

IDENTIFICATION OF MENINGIOMA TUMOR USING RECURRENT NEURAL NETWORKS

Abstract

From Covid 19 Pandemic, Number of Meningioma Tumor patients are Increasing in world. Identifying the Meningioma Tumor and its position in brain is not easy task by using Deep Neural Networking based medical imaging. But it is needed to identify meningioma tumors in brain by using AI based medical imaging for the purpose of Medical Artificial intelligence technology innovation. Comparing to neural network results with recurrent neural network results can give accurate results. For identifying the patients' present condition and prediction of future behavior by using recurrent neural network is need for us. Increase the accurate results for Neural networking based medical imaging in health care is very expensive. By using Recurrent Neural Networks (RNN) Algorithm with many hidden layers for identification of tumor(s) in human brain with high accuracy by comparison of existing images in our data base with new unknown medical image with low cost. In this study first we are collecting the masks of skull from MRI Image and dividing the masks to different types of datasets depending on age criteria like a child age ,middle age and old age with two types male and female. Then we can get totally 6 types of datasets. All these masks of mri images to binary imaging by using morphological erosion concept after that storing that masks in data sets then collect the new MRI Image and comparingits mask part of skull with existing dataset in Recurrent Neural Networks.

Keywords: Then we can get totally 6 types of datasets.

Authors

Dr. G. Rajesh Chandra

Professor

Department of Computer Science and Engineering

KKR & KSR Institute of Technology & Sciences

Vinjanampadu, Guntur, Andra Pradesh, India

grajeshchandra@gmail.com

Dr. Venkata Kishore Kumar Rejeti

Professor

Department of Computer Science and Engineering

KKR & KSR Institute of Technology & Sciences

Vinjanampadu, Guntur, Andra Pradesh, India

mail2rvkk@gmail.com

Dr. K. Jagan Mohan

Professor

Department of Computer Science and Engineering

KKR & KSR Institute of Technology & Sciences

Vinjanampadu, Guntur, Andra Pradesh, India

dr.kammili.jaganmohan@gmail.com

Hari Krishna

Assistant Professor

Department of Computer Science and Engineering

AI, KKR & KSR Institute of Technology & Sciences

Vinjanampadu, Guntur, Andra Pradesh, India

harikrishnadeevi@gmail.com

I. INTRODUCTION

Sum of gross cells in brain is called as a tumour. Tumors can be cancerous. While some tumours spread very fastly, others spread slowly. Most brain tumours are not malignant tumors. If a brain tumour becomes large enough to push on nearby nerves, blood vessels, or tissue, it can affect how well your brain functions as well as your health. Primary tumours are tumours that form in the brain. Secondary tumours are formed in different parts of the body before spreading to the brain. Is also known as metastatic brain tumours. Researchers identified that there are more than 150 different types of brain tumours. It affects children and adults and can develop at any time in his life span. Healthcare providers categorize primary tumors as glial or non-glial and benign tumors or malignant tumors. Many types of brain tumors can also form in your spinal cord. Only about 5 per 100,000 people are diagnosed with a primary brain tumor each year in the United States. About 4,100 children under the age of 15 are diagnosed with a brain tumor each year in the United States.

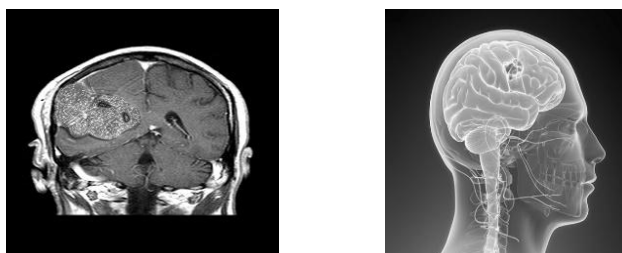


Figure 1: Brain Tumor and Meningioma tumor [U]

From the reports of National Brain tumor society [C] of USA, seven lakhs' people are suffering with primary diseases of brain tumor and 88970 citizens of USA [B] are diagnosed in 2022. This is a very unfortunate thing that in the entire world 78% of the death rate for the year 2022 is because of brain tumors only. Generally, we have two types of brain tumors in humans [F]. One is the primary [K] and another is metastatic brain tumor [K]. Primary tumor can start from the group of connected cells in brain and metastatic tumors can originate in another part of the human body [D] and pull up stakes to the brain [F]. These tumors are treated as a cancer [E]. Due to metastatic tumors only, human can get the lung cancer, breast cancer, kidney and skin cancers [I]. The metastatic tumors can spread from one part of the human body to another part of the human body. The first tumors did not spread from one part to another part of the human body. The types of human brain tumors included 9 types of tumors: those are gliomas and related brain tumors, choroid plexus tumors, Embryonal tumors, Germ cell tumors, Pineal tumors, Meningiomas, Nerve tumors, Pituitary tumors, and other brain tumors. By the symptoms like drowsiness, feeling very hungry and gaining weight. Trouble with balance, feeling very tired, speech problems, vomiting, fatigue, sleep problems, memory problems etc. with these only we can identify that, person is suffering from brain tumor. To identify brain tumors, we have so many methods. But no one method is not giving accurate results of brain tumors. Brain's main part is the cerebrum. Tumors in human brain can be originate in different parts of the human brain's cerebrum might cause different symptoms [H]. Those are the if tumor is originated at the front of the human brain then the patient will get the balancing problems and walking problems if the tumor is originated at

middle[H] of the brain then the patient will get sensing problems[H], vision problems and hearing problems, If the tumor is originated [H] at back part of the human brain, then the patient can lose the vision [H] if the tumor is originated at the lower part of the human brain then the patient [H] can get problems in smell and taste.

II. RNN OF AI

RNN plays important role in deep learning. The following figure shows the recurrent neural network. The below figure illustrates the concept of recurrent neural networks [V] this figure contains x , y , h x is the input layer and y is the output layer and h is the hidden layer. In hidden layer only multiple tasks are running. In recurrent neural networks only we can get accurate results comparing to conceptual neural networks.

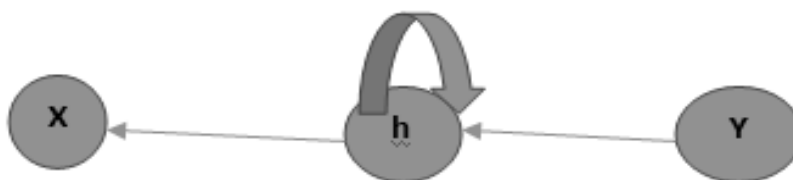


Figure 2: Concept of Recurrent Neural Networks

In modern research, we have many methodologies [K]to find out the position of the tumor in human brain. But we are not getting accurate results for the brain tumors by using the modern research. In this study we are increasing the accuracy of the results for the brain tumors by using RNN Algorithm in the stage of object detection of MRI images of brain tumor from DICOM format. After identifying the tumor in MRI Images, we have to apply data extraction Algorithms on that object of a images after then we have to compare that object's position with existing images of our data base then only by comparing with it all existing images, we have to predict that tumor position.

III. LITERATURE REVIEW

Soheila Saeedi1 et al said that [L] Artificial intelligence and machine learning have applications in a variety of fields, including health. Deep networks are being created and refined right now to find diseases based on imaging including health. To accomplish so, authors suggested computational-oriented approaches for classifying brain cancers. In this study, they built a novel 2D CNN architecture, a convolutional auto-encoder network, and six popular machine-learning approaches for detecting brain tumors' T1-weighted, contrast-enhanced MRI dataset used for this classification comprises three different types of malignancies as well as a healthy brain free of tumors. Six machine-learning algorithms were created to classify brain tumors in addition to the two deep networks employed in the study. These networks can be used as effective decision-support tools for radiologists in the diagnostic process because the study's findings show that they have an infinite generalization and a high execution speed.

Mahmoud Al-Ayyoub et al says that [N], Algorithms for assessing and categorizing medical pictures have lately received a lot of interest. The findings presented in this paper demonstrate that after pre-processing MRI. The neural network classification method performed the best on photos. Lazy-IBk performed admirably and finished second. Last were Nave Bayes and the J48 decision tree. Gaining a better dataset with high-resolution pictures collected directly from the MRI scanner can result in substantially improved accuracy. Moreover, classifier boosting techniques may be employed to increase the accuracy even further, allowing this technology to be a valuable addition to any medical facility dealing with brain tumors. One of the most serious difficulties facing artificial intelligence systems is medical diagnosis using image processing and machine learning. A machine learning technique is used to determine if an MRI picture of the brain includes a tumor or not. The findings indicate that such a strategy is quite promising.

Shtwai Alsubai et al says that [O], Because of the brain's intricate anatomy, detecting a brain tumor is difficult. The brain controls the operation of every organ in the body. An important role is played by automatic first stage brain tumor classification utilizing deep learning and machine learning approaches. These devices allow for faster diagnosis and improve patients' chances of survival. Furthermore, these strategies aid doctors and radiologists in their decision-making about diagnosis and treatment regimens. The CNN-based hybrid deep learning model CNN-LSTM was suggested in this work to identify brain malignancies using the MR brain tumor pictures dataset; initially, the image dataset was processed using thresholding, extreme point computation, and bicubic interpolation. Second, the proposed approach employs a convolutional neural network to extract information in the form of cropped images.

IV. METERIALS AND METHOD

In this study we collected Meningioma MRI scanned images and created six types of meningioma MRI scanned images' datasets those are the child male, child women, middle-aged male, middle-aged women, old age male, old age women. Every data set contains minimum 250 Meningioma MRI Scanned images of Meningioma patients. All images are categorized in 6 categories. And every MRI Image is converted to binary image and collected skull part of all binary images and stored in that datasets only. Based on image properties we can compare the skull part of new image with existing images if any skull part of binary image in any data set is matching with new image's skull part, then we can identify the position of new image's patient's health condition

Process

Our process is to identify the brain tumor can contains the following steps.

Step 1: Giving MRI Image as a input.

Step 2: Converting input image to gray scale image [N]

Step 3: Converting gray scale image to binary image.

Step 4: Selecting skull part of binary Image by morphological erosion [L,M]

Step 5: Comparing the skull part of binary image with existing skull part of binary images of Meningioma data sets those are available in our datasets.

Step 6: after completion of comparison, if any image is matched with our new image, then based on existing image data, we can identify the person's tumor position.

V. RESULTS AND DISCUSSION

- 1. Grayscale Image:** Converting the color MRI image to gray scale by using MAT Lab then get the gray scale image. The following figure shows the MRI image and gray scaled image. And the following sample code can illustrate the how to convert MRI Image to gray image.

```
A = rgb2gray (RGB).
```

```
figure
```

```
imshow (A)
```

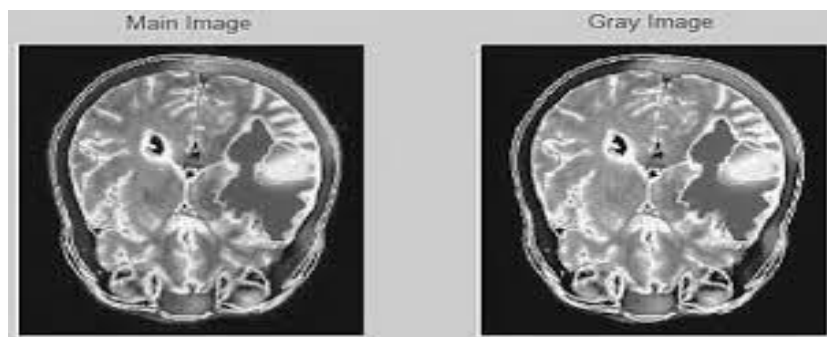


Figure 3: Difference between MRI Scan Image and Grayscale Image

Binary image converting the gray scale image to binary image by using MAT Lab. The following figure shows the gray image and Binary image. And the following sample code can illustrate the how to convert Gray Image to binary image.

```
BW = im2bw (X, map,0.4).
```

```
imshow (X,map), figure, imshow (BW)
```

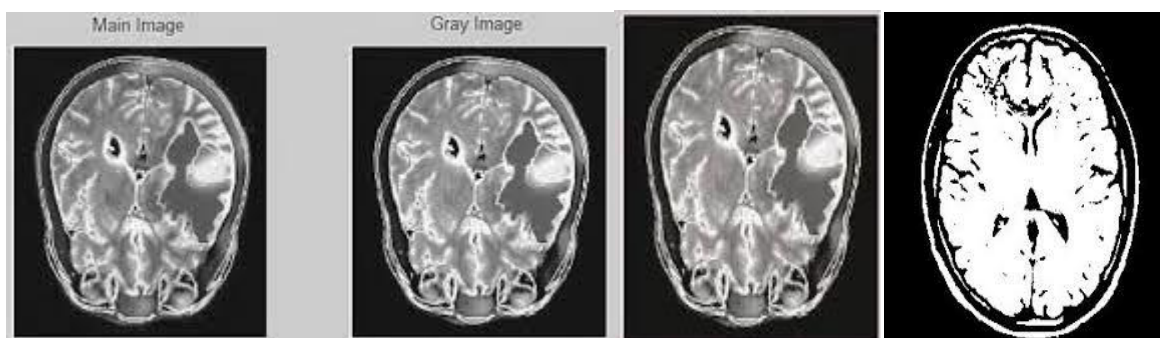


Figure 4: MRI Image to Gray scale image **Figure 5:** Gray scale image to binary image

- 2. Morphological Erosion:** If we want to remove the floating points and thin lines of images, then we can use this method. By using this we can select sub area of an image

and removes the unwanted area of the image. In our study of work, we are applying the morphological erosion technique on input MRI image for selecting the skull region of it.

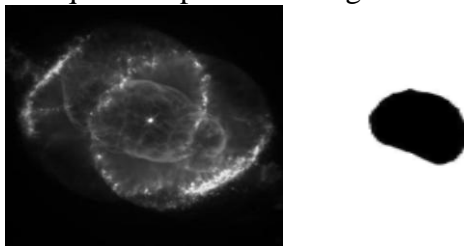


Figure 6: Before erosion of the image and after erosion of the MRI Image

By getting the tumor from the morphological erosion concept we have to compare with all images of all datasets. if any image is matching with current image. Then we can identify the current image's patient's tumor position.

VI. CONCLUSION AND FUTURE WORK

In this study we collected Meningioma diseased images from different locations. And every meningioma diseased MRI Scanned image is converting to grayscale image and after only it will be converted as a binary image and then select the skull part of each binary image through morphological erosion and store in our data sets. And select any new MRI Scan image and convert it to gray scale image and then convert it to binary image then compare with all images of our data set. If any image is matching with the new image, then we can identify the position of tumor based on matching image.

REFERENCES

- [1] Aminul Haq, jian ping li , Shakir khan, Mohammed Ali Alshara, Reemah Muneer Alotaibi & Cobbinah Bernard Mawuli, 2022 , DACBT: deep learning approach for classification of brain tumors using MRI data in IOT healthcare environment,
- [2] <https://www.cancer.net/cancer-types/brain-tumor/statistics>
- [3] <https://braintumor.org/brain-tumors/about-brain-tumors/brain-tumor-facts>
- [4] P.G.K. Sirisha and D. Haritha , 2020, hybrid shuffled frog leaping algorithm with probability dispersal method for tumor, , IOP Conference Series: Materials Science and Engineering, DOI 10.1088/1757-899X/1074/1/012001
- [5] Sirisha P.G.K., Dr. Haritha D, Vol. 29 No. 05 (2020): Vol. 29 No. 05 (2020) , International Journal of Advanced Science and Technology, Hybrid optimized segmentation of 3d brain tumor images using shuffled frog leaping algorithm -tabu search and expected maximization framework,
- [6] <https://www.aans.org/en/Patients/Neurosurgical-Conditions-and-Treatments/Brain-Tumors>
- [7] Sonavane and P Sonar, 2016, "Classification and segmentation of brain tumor using Adaboostclassifier", pp. 396-403, IEEE.
- [8] <https://www.mayoclinic.org/diseases-conditions/brain-tumor>
- [9] <https://www.healthline.com/health/brain-tumor#types>
- [10] Ahmed Abdel Khalek Abdel Razek, Ahmed Alksas, Mohamed Shehata, Amr AbdelKhalek,
- [11] Khaled Abdel Baky, Ayman El-Baz and Eman Helmy, 2021, Clinical applications of artificial intelligence and radiomics in neuro-oncology imaging
- [12] Masoumeh siar, Mohammad Teshnehlab, Department of Electrical Engineering, K.N. Toosi University of Technology, Tehran, Iran, IEEE, 9th International Conference on Computer and Knowledge Engineering (ICCKE), 2018, Brain Tumor Detection using deep neural network and machine learning algorithm,
- [13] Hamidreza Keshavarz2 and Sharareh R. Niakan Kalhori, BMC Publication , 2020, MRI-based brain tumor detection using convolutional deep learning methods and chosen machine learning techniques, Soheila Saedi1, Sorayya Rezayil

IDENTIFICATION OF MENINGIOMA TUMOR USING RECURRENT NEURAL NETWORKS

- [14] Ahmed Abde1 Khalek Abdel Razek1, Ahmed Alksas2, Mohamed Shehata2, Amr AbdelKhalek2, Khaled Abdel Baky4, Ayman El-Baz2 and Eman Helmy , 2019, Springer open, Clinical applications of artificial intelligence and radiomics in neuro-oncology imaging.
- [15] Mahmoud Al-Ayyoub , Ghaith Husari, Ahmad Alabed-alaziz , Omar Darwish , 2016, researchgate , Machine Learning Approach for Brain Tumor Detection ..
- [16] Shtwai Alsubai1, Habib Ullah Khan2*, Abdullah Alqahtani1 , Mohemmed Sha2*, Sidra Abbas3* and Uzma Ghulam Mohammad , 2008, Frontiers , Ensemble deep learning for brain tumor detection,
- [17] Nilesh Bhaskarrao Bahadure, Arun Kumar Ray, and Har Pal Thethi, Hindawi International Journal of Biomedical Imaging Volume 2017, Article ID 9749108, 2006, Image Analysis for MRI Based Brain Tumor Detection and Feature Extraction Using Biologically Inspired BWT and SVM.
- [18] siva skthi .s, 2018, A STUDY ON MORPHOLOGICAL IMAGE PROCESSING AND ITS OPERATIONS , Journal of Analysis and Computation (JAC) ,(An International Peer Reviewed Journal), ISSN 0973-2861 ,International Conference on Emerging Trends in IOT & Machine Learning,
- [19] U.Vanitha1 , P. Prabhu Deepak2 , N. Pon Nageswaran3 ,2015, R.Sathappan, Tumor Detection In Brain Using Morphological Image Processing urnal of Applied Science and Engineering Methodologies, Volume.1, No.1, Page.131-136,
- [20] Detection of Brain Tumor in MRI Images Using Watershed and Threshold-Based Segmentation, March 2020, International Journal of Signal Processing Systems
- [21] <https://www.simplilearn.com/tutorials/deep-learning-tutorial/rnn>
- [22] https://www.neuroendome.com/wp-content/uploads/2014/06/SciSource_BN6251.jpg