# Brain Tumor Detection with VGG-16 Model

Ajay Kumar
*Computer Science Engineering*
*IIIT Naya Raipur*
Naya Raipur, India
ajay18100@iiitnr.edu.in

Shreyas Lall
*Computer Science Engineering*
*IIIT Naya Raipur*
Naya Raipur, India
shreyas18100@iiitnr.edu.in

Swaraj Gupta
*Electronics & Communication Engineering*
*IIIT Naya Raipur*
Naya Raipur, India
swaraj18101@iiitnr.edu.in

***Abstract*—**
**Brain tumor can be very unforgiving to all age groups.Brain tumors account for 85% to 90% of all primary central nervous system (CNS) tumors. Most of the times, survival rates decrease significantly with the age. While the anatomy of brain is more complex than any other vital organ, It becomes very crucial to find out the chances of people developing brain tumor in later stages of life. The figure of finding brain tumor in an individual lifetime is 1 in every 100[4].**

***Index Terms*—Brain Tumor Classification, VGG-16 CNN Model,**

## I. Introduction

Brain Tumor is defined as growth of abnormal cells or mass inside the skull of an individual. Skull is a restricted space, so therefore any unknown development can be life-threatening. Brain tumors can be categorized into broadly two types i.e. cancerous (malignant) or noncancerous (benign). When benign or malignant tumors grow, they can cause the pressure inside your skull to increase. These symptoms can be observed by the person and immediate consultant with the specialist is advised with a brain tumor Specialist/Doctor. Study shows that 30.2% tumors are malignant and 69.8 % tumors are benign(see [5], [6]).Cancerous tumors is mainly divided into primary tumors and secondary tumors. Primary tumors start within the brain whereas secondary tumors spread from elsewhere, known as brain metastasis tumors. Tumors depends on location of site in the brain.

## II. Symptoms

Brain symptoms varies depending on type size Some signs are follows:
1. Headache Severe headache is a common symptom in about more than 50 percent people.Continuous pressure is being provided by tumour in brain to sensitive nerves blood vessels.following are some kind of headache: a). Having a sharp pain in head,unlike migraine. b). Accompanied by vomiting. c). gets worse while coughing and changing positions.
2. Seizures Brain tumours can interfere with presented electrical signals which result in seizures.It's actually first sign of tumour mostly people having brain tumour experienced it once.
3. Memory Loss and Confusion Due to tumour in frontal lobe,memory problems occur.which can effect in decision making and results in confusion.Following are some problems: a). Difficulty in concentrating and get easily distracted. b). Memory issues, planning issues,multitasking issues. These are the result of vitamin deficiencies, medications, or emotional disorders.
4. Fatigue Fatigue is more than feeling a little tired once in a while.Following are some signs: a). completely exhaustion,overall weakness,trouble in sleeping. Cancerous brain tumour result in fatigue.they are also side effect of cancer treatment.
5. Depression Depression is the mostly observed symptom in brain tumour patients. Following are some problems: a). longer lasting feeling of sadness in patients,than the normal ones. b). interest losing, lack of energy or showing less energetic in something. c). insomnia d). suicidal thoughts or feeling worthlessness
6. Weakness while body is fighting with brain tumour,it's obvious that one feels weakness in body,some tumours can cause tingling in hands feet.Weakness can also be cause by cancer treatments,multiple sclerosis,diabetic neuropathy.

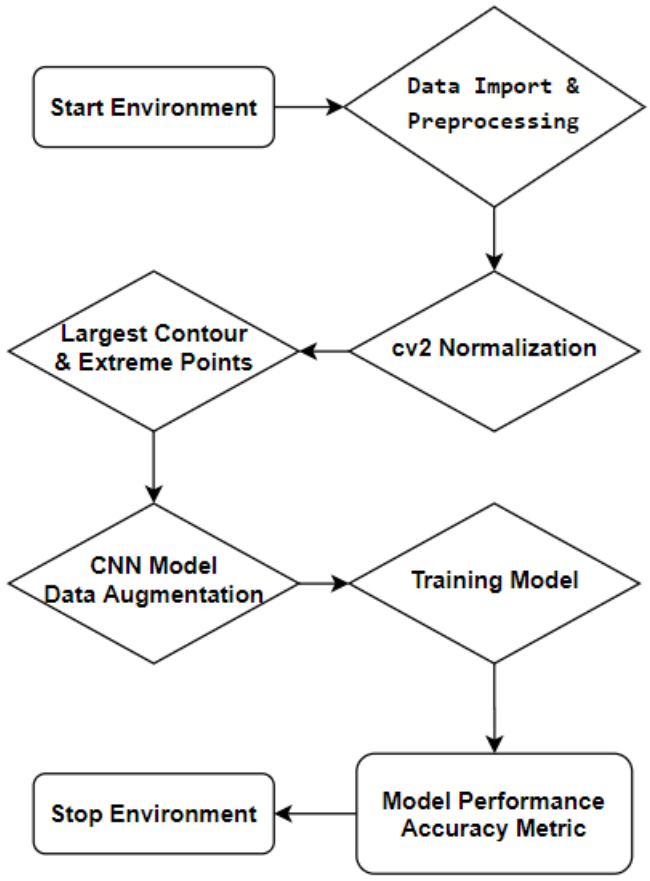
## III. Project Objective

The soul purpose of this report to classify random Magnetic resonance imaging (MRI) scan on the basis of presence of tumor on a Image Target by training a CNN-Model using VGG-16 model architecture (also called OxfordNet). We used accuracy as a measure to justify the model performance which can be defined as:

$$Accuracy = \frac{Numberofcorrectlypredictedimages}{Totalnumberoftestedimages} \text{ X } 100\%$$

## IV. Methods

### A. Flowchart




### B. Normalization

Since our dataset is comprised of images of different dimension, hue and saturation of colors,to bring the image into a range of intensity values i.e. better for later training the model meaning statistically it follows a normal distribution. The actual intensity distribution is graphed along the mean value of all images which should be determined with high confidence level. Traditionally, cv2 library is used to support a wide range of operation in normalization.

### C. Contour and extremity of an Image

Contours are the shape determined by cv2 operation based on changing intensities of image matrix[8]. They holds a Region of Interest(ROI) where the main information of the image lies, in our case, we want to analyse just the region of MRI enclosed within the Skull for tumor detection. While the contours are correctly detected, we can also point the extremities of the images present in the dataset for clearly assign coordinates to CNN Model for less computation and more accurac[11]y.

### D. CNN Model

Convolutional Neural Network (CNN) is a deep learning network used for classifying images. The basic premise behind CNN is using predefined convolving filters to identify patterns in image edges, parts of objects and the build on to this knowledge to detect complete objects like automobiles, animals, human being etc[10]. VGG16 is a convolutional neural network architecture named after the Visual Geometry Group from Oxford, who developed it. It was used to win the ILSVR (ImageNet) competition in 2014.

### E. Data Augmentation

When we don't have enough to train models, we can apt for data augmentation where a single image is multiplied with random crop and rotation. It helps the CNN model to provide enough data without actually collecting new data to train itself. Here, we also make use of this strategy that enables to significantly increase the diversity of our data available for training models. It involves operations like cropping, padding, and horizontal flipping[9].

## V. Result

Since we have completely identified out methodologies and explored implementation of the data obtained we now can now to next aspect i.e. results. We have attached Contour and Extremity of a single Image Target, Model accuracy and Model loss we acquired while training Model using CNN VGG16 architecture.

### A. Positioning Figures

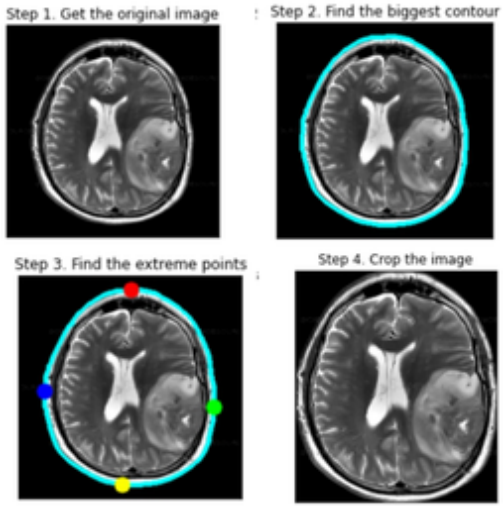



Fig. 1. Contour and Extremity

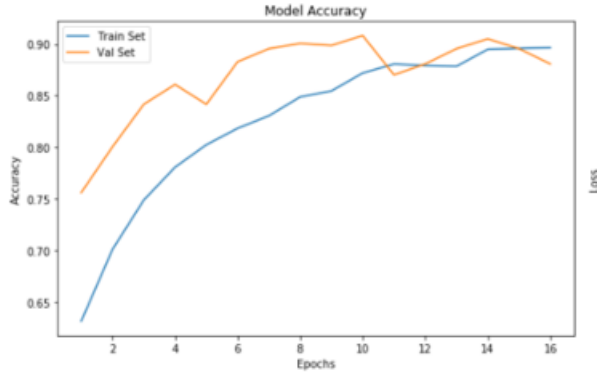



Fig. 2. Model Accuracy

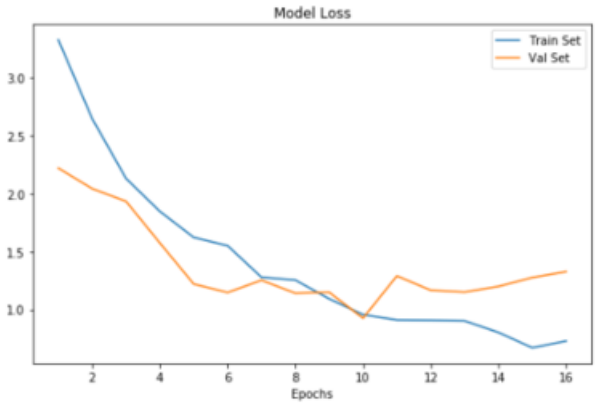



Fig. 3. Model Loss

### *B. Model Accuracy Graphs*

## VI. Conclusion

Brain Tumor is very critical in our society. It should be detected nascent stages to begin treatment as early as possible for the subject to recover faster. Other researchers(see [1],[2]) are also suggesting techniques which require large datasets while our model is using data augmentation for work as efficient as large datasets. Using VGG16 along with data augmentation is faster and use less computation processing power and obtain similar accuracy in detecting brain tumor. This model has been tested with different datasets consisting of high definition photos and give faultless results. This project is practically aimed towards a social cause and developement of medical sector and helps to create a system which will help patients to its fullest.

## References

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