

Brain Tumor Detection using Deep Learning

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Abstract: *The anomalous development of cells in brain causes brain tumor that may lead to death. The rate of deaths can be reduced by early detection of tumor. Most common method to detect the tumor in brain is the use of Magnetic Resonance Imaging (MRI). MR images are considered because it gives a clear structure of the tumor. In this paper we proposed a novel mechanism for detecting tumor from MR image by applying machine learning algorithms especially with CNN model.*

The motivation behind this study is to detect brain tumor and provide better treatment for the sufferings. The abnormal growths of cells in the brain are called tumors and cancer is a term used to represent malignant tumors. Usually, MRI scans are used for the detection of cancer regions in the brain. Positron Emission Tomography, Cerebral Arteriogram, Lumbar Puncture, Molecular testing are also used for brain tumor detection. In this study, MRI scan images are taken to analyze the disease condition. Objectives of this research work are:

- i) Identify the Abnormal Image
- ii) Segment Tumor Region.

Density of the tumor can be estimated from the segmented mask and it will help in therapy. Deep learning technique is employed to detect abnormality from MRI images. Multilevel thresholding is applied to segment the tumor region. Number of malignant pixels gives the density of the affected region.

Keywords: tumor

I. INTRODUCTION

Deep learning is an extremely fast-moving field, and the huge number of research papers and ideas can be overwhelming. Even seasoned researchers have a hard time telling company PR from real breakthroughs. The goal of this post is to review those ideas that have stood the test of time, which is perhaps the only significance test one should rely on. These ideas, or improvements of them, have been used repeatedly. They are known to work. If you were to start in deep learning today, understanding and implementing each of these techniques would give you an excellent foundation for understanding recent research and working on your own projects. Working through papers in historical order is also a useful exercise to understand where the current techniques come from and why they were invented in the first place.

The human body is made up of many organs and brain is the most critical and vital organ of them all. One of the common reasons for dysfunction of brain is brain tumor. A tumor is nothing but excess cells growing in an uncontrolled manner. Brain tumor cells grow in a way that they eventually take up all the nutrients meant for the healthy cells and tissues, which results in brain failure. Currently, doctors locate the position and the area of brain tumor by looking at the MR Images of the brain of the patient manually. This results in inaccurate detection of the tumor and is considered very time consuming.

A Brain Cancer is very critical disease which causes deaths of many individuals. The brain tumor detection and classification system is available so that it can be diagnosed at an early stage. Cancer classification is the most challenging tasks in clinical diagnosis. This project deals with such a system, which uses computer, based procedures to detect tumor blocks and classify the type of tumor using Convolution Neural Network Algorithm for MRI images of different patients. Different types of image processing techniques like image segmentation, image enhancement and feature extraction are used for the brain tumor detection in the MRI images of the cancer-affected patients. Detecting Brain tumor using Image Processing techniques it involves the four stages- Image Pre-Processing, Image segmentation, Feature Extraction, and Classification. Image processing and neural network techniques are used for improve the performance of detecting and classifying brain tumor in MRI images.

II. LITERATURE REVIEW

Paper-1: A New Convolutional Neural Network Architecture for Automatic Detection of Brain Tumors in Magnetic Resonance Imaging Image Author: AHMED S. MUSALLAM , AHMED S. SHERIF 2 , AND MOHAMED K. HUSSEIN

Publish Date: 2022

Facial expressions are mirrors of human thoughts and feelings. It provides a wealth of social cues to the viewer, including the focus of attention, intention, motivation, and emotion. It is regarded as a potent tool of silent communication. Analysis of these expressions gives a significantly more profound insight into human behavior. AI-based Facial Expression Recognition (FER) has become one of the crucial research topics in recent years, with applications in dynamic analysis, pattern recognition, interpersonal interaction, mental health monitoring, and many more. However, with the global push towards online platforms due to the Covid-19 pandemic, there has been a pressing need to innovate and offer a new FER analysis framework with the increasing visual data generated by videos and photographs. Furthermore, the emotion-wise facial expressions of kids, adults and senior citizens vary, which must also be considered in the FER research. Lots of research work has been done in this area. However, it lacks a comprehensive overview of the literature that showcases the past work done and provides aligned future directions. In this paper, the authors have provided a comprehensive evaluation of AI-based FER methodologies, including datasets, feature extraction techniques, algorithms, and recent breakthroughs with their applications in facial expression identification. To the best of the author's knowledge, this is the only review paper stating all aspects of FER for various age brackets and would significantly impact the research community in the coming years.

Learning Methods of Convolutional Neural Network Combined With Image Feature Extraction in Brain Tumor Detection Author: Weiguang Wang, Fanlong Bu , Ziyi Lin , And Shuangqing Zhai

Publish Date: 29 Jan 2019

With the increasing global attention to the problem of staff stress, scholars in the fields of sociology, psychology, and medicine are seeking effective solutions. Music therapy has entered the field of vision of scholars with its unique advantages and is used to maintain the mental health of workers in various industries and improve employee productivity. Regarding the definition of music therapy , we must first understand the two basic elements of music therapy: treatment target and treatment goals; countries around the world have different definitions of music therapy, but they are inseparable from the two basic elements of treatment target and treatment goals. Mayer defined music therapy in a recent literature as follows: "Music therapy is the use of various ways of music experience to help the person being treated achieve the goal of mental or physical health." (e target of music therapy is mainly graduate students who are about to graduate, industry workers, people with autism, and other groups with psychological and physical needs for treatment. Music therapy is not a random or simple process of playing music. (e treatment cycle is divided into short term and long-term types . (e treatment process contains a variety of theories and methods. After determining the treatment target , a detailed treatment plan needs to be formulated. Music psychotherapy, as an auxiliary means in psychological counseling, counseling, and activities, is a choice that meets the public's psychological needs and appreciation habits.

III. METHODOLOGY

3.1 Objective :

- To provide doctors good software to identify tumor and their causes.
- Save patient's time
- Provide a solution appropriately at early stages.
- Get timely consultation
- The main motivation behind Brain tumor detection is to detect brain tumors at very early stages

Magnetic resonance imaging (MRI) is a noninvasive method for producing three-dimensional (3D) tomographic images of the human body. MRI is most often used for the detection of tumors, lesions, and other abnormalities in soft tissues, such as the brain. Clinically, radiologists qualitatively analyze films produced by MRI scanners.

This project presents a novel, fully automatic method for intracranial boundary detection and tumor detection MR images of the head. The intracranial boundary is the boundary between the brain and the intracranial cavity. It accurately segments the tumor from other features in the head.

3.2 System Overview

External Interface Requirement

User Interface

Brain tumor detection using a deep learning approach

Hardware Interfaces:

RAM:8GB

As we are using Machine Learning Algorithm and Various High Level Libraries

Laptop

The RAM minimum required is 8 GB.Hard Disk: 4 GB

Data Set of Scan images is to be used hence minimum 4 GB Hard Diskmemory is required.

Processor: Intel i5 Processor

VS Code that Integrated Development Environment is to be usedand data loading should be fast hence Fast Processor is required

IDE: VS Code

Coding Language: Python Version 3.5 or above

Highly specified Programming Language for Machine Learning because ofavailability of High-Performance Libraries.

Operating System: Windows 10

Latest Operating System that supports all types of installation anddevelopment Environment.

Software Interfaces Operating System: Windows 10

Programming Language: Python

3.3 System Architecture

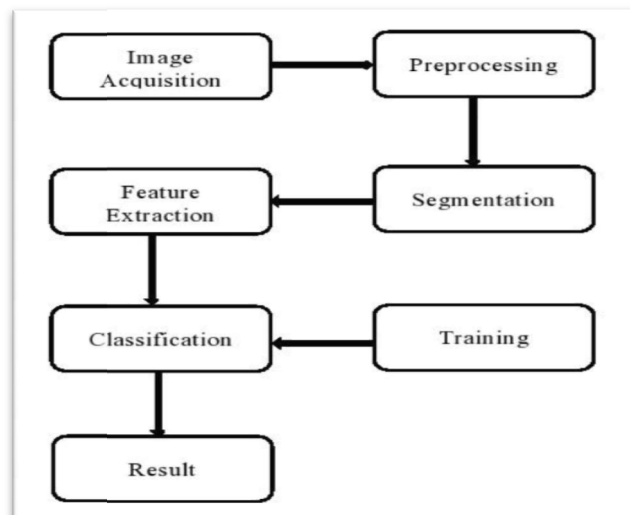


Fig. 3.1: System Architecture

UML DIAGRAMS

Unified Modeling Language is a standard language for writing software blueprints. The UML may be used to visualize, specify, construct and document the artifacts of a software intensive system. UML is process independent, although optimally it should be used in process that is use case driven, architecture-centric, iterative, and incremental. The Number of UML Diagram is available

Activity Diagram:

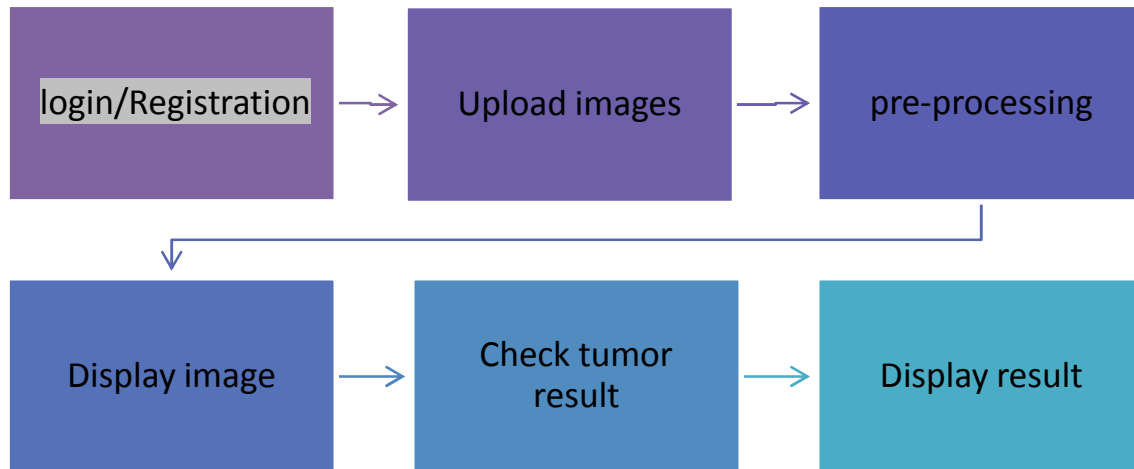


Figure 4.4: Class Diagram

IV. CONCLUSION

In brain tumor detection we have studied about image processing techniques like image pre-processing, image segmentation, features extraction, classification, and also deep learning technique- CNN.

In recent years, magnetic resonance imaging (MRI) has proven to be an excellent technique for clinical research, with applications such as brain tumor detection. When applied to these MRI pictures, deep learning algorithms aid in the detection of the tumor. In this system we have detected that a tumor is present or not. If the tumor is present then model return's yes otherwise it return's no.

This system can be improved to support with a web interface. Detection of different diseases can be also identified from the MRI images. In the healthcare field, the system will be quite beneficial. The proposed approach can determine whether or not a tumor exists. However, in the future, the system could be improved to recognise a specific type of tumor and provide therapy accordingly

REFERENCES

- [1]. Avigyan Sinha, Aneesh R P, Malavika Suresh, Nitha Mohan R, Abinaya D, Ashwin G Singerji- "Brain tumor Detection Using Deep Learning" 2021 Seventh International conference on Bio Signals, Images, and Instrumentation (ICBSII) 2.
- [2]. Dr. Chinta Someswararao, R Shiva Shankar, Sangapu Venkata Appaji, VMNSSVKR Gupta- "Brain Tumor Detection Model from MR Images using Convolutional Neural Network" IEEE ICSCAN 2020 3.
- [3]. G.Hemanth1, M.Janardhan2, L.Sujihelen- "DESIGN AND IMPLEMENTING BRAIN TUMOR DETECTION USING MACHINE LEARNING APPROACH" Proceedings of the Third International Conference on Trends in Electronics and Informatics (ICOEI 2019 4.
- [4]. www.kaggle.co