BRAIN TUMOUR DIAGNOSIS USING CONVOLUTIONAL NEURAL NETWORKS

Under the Guidance of
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What is Brain Tumour?

- Brain Tumour is a mass of abnormal cells inside the brain or skull; some are benign, others malignant with worst and good outcome, respectively
- Tumour can grow from the brain tissue itself (primary), or cancer from elsewhere in the body can spread to the brain (metastasis)
- When benign or malignant tumour grow, enclosed with in the bony skull, the brain cannot expand to make a room for a growing mass. This can cause brain damage, and it can be life-threatening.

Symptoms:

•Headache

•Seizures or convulsions

•Weakness or paralysis in one part or one side of body

•Loss of balance or dizziness

•Vision changes

•Hearing changes

Diagnosis:

- Brain tumour most of the times causes mass effect, which is life threatening, and symptoms based on the site of it’s origin like , effecting cranial nerve function
- Brain tumour can be suspected by basic neurologic and higher mental function testing
- It is accurately diagnosed with the help of MRI scan, with or without biopsy on case to case basis

INTRODUCTION:

- In Brain tumor segmentation, we find several methods that explicitly develop a parametric or non-parametric probabilistic model for the underlying data.
- These models usually include a likelihood function corresponding to the observations and a prior model.
- Being abnormalities, tumors can be segmented as outliers of normal tissue, subjected to shape and connectivity constrains.
- The proposed system can be used as the second opinion for assistance of radiologist and can get recommendations of tumour.

Existing System:

- There are many image processing method, for example, histogram equalization, picture segmentation, image enhancement, morphological operation, feature choice and obtaining the features, and order.
- A wide range of image processing techniques was used in segmenting brain tumor tissues. Some researchers used basic approaches for segmentation such as thresholding segmentation techniques.

DRAWBACKS:

- In image processing techniques used different types of filters and Fourier and discrete transform it increases the complexity the cost of those equipment also high.
- To know the result of the tumor concerned person has to be there. This diagnosis performs some particular equipment only.

Proposed System:

➢CNN (**Convolution Neural Network**) contains neurons with some weights and biases. These neurons receive some inputs from anterior layer. It calculates a dot product between the input and weights, and optionally follows it with a non-linearity. The CNN architectures makes postulation that the inputs are images which sanctions us to encode certain properties into the architecture.

➢Convolution layer contain more than one convolution layers with activation function ReLU and pooling step. At the end final layer is plenary connected layer is a standard neural network architecture.

LITERATURE SURVEY:

- Title: “A survey of MRI-based medical image analysis for brain tumor studies.”

- The objective in the segmentation is outlining the tumor including its sub-compartments and surrounding tissues, while the main challenge in registration and modeling is the handling of morphological changes caused by the tumor.

- The qualities of different approaches are discussed with a focus on methods that can be applied on standard clinical imaging protocols.

Data Sources From Kaggle :

- https://www.kaggle.com/navoneel/brain-mri-images-for-brain-tumor-detection
- https://www.kaggle.com/ruslankl/brain-tumor-detection-v1-0-cnn-vgg-16/data

ALGORITHM:

SEQUENTIAL

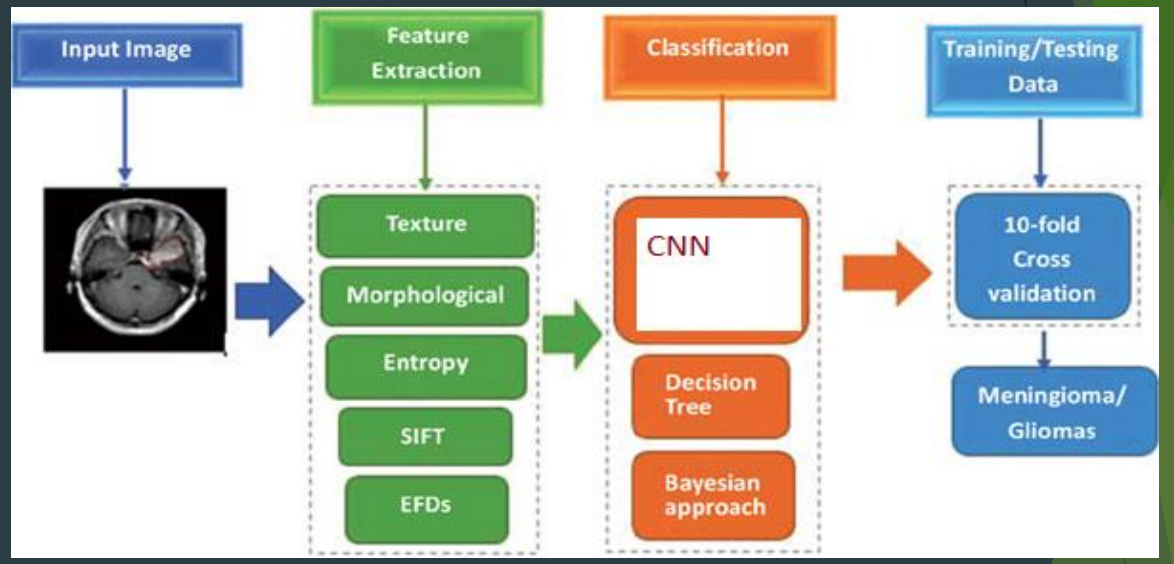
```
Classifier = sequential()
Clasifier .add(conv2D(32, (3, 3), input_shape = (64, 64, 3), activation = ‘relu’))
```

POOLING

```
Classifier .add(Maxpooling2D(pool_size = (2, 2)))
Classifier .add(conv2D(32, (3, 3), activation = ‘relu’))
Classifier . Add(Maxpooling2D(pool_size = (2, 2)))

Classifier .add(conv2D(32, (3, 3), activation = ‘relu’))
Classifier .add(Maxpooling2D(pool_size = (2, 2)))

Classifier .add(Flatten())

Classifier .add(Dense(activation = ‘relu’ ,units=128))
Classifier .add(Dense(activation = ‘sigmoid’ ,units=1))

Classifier .compile(optimizer = ‘adam’ , loss = ‘binary_crossentropy’ , metrics = [‘accuracy’])

Classifier.summary()
```

MODULES IN CNN

1. Preprocessing
2. Feature extraction
3. Image segmentation
4. Implementation of CNN



1. Preprocessing:

- The image is loaded as the .mat format and the image is in the form of MRI. MRI image is in either RGB or gray scale.
- The image is resized and converted to grey if the image was in color.

2. Feature Extraction:

In this part, we extract features of images to use in classification part. For feature extraction and feature selection, we use convolution neural network (CNN). CNN extracts the features of the dataset and perform the classification based on these features.

3. Image segmentation:

- Image Segmentation is a labelling process for each pixel in a medical image data set for indicating the type of tissue or the structure of anatomy. The labels that result from this approach have a vast area of applications in visualization and medical research.
- The method of dividing an image into sets of pixels which is also called super pixels is the image segmentation. The chief objective of segmentation is to identify the tumor's location.

4. Implementation of CNN:

- Convolutional Neural Network (CNN) issued to achieve some breakthrough results and win well-known contests.
- The weights of the kernels are adapted during the training phase by back propagation, in order to enhance certain characteristics of the input. CNN are easier to train and less prone to overfitting.

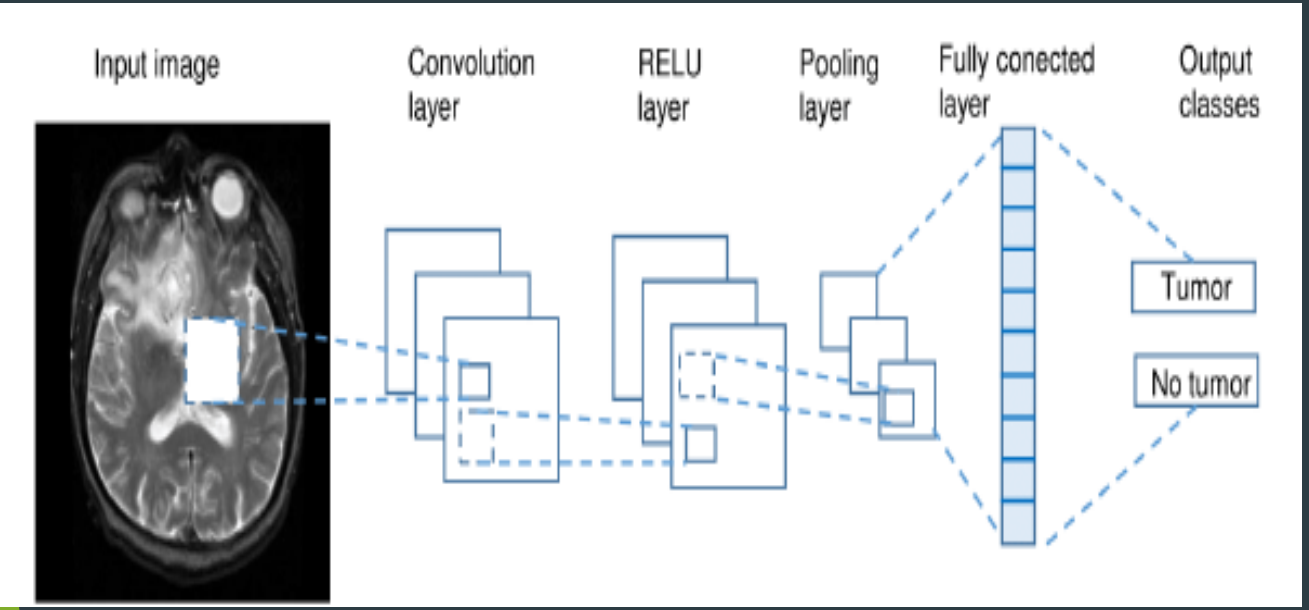
LIBRARIES:

- TENSORFLOW

An open source artificial intelligence library, using data flow graphs to build models. It allows developers to create large-scale neural networks with many layers.

- KERAS

Keras is an open-source neural-network library written in Python. It is capable of running on top of TensorFlow, Microsoft Cognitive Toolkit, R, Theano, or PlaidML.



DATA FLOW DIAGRAM

PROPOSED SYSTEM ARCHITECTURE:

The proposed system is built around conventional three-tier architecture. The three-tier architecture for web development allows programmers to separate various aspects of the solution design into modules and work on them separately.

- The Layout:

  This tier is at the uppermost layer and is closely bound to the user i.e., the users of the system interact with it through this tier.

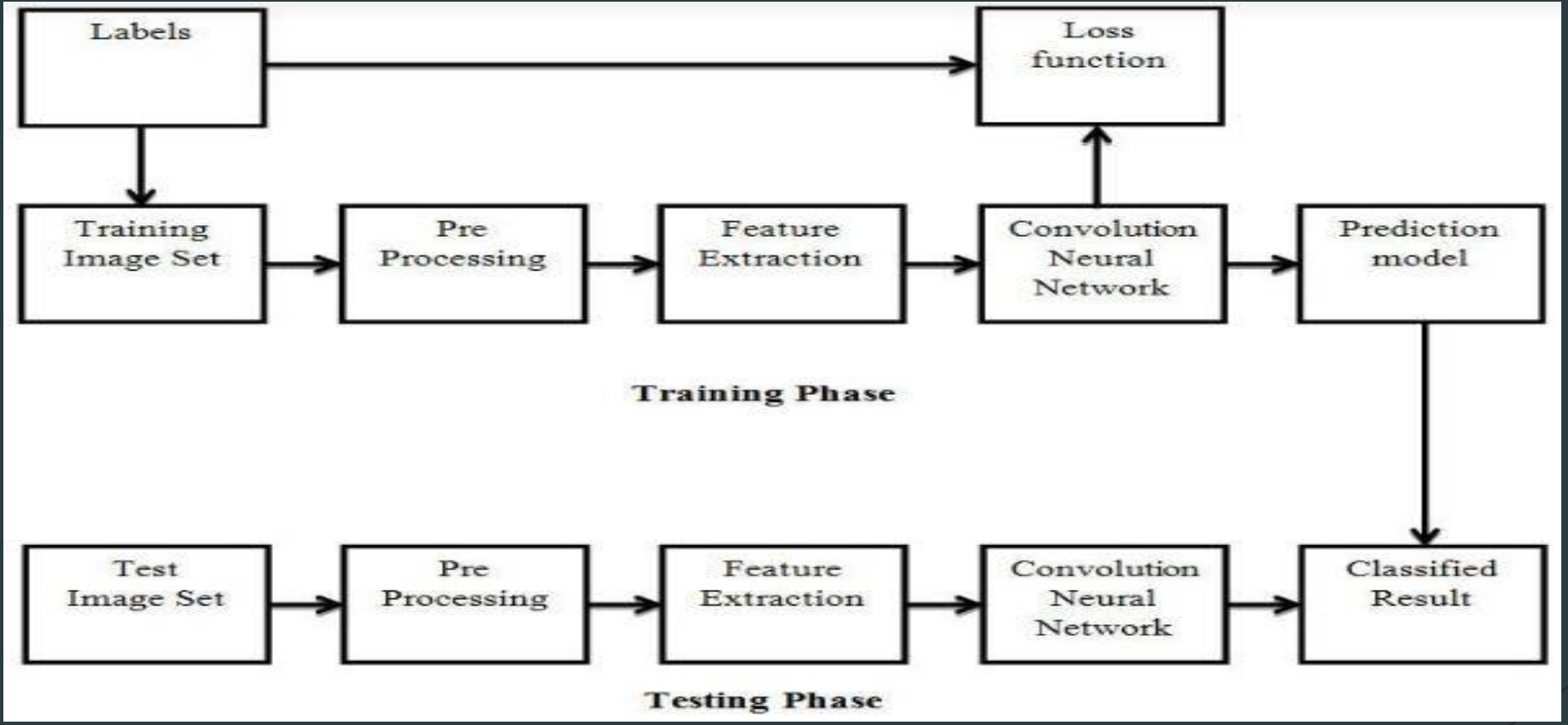
- The business-tier:

  This tier is responsible for implementing all the business rules of the organization.

- The data-tier:

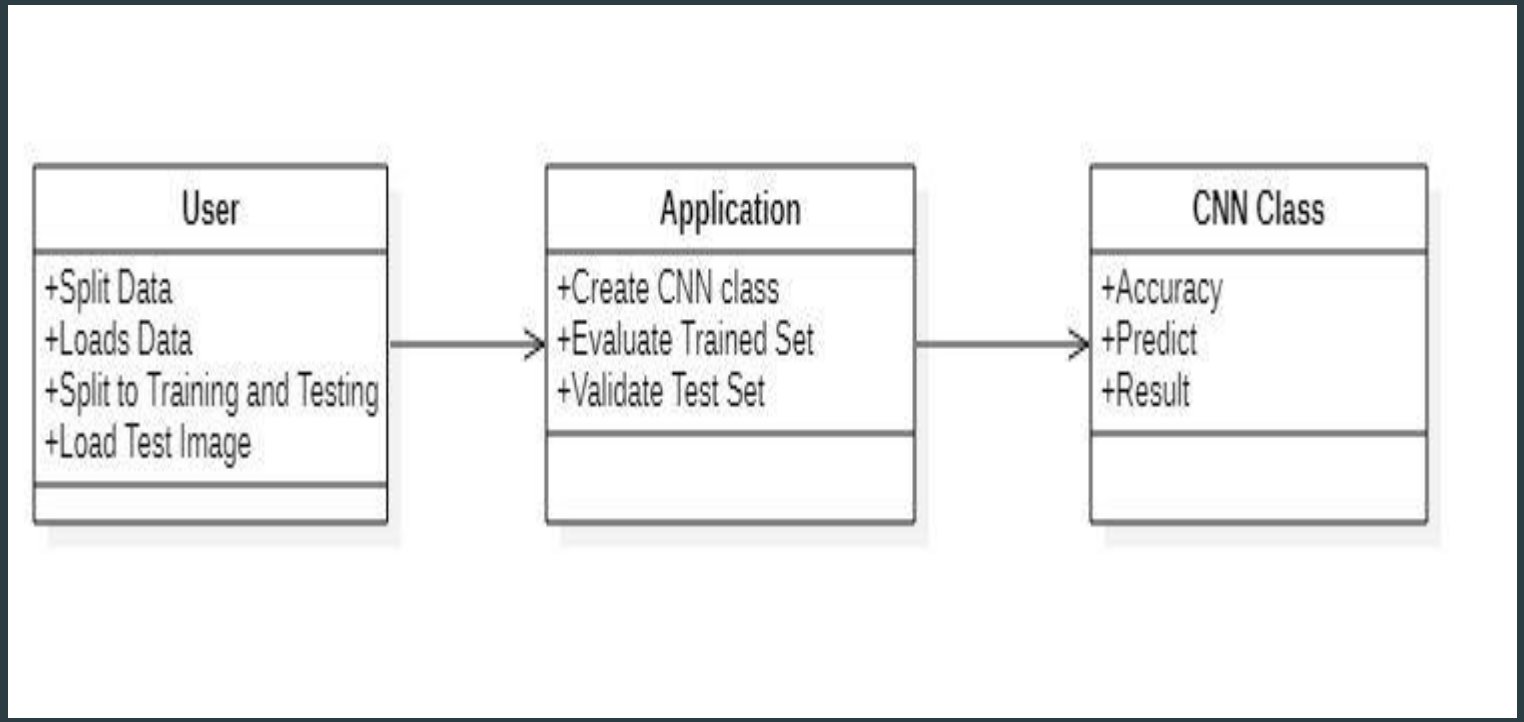
  This tier contains the persist able data that is required by the business tier to operate on.

TRANING AND TESTING PHASES

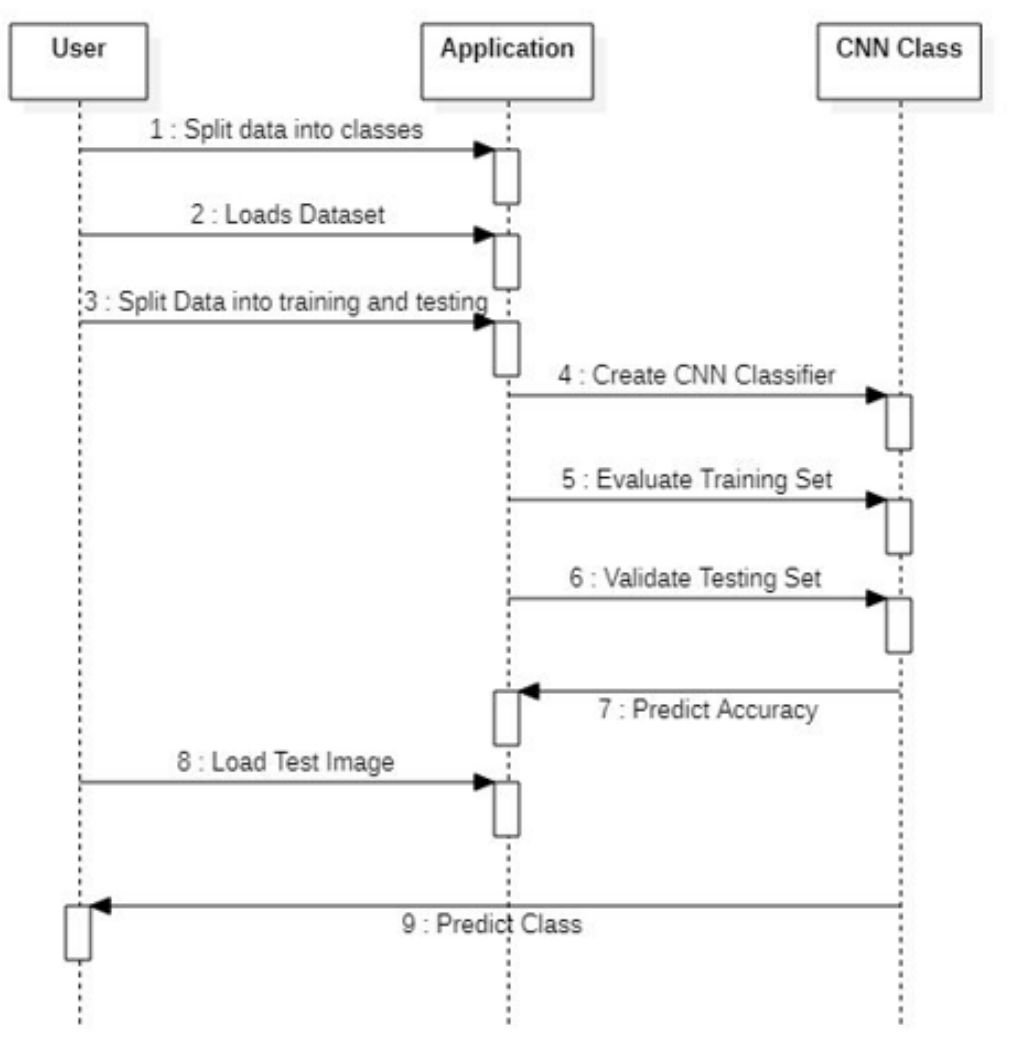


UML DIAGRAMS

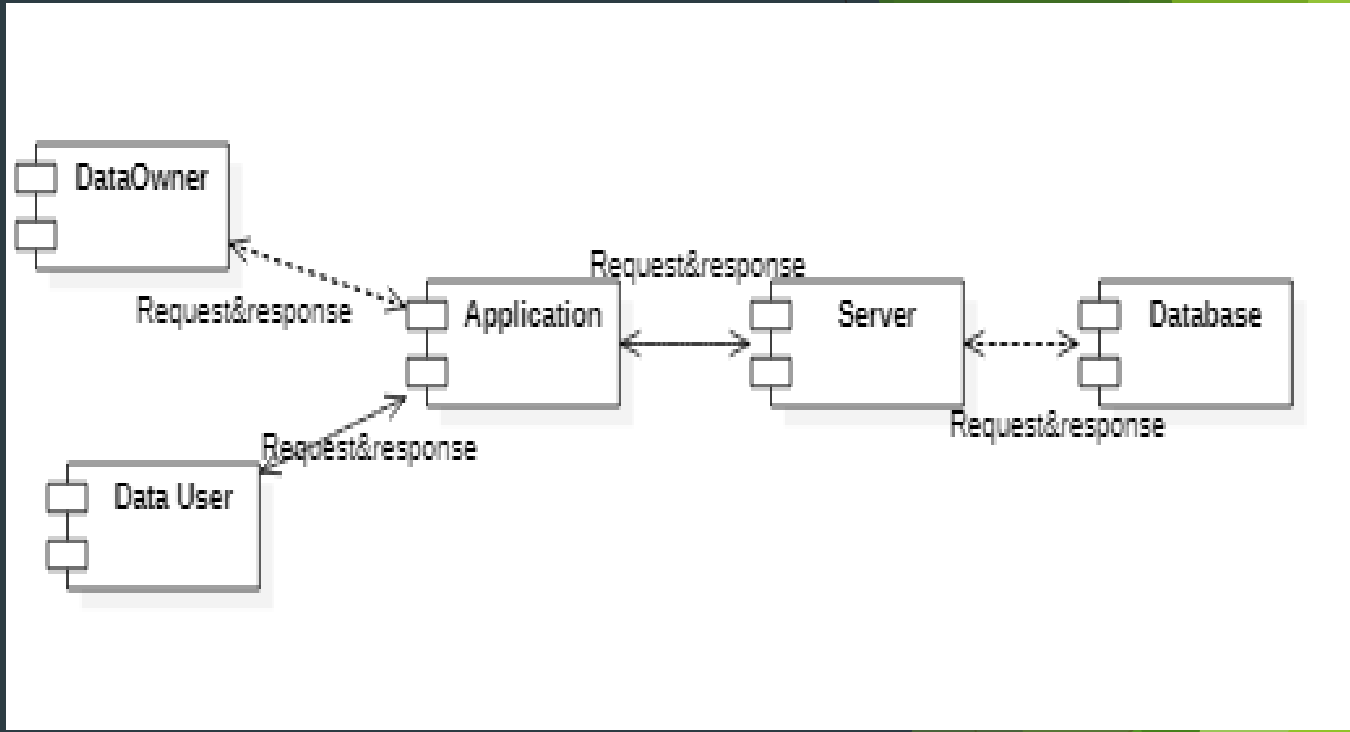
Class diagram



SEQUENCE DIAGRAM

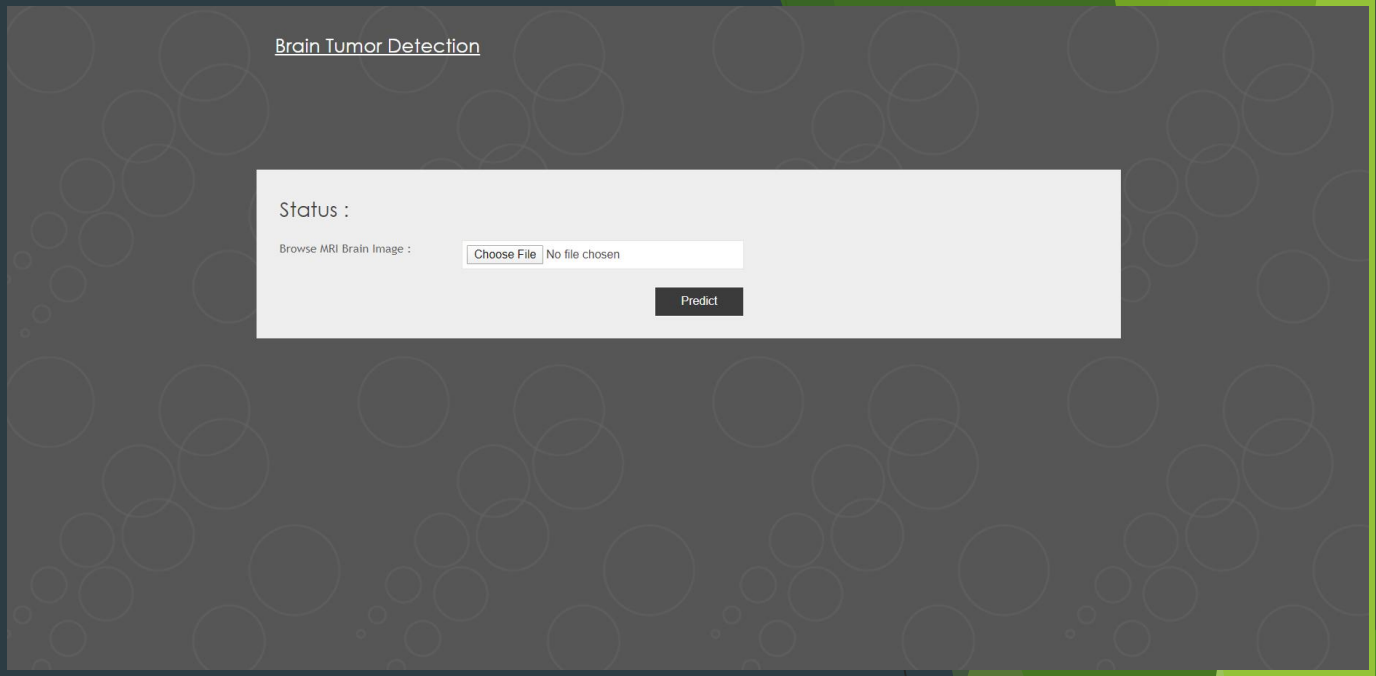


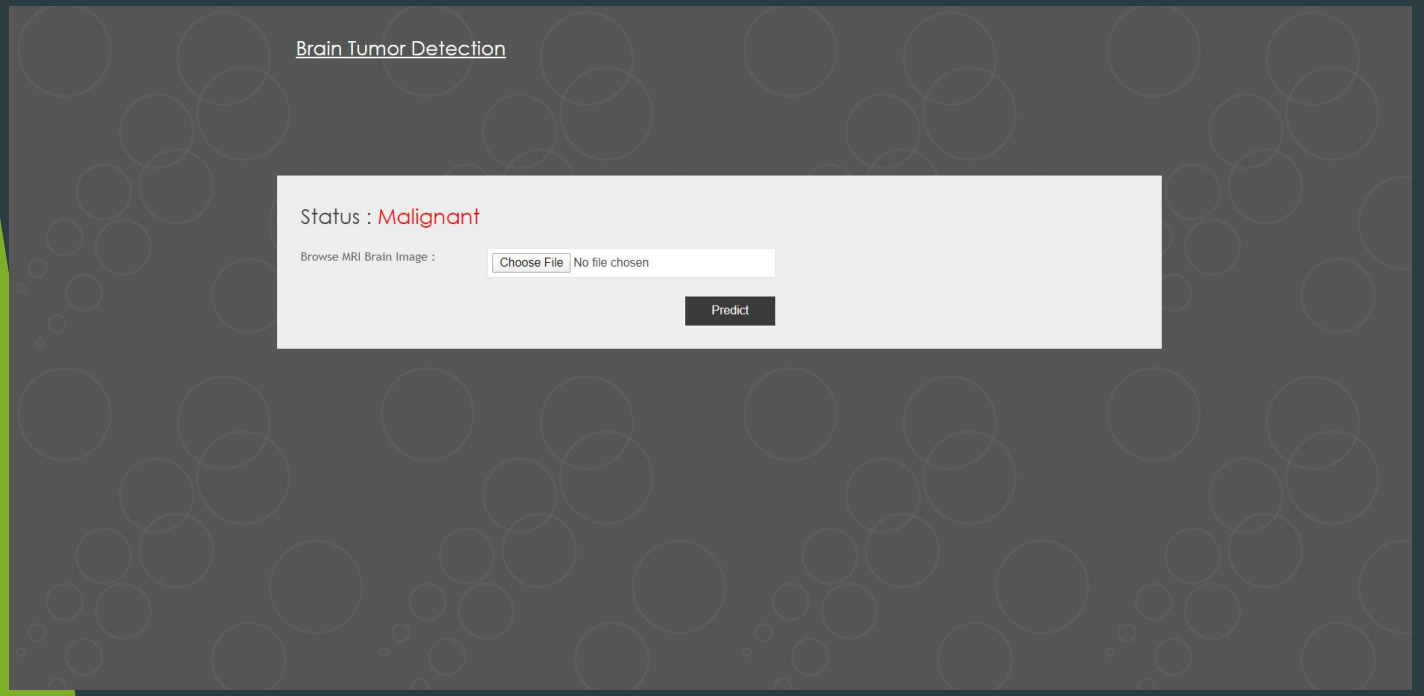
COMPONENT DIAGRAM



OUTPUT SCREENS

Home Page





Status Page

Accuracy :

Accuracy	Method		
	Deep Learning	Machine Learning	
	CNN	Logistic Regression	SVM
	95.6	33.33	33.33

Performance

- Comparison of activation performance on the basis of number of epochs.

Number of epochs	Re-Lu		Sigmoid	
	Accuracy	Time	Accuracy	Time
90	81.08	100.116	49.69	112.112
80	79.65	100.117	49.65	112.115
70	78.77	100.116	49.40	112.114
60	79.46	100.114	49.52	112.115
50	77.76	100.115	49.82	112.116
40	76.82	100.120	49.93	112.116
30	75.45	100.116	49.42	112.116

- Comparison of activation performance on the basis of number of layers

Number of Layers	Re-Lu		Sigmoid		SoftMax	
	Accuracy	Time	Accuracy	Time	Accuracy	Time
1	76.21	98.125	50.00	110.124	50.00	88.354
2	79.86	100.114	49.75	112.112	50.00	103.411
3	80.13	103.108	50.00	113.108	49.98	105.418
4	79.21	105.106	49.77	115.108	48.90	106.442

REQUIREMENTS

- **HARDWARE REQUIREMENTS:**
  - Processor : Intel i3 and above
  - RAM : 4GB and Higher
  - Hard Disk : 500GB: Minimum
- **SOFTWARE REQUIREMENTS:**
  - Programming Language / Platform : Python
  - IDE : Pycharm
  - Web Framework : Django
  - UI Technologies : HTML,CSS, JS
  - Database : SQLite

THANK YOU