

Devang Shakya

18012011017

CE-A

Sem-7th

Batch-AB5

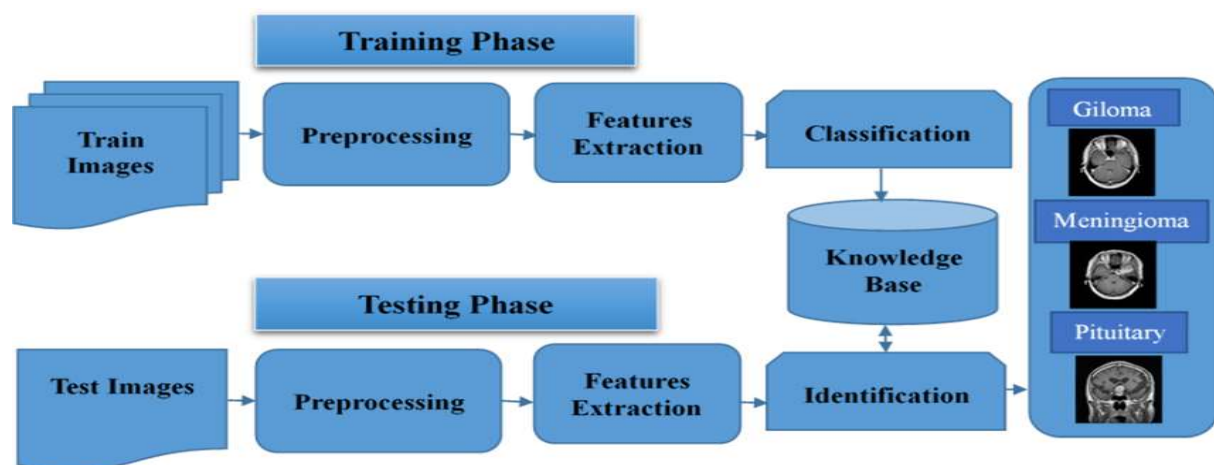
Project Title:Brain Tumor Classification

1.Introduction

In this project we are going to do the classification of Brain tumor and predict the type of tumor Glioma tumor, meningioma tumor and pituitary tumor. To Detect and Classify Brain Tumor using, CNN and TL, as an asset of Deep Learning and to examine the tumor position(segmentation).

2.Model Architecture

Brain tumor diagnosis and classification still rely on histopathological analysis of biopsy specimens today. This paper aims to make multi-classification of brain tumors for the early diagnosis purposes using convolutional neural network (CNN). Three different CNN models are proposed for three different classification tasks. Brain tumor detection is achieved with 99.33% accuracy using the first CNN model. The second CNN model can classify the brain tumor into five brain tumor types as normal, glioma, meningioma, pituitary and metastatic with an accuracy of 92.66%. The third CNN model can classify the brain tumors into three grades as Grade II, Grade III and Grade IV with an accuracy of 98.14%.



The objective of this paper is to designate three fully automatic CNN models for multi-classification of the brain tumors using publicly available datasets. To the best of author's knowledge, this is the first attempt of multi-classification of brain tumors from given MRI images, using CNN whose almost all hyper-parameters are automatically tuned by the grid search optimizer.

3.Dataset

A Brain tumor is considered as one of the aggressive diseases, among children and adults. Brain tumors account for 85 to 90 percent of all primary Central Nervous System(CNS) tumors. Every year, around 11,700 people are diagnosed with a brain tumor. The 5-year survival rate for people with a cancerous brain or CNS tumor is approximately 34 percent for men and 36 percent for women. Brain Tumors are classified as: Benign Tumor, Malignant Tumor, Pituitary Tumor, etc. Proper treatment, planning, and accurate diagnostics should be implemented to improve the life expectancy of the patients. The best technique to detect brain tumors is Magnetic Resonance Imaging (MRI). A huge amount of image data is generated through the scans. These images are examined by the radiologist. A manual examination can be error-prone due to the level of complexities involved in brain tumors and their properties.

The dataset is available on kaggle on the following address:

<https://www.kaggle.com/sartajbhuvaji/brain-tumor-classification-mri>

4.Libraries

These are the following libraries which are used in this project:

Python: Python is an interpreted high-level general-purpose programming language. It is dynamically-typed and garbage-collected. Python is widely used in multiple domains such as data science, machine learning and deep learning.

Tensorflow: Tensorflow is an open-source library for machine learning and deep learning. It is mainly used for training and inference of deep neural networks. It was developed by Google Brain Team for internal Google research and production.

NumPy: NumPy is a Python library used for working with arrays. It was developed by Travis Oliphant in 2005. NumPy provides array object which is 50x faster than traditional Python lists.

Maxpooling2d: Downsamples the input along its spatial dimensions (height and width) by taking the maximum value over an input window (of size defined by pool_size) for each channel of the input. The window is shifted by strides along each dimension.

5.Results

```
7/8 [*****>, ..., ] - ETA: 22s - loss: 1.7578 - accuracy: 0.7665WARNING:tensorflow:Your input ran out of data; interrupting training. Make
sure that your dataset or generator can generate at least `steps_per_epoch * epochs` batches (in this case, 8 batches). You may need to use the repe
at() function when building your dataset.
8/8 [*****] - 135s 19s/step - loss: 1.7578 - accuracy: 0.7665
0.7664874331855774
```

Precision: 76%

6.Conclusion

We were able to demonstrate that we can use CNN to predict tumors. Application of automated classification techniques using Machine Learning(ML) and Artificial Intelligence(AI)has consistently shown higher accuracy than manual classification. Hence, proposing a system performing detection and classification by using Deep Learning Algorithms using ConvolutionNeural Network (CNN), Artificial Neural Network (ANN), and TransferLearning (TL) would be helpful to doctors all around the world.