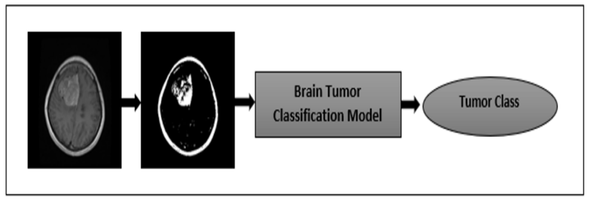
Brain Tumor Classification

Final Year Project (2017-2021)
Fatiha Ilyas (SP17-BCS-009)
Khizra Mughal (SP17-BCS-014)
Supervised By Mr.Qasim Khan

Department of Computer Science

Introduction

"Brain Tumor Classification" is a machine learning and digital image processing-based solution to classify the brain tumor into its three classes i.e. Meningioma, Glioma and Pituitary by means of an automatic system, saving time and efforts of radiologists. The system acquires an image from the user and perform different image processing techniques to classify the brain tumor. The process starts by preprocessing brain MRI image, followed by segmentation to produce masks. Using each preprocessed image of (64,64) dimensions as input to classification model, which extracts the features from image, ultimately results in classification by predicting tumor label.



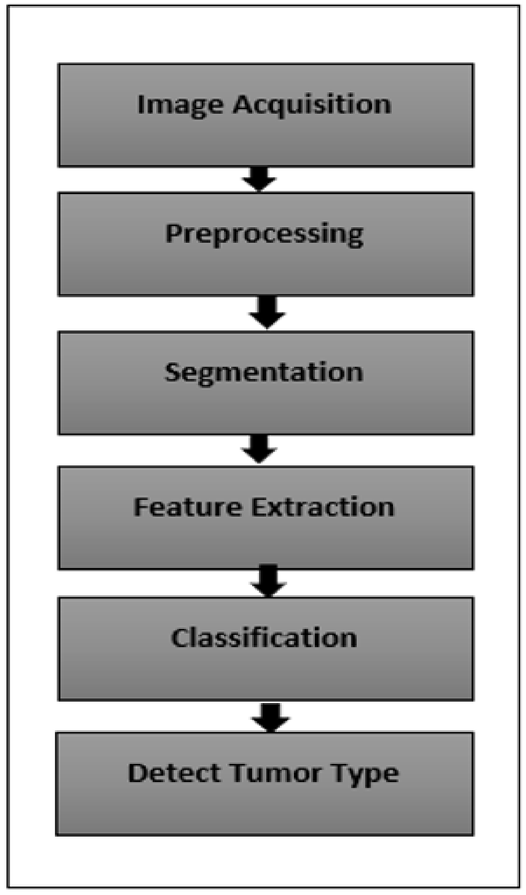
Motivation

- Brain tumor is expected to become the number one cause of death in future.
- The tumor type analysis is still done manually by radiologists, takes several time and effort.
- The chances of survival may increase if the tumor is correctly detected in its initial stage.
- Human fatigue and stress can affect the process of 5 of 9 analysis. Physicians sometime fail to detect the early signs.
- Automatically classifying the tumor type whether it is meningioma, glioma or pituitary is the required solution.

System Backgrond

- Radiologists and physicians must examine these MRI images and they consume a lot of their time and energy in coming up with results.
- To get rid of this problem, an automated system is introduced which help radiologist in early detection of brain tumor and to save the precious lives of patients.

System Architecture



Objective

- Accurately classify the brain tumor classes from images.
- Segment the brain tumor region and produce masks.
- Less prone to human error.
- Compare accuracy results with other techniques.
- To facilitate the radiologists in effective classification of brain tumor.

Results

```
Accuracy of the network on the  test images: 100 %
Accuracy of  Meningioma : 100.000000 %
Accuracy of Glioma : 100.000000 %
Accuracy of Pituitary  : 100.000000 %
```

Conclution

In this project, we implemented the CNN based computer-aided system which classify the brain tumor type which does not required region segmentation. Without prior segmentation, the CNN returns the good results. We achieved the 100% accuracy of the network. Three types of tumors: Meningioma, Glioma and Pituitary are used for prediction. Meningioma tumors have 100% classification accuracy. They are hard to predict due to their complex position in brain.

Future work

With a more extensive and diverse dataset, the overall classification accuracy can be dramatically increased. Also, this automatic system can be implemented in clinics for doctors' supportive tool to make decisions and treatments. Moreover, complex architectures, complex brain images, region-based CNN and combinations of multiple algorithms can enhance the performance of CNN.

Reference

1. https://www.sciencedirect.com/science/article/pii/S2314728817300636#fig1
2. https://ieeexplore.ieee.org/abstract/document/5479975
3. https://ieeexplore.ieee.org/document/6804439
4. https://pdfs.semanticscholar.org/3889/dc9221de455f782a3b2b55a925454783969f.pdf.