IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

BRAIN TUMOR DETECTION FROM MRI IMAGES USING CNN

[1]Anjaly Antony, [2]Minla K.S
[1]Msc Scholar, [2]Assistant Professor
[1,2]Department of Computer Science,
[1,2]St.Joseph's College (Autonomous), Irinjalakuda, Thrissur, India

Abstract: Brain tumor is the scariest disease. And the detection of brain tumor is very essential and important to save one's life. The classification and the identification of brain tumor have performed by biopsy, and that method is not usually conducted before brain surgery. To diagnosing Brain Tumor with the help of magnetic resonance imaging (MRI Images) has gained enormous prominence over the years primarily in the field of medical science. Our work involves the implementation of a convolutional neural network (CNN) for diagnosing brain tumor from MRI images. The latest technology can help radiologists in tumor diagnostics without invasive measures. The death rate of humans caused by the brain tumor was high before the early diagnosis of the brain tumor was identified. After the early diagnosis is found, the death rate is significantly decreased. Because of the exact identification of brain tumor at the starting stages, the chances of survival of a tumor patient are increased and the death rate is significantly decreased. If the brain tumor is predicted, the position and the size of the tumor can be identified. The aim of the project is to detect whether there is a presence of tumor or not in MRI images using convolutional neural network (CNN).

Key words- Brain tumor, MRI images, Neural Network.

I. INTRODUCTION

A brain tumor is the abnormal growth of cells inside skull or it is a scary disease occurring in human being. A tumor results from an uncontrolled division of abnormal or unwanted cells. That type of cells can affect the normal functionality of the tissue or organ. The treatment process mainly depends on tumor types, size and its location. Brain tumors are of different types. The high-grade tumors like malignant tumors, which are cancerous and the other one is also known as low grade tumors. We can compare to benign tumors with malignant brain tumor grows very rapidly and is more prone to invade adjacent tissues. Thus, the malignant brain tumors will reduce cognitive function and quality of life and it also leads to death of a person. The high-grade brain tumors are among the most dreadful types of tumors with direct consequences such as cognitive decline and poor quality of life. The earlier detection and identification of brain tumors will help for the survival of a patient and the wider the treatment options. The manual evaluation process is time consuming and that should

contain some human errors. The different methods may be employed to diagnose a brain tumor such as MRI scans, BIOPSY and SPECT (Single Photon Emission Computed Tomography). Magnetic resonance imaging (MRI imaging) is the most known method, due to its non-intrusive imaging. This is also conformable in terms of normalization of tissue contrast providing minute details of interest. In this paper, we use the images to train which consists of a convolutional neural network (CNN). CNN models are one of the deep learning networks; they are used for the diagnosis process.

II. LITERATURE SURVEY

The major difficulty in the brain Tumor Detection from MRI Images is the appearance of tumor region. The tumor region size, shape, location and intensity vary from images to images for a particular type. Usman Akram and some others implemented a Computer Aided System for Brain Tumor Detection, in which Global Thresholding technique was incorporated for segmenting tumor. A. Hazra proposed a method for Brain Tumor Detection and Localization on MRI Images. It has three major steps namely pre-processing, edge detection and segmented the tumor region with Kmeans Clustering algorithm.

Divyamary.D proposed a model of Brain Tumor Detection from MRI images using Naïve Classifier and the main objective is that, to develop an efficient method to detect the brain tumor at the early stages. The methodology used is the Naïve Bayes Classifier. In this method, the tumor is identified and also divided into normal and abnormal tumor. The accuracy rate is 84% with specificity rate 9.541284. Shahrjar proposed an Automatic Approach for Brain Tumor Detection. The brain tumor images were preprocessed using image enhancement filters and further segmentation was performed and is used for identifying the tumor. One of the most challenging as well as demanding task is to segment the region of interest from an object and segmenting the tumor from an MRI Image is an ambitious one. Nowadays Neural Network is based segmentation and it gives prominent outcomes.

Based on the edge detection approaches, Badran developed the canny edge detection model. The dataset contained 102 images. Images were first preprocessed, then for two sets of neural networks, for the first set Canny Edge Detection was applied, and for the second set, Adaptive Thresholding was applied. Dina introduced a model based on The Probabilistic Neural Network Model Related to Learning Vector Quantization. This model was evaluated on 64 MRI images. Connecting on Region based Fuzzy Clustering and deformable model, Rajendran accomplished 95.3% and 82.1% of ASM and Jaccard Index Based on Enhanced Probabilistic Fuzzy C-Means Model with some morphological operations.

III. PROPOSED SYSTEM

Our proposed system consists of the existed system with some improvements and more accuracy. CNN methods are best for the accuracy level with a lower rate of errors. Proposed system is used to detect the tumor more efficiently. The proposed system has good generalization capability and good execution speed. The system contains a pre-processing step, in which images are normalized. The implemented CNN architecture could be used as an effective decision support tool for radiologists in medical diagnostics. The developed system takes less time to compute and faster to train than other networks. The final decision of neuro specialists and radiologist for the tumor diagnosis mainly depend on evaluation of MRI images. The manual detection process is time consuming and that

process needs domain expertise to avoid human errors. To overcome this issue, deep learning algorithm was proposed for detecting the brain tumor from MRI images. The systems are created to solve problems. The major steps in system design are the pre-partition of input forms and the output reports in a form applicable to the user. Our proposed system design involves various stages as,

1. Data collection
2. Pre-Processing
3. Build CNN
4. Training
5. Create trained model
6. Testing

Working of each module can be classified as follows,

1. **Data collection:**
   This is the initial stage of the project. That is the selection of the dataset. In our data set, we have 253 images of varying dimensions. The data are collected from Kaggle datasets of brain MRI images. The dataset is labeled as two classes of YES and NO based on the presence of tumors and the normal brain MRI images. The 155 images with brain tumors and the remaining 98 images are of normal brains.
2. **Pre-Processing:**
   The pre-processing steps are applied to every images. That are, Crop brain containing a section of images, transform the images from different sources. Normalization are applied to scale the pixel values.
3. **Build CNN:**
   The area of medical image processing, the Neural Network is commonly used. Many researchers have tried to develop a model and that will give more accurate results and they recognize the tumor. CNN have a hierarchical structure. And it has an input and output layers, as well as ZeroPadding layer, Convolutional layer, MaxPooling layer, Flatten layer and Fully Connected layer.
4. **Training:**
   At the training stage, take the dataset and train the data set to identify the similarity functions. In this stage, the monitoring of the data and finding different values and the experiments were performed on the data.
5. **Create trained model:**
   Using CNN, we create a trained model and that consists of different layers. And also, the CNN is organized in layers and has a hierarchical structure.
6. **Testing:**
   Our model can single out the MRI images with tumors with an overall accuracy of 95%. The model is used to find the brain tumor using CNN method.

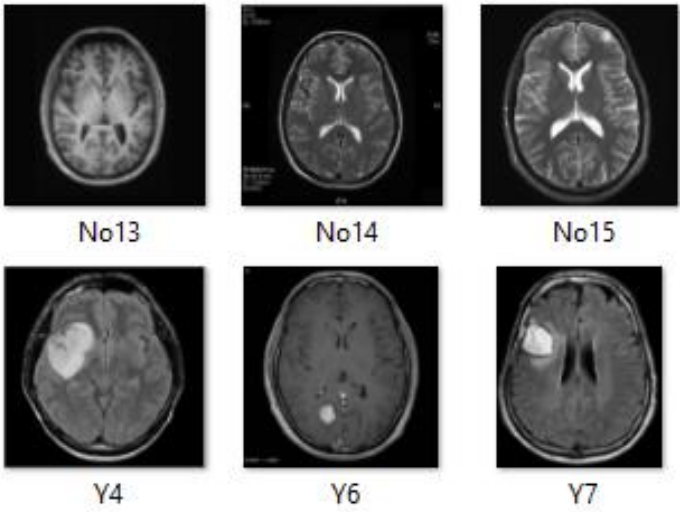

Fig 1. Testing and Training Images

i. ADVANTAGES OF PROPOSED SYSTEM

The main advantages of the brain tumor detection methods are,

1. It increases the spatial localization of image and thus improves the performance relative to the other system.
2. CNN models are best for the accuracy level with a lower rate of error. The accuracy method is most arises using CNN.
3. It takes less time to compute and is faster to train than other networks with fewer parameters.
4. Image processing can be performed on these MRI images, which a machine can understand for further analysis.
5. With this approach, brain tumor detection and segmentation are achieved without human intervention that saves the cost and time.
6. The proposed system only requires a limited number of datasets and that produces high accuracy.
7. From this method the tumor region, size, shape, location and intensity are identified.
8. The system only requires limited amount of time to train images with more accuracy.

ii. ALGORITHM

1. **Zero Padding layer:**
   It occurs when we add a border of pixels all with value zero around the edges of the input images. That is, zero around the outside of the images.
2. **Convolutional layer:**
   Conv2d(), it is a convolutional layer, that construct a two-dimensional Convolutional layer with the number of filters, padding, filter kernel size and activation function like arguments.
3. **Max Pooling layer:**
   In this technique, we split feature maps into subfields and only holds maximum values. It takes the largest element from the window and modifies all the nearby elements in that window, replacing them with the large element.

4. **Flatten layer:**

   This is an essential layer after the pooling layer, because we have to transformed the whole matrix representing the input images into a single column vector and it's imperative for processing.

5. **Fully Concentrated layer:**

   These layers were employed Dense-1 to represented the dense layer. The dense function is applied for the processing of the Neural Network, and the obtained vector is work as an input for this layer.

IV. SYSTEM ARCHITECTURE

Our system consists of one message box and three buttons named as UPLOAD, SUBMIT and EXIT. In our system each button has their own properties. The UPLOAD button is used for uploading an MRI image from our system and the SUBMIT button is used for submitting an image and the last button EXIT is used for exiting from our system. Using the image box, we can display the status of our MRI image. The proposed system consists of several steps. At the first step, the brain MRI image is taken as an input to our system. At the next step data normalization is conducted, and after that, the resize operation is applied. The dataset used in this study is composed of images of brain MRI scans. After these steps, the pre-processing was employed. The images are having different black corners, it is a challenging for CNN. The CNN is a convolutional neural network, is a type of neural network that can extract important features from images, and analyse those features, and classify them accurately. There are different types of architectures in CNN, and that consists of three primary layers, the convolutional layer which is followed by the pooling layer and the fully connected layer. These layers will predict the tumorous or the normal images.

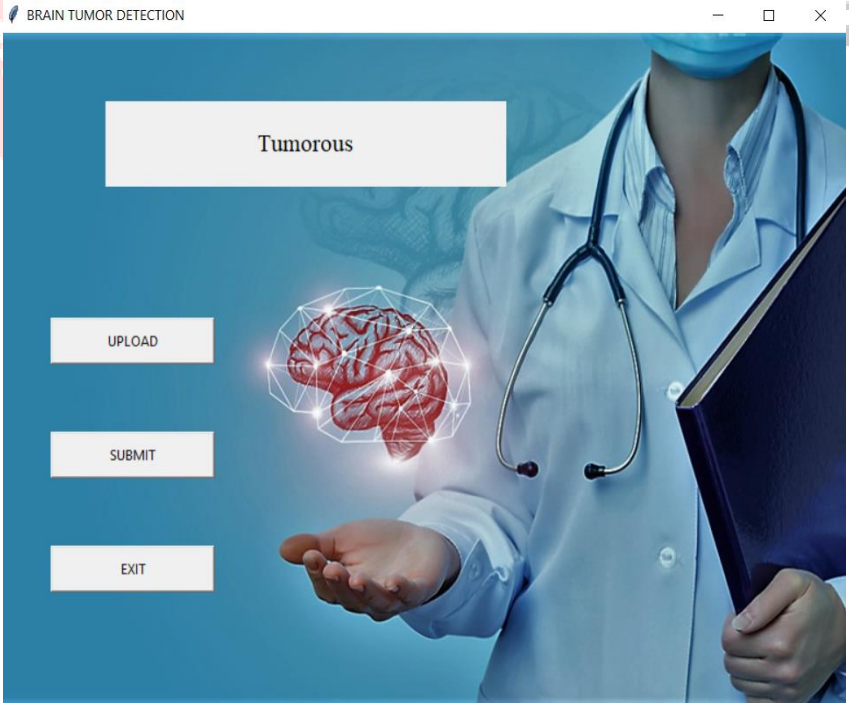

Fig 2. Proposed System

V. CONCLUSION

Detection of brain tumor at the starting stages plays an important role in the human's life and medical interventions. It plays an essential role in the processing of medical images, as images with different variations like their shape, size or some other features. Using this brain tumor detection method using CNN, diagnosis is used to save the patient's life and the mortality rate is significantly decreased. The use of CNN models is the way to improve the accuracy of tumor prediction and diagnosis. In this paper, a neural convolution network (CNN) is developed to detect the brain tumor from MRI images of brain tumor at the starting stages. The CNN models are trained for faster and effective training method using CNN network. Several pre-processing procedures are conducted to improve the model's efficiency. The results validate that the model achieved an overall classification accuracy of 95%. Thus, the proposed system could be executed as a handy system for doctors or radiologists to provide desirable medical treatments for early detection of brain tumors. To detect the location of the tumor utilizing CNN, this work is expected to expand with 3D brain scans in the future.

VI. REFERENCES

[1] Abu, Abyaz, Shadman, Madiha, Mohammad and Nowrin. 4th I-SMAC. "Deep Convolutional Neural Networks Model based brain tumor detection in brain mri images".

[2] Mariam Saii, Zaid Kraitem. 2017." Automatic Brain tumor detection in MRI using image processing techniques".Biomedical Statistics and Informatics.

[3] Seetha, J & Selvakumar Raja. 2018." Brain Tumor Classification Using Convolutional Neural Networks. Biomedical and Pharmacology Journal",

[4] Logeswari and Karnan. 2010. "An Improved Implementation of Brain Tumor Detection Using Segmentation Based on Hierarchical Self Organizing Map".

[5] Hossain, Shishir, Shraf, Nasim and Muhammad Shah. 2019 1st ICASERT." Brain Tumor Detection Using Convolutional Neural Network".

[6] Zahra, Rezaei, Safiyeh, Noroozi, Sobhaninia, Alireza, Ahmadi, Mehdi, Zarrabi, hamidreza, Karimi, Nader, Emami, Ali, Samavi, and Shadrokh. 2018. "Brain Tumor segmentation using deep learning by type specific sorting of images",

[7] H.E.M.Abdalla and M.Y.Esmail. 2018-ICCCEEE." Brain Tumor Detection by using Artifical Neural Network".

[8] Anam Mustaqeem, Ali Javed, Tehseen Fatima. I.J Image Graphics and Signal Processing. 2012." An Efficint Brain Tumor Detection Algorithm Using Watershed & Thresholding Based Segmentation".

[9] B. Devkota, Abeer, Prasad, A.K. Singh, Elchouemi. 6th International Conference on Smart Computing and Communications, ICSCC, 2017. "Image Segmentation for Early-Stage Brain Tumor Detection Using Mathematical Morphological Reconstruction".

[10] Anandhanarayanan, Yakub Bhanothu, & Govindaraj. 2020. "Detection and Classification of brain tumor in MRI images using Deep Convolutional Network".