



# DETECTION AND CLASSIFICATION OF BRAIN TUMOR USING ANN AND CNN

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**ABSTRACT** Brain is the irreplaceable part and plays a vital role in our human body. But the difficulty faced by the brain is the "Brain Tumor" which affects the people of all age groups. It is caused by abnormal formation of cells. In the recent decades, several researches have been done in the medical imaging field to precisely recognize brain tumors. Most recently Apollo Hospital Chennai introduced the Asia's first Proton cancer therapy. In neural networking there are a lot of techniques available. In that some techniques are slower and require more memory space to store the model. In this proposed method we overcome the difficulties faced in previous techniques by using ANN back Propagation and CNN classifier to classify the MRI image. This system attempts to improve the accuracy compared to prior methods. The proposed project comprises of three stages: image procurement, pre-processing and post-processing. In image acquisition, a database of cerebrum tumor MRI pictures is created with openly accessible online sources. In the post-processing stage, k-means clustering calculation is utilized to isolate the picture into four groups of fluctuating force levels. Features like energy, contrast, kurtosis, correlation and homogeneity are found along with the area and perimeter of the tumor and the accuracy of the extraction. These separated highlights can be utilized later on to all the more precisely arrange cerebrum tumors with the assistance of neural systems. In this project we give a comparative analysis of R-CNN (convolutional Neural Network) and ANN back Propagation classifier.

**Keywords:** Tumor, MRI, ANN, CNN.

## INTRODUCTION

Brain tumor is defined as the unusual growth of mass tissues within the brain which can affect the normal functioning of brain. There are more than 120 types of brain tumors identified. Commonly there are three general types of tumors present. They are

1. Benign
2. Pre-malignant

3. Malignant.

### BENIGN:

Benign tumors are the beginning stage of the brain tumor, and it does not affect the other normal tissues.

### PRE-MALIGNANTS:

These tumors are precancerous stage. If it is not properly treated it may lead to cancer.

### MALIGNANT:

Malignant tumor, which is very serious and has more complex to cure. It is a severe stage. Malignant tumors consist of two types,

1. Primary tumor
2. Secondary tumor

**Primary tumor:** A tumor formed due to development of abnormal cells within the brain.

**Secondary tumor:** A cancerous tumor that starts in another part of the body and then spreads to the brain. The type of cancer most likely to spread to brain are breast cancer, lung cancer, kidney cancer and melanoma.

Generally treatment of brain tumor depends on :

1. Age of patient
2. Previous medical history
3. Kind of tumor
4. Position
5. Size of tumor.

<b>SYMPTOMS</b>	Headache, Blurred vision, Loss of balance, Confusion, Seizures, Stumbling, Speech problem.
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### TYPES OF SCANS:

Various scanning techniques are used such as CT, MRI, PET, etc

Out of these techniques MRI technique is very special one of the brain tumor detection and cancer imaging. MR Imaging is safe as compared to other scans as like CT scans. Because it does not use any harmful radiations. It is also able to produce 3D Image. MRI is basically used in the Bio medical to

S. no	Title of paper	Description
1	Brain Tumour Detection and Classification using Fusion Technology on IOT, Malarvizhi K,Ramya Devi P,Akshay G Bhat, (IJARCCE) FEB 2019	Too much of data is need for manual interpretation and analysis.
2	A Unique Six Sigma Based Segmentation Technique for Brain Tumor Detection and Classification using HybridCNN-SVM Model, Arati Kothari,B.Indira, (IJRTE) JULY 2019.	The system is implemented to classify brain MRI image as normal and abnormal brain using supevised hybrid CNN-SVM model
3	Brain MRI Classification Using PNN and Segmentation by K-Means Clustering, VaradeA.A, Ingle K.S., (IJAREEIE) MAY2017.	Here various smoothing factor(SV) are used to Obtain better accuracy in identifying correct class. SV from 1 to 5 used for accuracy checking.
4	Automatic classification of MR Brain Images using Artificial Neural Network, Manickam T,Anubharathi P,Gowtham N, Rathamani k,Saravanan, (IJAREEIE) MAY 2017	The Medical decisionMaking System WasCalculated by the Grey level co occurrence matrix,and the supervised learning method(FP-ANN) that we have make a very talented results in classifying the healthy and brain patient having injury.classification percentage is more than 90% in case of feedforward artificial neural network.
5	Brain Tumour Detection Using Image Processing : A Survey, Amruta Pramod Hebli,SudhaGupta,(IRFI C) NOV2016.	In this Work ,Several methodologies are examined to denote the conventional stages of MRI image Processing also analyzed individual segmentation approach
6	Brain MRI Image Classification Using Probabilistic Neural Network and Tumour detection Using Image Segmentation, Pergad N.D, KshitijaShingare,(IJARC ET JUNE 2015	Percentage of correct classification :88.2% Percentage of incorrect classification :11.8%

detect and Visualize finer details in the internal structure of the body.

#### EXISTING SYSTEM

The Existing system starts by reading the input MRI image of brain and convert it into gray scale image. There are four steps in this system. Preprocessing, Decomposition using DWT, Feature extraction using GLCM, Classification by PNN and Segmentation.

#### Disadvantages:

- It takes long time form testing of New samples.
- Requires more memory space to store the model.

#### BLOCK DIAGRAM

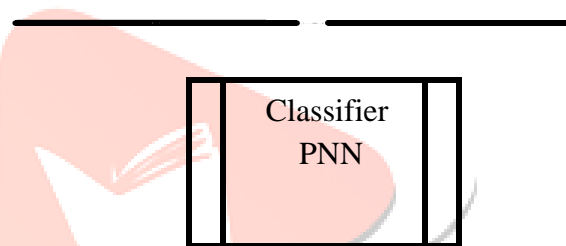


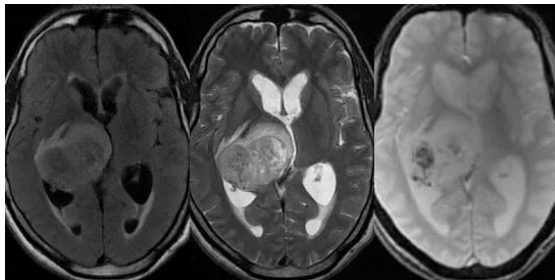
Fig (d)

## **PROPOSED SYSTEM**

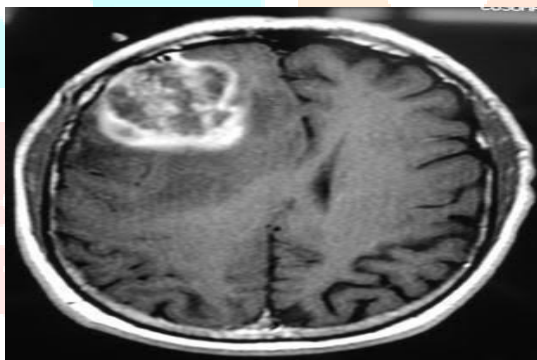
The proposed project encompasses of three stages: Image procurement, pre-processing and post-processing. Fig (c) represent Propopsed block diagram.

### **IMAGE ACQUISITION:**

In image acquisition, a database of brain tumor MRI pictures is created with the assistance of openly accessible online sources. The input is obtained from MRI scan and displayed in 2Dimensional.The MRI image is stored in database as JPEG format. The images are displayed as gray scale image. Fig(a).The entries of gray scale image are ranging from0-255.



Fig(a)



Fig(b)

### **PREPROCESSING:**

The pre-processing stage includes changing over the picture to gray scale and applying disorder channels to improvement thepicture.

#### **Pre-processing and enhancement of an image:**

The first step of image processing is pre preprocessing. It is used to detect suspicious region in brain tumor .Main purpose of noise removed from the image clearly.

#### **Steps of preprocessing**

- Imageresampling
- Gray scale contrastenhancement
- Noiseremoval

- Mathematicaloperation
- Manualcorrection.

#### **Image resampling:**

Reduce (or) increase number of pixels of datasets

#### **Gray scale contrast:**

Improve the visualization by the brightening the dataset or information.Conversion to gray scale image is the most common pre-processing practice.

#### **Noise removal:**

This is used to remove unwanted noise around the image. Filtering is a technique used for eliminating the noise present in an image.

1. Low - passfilter
2. High - passfilter
3. Band - passfilter
4. Spatialfilter
5. Meanfilter
6. Medianfilter.

#### **Anisotropic Filter:**

It is used to remove Background Noise.

#### **Weighted Median Filter:**

It is used to remove Salt and Pepper Noise. Also use low pass, high pass, and band pass filter in terms of Spatial Filtering Mean and Median Filtering.

#### **Median Filter:**

The most common technique which is used for noise elimination. It is Nonlinear Filtering. It is also reduce Speckle Noise.

#### **Disadvantages:**

Complexity & time Consumption as compared to other Filter especially mean filters.

#### **Mean filter/Average Filter:**

The Filter is also a De nosing Filter that is based on average value of pixel. Improve the image quality and Contrast.

#### **Advantage:**

Reduce Gaussian Noise and the response time is fast.

#### **Dis Advantage:**

It Distorted Boundaries and Edges.

#### **Wiener Filter:**

The Filter is also a De nosing Filter that is based on the inverse filtering in the frequency region. At Low Speed and is not suitable for SpeckleNoise.

#### **Gaussian High Pass Filter:**

It is used in range of High Frequency information within an image while reducing the low frequency Information in the image intensity at clear Level. It

increases the brightness of the center of pixel and also relative Neighboring Pixels.

**Low pass filtering:** Replace all pixels of intensity higher than a specified value.

**High pass filtering:** Replace all pixels of intensity lower than a specified value.

**Bands pass filtering:** Replace all pixels of intensity lower than a specified value and higher than anotherone.

**Mean filtering:**

- Fast to compute,
- Bluredge,
- S means noisespecies.

**Median Filtering:**

1. Slower to Compute,
2. Pre newer Edges,
3. Can Remove Noise

**Manual Correction:**

- Pixel ByPixel,
- Using Lines or Splines, Using Predefined 2D or 3D Shapes(Rectangle, Sphere, Brick)

**Segmentation:**

**1. ImageDomain:**

- ❖ Manual
- ❖ Thresholding
- ❖ RegionGrowing
- ❖ Hierarchical

**2. FeatureDomain:**

- ❖ SupervisedSegmentation
- ❖ UnsupervisedSegmentation.

**POST PROCESSING:**

In the post-processing stage, k-implies clustering calculation is utilized to isolate the picture into four groups of changing force levels.

**K-MEAN CLUSTRING:**

K-means clustering is an algorithm to group objects based on attributes/features into k number of groups where k is a positive integer. The grouping (clustering) is done by decreasing the Euclidean distance between the data and the corresponding cluster centroid. Thus the function of k-means clustering is to cluster the data. The bunch with the tumor is found and afterward the tumor is removed by utilizing morphological and locale properties activities.

**FEATURE EXTRACTION:**

The existing system uses Gray Level Co occurrence Matrices (GLCM ) for feature extraction. In this method first order features are extracted from Histogram of the image. GLCM is a statistical method of finding the textures that

examine the spatial relationship of pixels. Features like energy, contrast, kurtosis, correlation and homogeneity are found along with the area and boundary of the tumor and the accuracy of the extraction.

**CLASSIFIERS:**

Recently Neural Networks are broadly used for classification. In this proposed system **Artificial Neural network (ANN)** and **Convolution Neural Network (CNN)** are used. In Artificial Neural Network we use Back propagation technique. This **Back propagation algorithm** looks for the minimum value of the error function in weight space using a technique called the delta rule or gradient descent. In CNN we use R-CNN method, which is Region-CNN .It identifies a Bounding box objectregions.

S. N O	PNN	ANN	CNN
1	When classifying new cases, PNN are slower than multilayer perceptron networks	ANN had the ability to work with knowledge inadequate	Only the last layer of the CNN is connected .
2	More memory space is required to store the model	Information is stored throughout entire network	More efficient ,because it reduce the number of parameters.
3	These networks are quite Insensitive to outliers.	ANN have distributed memory	It posses more feature compatibility.
4	It approach Bayes optimal classification	It has ability of machine learning and Parallel processing capability.	It forms a small neighborhood to share their weights

**BLOCK DIAGRAM****Fig (c)****CONCLUSION:**

This paper proposed new method for brain tumor classification at first stage MRI image enhanced and improved. Resultant image will give significant improvement in contrast of MRI images depending on results from quality metric. Convolutional neural network CNN classifier is implemented and used to classify the MRI brain tumor and to get the accurate results.

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