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Brain Cancer Detection Web Application – "BRAINWIZ"

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ABSTRACT

These days, the tumor is the second main reason for cancer. A Brain Tumor is largely a shapeless molecular boom that may be cancerous or non-cancerous. Brain Tumor Detection is one of the maximum complicated responsibilities in scientific photograph processing. Brain tumors stand up from distinct sorts of cells and the cells can advise matters just like the nature, severity, and rarity of the tumor. Tumors can arise in distinct places and the vicinity of tumors can advise something approximately the form of cells inflicting the tumor which could resource in addition diagnosis. The tumor withinside the Brain is the maximum risky disorder and may be recognized effortlessly and reliably with the assistance of detection of the tumor with computerized strategies on MRI Images. This paper proposes a unique approach to stumble on mind tumors from diverse mind photos through first wearing out distinct photograph preprocessing strategies i.e. Histogram equalization and commencing which changed into accompanied through a convolutional neural network. The paper additionally discusses different photograph preprocessing strategies aside from those which might be finalized for education and their effect on our dataset. The experimental have a look at changed into achieved on a dataset with distinct tumor shapes, sizes, textures, and places. We can use a Deep Learning structure CNN (Convolution Neural Network) typically referred to as NN (Neural Network) and VGG 16(visible geometry group) Transfer gain knowledge of stumbling on the mind tumor. Convolutional Neural Network (CNN) changed into hired for the mission of class. In our work, CNN performed a don't forget of 98.55% at the education setting, 99.73% at the validation set which could be very compelling. Brain Tumor segmentation is one of the maximum vital and exhausting responsibilities withinside the terrain of scientific photograph processing as a human-assisted guide class can bring about faulty prediction and diagnosis. Moreover, it's miles a stressful mission whilst there's a huge quantity of information gift to be assisted. The overall performance of the version is to expect photograph tumor is a gift or now no longer withinside the photograph. If the tumor is the gift it returns sure in any other case go back no. The important goal of this paper is to differentiate among ordinary and unusual pixels, primarily based totally on texture-primarily based totally and statistical-primarily based feature.

Keywords : Brain Tumor Detection ,Computer aided Diagnosis, Convolutional Neural Network(CNN), Deep Learning(DL) , Image Processing ,Genetic Algorithm(GA).

I. INTRODUCTION

The mind is one of the most complex organs in the human frame that works with a completely big no of cells. Brain tumors grow whilst there's an unregulated department of cells that bureaucracy an irregular. The organization of a mobileular will affect the regular capability of the conduct of the mind interest and harm the healthful mobileular . Primary tumors are those that originate withinside the mind itself while secondary tumors are those that metastasize to distinctive elements of the frame. Tumors could have distinctive origins and are primarily based totally on the cells or the beginning acquired from distinctive sorts of tumors. For instance, gangliogliomas are tumors that consist of neoplastic neurons and are generally grade I or low-grade tumors which shows that the tumor is well-differentiated and has sluggish growth. Another instance is meningioma which originates from the meninges (The set of three membranes overlaying the mind and spinal cord) and maybe grade I, II, or III and it's far slow growing. Symptoms of a mind tumor consist of headache which may be acute and persistent, muscular disorders, dizziness, cognitive disorders, etc. According to, Brain and different worrying machines most cancers are the tenth main motive of dying, and the five-year survival charge for humans with a cancerous mind is 34% for guys and 36% for women. Additionally, the World Health Organization (WHO) states that approximately 400,000 people within worldwide are affected by brain cancer and 120,000 humans died in 2018. Moreover, an anticipated 86,970 new instances of number one malignant and non-malignant mind and different Central Nervous System (CNS) tumors are predicted to be identified withinside the United States in 2019. In the management of MRI photography, the treatment of virtual photography

assumes an important task. In the restorative discipline, X-ray pics are normally used for comparing and spotting the frame's tumor growth.

Both youngsters and adults have a not unusual place mind tumor. Tumors motive severe mental stress, which unfolds throughout the whole mind location. Inside the cranium, tumor improvement takes vicinity and interferes with regular mind function. There might be a tumor main to Cancer, the main motive of dying and answerable for approximately thirteen percent of all deaths worldwide, that's the main motive of dying. The most cancers occurrence charge is dynamic growth at an alarming charge of the international. Brain tumors in MRI scans (or every other scan) are diagnosed with the aid of using odd blobs withinside the mind. These blobs or areas have a distinctive illumination than the relaxation of the mind and are generally brighter than the background. However, the procedure of segmenting the tumors in MRI pics is a completely hard task.

The tumors have distinctive sizes, textures, or even the positions wherein they're found. If we take into account segmenting the tumor with the aid of using residences along with illumination, we can also add face troubles along with overlapping pixel intensities with the regular tissues. Identification and segmentation of mind tumors in MRI pics is essential because it shows the presence of the odd tissues for remedy or affected person follow-up purposes. Most mind tumors additionally motive edema which is likewise a component that distorts the close-by systems and might alternate the pixel intensities across the tumor. CNN at the side of a few preprocessing strategies can deliver accuracy similar to or maybe better than human beings. The National Cancer Institute (NCI) has suggested that 22,070 new instances of mind most cancers and different crucial worried structures may be identified inside the US in 2009. The American Brain Tumor Association explains these statics, in addition, suggesting that 62,930 is the brand new case of a benign degree of mind tumor.

There is presently no easy identity of the number one motive of mind tumors. However, they're a result of radiation infection in the course of MRI, CT test, and X-rays. The following signs and symptoms verify the life of mind tumors, excessive seizure, lack of motor function, convulsions, neurological disturbances, and troubles with numbness, speech and additionally hormonal abnormalities and persona alternate also can signs and symptoms of mind tumor. Treatment of the identical consists of chemotherapy, radiotherapy, tomotherapy, and surgery (craniotomy). Although mind tumor is relatively rare ie. 1.4% new instances according to yr, in advanced countries, fatalities because of mind tumors have improved over the last few decades. CNS tumor instances in India variety from five to ten according to 100,000 populace with a growing fashion and its debts for 2% of malignancies.

The ultra-modern conventional diagnostic technique is primarily based totally on the revel in of human beings withinside the notion of a choice in MRI test and rise the threat of fake prognosis and mind tumor reputation as well. Applying, on the alternative hand, Digital photograph processing permits the identity of the tumor without difficulty and reliably. An important factor of the studies turned into a scientific photograph. The Presence of Brain Tumor segmentation, because it inherited complex troubles for the correct segmentation of pics in mental disorder. Radiologists use a CT test and MRI to visually take a look at the affected person. They take a look at the mind systems, tumor size, and tumor place turned into illustrated with the aid of using MRI Images. Imaging performs an essential function in Brain tumor prognosis. They frequently tend on MRI to be both hypo disturbing or iso disturbing. As the pics are known as edges, on-the-spot shifts in gray tones arise. Area detection techniques convert photos to Edge photos to appreciate grayscale changes in photos. The segmentation photograph is acquired with no adjustments withinside the number one photograph's bodily characteristics. The MRI pics from the radiologists offered info along with the place of tumors, an easy manner to diagnose the tumor, and put together the surgical procedure, a)Normal Brain, b) Benign Tumor, c)Malignant Tumor Fig.2 illustrates from the mind location of a tumor shows, wherein the inflamed part of the mind is located.

The three-dimensional representations of the name of the game organ are acquired through the use of a heavy discipline of magnetism and radio waves in MRI. The MRI approach has the gain that ionizing radiation isn't a threat. The huge bonus of magnetic resonance scans is the scarcity of ionizing radiation. By making use of photograph processing strategies, the diagnostic functionality of the MRI pics is improved. In scientific photograph processing, mind photograph is an important task. The advent of scientific pics makes scientific prognosis viable with the aid of using exposing the inner mechanisms of the human frame's unseen organs. The processing of scientific pics lowers the weight on each sufferer and physician. It is one of the major optical photograph processing programs wherein mathematical operations are carried out to a photograph to grow its accuracy. This technique used for the identity of mind tumors use of photograph processing has been in use for plenty of decades. The researchers indicated many semi-automatic strategies for detecting the tumors of the mind and many computerized photographs, processing strategies, however maximum of them do now no longer consist of green and dependable effects because of the life of noise and

vulnerable contrasting pics that normally arise at some point of the Medical Images.

Because of the complicated mind shape and mind tumor segmentation is hard. But early and dependable tumor detection is hard. The diagnostic tool could be very important for tumors, edema, and necrotic tissues. Tumors are at risk of harm to regular mind cells Inflammation is created and the stress is positioned on elements of the mind location and stress withinside the cranium is improved. Currently existing, the algorithms used in the context of the processing of scientific pics used partial differential equations, stimulated curate flows, and numerous mathematical trends. In this article, we proposed a green and powerful technique that allows in the segmentation and the detection of the mind tumor with no human help primarily based totally on each conventional classifier and Convolutional Neural Network. In this paper, we begin with the aid of using discussing the technique we used – ie beginning from the dataset accompanied with the aid of using discussing the results of various photograph processing strategies at the dataset after which getting ready the right dataset layout for schooling, photograph augmentation, and schooling and via the overall performance metrics to the result.

II. LITERATURE REVIEW

One of the most difficult and challenging tasks is to segment the region of interest. An object and segment, the tumor of an image of the brain of the magnetic resonance is ambitious. Researchers around the world are working on this area to get the return on investment of Bessiesse and various disparate approaches simulated by a separate perspective. Nowadays, segmentation based on neural networks offers significant results and the flow of use of this model is increasing day by day the whole segmentation process based on mathematical morphological operations and the spatial algorithm FCM which improves calculation times, but the proposed solution has only been tested in the evaluation phase and results such as Detect Cancer with 92% and Classifier have an accuracy of 86.6%. resembled Histogram based segmentation technique. About the task of segmenting the brain tumor into three classes (tumor which Includes necrosis in tumor, edema and normal tissue) Classification problem linked to two flair modes and T1.

Abnormal regions have been detected using an active contour model in the region mode. Edema and tumor tissues have distinguished themselves in abnormal regions based on the improvement of the contrast T1mode with the K-means method and obtained a die coefficient and a sensitivity of 73.6% and 90.3% respectively. based on the edge detection approach, Badran et al. Adopted the Cashed Cashed Border Detection model with an adaptive threshold to extract return on investment. The dataset contained 102 .0 images. The images have been pre-treated for the first time, so for two sets of the neuronal network, the first set of smart edge detection was applied and an adaptive threshold was applied for the second set. The segmented image is then represented by a level number and the characteristic features are extracted with the Harris method. Then, two neural networks are used, the first for the detection of healthy or brain tumors and the second for the detection of the tumor type. Describing the results and comparing these two models, the smart edge detection method showed better results in terms of accuracy. Pey et al. He proposed a technique that uses models of tumor growth as new features to improve the segmentation of the longitudinal MRI tumor. Label maps are used to obtain tumor growth patterns and predict cell density after plot extraction (eg., fractal and mBm) and intensity characteristics. Model performance is reflected as an average DSC with tumor cell density LOO: 0.819302 and 3Folder: 0.82122. introduced a model based on the probabilistic neuronal network model relating to vector quantification learning. The model was noted on 64 MRI images, including 18 MRI images were used as a test set and the rest was used as a training set. The Gaussian filter has smoothed the images.79% of processing time was reduced by the modified PNN method. Othman et al implement a probabilistic neural network segmentation technique. The analysis of the main components (PCA) was used for the extraction of the function and to reduce the large dimension of the data . The MRI images are converted into tables, then the probabilistic neural network is used for classification.

Finally, the analysis of the performance is carried out. The training data set contained 20 topics and the test data set included 15 topics. Based on the spread value, the accuracy ranged from 73% to 100%. Focusing on region-based fuzzy clustering and the deformable model, Rajendran et al. reaches 95.3% and 82.1% of the ASM and Jacpard index based on an improved fuzzy cryptographic probabilistic model of certain morphological operations. performed with the LinkNet network for tumor segmentation. Initially, they used a single Linnet network and sent the seven sets of training data to this network for segmentation. They did not consider the angle of view of the images and introduced a method for the CNN to Automatically the most common types of brain cancer that do not require pre-treatment phases. 73 is obtained for a single network and 0.79 is obtained for multiple systems.

III. RELATED WORK

In this section, we discussed many existing brain tumor detection techniques in the field. It describes an approach to

ordering MRI images, which depends on the backpropagation of the neural system procedure. The strategy is built using the techniques of enrichment, segmentation, registration, character recognition, and image segregation. During the segmentation procedure, morphological operations and thresholds are considered. These training image and experiment is analyzed by a neural network technique of backpropagation algorithm to the recognition of the presence of a tumor proposed a novel method for automatic cancer detection using DNN(deep neural network) for expertise detection of glioblastomas. Its use a final layer which implementation on fast segmentation, which is an order of 24 seconds to 3 minutes for an entire region of the lungs. Last progress in the use of magnetic resonance images in the process of biomedical images. Imaging (MRI) allows rapid diagnosis and localization of brain tumors. We plan to divide brain scans into eight categories, with seven categories indicating various types of tumors and one category for the normal brain.

Using the Leave2-Out cross-validation process, the suggested classification strategy is validated. Arya, et al. presented a review on various image preprocessing and segmentation techniques like image filtration method, Denoising method, Histogram based segmentation, Watershed segmentation, SVM-based segmentation, and MRF-based segmentation can be a module for a better result for accuracy and a lower rate of error. Convolutional Neural Network (CNN) was used to detect a tumor. The CNN was the first place where images were seen. The Softmax Fully Connected plate, which was used to classify images, had a classification accuracy of 98.67 percent. The CNN's precision is also 97.34 percent with the Radial Basis Function (RBF) classifier and 94.24 percent with the Decision Tree (DT) classifier.

IV. REQUIREMENT

1. Python: Python was the language of selection for this project.

Python as a language is forgiving and permits for program that appear as if pseudo code.

2. Jupiter Notebook: The Jupyter Notebook is an open-source web application that enables you to make and share documents that contain live code, equations, visualizations, and narrative text. Uses include data cleaning and processing, digital simulation, statistical modeling, data display, automatic learning, and more.

3. Removing noise and sharpening: The undesirable data of the element are removed using the filter and the image can be sharpened and the black and white gray image is used as input.

4. Erosion and expansion*:* It is applied to the binary image, but there are many versions so that it can operate on gray-level images. The basic effect of the operator on a binary image is the erosion of region boundaries for pixels on the ground.

5. Negation: a negative is an image, usually used on a transparent band or sheet plastic film on the negative side, the brighter areas of the photographed subject appear darker and the darker areas appear brighter.

6. Subtraction: The process of image subtraction is the digital numerical value of a pixel or the entire image is subtracted from another image. The white part of the tumor can be subtracted from another remaining part which is the black part of the images

7. Threshold: Threshold is an image segmentation process. Converts the grayscale image into the binary image.

8. Contour detection: The total area or limit can be formed correctly using the limit detection method. The white part of tumor tissues can be highlighted and their proper boundary can be detected. It is a useful method for calculating the size and shape occupied by tumor tissues.

V. METHODOLOGY

In our proposed methodology, there are two distinct models for brain tumor segmentation and detection.

The first segmented model is the tumor that uses FCM and is classified by traditional automatic learning algorithms, depending on the model focused on deep learning for tumor detection.

The FCM segmentation offers a better result for the noisy cluster dataset. Although it takes a longer execution time, it keeps more information.

Proposed Methodology Using CNN :

The Convolutional Neural Network is widely used in the field of Medical Image Processing. Over the years, many researchers have tried to build a model that can detect the tumor more efficiently. We tried to invent a specimen that can accurately classify MRI image cancer with a 2D brain. A fully connected neural network can detect cancer, but because of the sharing of parameters and the connection shortage, we adopted CNN for our model.A Five-Layer Convolutional Neural Network is introduced and implemented for tumor detection. The aggregated model composed of seven steps, including the hidden layers, gives us the most important result for understanding the tumor. Below is the proposed methodology with a brief narration

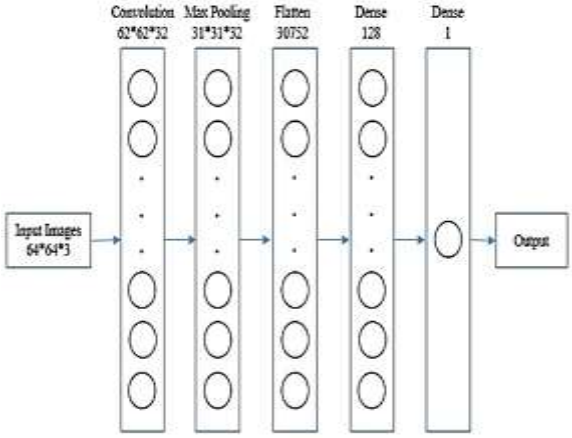


Fig. 1. Proposed Methodology for tumor detection using 5-Layer Convolutional Neural Network

Using the convolutional layer as the beginner layer, an input shape of the MRI images is generated which is 64*64*3 converting all the images into a homogeneous dimension. After accumulating all the images in the same aspect, we created a convolutional kernel that is convoluted with the Input layer - Administration with 32 containment filters 3 * 3 each with the 3-channel tensor support. ReLU is used as an activation function so that it's not corroborating with the output. In this ConvNet architecture, progressively shorten the spatial size of the depiction for diminishing the chunk of parameters and computational time of the network. Working on the cerebral MRI image can also cost excessive contamination and for this level, the maximum pooling works perfectly for this perception. For spatial data which substantiates our input image, we use MaxPooling2D for the model. This convolutional layer runs on 31*31*32 dimensions. Because of dividing the input images into both spatial dimensions, the pool size is (2, 2) which means a tuple of two integers by which to downscale vertically and horizontally.After the pooling layer, a pooled feature map is obtained. Flattening is one of the essential layers after the pooling because we've to transform the whole matrix representing the input images into a single column vector and it's imperative for processing. It is then fed to the Neural Network for processing. Two completely connected layers were used Dense1 and Dense2 represented the dense level. The dense function is applied in Keras for the processing of the Neural Network, and the obtained vector works as an input for this layer. There are 128 nodes in the hidden layer. Because the number of dimension or nodes is proportional with the computing resources we need to fit our model we kept it as moderate as possible and for this perspective 128 nodes gives the most substantial result. ReLU is used as the activation function because of showing better convergence performance. After the first dense layer, the second fully connected layer was used as the final layer of the model. In this layer, we used the sigmoid function as an activation function where the total number of the node is one because we need to lower the uses of computing resources so that a more significant amount assuages the execution time. Though there is a chance of hampering the learning in deep networks for using the sigmoid as the activation function, we scale the sigmoid function, and the number of the nodes is much lesser and easy to handle for this deep network. In a summary, Fig. 2.a shows the working flow of the proposed CNN model.

Working Of CNN Model :

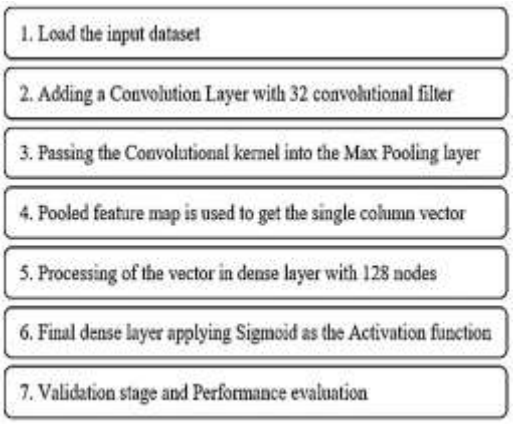


Fig. 2(a). Working flow of the proposed CNN Model.

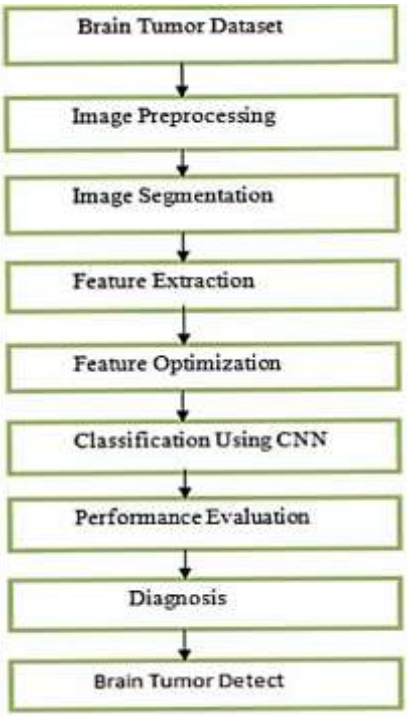


Fig. 2(b). Overall flow of the brain tumor detection system

A. *Image Preprocessing :*

Fig.3 illustrates image preprocessing. The following preprocessing steps were applied to every image:

1. Cultural brain containing a section of images. Transform the images to the shape of (240, 240,3) as images have come from different sources. so they may have different images since images in the dataset come in different sizes. So all images need to be in the same form for feeding input to the neural network. 3. Normalization applied: to scale the pixel values to the 0-1 range .

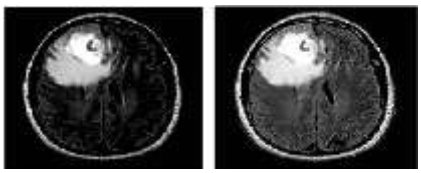


Fig. 3. Raw Image and Preprocessed Image

B. *Image Segmentation*

It is the mechanism by which an image is split into regions with different shades, textures, brightness, contrast, and gray characteristics level. An image of digital gray levels is an entry for the operation. The use of segmentation is to have greater data than existing in medical photos. Different processes, such as Neural Networks, the decision tree, and the algorithm based on rules and Bayesian Networks in a segment are used to obtain desired performance data. There are many other segmentation methods.

1) *Threshold method*: As the name suggests, the voxels greater than the threshold are called belonging to the tumor.

2*) Region growing method*: Seed voxel is entered into the segmentation; from this seed, voxels that are identical are identified as belonging to the tumor.

3) *Region growth method*: Density changes between voxel edges are considered as tumor boundaries.

C. *Watershed Algorithm :*

It is a unique segmentation method in which the intensities or gradients of a voxel are represented by a topographic map similar to those observed in geography. Depending on the "slope" of the map, a limit is assigned.

D. *Feature Selection:*

Feature Extraction is a method of collecting an image's visual content. The extraction of features is the method of portraying the raw image in its reduced form to promote decision-making, such as the classification of patterns. After Segmentation of the brain, DWT is used for the segmentation of MRI Images.The most important characteristics of the low chained passage filter and high passage to derived characteristics.

E. *Image Classification :*

Classification means marking the pictures according to their characteristics. The best function is defined by the application of the GA in other articles. The other approach is advanced by involving the GA in three comparative performance classifiers, such as CNN and ML.

F. *Feature Optimization*

Feature optimization is the combined process of feature selection and extraction which plays a crucial role in brain image processing. The initial feature selection process reduces the dimensionality of feature sets and takes minimal time to discover. Next, extract the best sets of entity raw datasets. The genetic algorithm (GA) is used.

G. *Classification*

Classification means labeling the image as per requirement in features. Apply on best feature is recognized by the Genetic Algorithm and such classifier like CNN for result .

H. *Convolution Neural Network*

In the area of medical image processing, the Neural Network is commonly used. Many researchers have tried to develop a model over the years that can more accurately recognize the tumor. To determine the usefulness of the proposed brain cancer classification system, the accuracy of the training, the accuracy of the validation and the loss of validation are measured.

We attempted to come up with an example that could correctly identify the tumor from 3D images of the brain MRI. This tumor can be identified by a fully-connected neural network,

but we adopted CNN for our model because of parameter sharing and connection sparsity.

Fig. 4. Convolution Neural Network Architecture

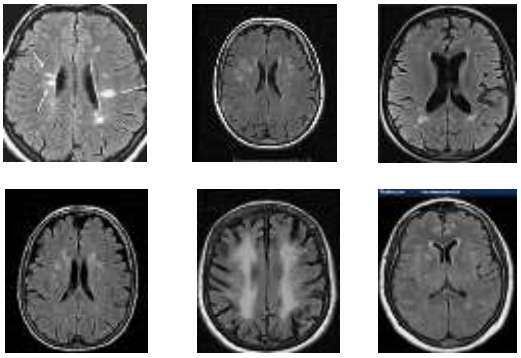
Each X input (image) has one (224 height, 224 widths, 1 channel) is given to the neural network and switches on the following layers. Figure 5 illustrates the functioning of the neural network as a) a layer of 0 fills and (5, 5) the dimensions of the pool.

VI. DATASET

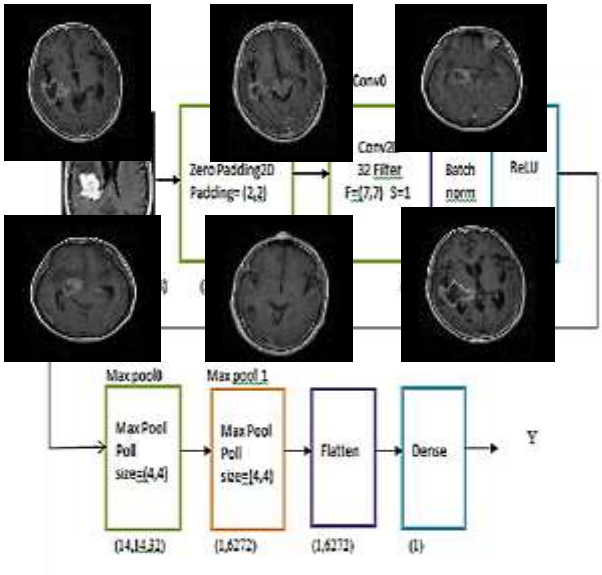
The entry data set consisted mainly in a subset of a data set consisting of 506 tumor images and the subset contained 250 images. The subset selection was performed according to the removal of images that can be lost during the formation of the model. This dataset contains 206 tumor images and 200 non-tumorous images. all 206 non-tumor images from another dataset were used. The Non-tumor Images folder has been named "Not have a tumor" in the original dataset.

The images were preprocessed and then a split of 70% and 30% were performed to obtain the training and validation dataset. The applied pre-processing consisted of histogram equalization followed by an aperture. The resulting dataset was oversampled to produce the final dataset of 506 images consisting of 200 tumor formation images, 200 non-tumor formation images, 206 tumor validation images, and 309 non-tumor validation images. Upsampling was performed when the dataset should be large enough for the model.

*Some Sample MRI Images having tumor that have been used in building the model.



*Some Sample MRI Images having NO tumor that have been used in building the model.



The dataset has 500 images with different types of tumor and also includes images that have tissues of Fat or water.

1.DICOM Sample Image Sets, http://www.osirixviewer.com/.

2."Brainweb:SimulatedBrainDatabase," http://brainweb.bic.mni.mcgill.ca/cgi/brainweb.

Tensorflow and Keras, developing a Brain tumor detection model using a CNN. The dataset combination of Br35H 2020 and Central research UK and the dataset includes three categories: yes, no, and prediction file containing 500 MRI images of the brain, and yes contain. 1500 MRI images of tumorous and no contains 1500 brain MRI images of

nontumorous MRI images and prediction contain 60 brain MRI images

. A. Brain Tumor Cases illustrates the Cancer Research UK, brain, other CNS intracranial tumor incidence related to age, with the highest incidence relate increasing in older people. In central research UK in 2015-2017. On Avg, no cases increase in each year 23 percent in older age in 75 and most types of brain and Intracranial tumors also increase rapidly in younger age. This maximum reflects cell DNA damage from time to time. Normal MRI does not see flowing fluid, such as blood in an artery, and this produces flow voids that appear in the picture as black holes. Mostly detected is a tumor in the brain recognized in a malignant stage, because a small tumor is not detected in MRI, CT scan, and X-ray images.

VII. WORKING

Fig.5.Working of CNN model for brain tumor detection

➢ *The layer of CNN model:*

i. Convolution 2D
ii. MAX Poolig2D
iii. Dropout
iv. Flatten
v. Dense
vi. Activation

- ***Convolution 2D*:** In the Convolution 2D extract the featured from the input image. It gives the output in matrix form.

- ***Max Fooding 2D**:* In maximum 2D pooling, take the largest element from the adjusted function board. ➢ Dropout: Dropout is randomly selected neurons that are ignored during training.

- ***Flatten:*** Flatten feed output into a fully connected layer. It gives data in list form.

- ***Dense:*** A Linear operation in which every input is connected to every output by weight. It is followed by a nonlinear activation function.

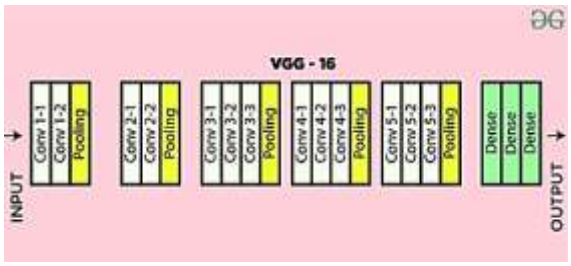
- ***Activation*:** It used the Sigmoid function and predict the probability 0 and 1.

- In the compiled model we used binary cross-entropy because we have two layers 0 and 1.

- We used Adam optimizer in compile model.

Adam:- Adaptive moment estimation. It is used for non-convex optimization problem like straightforward to implement. ▪ Computationally efficient. Little memory requirement.

Working of VVG16 model:



Transfer learning is a knowledge sharing method that reduces training data size, processing time, and costs when building deep learning models. Transfer of learning helps to transfer learning from a Earlier-trained model to a new model. Transfer learning has been used in various applications, such as cancer classification, forecasting software defects, recognition of activities and the classification of sentiments. In this case, the performance of the proposed deep CNN model was compared to the popular VGG16 transfer learning approach.

VIII. RESULT

We have got this result with all our model checks and working with approx. precision of detection.

Figure 6-a: Before Resizing

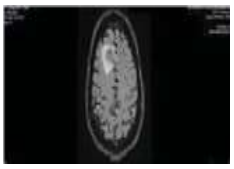


Figure 6-b: After Resizing

IX. CONCLUSION

Image segmentation plays an important role in the treatment of medical images as medical images have different differences. For brain tumor segmentation, we used MRI and CT scan images. MRI is widely used for brain tumor segmentation and classification. In our work, we used Fuzzy C-Means clustering for tumor segmentation which can predict tumor cells accurately. The segmentation process was followed by classification using traditional classifiers and Convolutional Neural Network.In the traditional classifier part, we applied and compared the results of different traditional classifiers such as K-Nearest Neighbor, Logistic Regression,, CNN and Support Vector Machine.

The input image should be of a good enough size because if it's not, after resizing the image to the size we have set in the image augmentation step i.e., 150x150, the image can become unsuitable for use (Figure 6-a and 6-b). For future improvements, we can use ensemble techniques and combine the performance of different models for better performance.

The output of the image will be shown in the terms of Yes or No with proper guidance if detected the tumor. The web page will be user friendly i.e., free of cost which is the motto we are keeping; cost effective. The references of world class doctors are also being inscribed into the webpage to maintain the legacy of our website.

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