatten_1 (Flatten)	(None, 1152)	0
dense_1 (Dense)	(None, 128)	147584
dense_2 (Dense)	(None, 1)	129

Total params: 167,105
Trainable params: 167,105
Non-trainable params: 0

Figure 3: Convolution Layers

Training dataset is used to train the model and validation dataset is used to measure the performance of the model and the graph between training and validation accuracy is shown in fig 4.

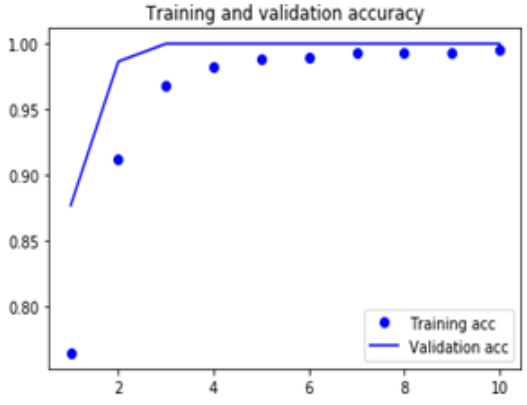

Figure 4: Training and validation accuracy

Training loss is the error occur at the time of running the network and validation loss is the error obtained after running the validation dataset through the trained network and this graph is shown in fig 5.

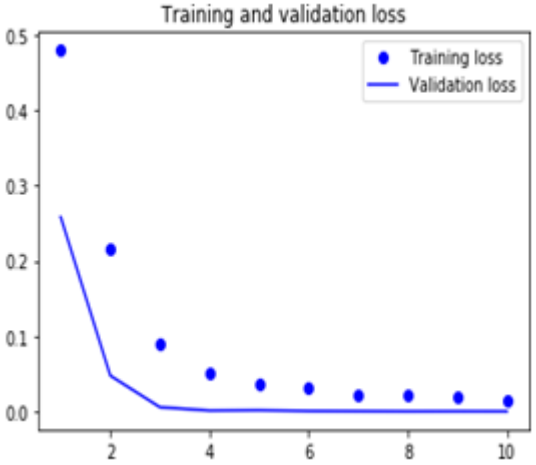

Figure 5: Training and Validation loss

In this paper we show the importance of technology in healthcare where with the help of CNN algorithm we are able to diagnose the disease in early stage and we are able to get more than 98% of accuracy in our work. It means out of 100 times ,98 times our model predict whether the person is infected from brain tumor or not and as there is increase in different type of dataset its accuracy increase automatically because deep learning algorithm has the ability to learn from experience.

V. FUTURE SCOPE

This system holds a lot of future scope as this is what will solve the problem of the delay in medical attention of the people having tumor who require instant medication. This is environment friendly and do not make use of infrared radiations but only a simple system Moreover this also helps in reducing the delay in any medical attention if brain tumor is detected. This project is the game changer that will lead to safer and lesser cases of brain tumor death rates all over the world. This project can be integrated in the on-going medical industry. If this medical system is integrated in the CT scan and MRI machines, then the person who is under the process can be depicted by the algorithm even before the report id sent to the doctor. The system does have a future scope because the model is continuously trained by the dataset. This trained model not only gives the medical results of the patient but if integrated and worked on in further analysis can also analyze the real time data and prove the initial stage remedies to put the patient into the medical journey of recovery.

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