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Overall Survival Prediction in Glioblastoma with Radoimic Features using Machine Learning

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Abstract: *Glioblastoma is a WHO grade IV brain tumor,which leads to poor overall survival (OS) of patients. Forprecise surgical and treatment planning,OS prediction of glioblastoma (GSM) patients is highly desired by clinicans and oncologists. Radiomic research at predicting disease prognosis, thus providing beneficial information for personalized treatment fron a variety of imaging features extracted from multiple MR images. In this study, firstorder, intensity-based volume and shape-based and textual radiomic features are extracted from fluid-attenuated inversion recovery (FLAIR) and T1ce MRI data. The region of intrest is further decomposed with stationary wavelet transform with low-pass and high-pass filtering. Further, radiomic features are extracted on these decomposed images, which helped in acquiring the directional information. The efficiency of the proposed directional algorithm is evaluated on Brain Tumor Segmentation (BraTS) challenge training, validation, and test dataset. The proposed approach secured the third position in BraTS 2018 challenge for the OS prediction task.*

Keywords: Image processing, Machine Learning ,Brain Tumor

I. INTRODUCTION

A brain tumor is defined as abnormal growth of cells within the brain or central spinal canal. Some tumors can be cancerous thus they need to be detected and cured in time. The exact cause of brain tumor is not clear and neither is exact set of symptoms defined, thus, people may be suffered fron it without realizing the danger. Brain tumor can be either malignant (contain cancer cells) or benign (do not contain cancer cells). CT scans, X-Ray, and MRI scans are the common imaging methods among magnetic resonance imaging(MRI) that are the most reliable and secure. Brain tumor occurred when the cells were divind and growing abnormally. It is appearing to be a solid mass when it diagnostic medical imaging techniques.

II. LITERATURE SURVEY

Sr. No.	Paper Title	Author	Year	Advantages	Disadvantages
1	Machine Learning and Radiomic Features to Predict Overall Survival Time for Glioblastoma Patients.	LinaChato And Shahram Latifi	2021	Easy to understand and implement	expensive
2	Radiomics for Glioblastoma survival and analysis in pre-operative MRI: exploring feature Robustness, class Boundries, and Machine learning technique	Yannick Sute, Urspeter Knecht, Mariana Alao	2020	Easy to implement and understand	It has some security problem

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3	Overall Survival Prediction in Glioblastoma With Radiomic Features using Machine Learnin	Sudeep Gupta, Ujjwal Baid	2020	High security and Assurance User experience is convinent	expensive

III. ARCHITECTURE

Preprocessing: Image preprocessing technique is the first step of the method that is used to improve the quality of an image before processing it into an applications. The aim of image preprocessing is to remove noise from the original image and for this, we used Gussian, high pass and median filtering techniques. Gaussian filter is implemented to reduce the noise present in MRI brain images. High pass filtering removes unwanted frequencies from the image, and Median filtering increases the image quality.

Segmentation: Segmentation is a crucial part of an image classification method where the brain image is segmented to isolate different objects like gray matter, white matter, cerebral spinal fluid, skull, Tumor, etc, from each other and the background, as well as different Tumors, are labelled. In this, work, MLS method is developed by combining optimal threshoulding followed by watershed segmentation and morphological operations. The proposed MLS method is applied in which firstly, we used the optimal threshoulding method that processes the input brain image using single-pixel value. Then watershed segmentation is applied to separate multi-label regions that are close together of the thresholder objects and finally, the morphological operation is utilized precisely segment the defected area of Tumor.

Feature Extraction: Features extraction process extracts features from the segmented brain Tumors and in the MLS-CNN process, the CNN method is used for feature extraction as it is now the go-to model on every image related problem. The main advantages of CNN compared to its predecessors is that it automatically detects the important features without any human supervision. Also,It can perform parameter sharing that enbles us to run the CNN model on any device. Moreover , this approach requires less amount of data for faster training and it searches for the features at their base level. It consists of a series of special convolution with pooling operations followed by several fully connected layers.

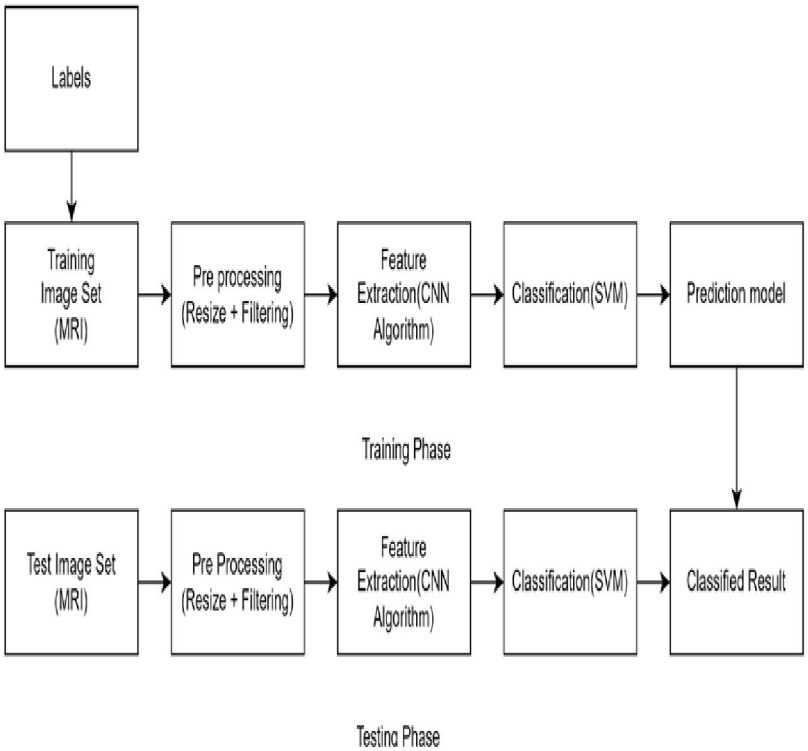

Fig 1: System Architecture

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Classification: Classification is the final step of image analysis method that involves sorting feature data in an image into separate classes. After segmenting a suspicious region, feature extraction and selection scheme are performed to extract the relevant information from the region; and a classification technique is used so that the best results are achieved, based on the available features and the Tumor classes.

IV. METHODOLOGY

In this research CNN algorithm is used to detect the disease from given ECG image. We have used three layers of the CNN these are Convolutional Layer, Pooling Layer and fully connected layer. Here, convolutional layer and pooling layer, both layer work together. First it represents the image into three- diamension vector space then applies filters to convert that image into 2 diamentions. Again fully connected layer applies the filters to recognize the image. After training the system when we pass the image to test it, as per the specified categories it classifies the image and detect the disease accurately. After disease detection system suggests the medicine on the detected disease

V. IMPLEMENTATION

Material

S/W Requirements

Platform:
Operating System: Windows 10
IDE: Anaconda
Programming Language: Python

H/W Requirement

Sr. No.	Parameter	Minimum Requirement	Justification
1	CPU speed	2 GHz	Remark Required
2	RAM	3 GB	Remark Required

Preprocessing of image

Pre-processing steps is clean the Image and Remove Blur part.

The steps to be taken are:

Read image
Resize image
Text Recongnition

Text Recongnition

Feature Extraction: Feature extraction process extracts features from the segmented brain Tumors and in the MLS-CNN process, the CNN method is used for feature extraction as it is now the go-to model on every image related problem. The main advantage of CNN compared to its predecessors is that it automatically detects the important features without any human supervision.

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VI. CONCLUSION

As we all know the brain tumor is one of the dangerous diseases. It can cause the human death. This disease is not possible to detect early using manual processing. So, in this paper we used some deep learning model to detect tumor as early as possible.In our system we have used CNN algorithm as well as SVM algorithm which is very important for image processing and classification. In CNN there are three main layers i.e, convolutional layer, activation layer and

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pooling layer. These all layers are interconnected so that CNN can process and perceive data in order to classify images. Based on classification prediction is done.

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