

A GENERAL STUDY ON MRI SCAN FOR BRAIN TUMOR USING ARTIFICIAL NEURAL NETWORK

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ABSTRACT

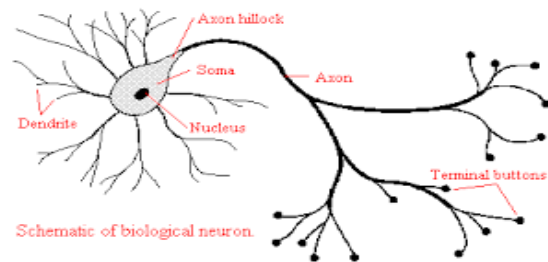
An Artificial Neural Network (ANN) is the inspired model based on human's biological Neural Network (BNN). BNN includes the central nervous system of animals especially the brain. The primary component of brain is a Neuron. Generally our human brain has 1×10^{10} power 10 neurons. Like our human brain ANN can make its own decision, can learn and can train them efficiently. **What is MRI** and how it identify brain tumor. This paper will provides the deep information about the Brain Tumor deduction.

Keywords: ANN, imaging techniques, MRI, fuzzy classifier

I – INTRODUCTION

The biological neuron looks like a tree within which the body is called the soma. The soma is covered by a semi permeable membrane. The branch like extensions on the body of the soma is dendrite. The part of the dendrite which will make contact with other neuron to receive the signal is the synapse. The impulses that are created at the soma are transmitted through the trunk of the neuron which is called as Axon and reaches the root of the neuron is the bout

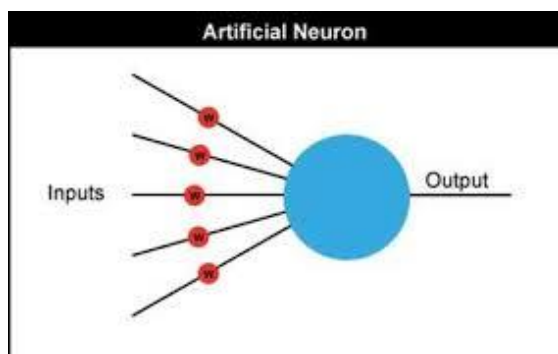
on. In this paper Chapter I refers to Introduction about ANN, Chapter II deals with the working examples of ANN, Chapter III explains the detection methodology of tumor using ANN, IV refers to detection of tumor using fuzzy classifier, V is the conclusion.



1.1-ARTIFICIAL NEURON

Artificial neuron looks and behaves like a Biological neuron. It accepts the input as a weight which is given by the user and gives us a desired output. The memory used in this network is not a central memory. The data is stored in some categories. This information is not permanent and it can change in order to the next input. Because of its distributed memory artificial neurons never came up with a fault. An ANN may have either recurrent (FEED-

BACK) or non recurrent (FEED-FORWARD) structure. The recurrent structure gets the input and calculate its necessary output and then feedback the changes to the input again. But non recurrent structures do not form a feedback loop[2].



II-WORKING EXAMPLES OF NEURAL NETWORK IN THE FIELD OF MEDICINE

Nowadays Artificial Neural Network is widely used in many fields. The application of ANN is thought provoking, especially in medicine. Any technique that is used to save a life will be very much appreciated. Here the applications of ANN in diagnostic purposes are discussed.

ABOUT BRAIN TUMOR

Brain Tumor is nothing but the continuous growth of cells in our brain. According to its size, shape and position of the tumor it may be malignant or benign. Brain tumor can be detected by various imaging techniques. The conclusions are given by the experienced radiologist and neurologist about the treatment.

IMAGING TECHNIQUES

One of the applications of ANN is the imaging technique. A milestone in neuroscience is the new discipline of viewing the morphological and anatomical structure of our nervous system. The physicians who involved in this type of neurological process are said to be neuro radiologist. Neuro imaging fall into

two broad categories .One is structural imaging and functional imaging. Structural imaging shows the external morphological structure and functional imaging shows the internal anatomical structure.

Various Imaging Techniques Used In Diagnosing Brain Tumor

2.1 Computed Axial Tomography (CT SCAN)

CT scan is used specially for brain injuries because it provides a multidimensional view of the head. It works with the series of x rays.

2.2-DIFFUSE OPTICAL IMAGING (DOI)

DOI is one of the imaging techniques which use the infrared rays to find the structure of the images. The images are identified by the area with the absorption and diffusion of haemoglobin.

2.3-EVENT RELATED OPTICAL SIGNAL (EROS)

EROS identifies the image by the properties of neuron that are scattered all over the area of brain. It is economically efficient.

2.4-POSITRON EMISSION TOMOGRAPHY (PET)

In this type of imaging technique the radioactive chemicals are directed into our blood. By this method we can easily image the structure of the brain by the blood flow.

2.5-SINGLE PHOTON EMISSION COMPUTED TOMOGRAPHY (SPECT)

SPECT uses the 'SPECT AGENT' which is a radioactive material which emits the gamma rays. It is taken up by the brain within 30 to 60 seconds. It also uses the gamma cameras within the computer to view the radioisotopes emitting the gamma rays.

2.6-ELECTROENCEPHALOGRAPHY (EEG)

An EEG is a technique which uses electrodes outside the body of the patient to collect the

information about the electrical activities that are taking part inside the brain during the diagnosis.

2.7-MAGNETOENCEPHALOGRAPHY (MEG)

MEG shows the image by using the magnetic fields that are created during the electrical activities in the nervous system. It uses a special device called SUPERCONDUCTING QUANTUM INTERFACE DEVICE (SQUID).

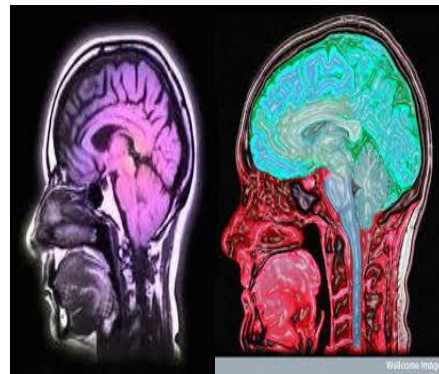
III – About MRI:

MRI uses magnetic fields and radio waves to view the structure of the brain. It produces two or three dimensional images of the brain. It is one of the safest imaging techniques because it uses magnetic field for diagnosis. There are different types of MRI. A contrast medium is injected into the patient's body. It gives detailed pixels of the image .It can point the exact position and function of the brain.

Diagnosis Of Brain Tumor Using Magnetic Resonance Imaging (MRI)

3.1 FUNCTIONAL MRI

It is the most used imaging techniques because it shows the image using the haemoglobin by checking whether it is oxygenated or deoxygenated .It also uses the neural activity of the brain to broadcast the images. It gives the anatomical structure of the brain for identifying the brain tumor inside the brain tissues or any internal part of the brain. Functional MRI is the widely used scan technique. In functional MRI, the patients are asked to perform different functions such as any actions to verify which part of the brain is undergoing its function. It is based on the oxygen flow in the blood. It captures the brain muscle action.



3-2-MAGNETIC RESONANCE SPECTROSCOPY (MRS)

MRS scan is used to identify the defected part in the brain tissues. It shows the functional structure of the brain. It differentiates the dead tissue and normal tissue using the chemical composition. MRS will detail the images that are not clearly seen in MRI. It also shows the scar tissues.

3.3-MAGNETIC RESONANCE PERFUSION (MRP)

It uses the contrast dye to view the flow of blood into the tissues of brain. Fastest growing tumor located in the parts of a brain needs more oxygen supply and blood. So the area with more blood flow will be the tumor affected area.

3.4-SPINAL MRI

Spinal MRI is specially used to find the tumor in or around the spine.



3.5-INTRAVENOUS GADOLINIUM ENHANCED MRI

A contrast dye called gadolinium is injected into the suspect's body. It will be always followed by the normal MRI.

MRI is considered as the safest of all imaging techniques that uses x rays or infrared rays to produce an image of the brain. MRI can produce two or three dimensional images. It has high resolution so that it produces a detailed view of the images. These MRI are there to give distinguished view of the brain[8].

3.6-POSITION OF THE TUMOR IN BRAIN AND OITS CORRESPONDING MRI

POSITION	SYMPTOMS	TYPES OF MRI
FRONTAL LOBE	Problems in eye sight.	Magnetic resonance spectroscopy
TEMPORAL LOBE	Short term memory loss	Magnetic resonance spectroscopy
PARIETAL LOBE	Loss of feelings	Functional MRI
OCCIPITAL LOBE	Loss of vision	Functional MRI
BRAIN STEM	Difficulty swallowing	Perfusion MRI
SPINAL CORD	Weakness in legs	Spinal MRI
PITUITARY GLAND	Infertility in men and women	Enhance MRI

IV-DETECTION OF TUMOR IN MRI IMAGES USING ARTIFICIAL NEURAL NETWORK

Once the MRI scan is taken, it is very important to diagnose the problem. Manually it cannot be diagnosed. So we use ANN technique to solve this problem. Image classification is done to diagnose the brain tumor.

4.1STEPS IN IMAGE SEGMENTATION

IMAGE HISTOGRAM EQUALIZATION

In this step, it differentiates the pixels into black and white in which we can identify whether it is affected or not[3].

MORPHOLOGICAL OPERATIONS

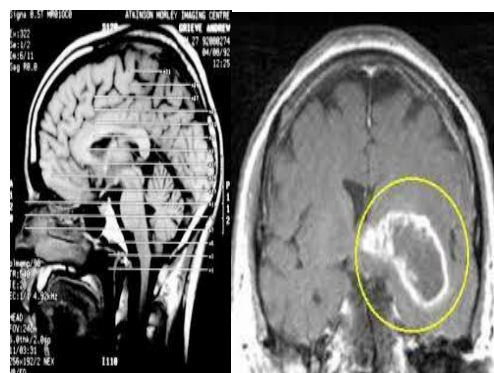
It fills the gap in the split images to form a continuous image so that it helps the radiologist to detect the tumor easily.

SEGMENTATION BY THRESHOLDING

Segmentation by thresholding is one of the methods of binarization. Here all the values are changed to 0's and 1's[1].

REGION ISOLATION

In this technique it isolates or erases the background so that the region what we want can be easily identified[6].



4.2-DECISSION

Every method has queries, to overcome it we can describe these queries into:

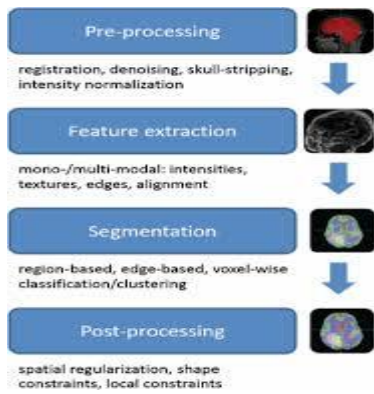
True positive-It has all the MRI report which shows that it is cancer by the above algorithm.

False positive-It has all the MRI report which shows that it is cancer but it is actually normal by the above algorithm.

True negative-It has all the MRI report which shows that it is normal by the above algorithm.

False negative-It has all the MRI reports which show that it is normal but actually it is tumor.

Finally we verify our report with the above four decisions to detect whether tumor is there[5].



4.3-BRAIN TUMOR DETECTION BY USING ARTIFICIAL NEURAL NETWORK FUZZY CLASIFIER

PROPOSED METHEDOLOGY:

STEP 1: Verify our MRI scan images.

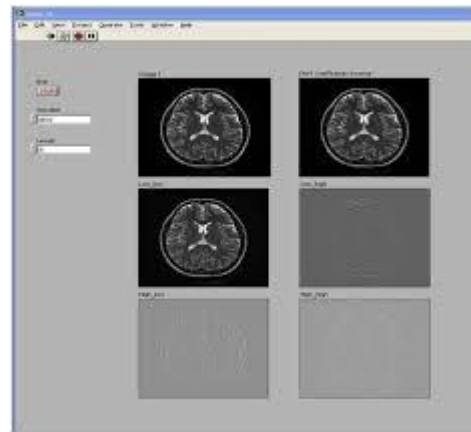
STEP 2: We have to practice the network with the MRI database.

STEP 3: We have to practice the network with knowledge.

STEP 4: Two results will be formed.

Either tumor detected or not detected[9].

This technique include database preparation for which all the information about the MRI scan will be collected and organized in an order to use it efficiently by the neuro radiologist[4].



The proposed system is based on the GRAPHIC USER INTERFACE. It is very easy for the radiologist to diagnose the brain tumor with this fuzzy interface.

V-CONCLUSION

The paper gives a detailed study about ANN, its structure, and its application in the detection of brain tumor using different types of MRI. This method helps in reducing the neuro radiologist time during detection of tumor[7].

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