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"Brain Tumor Detection using Machine Learning and Block Chain"

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Abstract: Brain tumor can be classified into two types: benign and malignant. The brain tumors, are the most common and aggressive disease, leading to a very short life expectancy in their highest grade. Thus, treatment planning is a key stage to improve the quality of life of patients. Generally, various image techniques such as Computed Tomography (CT), Magnetic Resonance Imaging (MRI) and ultrasound image are used to evaluate the tumor in a brain, lung, liver, breast, prostate…etc. Especially, in this work MRI images are used to diagnose tumor in the brain. However the huge amount of data generated by MRI scan thwarts manual classification of tumor vs non-tumor in a particular time. But it having some limitation (i.e) accurate quantitative measurements is provided for limited number of images. Hence trusted and automatic classification scheme are essential to prevent the death rate of human.

The automatic brain tumor classification is very challenging task in large spatial and structural variability of surrounding region of brain tumor. In this work, automatic brain tumor detection is proposed by using Convolutional Neural Networks (CNN) classification. The deeper architecture design is performed by using small kernels. The weight of the neuron is given as small. Experimental results show that the CNN archives rate of 97.5% accuracy with low complexity and compared with the all other state of arts methods.

Brain tumor identification is really challenging task in early stages of life. But now it became advanced with various machine learning and deep learning algorithms. Now a day's issue of brain tumor automatic identification is of great interest. In Order to detect the brain tumor of a patient we consider the data of patients like MRI images of a patient's brain. Here our problem is to identify whether tumor is present in patient's brain or not. It is very important to detect the tumors at starting level for a healthy life of a patient. There are many literatures on detecting these kinds of brain tumors and improving the detection accuracies.

The segmentation, detection, and extraction of infected tumor area from magnetic resonance (MR) images are a primary concern but a tedious and time taking task performed by radiologists or clinical experts, and their accuracy depends on their experience only. So, the use of computer aided technology becomes very necessary to overcome this limitation. We estimate the brain tumor severity using Convolutional Neural Network algorithm which gives us accurate results.

Keywords: Tumor Detection, Convolutional Neural Network, Gaussian Filters, MRI Images, Brain.

I. INTRODUCTION

As you all know nowadays, medical imaging technology plays an increasingly important role in daily medical diagnosis and medical research. Therefore, research on medical diagnostic image data is very important. As a tumor disease with frequent occurrence and complexity, brain tumor has become a key research topic in the medical field.

Brain tumor is one of the vital organs in the human body, which consists of billions of cells. The abnormal group of cell is formed from the uncontrolled division of cells, which is also called as tumor. Brain tumor are divided into two types such low grade (grade1 and grade2) and high grade (grade3 and grade4) tumor. Low grade brain tumor is called as benign. Similarly, the high grade tumor is also called as malignant. Benign tumor is not cancerous tumor. Hence it doesn't spread other parts of the brains. However the malignant tumor is a cancerous tumor. So it spreads rapidly with indefinite boundaries to other region of the body easily. It leads to immediate death.

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The diagnosis of brain tumors is usually based on imaging data analysis of brain tumor images. Accurate analysis of brain tumor images is a key step in determining a patient's condition. Therefore, how to accurately detect brain tumor images is very important. Brain MRI image is mainly used to detect the tumor and tumor progress modeling process. This information is mainly used for tumor detection and treatment processes.MRI image gives more information about given medical image than the CT or ultrasound image. MRI image provides detailed information about brain structure and anomaly detection in brain tissue. Actually, Scholars offered unlike automated methods for brain tumors finding and type cataloging using brain MRI images from the time when it became possible to scan and freight medical images to the computer. Conversely, Neural Networks (NN) and Support Vector Machine (SVM) are the usually used methods for their good enactment over the most recent few years.

So we propose a system where we use MRI or CT scan images as input and using Machine Learning and Block chaining we will detect brain tumor of the patient. **CNN** (Convolutional Neural Networks) Algorithm will be used to train our model and block chaining will play an important role for transferring data using particular block.

II. PROPOSED WORK

The human brain is modeled by using design and implementation of neural network. The neural network is mainly used for vector quantization, approximation, data clustering, pattern matching, optimization functions and classification techniques.

In the normal neural network, image cannot scalable. But in convolution neural network, image can scalable it will take 3D input volume to 3D output volume (length, width, height).The Convolution Neural Network (CNN) consists of input layer, convolution layer, Rectified Linear Unit (ReLU) layer, pooling layer and fully connected layer. In the convolution layer, the given input image is separated into various small regions. Element wise activation function is carried out in ReLU layer. Pooling layer is optional. We can use or skip. However the pooling layer is mainly used for down sampling. Finally, the convolution neural network is used for automatic brain tumor classification.

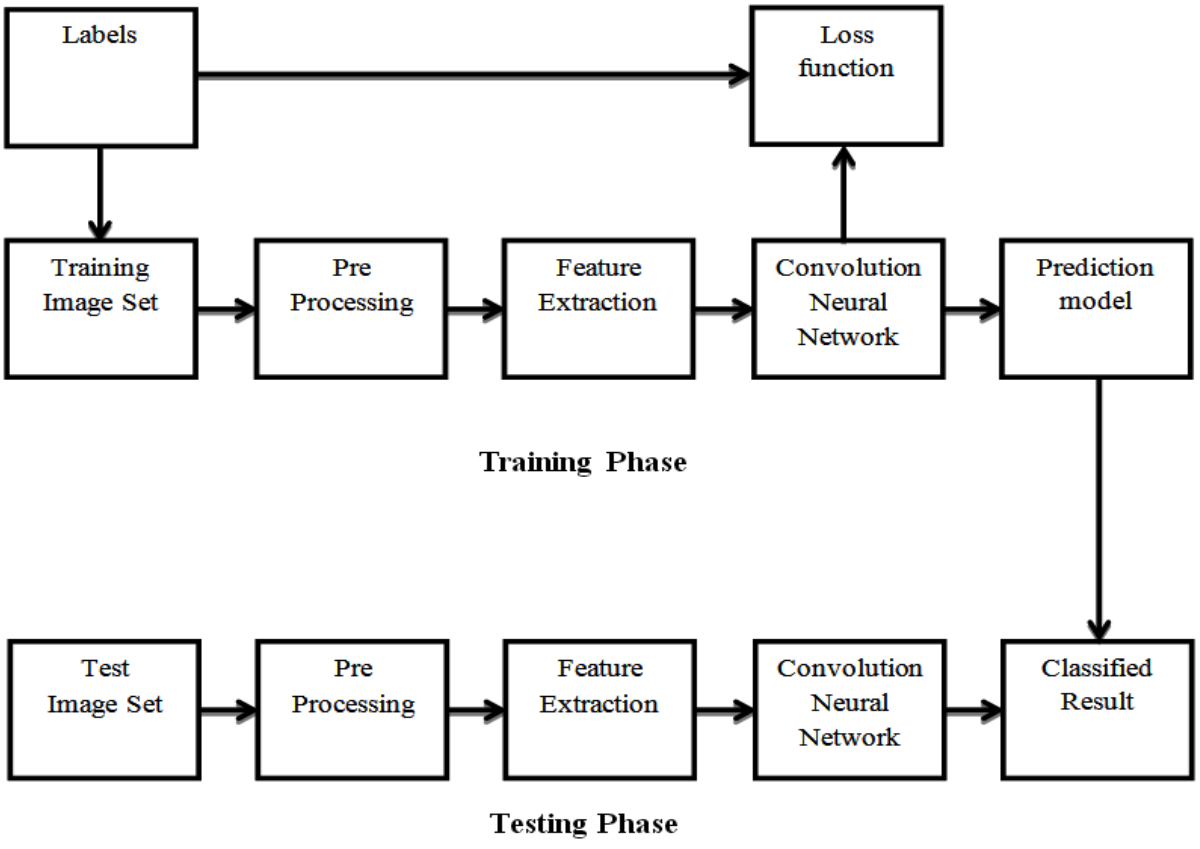

Fig1: Block Diagram of Brain Tumor based on CNN

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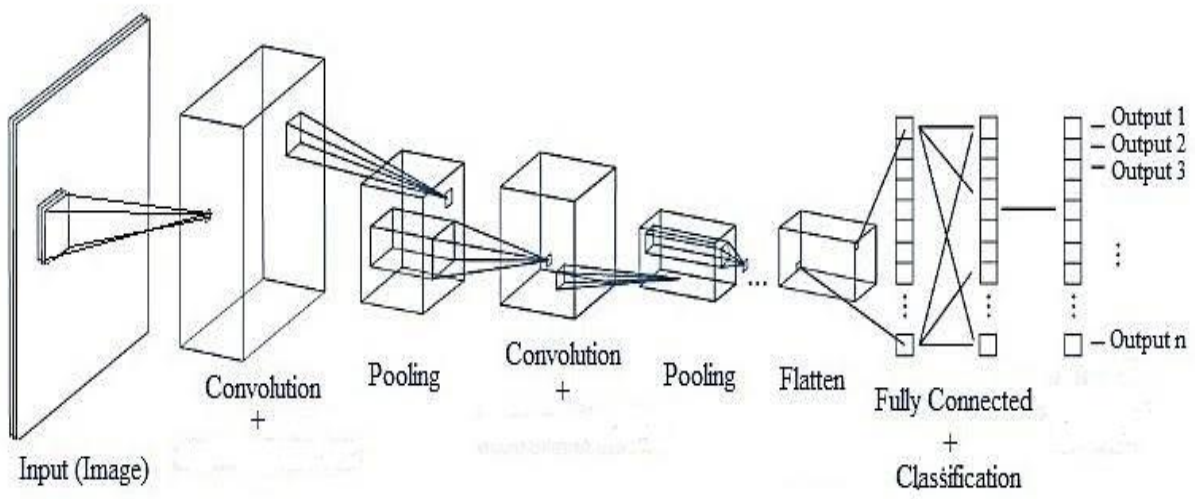
Working:

- The block diagram of brain tumor classification based on convolution neural network is shown in fig. The CNN based brain tumor classification is divided into two phases such as training and testing phases. The number of images is divided into different category by using labels name such as tumor and non-tumor brain image…etc. In the training phase, pre processing, feature exaction and classification with Loss function is performed to make a prediction model. Initially, label the training image set. In the pre processing image resizing is applied to change size of the image.

- The loss function calculation is very important to improve the accuracy. If the loss function is high, when the accuracy is low. Similarly, the accuracy is high, when the loss function is low. The gradient value is calculated for loss function to compute gradient descent algorithm. Reputably evaluate the gradient value to compute the gradient of loss function.

- Our Dataset contains tumor and non tumor MRI images. The efficient automatic brain tumor detection is performed by using convolution neural network. Simulation is performed by using python language. The accuracy is calculated and compared with the all other state of arts methods. The training accuracy, validation accuracy and validation loss are calculated to find the efficiency of proposed brain tumor classification scheme. Convolutional Neural Network (CNN) is implemented using Keras and Tensorflow because it yields to a better performance than the traditional ones. In our work, CNN gained an accuracy of 97.87%, which is very compelling.

Architecture Diagram:



Algorithm for CNN based Classification

1. Apply convolution filter in first layer.

2. The sensitivity of filter is reduced by smoothing the convolution filter (i.e) sub sampling.

3. The signal transfers from one layer to another layer is controlled by activation layer.

4. Fasten the training period by using rectified linear unit (RELU).

5. The neurons in proceeding layer is connected to every neuron in subsequent layer.

6. During training Loss layer is added at the end to give a feedback to neural network.

Softmax

ReLU

ReLU

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Working:

CNN is Convolutional Neural Network which takes input as image, process that image and classified that image in certain categories. Firstly we will extract some features from the input image and after that we are going to classify that image or we are going to recognize that image.

CNN has two main stages:

1. Feature Extraction.
2. Classification.

1. Feature Extraction:

It has mainly three layers:

- Convolution layer: - It is mathematical function and it is used to extract features from an input image.
- RELU layer: - It stands for Rectified Linear unit for a non-linear operation. The output is f(x) = max (0, x). If we have some negative terms in convolved matrix/feature after performing RELU transfer function the negative terms are converted to 0. In simple language RELU means converting negative terms from the convolved feature to 0.
- Pooling: - Pooling layer is basically use for reducing the number of parameters when the images are too large. So, generally when images are too large and they are generating large feature matrix so in order to process that thing it need lots of time for training algorithm it will take lots of time to train your model or train your neural network.

2. Classification:

It has three layers:

- Flatten layer: - The flatten or flattening layer will convert the feature matrix into 1D array or vector and after that fully connected layer will operate.
- Full Connected layer: - In fully connected layer, Every neuron or node is connected to every other neurons or nodes in next layer and this is how fully connected layer can be formed.
- Softmax layer.

Advantages

- It will help many people in diagnosing the brain tumor without wasting the money on check-up.
- No need of internet connection while diagnosing brain tumor.
- It can save you lot of time.

Disadvantages

- Possibility of Minor Error :- The problem occurs in the training and testing of data. Sometimes removing errors becomes nearly impossible. So it might failed to identify tiny brain tumors.
- Data Acquisition :- Due to huge amount of data the process can sometimes cause data inconsistency.
- Time Consuming:- Due to large amount of data system might take more time to train and test data.

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IV. CONCLUSION

The main goal of this research work is to design efficient automatic brain tumor classification with high accuracy, performance and low complexity. This project consists of the details about the model which was used for the detection of brain tumor using the MRI images of the brain from the normal persons and the persons who had a brain tumor. If it is deployed in the real-time scenario then it will help many people in diagnosing the brain tumor without wasting the money on check-up. If the brain tumor is confirmed by the model, then the person can reach the nearest hospital to get the treatment. It can be the best way of practice for people to save money. As we know that the data plays a crucial role in every deep learning model, if the data is more specific and accurate about the symptoms of the brain tumor then that can help in reaching greater accuracy with better results in real-time applications.

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