

PROFESSIONAL TRAINING REPORT - II

entitled

MRI brain tumor detection using CNN model

Submitted in partial fulfillment of the requirements for the award of
Bachelor of Engineering degree in Computer Science and Engineering with
specialization in Artificial Intelligence

by

M . BHANU PRAKASH - 41613004



**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING
SCHOOL OF COMPUTING**

SATHYABAMA

**INSTITUTE OF SCIENCE AND TECHNOLOGY
(DEEMED TO BE UNIVERSITY)**

CATEGORY -1 UNIVERSITY BY UGC

Accredited with Grade "A++" by NAAC | 12B Status by UGC | Approved by AICTE

JEPPIAAR NAGAR, RAJIV GANDHI SALAI, CHENNAI - 600 119

APRIL 2024



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BONAFIDE CERTIFICATE

This is to certify that this Professional Training Report is the bonafide work of **Mr./Ms. M . BHANU PRAKASH (41613004)** who carried out the project entitled " **MRI brain tumor detection using CNN model** " under my supervision from JANUARY 2024 to MAY 2024.

Internal Guide

Ms. Lekshmi S Raveendran M.Tech

Head of the Department

Dr. S. VIGNESHWARI, M.E., Ph.D.,

Submitted for Viva voce Examination held on 1/5/24

Internal Examiner

External Examiner

DECLARATION

IM. BHANU PRAKASH (41613004) , hereby declare that the Professional Training Report-II entitled " MRI brain tumor detection using CNN model " done by me under the guidance of * .Ms. Lekshmi S Raveendran M.Tech, is submitted in partial fulfilment of the requirements for the award of Bachelor of Engineering degree in Computer Science and Engineering with specialization in Artificial Intelligence.

DATE: 07-05-2024

PLACE:



SIGNATURE OF THE CANDIDATE

ACKNOWLEDGEMENT

I am pleased to acknowledge my sincere thanks to **Board of Management of SATHYABAMA** for their kind encouragement in doing this project and for completing it successfully. I am grateful to them.

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SAMPLE COURSE CERTIFICATE



ABSTRACT

Now a day's tumor is second leading cause of cancer. Due to cancer large no of patients are in danger. The medical field needs fast, automated, efficient and reliable technique to detect tumor like brain tumor.

Detection plays very important role in treatment. If proper detection of tumor is possible then doctors keep a patient out of danger. Various image processing techniques are used in this application. Using this application doctors provide proper treatment and save a number of tumor patients. A tumor is nothing but excess cells growing in an uncontrolled manner. Brain tumor cells grow in a way that they eventually take up all the nutrients meant for the healthy cells and tissues, which results in brain failure. Currently ,doctors locate the position and the area of brain tumor by looking at the MRI Images of the brain of the patient manually. This results in inaccurate detection of the tumor and is considered very time consuming.

A tumor is a mass of tissue it grows out of control. We can use a Deep Learning architectures CNN (Convolution Neural Network) generally known as NN (Neural Network) and VGG 16(visual geometry group) Transfer learning for detect the brain tumor. The performance of model is predict image tumor is present or not in image. If the tumor is present it return yes otherwise return no.

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CHAPTER 1

INTRODUCTION

1.1 OVERVIEW:

I am demonstrating a Adaptive contrast Algorithm based on MRI brain tumor detection using deep learning and machine learning. For this project we used machine learning using python because ML provides better result for prediction by constructing different models from the datasets collected from various patients. The main purpose of this project is to show how the machine learning can solve our realworld problems and to showcase the different dimensions in machine learning

So we have taken MRI brain tumor problem and followed all the steps in this process to achieve the outcome with a good accuracy. A brain tumor is a collection or , or mass of abnormal cells in brain . Skull which encloses the brain, is very rigid any growth inside this restricted place can cause problems. When these tumors grow inside the brain it increases intra cranial pressure, which can cause brain damage and may even life threatening.

Main part in human nervous system is human brain. It is located in human head and it is covered by the skull. The function of human brain is to control all the parts of human body. It is one kind of organ that allows human to accept and endure all type of environmental condition. The human brain enables humans to do the action and share the thoughts and feeling. In this section we describe

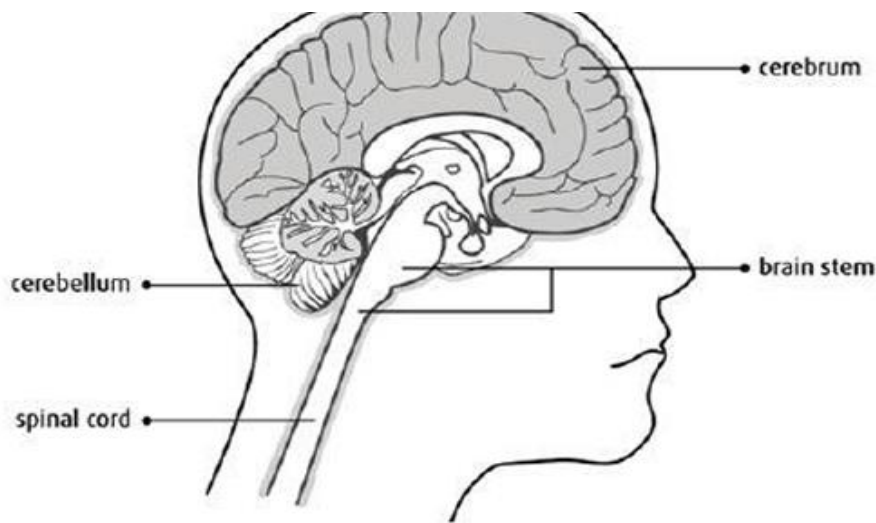


Figure 1 - Brain of human

the structure of the brain for understanding the basic things.

The brain tumors are classified into mainly two types: Primary brain tumor (benign tumor) and secondary brain tumor (malignant tumor). The benign tumor is one type of cell grows slowly in the brain and type of brain tumor is gliomas. It originates from non neuronal brain cells called astrocytes. Basically primary tumors are less aggressive but these tumors have much pressure on the brain and because of that, brain stops working properly [6]. The secondary tumors are more aggressive and more quick to spread into other tissue. Secondary brain tumor originates through other part of the body. These type of tumor have a cancer cell in the body that is metastatic which spread into different areas of the body like brain, lungs etc. Secondary brain tumor is very malignant. The reason of secondary brain tumor cause is mainly due to lungs cancer, kidney cancer, bladder cancer etc.

MAGNETIC RESONANCE IMAGING (MRI) Raymond v. Damadian invented the first magnetic image in 1969. In 1977 the first MRI image were invented for

human body and the most perfect technique. Because of MRI we are able to visualize the details of internal structure of brain and from that we can observe the different types of tissues of human body. MRI images have a better quality as compared to other medical imaging techniques like X-ray and computer tomography. MRI is good technique for knowing the brain tumor in human body. There are different images of MRI for mapping tumor induced Change including T1 weighted, T2 weighted and FLAIR (Fluid attenuated inversion recovery) weighted shown in figure.

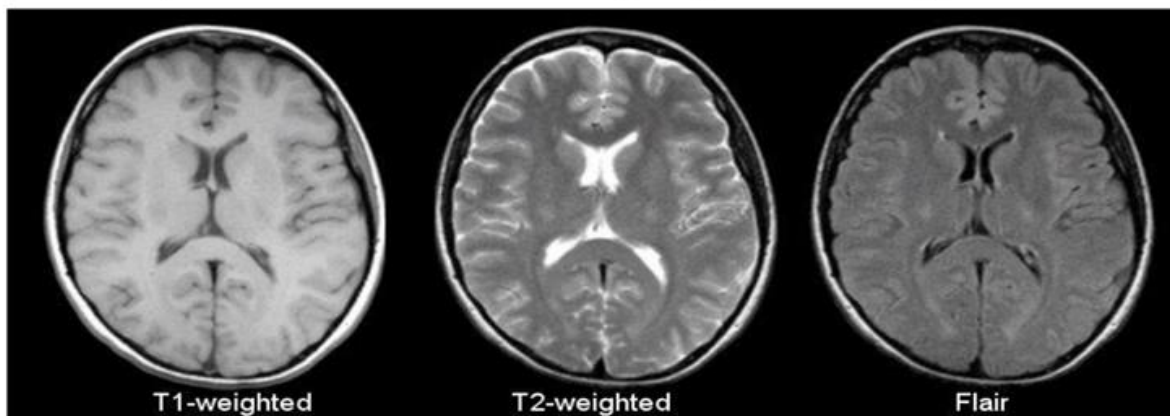


Figure 2 - T1, T2 and Flair image

The most common MRI sequence is T1 weighted and T2 weighted. In T1 weighted only one tissue type is bright FAT and in T2 weighted two tissue types are Bright FAT and Water both. In T1 weighted the repetition time (TR) is short in T2 weighted the TE and TR is long. The TE and TR are the pulse sequence parameter and stand for repetition time and time to echo and it can be measured in millisecond(ms)[9]. The echo time represented time from the centre of the RF pulse to the centre of the echo and TR is the length of time between the TE repeating series of pulse and echo is shown in figure.

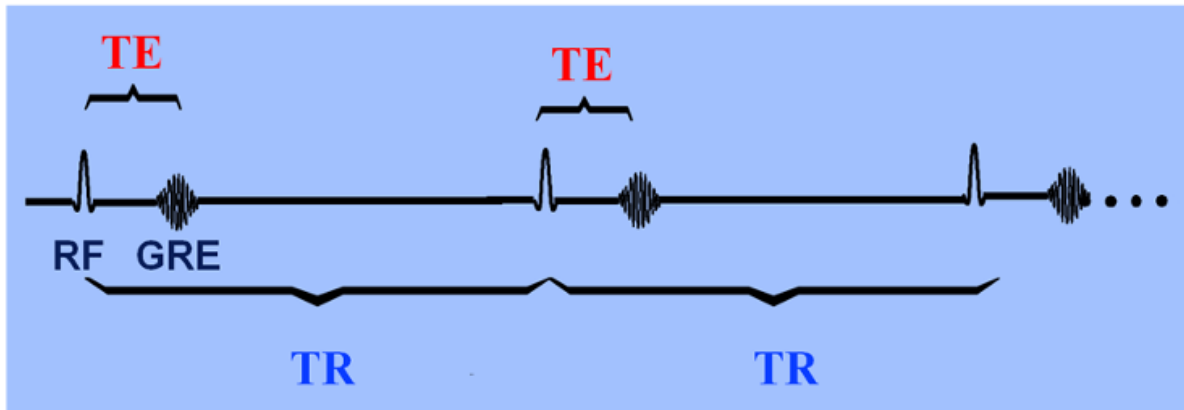


Figure 3 - Graph of TE and TR

The third commonly used sequence in the FLAIR. The Flair sequence is almost same as T2-weighted image. The only difference is TE and TR time are very long. Their approximate TR and TE times are shown in table.

	TR (msec)	TE (msec)
T1-Weighted (short TR and TE)	500	14
T2-Weighted (long TR and TE)	4000	90
Flair (very long TR and TE)	9000	114

Figure 4 - Table of TR and TE time

CHAPTER 2

LITERATURE REVIEW

2.1 SURVEY :

Paper-1: Image Analysis for MRI Based Brain Tumor Detection and Feature Extraction Using Biologically Inspired BWT and SVM

- Publication Year: 6 March 2017
- Author: Nilesh Bhaskarrao Bahadure, Arun Kumar Ray, and Har Pal Thethi
- Journal Name: Hindawi International Journal of Biomedical Imaging
- Summary: In this paper using MR images of the brain, we segmented brain tissues into normal tissues such as white matter, gray matter, cerebrospinal fluid (background), and tumor-infected tissues. We used pre-processing to improve the signal-to-noise ratio and to eliminate the effect of unwanted noise. We can use the skull stripping algorithm its based on threshold technique for improve the skull stripping performance.

Paper-2: A Survey on Brain Tumor Detection Using Image Processing Techniques

- Publication Year: 2017
- Author: Luxit Kapoor, Sanjeev Thakur
- Journal Name: IEEE 7th International Conference on Cloud Computing, Data Science & Engineering
- Summary: This paper surveys the various techniques that are part of Medical Image Processing and are prominently used in discovering brain tumors from

MRI Images. Based on that research this Paper was written listing the various techniques in use. A brief description of each technique is also provided. Also of All the various steps involved in the process of detecting Tumors, Segmentation is the most significant.

Paper-3: Identification of Brain Tumor using Image Processing Techniques

- Publication Year: 11 September 2017
- Author: Praveen Gamage • Journal Name: Research gate
- Summary: This paper survey of Identifying brain tumors through MRI images can be categorized into four different sections; pre-processing, image segmentation, Feature extraction and image classification.

Paper-4: An efficient Brain Tumor Detection from MRI Images using Entropy Measures

- Publication Year: December 23-25, 2016
- Author: Devendra Somwanshi , Ashutosh Kumar, Pratima Sharma, Deepika Joshi
- Journal Name: IEEE International Conference on Recent Advances and Innovations in Engineering
- Summary: In this paper, we have investigated the different Entropy functions for tumor segmentation and its detection from various MRI images. The different threshold values are obtained depend on the particular definition of the entropy. The threshold values are dependent on the different entropy function which in turn affects the segmented results.

CHAPTER 3

REQUIREMENTS ANALYSIS

3.1 OBJECTIVE OF THE PROJECT :

- To provide doctors good software to identify tumor and their causes
- Save patient's time.
- Provide a solution appropriately at early stages.
- Get timely consultation.

Since all these methods are based on binary classification (normal and abnormal), it is not sufficient for the radiologist to decide the patient's treatment concerning tumor grading.

Those methods are based on different hand-crafted feature extraction techniques, which are time-consuming, complex, and in many cases not effective.

Techniques that were used in those studies performed well with a small amount of data. However, working with a large volume of data required advanced classifiers.

APPLICATION :

- The main aim of the applications is tumor identification.
- The main reason behind the development of this application is to provide proper treatment as soon as possible and protect the human life which is in danger
- This application is helpful to doctors as well as patient.
- The manual identification is not so fast, more accurate and efficient for user. To overcome those problem this application is design.
- It is user friendly application.

3.2 REQUIREMENTS

3.2.1 HARDWARE REQUIREMENTS :

. Any Operating System

3.2.2 SOFTWARE REQUIREMENTS :

Python: Python was the language of selection for this project. This was a straightforward call for many reasons. 1. Python as a language has a vast community behind it. Any problems which may be faced is simply resolved with a visit to Stack Overflow. Python is among the foremost standard language on the positioning that makes it very likely there will be straight answer to any question 2. Python has an abundance of powerful tools prepared for scientific computing Packages like NumPy, Pandas and SciPy area unit freely available and well documented. Packages like these will dramatically scale back, and change the code required to write a given program. This makes iteration fast. 3. Python as a language is forgiving and permits for program that appear as if pseudo code. This can be helpful once pseudo code given in tutorial papers must be enforced and tested. Using python this step is sometimes fairly trivial. However, Python is not without its errors. The language is dynamically written and packages are area unit infamous for Duck writing. This may be frustrating once a package technique returns one thing that, for instance, looks like an array instead of being an actual array. Plus the actual fact that standard Python documentation does not clearly state the return type of a method, this can lead to a lot of trials and error testing that will not otherwise happen in a powerfully written language. This is a problem that produces learning to use a replacement Python package or library more difficult than it otherwise may be.

Jupyter 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 transformation,

numerical simulation, statistical modelling, data visualization, machine learning, and much more.

Noise Removal and Sharpening: Unwanted data of element are remove using filter and image Can be sharpen and black and white gray scale image is used as a input.

Erosion and Dilation: It is applied to binary image, but there are many versions so that can be work on grayscale images. The basic effect of the operator on a binary image is eroding away to the boundaries of regions for ground pixels.

Negation: A negative is an image, usually it used on a strip or sheet of transparent plastic film, in negation the lightest areas of the photographed subject appear darkest and the darkest areas appear lightest.

Subtraction: Image subtraction process is the digital numeric value of one pixel or whole image is subtracted from another image. The white part of tumor can be subtracted from another remaining part that is the black portion of the images.

Threshold: Thresholding is a process of image segmentation. It converts the gray scale image into binary image.

Boundary Detection: Total area or boundary can be form properly using boundary detection method. White part of tumor tissues can be highlighted and there proper boundary can be detected. It is useful method to calculate the size and shape occupy by tumor tissues.

CHAPTER 4

DESIGN DESCRIPTION OF PROPOSED PROJECT

4.1 PROPOSED METHODOLOGY

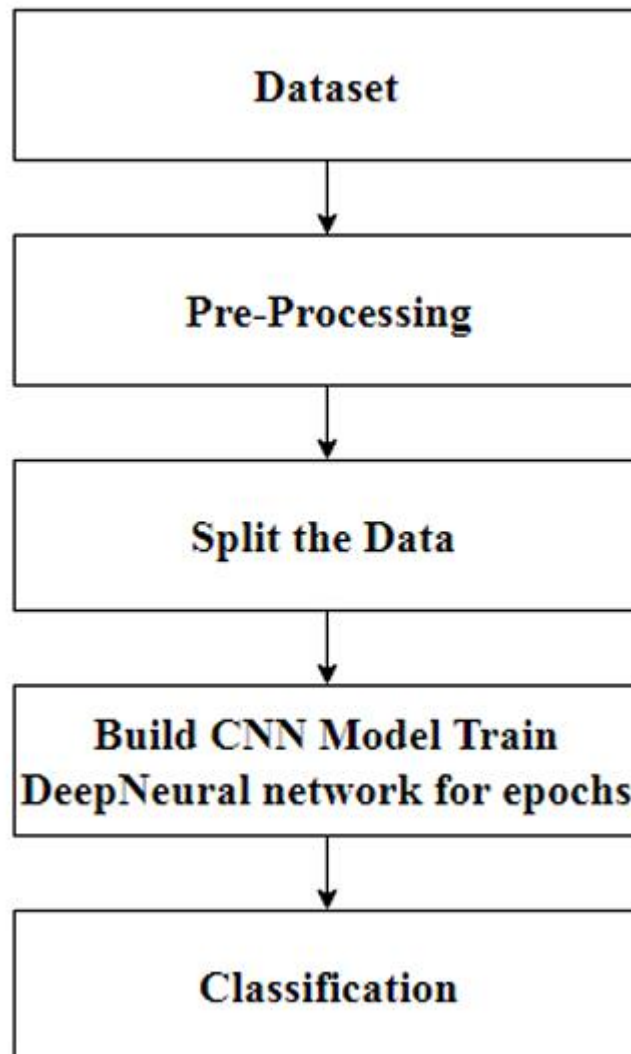


Figure 5 - Steps used in skull stripping algorithm

The proposed system has mainly five modules. Dataset, Pre-processing, Split the data, Build CNN model train Deep Neural network for epochs, and classification. In dataset we can take multiple MRI images and take one as input image. In pre-processing image to encoded the label and resize the image. In split the data we set the image as 80% Training Data and 20%

Testing Data. Then build CNN model train deep neural network for epochs. Then classified the image as yes or no if tumor is positive then it returns yes and the tumor is negative the it returns no.

4.1.1 Ideation Map/System Architecture

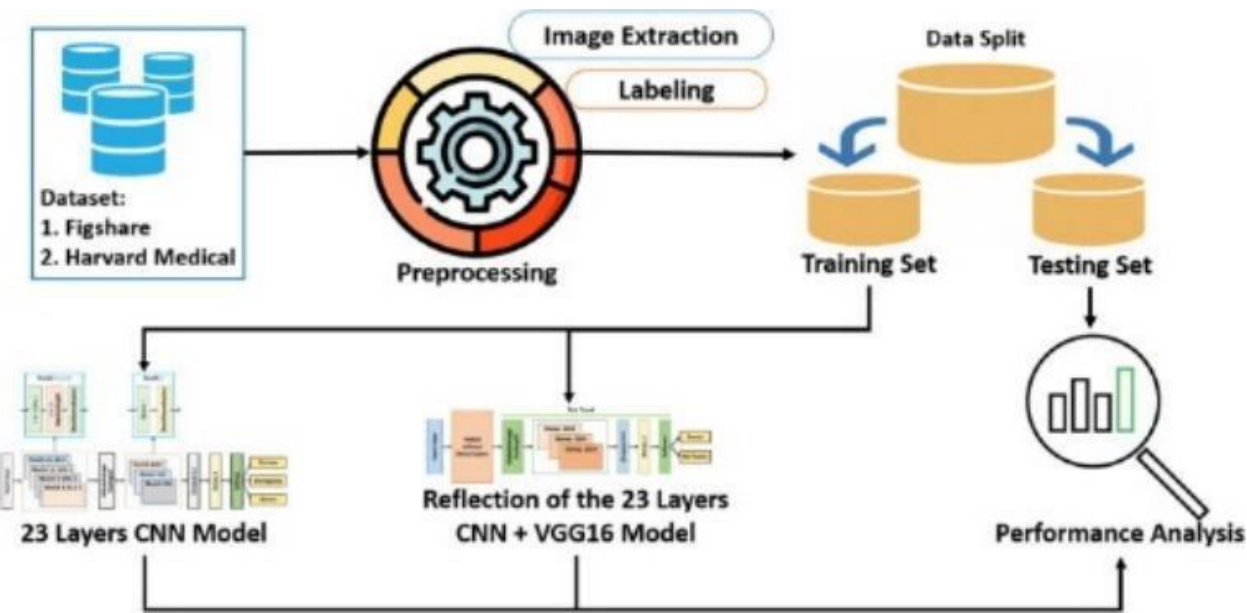


Figure 6 - System architecture

4.1.2 Various Stages

Working of CNN model :

- Layer of CNN model:
- o Convolution 2D
 - o MAX Poolig2D
 - o Dropout
 - o Flatten
 - o Dense
 - o Activation

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

MAX Poolig2D: In the MAX polling 2D it take the largest element from rectified feature map. ➤

Dropout: Dropout is randomly selected neurons are ignored during training. ➤ **Flatten:** Flatten feed output into 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 followed by nonlinear activation function. ➤ **Activation:** It used Sigmoid function and predict the probability 0 and 1. In the compile 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 used for non convex optimization problem like straight forward to implement. ▪ Computationally efficient. ▪ Little memory requirement.

4.1.3 Internal or Component design structure



Figure 7 - Brain Tumor

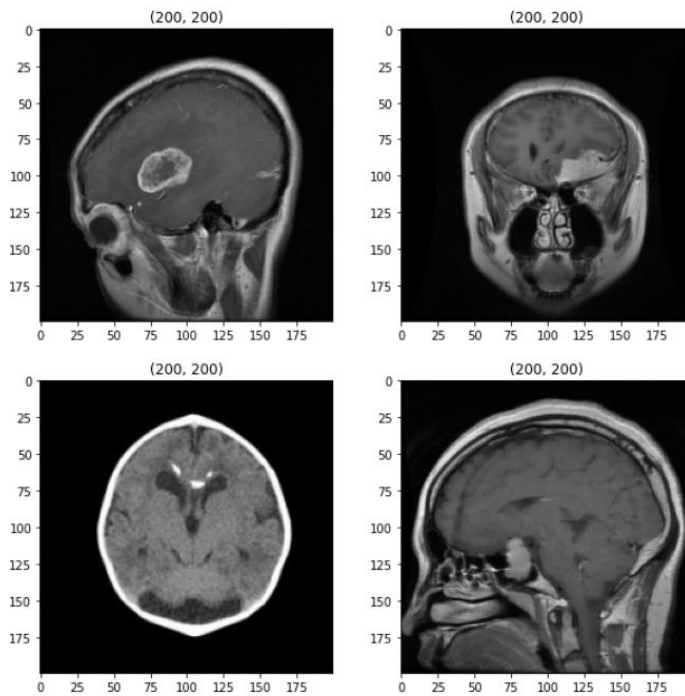


Figure 8 - brain interior design

4.1.4 working principles :

Transfer learning is a knowledge- sharing method that reduces the size of the training data, the time and the computational costs when building deep learning models. Transfer learning helps to transfer the learning of a pre-trained model to a new model. Transfer learning has been used in various applications, such as tumor classification, software defect prediction, activity recognition and sentiment classification. In this, the performance of the proposed Deep CNN model has been compared with popular transfer learning approach VGG16.



Figure 9 - VGG16 layered architecture

VGG16 is a convolutional neural network. The input of the 1 convolution layer is of fixed size 224 x 224 RGB image. The image is passed through a stack of convolutional layers, where the filters are used with a very small receptive field 3×3 (which is the smallest size to capture the notion of left/right, up/down, center). In the configurations, it is also utilizes 1×1 ,

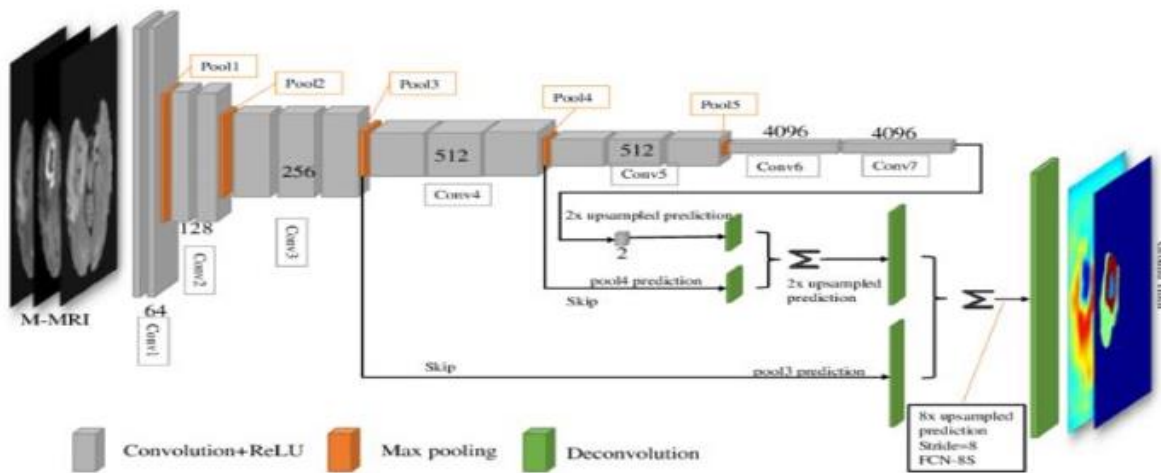


Figure 10u - .Working of VGG16 model for brain tumor detection

convolution filters, and it can be seen as a linear transformation of the input channels. The convolution stride is fixed to 1 pixel, and the spatial padding of convolution. Input layer is the spatial resolution is preserved after convolution, i.e. the padding is 1-pixel for 3×3 convolution layers. Spatial pooling is carried out by five max-pooling layers, which follow the some convolution layers (not all the conv. layers are followed by max-pooling). Max pooling is performed over 2×2 pixel window, with stride 2.

Three Fully -Connected (FC) layers are follow a stack of convolutional layers which has a different depth in different architectures and the first two have 4096 channels each, the third performs 1000-way ILSVRC classification and it contains 1000 channels one for each class. The final layer is the soft-max layer. The configuration of the fully connected layers is same in every network.

All hidden layers are equipped with the rectification (ReLU) nonlinearity. It is also noted that none of the networks (except for one) contain Local Response Normalization (LRN), such normalization does not improve the performance on the ILSVRC dataset, but leads to increased memory consumption and computation time.

4.2 FEATURES :

- Preprocessing
- Feature Extraction
- Model Architecture
- Loss Function
- Validation and Evaluation
- Post-processing
- intererpretability
- Data Augmentation

4.2.1 RESULT :

- *Import Libraries*

```
import cv2
import os
import numpy as np
import pandas as pd
import seaborn as sns
import random
import matplotlib.pyplot as plt
import tensorflow as tf
from sklearn.utils import shuffle
import glob
from tensorflow.keras.models import Model, Sequential
from tensorflow.keras.layers import Input, Conv2D, Dense, Flatten, Dropout, MaxPooling2D, BatchNormalization, GlobalAveragePooling2D
from tensorflow.keras.utils import to_categorical
from sklearn.model_selection import train_test_split
from tensorflow.keras.callbacks import EarlyStopping, LearningRateScheduler, ReduceLROnPlateau
from tensorflow.keras.preprocessing.image import ImageDataGenerator
from keras.optimizers import Adam, RMSprop
from sklearn.metrics import accuracy_score, confusion_matrix
from keras.applications.vgg16 import VGG16, preprocess_input
from tensorflow.keras import regularizers
```

- Preprocessing & Visualization

```
path_No = '/kaggle/input/brain-mri-images-for-brain-tumor-detection/no/*'
path_Yes = '/kaggle/input/brain-mri-images-for-brain-tumor-detection/yes/*'

tumor = []
no_tumor = []
random_state = 42

for file in glob.iglob(path_Yes):
    img = cv2.imread(file) #Reading the images from the path
    img = cv2.cvtColor(img, cv2.COLOR_BGR2RGB) #Changing the color from BGR to RGB
    img = cv2.resize(img, (128, 128))
    tumor.append((img, 1)) # Appending tuple with image and label 1 (indicating presence of tumor)

for file in glob.iglob(path_No):
    img = cv2.imread(file)
    img = cv2.cvtColor(img, cv2.COLOR_BGR2RGB)
    img = cv2.resize(img, (128, 128))
    no_tumor.append((img, 0)) # Appending tuple with image and label 0 (indicating absence of tumor)

# Concatenating the two lists and shuffle the data
all_data = tumor + no_tumor

# Splitting data and labels
data = np.array([item[0] for item in all_data])
labels = np.array([item[1] for item in all_data])
```

- Visualizing the images with their labels

```
plt.figure(figsize=(15, 5))

# Display tumor images with label 'yes'
for i in range(3):
    plt.subplot(2, 3, i+1)
    plt.imshow(tumor[i][0])
    plt.title("Tumor: Yes")
    plt.axis('off')

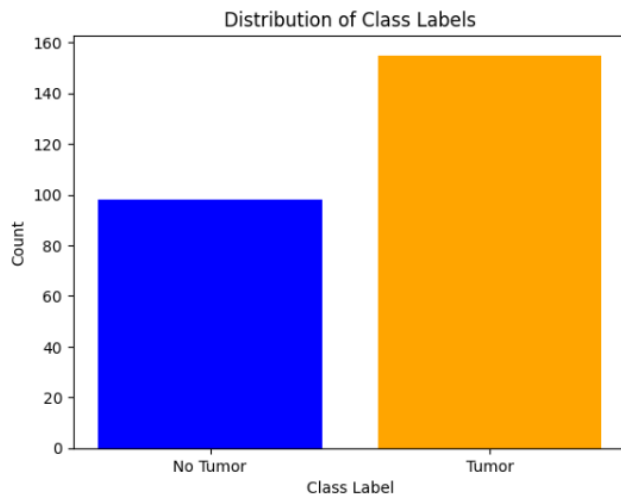
# Display no_tumor images with label 'no'
for i in range(3):
    plt.subplot(2, 3, i+4)
    plt.imshow(no_tumor[i][0])
    plt.title("Tumor: No")
    plt.axis('off')

plt.tight_layout()
plt.show()
```

- Lables distribution

```
# Counting the occurrences of each class label
unique_labels, label_counts = np.unique(labels, return_counts=True)

plt.bar(unique_labels, label_counts, color=['blue', 'orange'])
plt.xticks(unique_labels, ['No Tumor', 'Tumor'])
plt.xlabel('Class Label')
plt.ylabel('Count')
plt.title('Distribution of Class Labels')
plt.show()
```



- Brain cropping function

```
def crop_brain_region(image, size):
    # Converting the image to grayscale
    gray = cv2.cvtColor(image, cv2.COLOR_RGB2GRAY)

    # Applying Gaussian blur to smooth the image and reduce noise
    gray = cv2.GaussianBlur(gray, (5, 5), 0)

    # Thresholding the image to create a binary mask
    thresh = cv2.threshold(gray, 45, 255, cv2.THRESH_BINARY)[1]

    # Performing morphological operations to remove noise
    thresh = cv2.erode(thresh, None, iterations=2)
    thresh = cv2.dilate(thresh, None, iterations=2)

    # Finding contours in the binary mask
    contours, _ = cv2.findContours(thresh.copy(), cv2.RETR_EXTERNAL, cv2.CHAIN_APPROX_SIMPLE)

    # Assuming the brain part of the image has the largest contour
    c = max(contours, key=cv2.contourArea)

    # Getting the bounding rectangle of the brain part
    x, y, w, h = cv2.boundingRect(c)

    # Drawing contours on the original image
    contour_image = cv2.drawContours(image.copy(), [c], -1, (0, 255, 0), 2)

    # Drawing bounding box on the original image
    bounding_box_image = cv2.rectangle(image.copy(), (x, y), (x + w, y + h), (0, 255, 0), 2)

    # Cropping the image around the bounding rectangle
    cropped_image = image[y:y+h, x:x+w]

    # Resizing cropped image to the needed size
    resized_image = cv2.resize(cropped_image, size)

    return contour_image, bounding_box_image, cropped_image, resized_image

output_size = (128, 128)

example_image = cv2.imread('/kaggle/input/brain-mri-images-for-brain-tumor-detection/yes/Y1.jpg')
example_image = cv2.cvtColor(example_image, cv2.COLOR_BGR2RGB)

contour_image, bounding_box_image, cropped_image, resized_image = crop_brain_region(example_image,
output_size)

plt.figure(figsize=(15, 10))

plt.subplot(2, 2, 1)
plt.imshow(contour_image)
plt.title("Contour")

plt.subplot(2, 2, 2)
plt.imshow(bounding_box_image)
plt.title("Bounding Box")

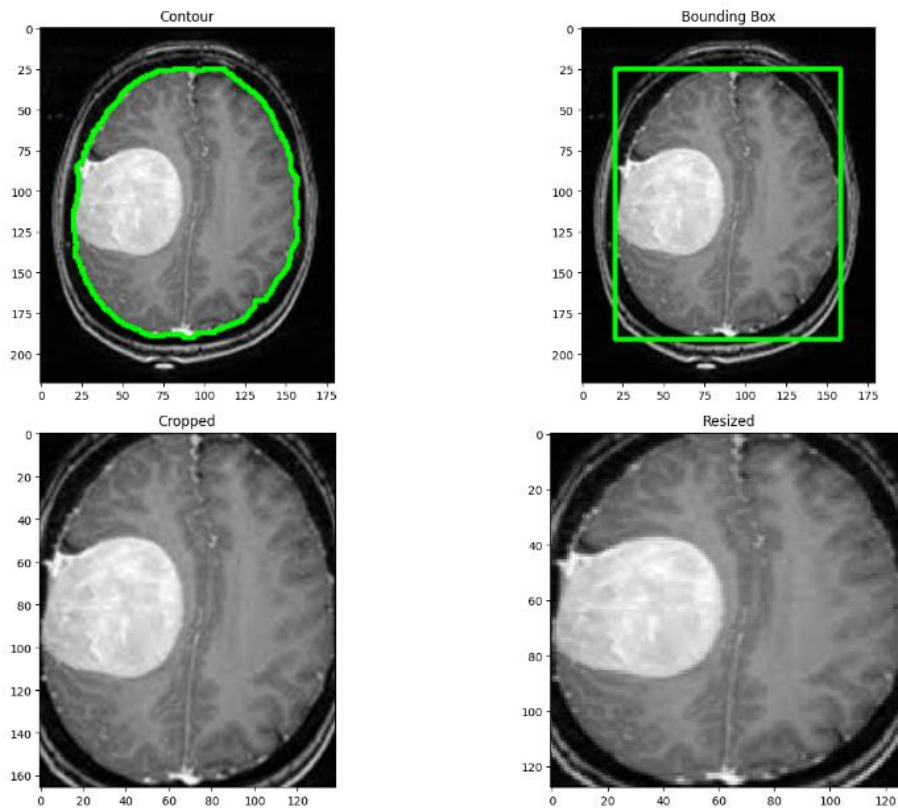
plt.subplot(2, 2, 3)
plt.imshow(cropped_image)
plt.title("Cropped")

plt.subplot(2, 2, 4)
plt.imshow(resized_image)
plt.title("Resized")

plt.tight_layout()
plt.show()

all_cropped = []

# Applying the crop function to each one of our images
for image in data:
    _, _, _, resized_image = crop_brain_region(image, output_size)
    all_cropped.append(resized_image)
```



- Data Splitting

```
all_cropped=np.array(all_cropped)
```

```
# Shuffling the data to make sure the images are randomized and there is no order in labels
all_cropped_shuffled, labels_shuffled = shuffle(all_cropped, labels, random_state=42)

train_images, test_images, train_labels, test_labels = train_test_split(all_cropped_shuffled, labels_shuffled, test_size=0.2, random_state=42)
test_images, val_images, test_labels, val_labels = train_test_split(test_images, test_labels, test_size=0.5, random_state=42)

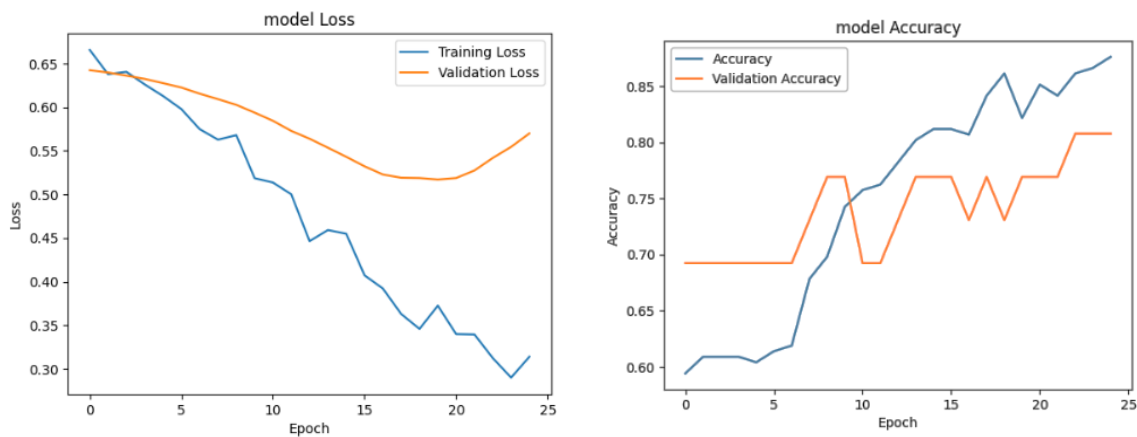
print("Train data shape:", train_images.shape)
print("Train labels shape:", train_labels.shape)
print("Validation data shape:", val_images.shape)
print("Validation labels shape:", val_labels.shape)
print("Test data shape:", test_images.shape)
print("Test labels shape:", test_labels.shape)
```

```

Epoch 1/50
7/7 ----- 6s 473ms/step - accuracy: 0.5612 - loss: 0.6829 - val_accuracy: 0.6923
- val_loss: 0.6422
Epoch 2/50
7/7 ----- 3s 417ms/step - accuracy: 0.5702 - loss: 0.6691 - val_accuracy: 0.6923
- val_loss: 0.6396
Epoch 3/50
7/7 ----- 5s 429ms/step - accuracy: 0.5702 - loss: 0.6753 - val_accuracy: 0.6923
- val_loss: 0.6360
Epoch 4/50
7/7 ----- 5s 477ms/step - accuracy: 0.5702 - loss: 0.6629 - val_accuracy: 0.6923
- val_loss: 0.6323
Epoch 5/50
7/7 ----- 5s 426ms/step - accuracy: 0.5683 - loss: 0.6461 - val_accuracy: 0.6923
- val_loss: 0.6274
Epoch 6/50
7/7 ----- 5s 433ms/step - accuracy: 0.5721 - loss: 0.6358 - val_accuracy: 0.6923
- val_loss: 0.6224
Epoch 7/50
7/7 ----- 3s 424ms/step - accuracy: 0.5757 - loss: 0.6130 - val_accuracy: 0.6923
- val_loss: 0.6154
Epoch 8/50
7/7 ----- 3s 419ms/step - accuracy: 0.6263 - loss: 0.6048 - val_accuracy: 0.7308
- val_loss: 0.6091
Epoch 9/50
7/7 ----- 3s 417ms/step - accuracy: 0.6780 - loss: 0.6001 - val_accuracy: 0.7692
- val_loss: 0.6026
Epoch 10/50
7/7 ----- 3s 435ms/step - accuracy: 0.7282 - loss: 0.5624 - val_accuracy: 0.7692
- val_loss: 0.5936
Epoch 11/50
7/7 ----- 3s 415ms/step - accuracy: 0.7196 - loss: 0.5635 - val_accuracy: 0.6923
- val_loss: 0.5843
Epoch 12/50
7/7 ----- 5s 434ms/step - accuracy: 0.7413 - loss: 0.5487 - val_accuracy: 0.6923
- val_loss: 0.5777

```

Model loss & Model Accuracy :



Output :



CHAPTER 5

CONCLUSION

In brain tumor detection we have studied about feature based existing work. In feature based we have study about image processing techniques likes image pre-processing, image segmentation, features extraction, classification. And also study about deep learning techniques CNN and VGG16. In this system we have detect the tumor is present or not if the tumour is present then model return's yes otherwise it return no. and we have compared CNN with the VGG 16 Model. The result of comparison VGG 16 is more accurate than CNN. However, not every task is said to be perfect in this development field even more improvement may be possible in this application. I have learned so many things and gained a lot of knowledge about development field.

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RESEARCH PAPER :

MRI brain tumor detection using CNN model

ABSTRACT : Now a day's tumor is second leading cause of cancer. Due to cancer large no of patients are in danger. The medical field needs fast, automated, efficient and reliable technique to detect tumor like brain tumor. Detection plays very important role in treatment. If proper detection of tumor is possible then doctors keep a patient out of danger. Various image processing techniques are used in this application. Using this application doctors provide proper treatment and save a number of tumor patients. A tumor is nothing but excess cells growing in an uncontrolled manner. Brain tumor cells grow in a way that they eventually take up all the nutrients meant for the healthy cells and tissues, which results in brain failure. Currently ,doctors locate the position and the area of brain tumor by looking at the MRI Images of the brain of the patient manually. This results in inaccurate detection of the tumor and is considered very time consuming A tumor is a mass of tissue it grows out of control. We can use a Deep Learning architectures CNN (Convolution Neural Network) generally known as NN (Neural Network) and VGG 16(visual geometry group) Transfer learning for detect the brain tumor. The performance of model is predict image tumor is present or not in image.

If the tumor is present it return yes otherwise return no.

1 . INTRODUCTION :

The human body is made up of many organs and brain is the most critical and vital organ of them all. One of the common reasons for disfunction of brain is brain tumor. A tumor is nothing but excess cells growing in an uncontrolled manner. Brain tumor cells grow in a way that they eventually take up all the nutrients meant for the healthy cells and tissues, which results in brain failure. Currently, doctors locate the position and the area of brain tumor by looking at the MR Images of the brain of the patient manually. This results in inaccurate detection of the tumor and is considered very time consuming. A Brain Cancer is very critical disease which causes deaths of many individuals. The brain tumor detection and classification system is available so that it can be diagnosed at early stages. Cancer classification is the most challenging tasks in clinical diagnosis. This project deals with such a system, which uses computer, based procedures to detect tumor blocks and

classify the type of tumor using Convolution Neural Network Algorithm for MRI images of different patients. Different types of image processing techniques like image segmentation, image enhancement and feature extraction are used for the brain tumor detection in the MRI images of the cancer-affected patients.

Detecting Brain tumor using Image Processing techniques its involves the four stages is Image Pre-Processing, Image segmentation, Feature Extraction, and Classification. Image processing and neural network techniques are used for improve the performance of detecting and classifying brain tumor in MRI images.

2 . LITERATURE SURVEY :

Paper-1: Image Analysis for MRI Based Brain Tumor Detection and Feature Extraction Using Biologically Inspired BWT and SVM

- Publication Year: 6 March 2017
- Author: Nilesh Bhaskarrao Bahadure, Arun Kumar Ray, and Har Pal Thethi
- Journal Name: Hindawi International Journal of Biomedical Imaging
- Summary: In this paper using MR images of the brain, we segmented brain tissues into normal tissues such as white matter, gray matter, cerebrospinal fluid (background), and tumor-infected tissues. We used pre-processing to improve the signal-to-noise ratio and to eliminate the effect of unwanted noise. We can used the skull stripping algorithm its based on threshold technique for improve the skull stripping performance.

Paper-2: An efficient Brain Tumor Detection from MRI Images using Entropy Measures

- Publication Year: December 23-25, 2016
- Author: Devendra Somwanshi , Ashutosh Kumar, Pratima Sharma, Deepika Joshi
- Journal Name: IEEE International Conference on Recent Advances and Innovations in Engineering
- Summary: In this paper, we have investigated the different Entropy functions for tumor segmentation and its detection from various MRI images. The different threshold values are obtained depend on the particular definition of the entropy. The threshold values are dependent on the different entropy function which in turn affects the segmented results.

3 . RESEARCH METHODOLOGY :

OVERVIEW OF EXITING WORK :

- In the first stage, there is a computer based procedures to detect tumor blocks and classify the type of tumor using Artificial Neural Network Algorithm for MRI images of different patients.
- The second stage involves the use of different image processing techniques such as histogram equalization, image segmentation, image enhancement, morphological operations and feature extraction are used for brain tumor detection in the MRI images for the cancer-affected patients.
- This work iss introduced one automatic brain tumor detection method to increase the accuracy and decrease the diagnosis time.

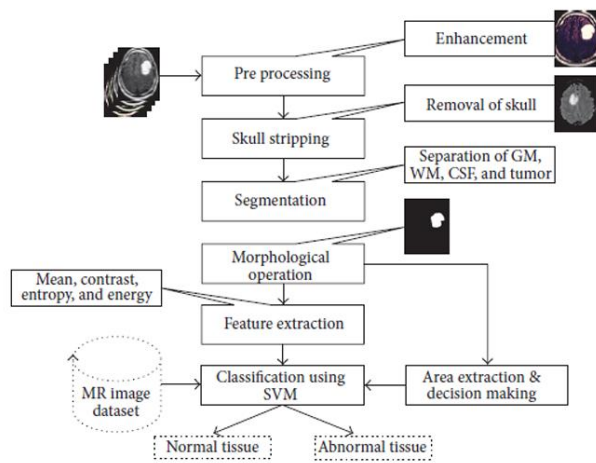


Figure 1

- **Image Preprocessing:** As input for this system is MRI, scanned image and it contain noise. Therefore, our first aim is to remove noise from input image. explained in system flow we are using high pass filter for noise removal and preprocessing
- **Segmentation:** Region growing is the simple region-based image segmentation technique. It is also classified as a pixel based image segmentation technique since it is involve the selection of initial seed points.
- **Morphological operation:** The morphological operation is used for the extraction of boundary areas of the brain images. This operation is only rearranging the relative order of pixel value, not mathematical value, so it is suitable for only binary images. Dilation and erosion is basic operation of morphology. Dilation is add pixels to the boundary region of the object, while erosion is remove the pixels from the boundary region of the objects.
- **Feature Extraction:** The feature extraction is used for edge detection of the images. It is the process of collecting higher level information of

image such as shape, texture, color, and contrast.

- **Connected component labeling:** After recognizing connected components of an image, every set of connected pixels having same gray-level values are assigned the same unique region label.
- **Tumor Identification:** In this phase, we are having dataset previously collected brain MRIs from which we are extracting features. Knowledge base is created .

4 . PROPOSED WORKFLOW :

The proposed system has mainly five modules. Dataset, Pre-processing, Split the data, Build CNN model train Deep Neural network for epochs, and classification. In dataset we can take multiple MRI images and take one as input image. In pre-processing image to encoded the label and resize the image. In split the data we set the image as 80% Training Data and 20% Testing Data. Then build CNN model train deep neural network for epochs. Then classified the image as yes or no if tumor is positive then it returns yes and the tumor is negative the it returns no.

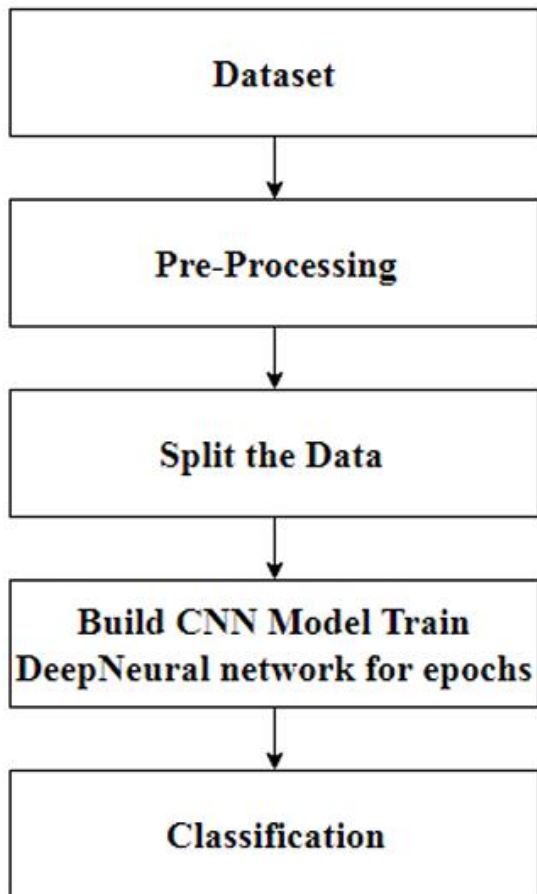


Figure 2

5 . Working of CNN model :

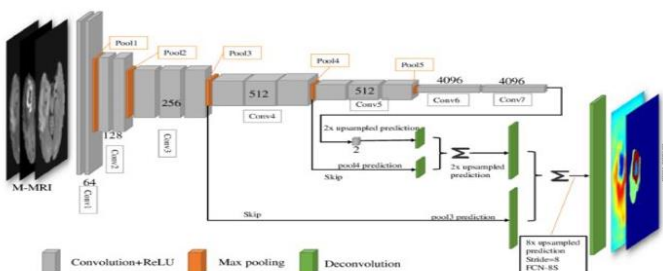


Figure 3

Layer of CNN model:

- o Convolution 2D
- o MAX Poolig2D
- o Dropout
- o Flatten
- o Dense
- o Activation

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

➤MAX Poolig2D: In the MAX polling 2D it take the largest element from rectified feature map.

➤Dropout: Dropout is randomly selected neurons are ignored during training.

➤Flatten: Flatten feed output into 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 followed by nonlinear activation function

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

➤In the compile 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 used for non convex optimization problem like straight forward to implement. ▪ Computationally efficient.

▪ Little memory requirement.

6 . Architecture diagram :

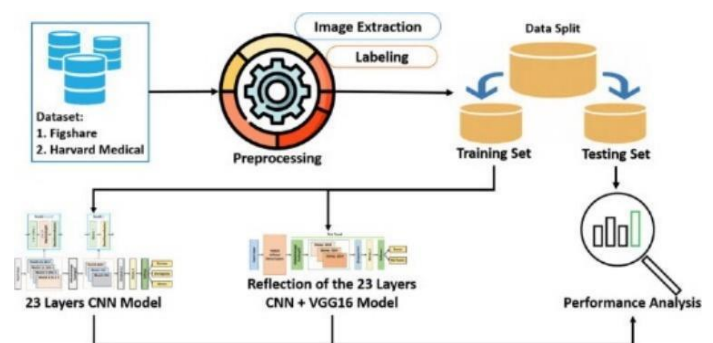


Figure 4

7 . APPLICATION :

- The main aim of the applications is tumor identification.
- The main reason behind the development of this application is to provide proper treatment as soon as possible and protect the human life which is in danger.
- This application is helpful to doctors as well as patient.
- The manual identification is not so fast, more accurate and efficient for user. To overcome those problem this application is design.
- It is user friendly application.

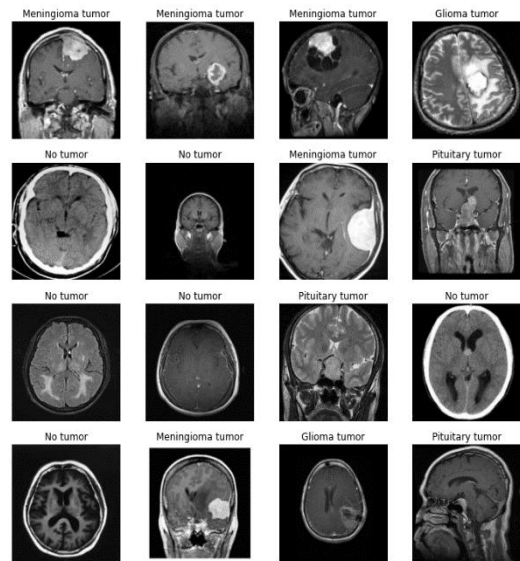


Figure 5

8 . Types of Brain tumor :

Glioma - Occurs at the base of the brain.

Pituitary - tumors occur in pituitary gland (responsible for growth of the body).

Meningioma - tumor grows from meninges, layers of tissue covering the brain and the spinal cord.

9 . OBJECTIVE ;

- To provide doctors good software to identify tumor and their causes.
- Save patient's time.
- Provide a solution appropriately at early stages.
- Get timely consultation.

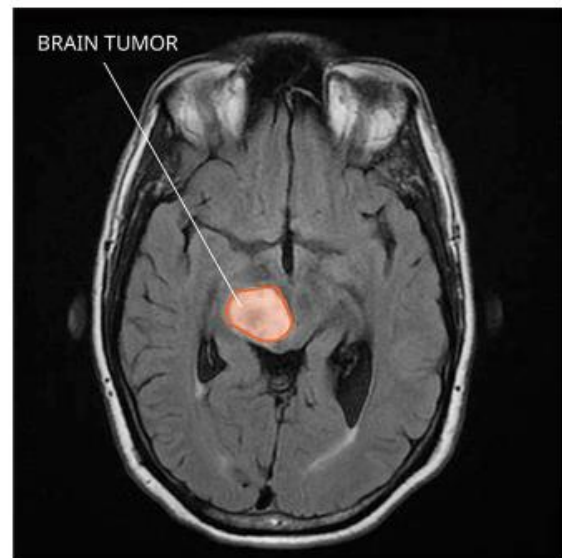


Figure 6

10 . RESULT :

11. CONCLUSION :

In brain tumor detection we have studied about feature based existing work. In feature based we have study about image processing techniques likes image pre-processing, image segmentation, features extraction, classification. And also study about deep learning techniques CNN and VGG16. In this system we have detect the tumor is present or not if the tumour is present then model return's yes otherwise it

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