

## **Proposed Area and Topic of Research**

**Name of the Candidate** : **Jasmin Basheer**

**Field of Research** : **Medical Image Processing**

### **Proposed Title of Work**

Deep learning techniques for Brain MRI Segmentation

### **Research problem**

The proposed work is based on Deep learning technique which is a deep neural network and probabilistic neural network to segment abnormal tissues in the brain. The segmentation can be done using a convolution neural network and Probabilistic neural network and compare sketch of various models.

### **Scientific background**

Magnetic resonance imaging (MRI) is usually the modality of choice for structural brain analysis, since it provides images with high contrast for soft tissues and high spatial resolution and presents no known health risks. To quantify tissue atrophy, segmentation and corresponding measurements of brain tissues are needed. Similarly, quantification of change in brain structures requires segmentation of the MRI obtained at different time points.

### **Novelty**

Detecting and analyzing the brain tumor at the earlier stage is an essential one which reduces the possibility to be a victim. Many examinations were conducted by various researchers and finally achieved in identifying several models to detect the presence of brain tumor using machine learning techniques

### **Objectives**

The main objective is to detect abnormal tissue in brain which cause tumor using deep learning technique such as convolution neural network and Probabilistic neural network

## **Methodology**

A large dataset of brain tumor MR scans are collected and analyze using segmentation. The flow chart of proposed method is shown in Figure: 1. The proposed method is divided into five steps; namely, pre-processing, designing model architecture, training data with designed architecture, Testing data, accuracy prediction and comparison.

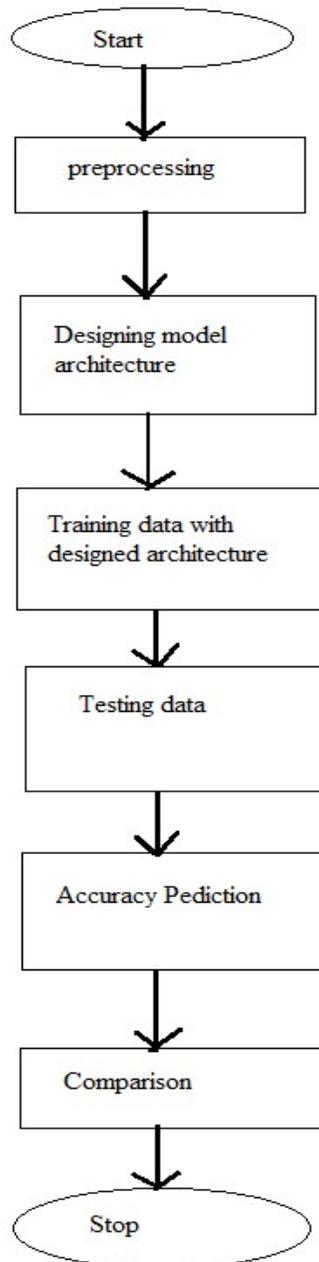


Figure 1

### **Research time plan (Chart):**

Stages of Research	0-6 months	6-12 months	12-18 months	18-24 months	24-30 months	30-36 months
Course Work	✓	✓				
Selection of topic	✓	✓				
Literature Review		✓	✓			
Research methodology plan		✓	✓			
Selection of appropriate research techniques			✓	✓		
Analysis				✓	✓	
Findings and recommendations				✓	✓	
Data Compilation, Publications and Final Report					✓	✓

### **Possible outcome:**

Segmentation of the brain tumors automatically for cancer diagnosis is a challenging task. Even Convolution Neural Network can automatically extract complex features from the images. Further improvements and modifications in CNN architectures and addition of complementary information can improve the efficiency of segmentation.

### **References:**

[1] Zeynettin Akkus, Alfiia Galimzianova, Assaf Hoogi, Daniel L. Rubin & Bradley J. Erickson, “ Deep Learning for Brain MRI Segmentation: State of the Art and Future Directions”, *Journal of Digital Imaging* volume 30, pages449–459(2017), *Science direct*.

- [2] S. Somasundaram R ; R.Gobinath,” . Current Trends on Deep Learning Models for Brain Tumor Segmentation and Detection – A Review”, *2019 IEEE International Conference on Machine Learning, Big Data, Cloud and Parallel Computing (COMITCon)*.
- [3] Alexander Selvikg Lundervold, ArvidLundervold, “An overview of deep learning in medical imaging focusing on MRI”, *Volume 29, Issue 2, May 2019, Pages 102-127, springler*.
- [4] G Madhupriya;Narayanan M Guru;S Praveen;B Nivetha, “Brain Tumor Segmentation with Deep Learning Technique”, *2019 IEEE 3rd International Conference on Trends in Electronics and Informatics (ICOEI)*.
- [5] Bhagyashree Rajendra Gaidhani;R. R.Rajamenakshi;Samadhan Sonavane, “Brain Stroke Detection Using Convolutional Neural Network and Deep Learning Models”, *2019 IEEE 2nd International Conference on Intelligent Communication and Computational Techniques (ICCT)*.
- [6]K.VenuP. Natesan;N. Sasipriyaa;S. Poorani, “Review on Brain Tumor Segmentation Methods using Convolution Neural Network for MRI Images”, *2018 IEEE International Conference on Intelligent Computing and Communication for Smart World (I2C2SW)*.
- [7] Soukaina El Idrissi El kaitouni;Hamid Tairi, “Segmentation of medical images for the extraction of brain tumors: A comparative study between the Hidden Markov and Deep Learning approaches”,*2020 IEEE International Conference on Intelligent Systems and Computer Vision (ISCV)*.
- [8] Y. LeCun, Y. Bengio, and G. Hinton, “Deep learning, Nature”, *vol.521, no. 7553, pp. 436–444, 2015*.
- [9] Lin D, Vasilakos AV, Tang Y, Yao Y, “ Neural networks for computer-aided diagnosis in medicine: A review”, *Neurocomputing 216:700–708, 2016*.
- [10] . Kooi T et al, “Large scale deep learning for computer aided detection of mammographic lesions”, *Med. Image Anal. 35:303–312, 2017*.