# Brain Tumor Revelation with E-Report Generation

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*Abstract:* **The brain tumor is a deformed tissue mass formed by the uncontrollable multiplication of tissue cells. The location of tumor in the brain is identified using MRI (Magnetic Resonance Imaging). Manual evaluation of the scans in tons as observed in the medical application is time and energy consuming. Thus, in this paper, an automated method of detection for brain tumor is adapted using an efficient variant of neural network called CNN (convolutional neural network). A five-layer CNN is implemented which provides feature extraction and classification, then an authentication provided by doctor is implemented, which is displayed using a GUI (Graphical user interface). The primary purpose of authentication is to achieve ensured security for patent's personal health information. Further an e-report is generated using the concept of file handling in python.**

***Keywords*: CNN, MRI, GUI, Authentication, Python.**

## I. INTRODUCTION

One of the non-invasive methods to analyze the inside of the human body is medical imaging. Medical images enclose various modes of analysis and processes to figure out the human body for diagnosis and treatments. Hence, playing a significant role in the betterment of health of the mankind. The higher rate of success in image processing is essentially determined by the image segmentation. The chief purpose of image segmentation lies in processing widely tumor revelation, effective machine vision vison and obtaining accurate results for further diagnosis. The improvement of image sensitivity and specifity of tumor has become a highlighting issue in medical images using computer aided diagnostic (CAD) systems. According to surveys, the tenth leading cause of death rate in the world is brain tumor and other nervous system tumor. The survival rate for five years for men and women with brain tumor is 34% and 36%, respectively. Furthermore, it is stated by World Health Organization (WHO) that about 400,000 in people in the world are prone to this tumor. A brain tumor is observed when there is an abnormal growth of brain cells. This tumor is majorly of two types: Malignant and Benign. The former tumor emanates in the brain, grows rapidly and vigorously spread to the adjacent tissues. It infects the different parts of the brain and the overall nervous system. The latter tumor types spreads from another place and grow slowly. Hence, there should be early revelation of tumor to improve the possibilities of treatment, which can result in higher survival rate. But manual detection and segmentation is very time consuming, challenging and worrisome job as heaps of MRI scans are produced in regular medical practice. The brain tumors imaging consists of plentiful amount of data. Also, the tumors can be blurred with soft tissue boundaries. Thus, it is an intensive task to achieve accurate and satisfactory results of tumors in human brain. Besides tumor revelation, the patient information has to be double checked and secured in order to prevent any mis happening with respect to the patient's personal information. In this paper, we propose an effective and accomplished technique to ease the revelation of brain tumor without any human intervention based on CNN and authentication provided by the doctor.

## II. LITERATURE REVIEW

The most arduous task is to segment the region of interest from an report or image. Scientists are working in obtaining the best solution to obtain best sectionalized frames from images. Automation is everywhere looking at the current trends and so it is here as well where automation techniques are used to identify and sectionalize each MRI Image. This technique is based on super pixel method where each pixel is sectionalized into smaller frames or pixels forming super pixel, it can be a single pixel or a group of pixels group together into smaller frame. Comparisons between sectionalizing techniques is done which are Extremely Randomized Trees (ERT) and Support Vector Machine (SVM) where both had to sectionalize each super pixel into tumor and normal frames. The results demonstrated good performance and efficiency of these techniques. But when we see the upcoming developments in neural network techniques it was observed that they provide better performance than other techniques.

Hussain Elnoor Mohammed Abdalla, M. Y. E-mail[2], Brain tumor is one of the perilous diseases which needs antecedent and accurate detection techniques. Most detection and diagnosis method depends on decision of neuro specialists and radiologists for image assessment which poses the backlogs like human errors and failures also it's a time consuming process. This study reviews the techniques used in detecting brain tumors base on MRI scans. Initially two major steps are carried over data pre and post processing. This helps in enhancement and analysis of images or samples easily. Then the obtained data is grouped in grey level dependency matrix. Raducu Gavrilescu, Cristian Fosalau[1], The Moto of this paper was to provide a view on how to utilize the upcoming image processing algorithms for detection of traffic progression traces safe enough to use in driving a car. And it was concluded that the faster RCNN which is Regional based

Convolutional Neural Network. Multiple image copies were taken further train systems.

## III. METHODOLOGY

In our proposed methodology, we use an automated technique of brain tumor revelation. The algorithm used for this purpose is convolutional neural network. The basic role of whose is to perpetuate the attributes of the picture. The CNN chiefly comprises of feature extraction and classification. A dataset of MRI image is utilized in our work, which is further given authentication by doctor and a report is generated.

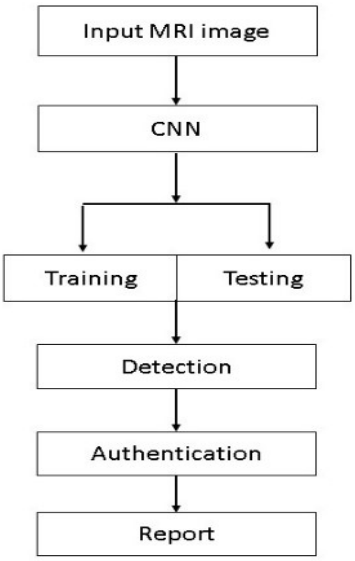


Fig 1: An overall architecture

### A. Input

A reliable image of MRI scan is fed as the input to the CNN. A dataset of various images is built which includes the MRI scans of healthy human brains as well as the ones affected with tumor, which are used for testing and training. A dataset of 200 cases is considered here.

### B. CNN

The CNN has a unique architecture when compared with the regular network. These networks comprise of various hidden layers, whose fundamental entity is neuron. One layer is connected to the other layer. Consequently, the final layer is the output layer, which results in predictions. The distinguishable trait of this method is that the link lasts only between a set of neurons, not all of them in the layer. The CNN is comprised majorly of two parts:

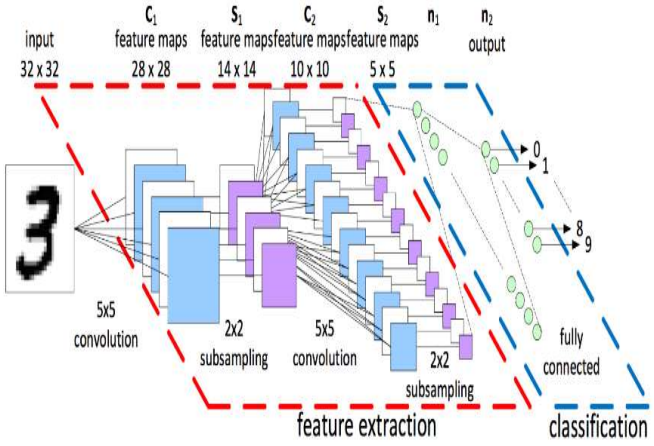


Fig 2: Classification of CNN

### C. Feature extraction

This section comprises of various actions like receptive fields, activation functions and pooling layer (also known as subsampling). The receptive fields link neurons of one layer to the another one, leading to a region formation called receptive filed. The activation functions can be tanh, sigmoid, ReLu (Rectified Linear Unit). The latter function is regularly used and given by:

$$F(y)= \max(0,y)$$

The ReLu converts a negative unit into zero and positive unit for output. The pooling layer results in lessening of the spatial dimensions of the image. It performs the function of filtering. This in turn reduces the training time and computational power. Pooling is classified into two types: Max pool and Average pool. The former type throws a maximum value from the area occupied by the kernel while the latter type throws an average value from the area occupied by the kernel. They are given by:

$$a_j = \max_{(p,q)\in R_{ij}} a_{kpq} \qquad \text{(Max pooling)}$$

$$a_{kij} = \frac{1}{|R_{ij}|}\sum_{(p,q)\in R_{ij}} a_{kpq} \qquad \text{(Average Pooling)}$$

$$h_{i,j} = \sum_{k=1}^{m}\sum_{l=1}^{m} w_{k,l}x_{i+k-1,j+l-1}$$

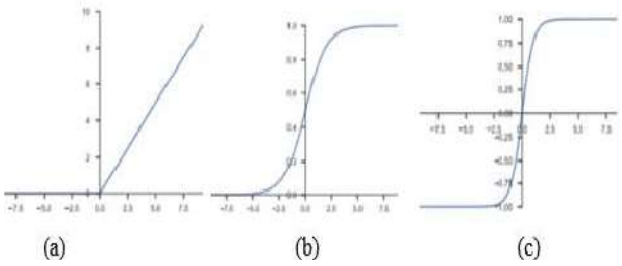


Fig. 3. Activation functions used in neural networks :(a) ReLU (b) sigmoid (c) tanh

*D. Classification*

Having converted the input image into a reliable form, this form is flattened into a column vector. After a continued looping, the structure differentiates attributes and then classifies. The loss function is also calculated, which measure the closeness between the prediction of value and the actual truth. It is given by:

$$E(\theta) = -\sum_{i=1}^{n}\sum_{j=1}^{k} t_{ij} \ln y_j(x_i, \theta)$$

*E. Authentication*

In order to provide double verification, authentication is provided by doctor. It is developed using pyqt5 and its tools. For the purpose of authentication login ID and password is generated from the doctor. A GUI is created for the login interaction. The another need for providing authentication is to ensure the security to the patient's personal health information, as an intruder can misuse the health information to claim medical benefits like insurances, etc. Thus, the application of authentication finds a necessity.

*F. E-Report*

Having all the details of the patient's health i.e., the revelation of brain tumor and its further treatment and E-report is generated by using file handling in python. The retrieval, reading, writing and many more operations can be performed using the file handling feature in python. The complexity of file handling is lesser when compared to other programming languages. Thus, a final report is generated using python.

## IV. SIMULATION RESULTS

The five-layer CNN algorithm was successfully able to reveal the identification of brain tumor very precisely. The testing and training ratio were divided as 80 and 20, respectively. The algorithm gives an accuracy of 100%on the dataset of 250 scans. Furthermore, an authentication is provided for double verification and an e-repot is generated.

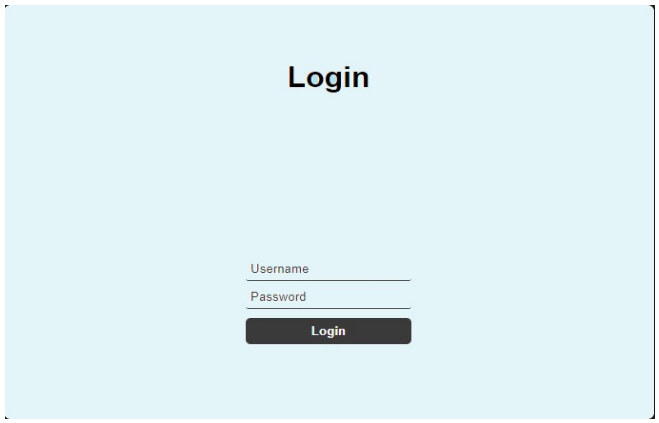


Fig 4: Authentication Page

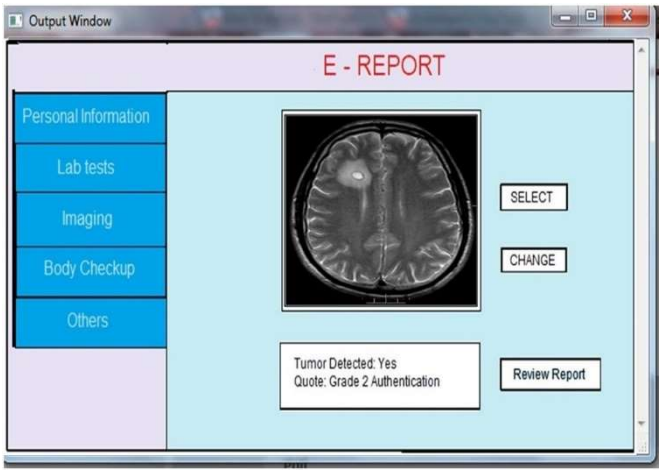


Fig 5: E Report Window

## V. CONCLUSION & FUTURE WORK

The work proposed in the paper gives an automated revelation of brain tumor. It outshines the drawbacks of time and energy consumption. The algorithm is well trained and tested. Hence, giving cent percent efficiency. After which authentication is provided and an e-report is generated. In future, we intend to work upon various diseases and provide encryption in order to provide confidentiality and security while being communicated from one place to another.

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