BRAIN TUMOUR DETECTION IN MR IMAGES

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***Abstract*: Clinical pictures assume a vital part in making the right determination for the specialist and in the patient's treatment interaction. Utilizing clever calculations makes it conceivable to rapidly recognize the injuries of clinical pictures, and it is particularly essential to separate elements from pictures. Many examinations have coordinated different calculations into clinical pictures. For clinical picture include extraction, a lot of information is investigated to acquire handling results, assisting specialists with presenting more exact defense analysis. In view of this, this paper takes cancer pictures as the exploration article, and first performs nearby double example highlight extraction of the cancer picture by revolution invariance. As the picture shifts and the turn changes, the picture is fixed comparative with the direction framework. The strategy can precisely portray the surface highlights of the shallow layer of the growth picture, consequently upgrading the vigor of the picture area portrayal. Zeroing in on picture include extraction dependent on convolutional neural organization (CNN), the fundamental system of CNN is assembled. To break the impediments of machine vision and human vision, the examination is reached out to multi-channel input CNN for picture include extraction. Two convolution models of Xception and Dense Net are worked to work on the exactness of the CNN calculation. It tends to be seen from the exploratory outcomes that the CNN calculation shows high precision in cancer picture include extraction. In this paper, the CNN calculation is contrasted and a few traditional calculations in the nearby paired mode.**

***Keywords*: CNN, FCM, Medical Image, segmentation, SVM**

INTRODUCTION

Medical imaging techniques are used to image the inner portions of a human body for medical diagnosis. And medical image classification is one of the most challenging & affluent topics in the field of Image Processing. Medical image classification problems, tumor detection or detection of Cancer is the most prominent one. The statistics about the death rate from brain tumor suggest that it is one of the most alarming and critical cancer types in the Human body. As per the International Agency of Research on Cancer (IARC), more than 1,000,000 people are diagnosed with brain tumor per year around the world, with ever increasing fatality rate. It is the second most fatal cause of death related to Cancer in children and adults younger than 34 years [1]. In recent times, the physicians are following the advanced methods to identify the tumor which is more painful for the patients. To analyse the abnormalities in different parts of the body, CT (Computed Tomography) scan and MRI (Medical Reasoning Imaging) are two convenient methods. MRI-based medical image analysis for brain tumor studies has been gaining attention in recent times due to an increased need for efficient and objective evaluation of large amounts of medical data.

The medical imaging processing refers to handling images by using the computer. This processing includes many types of techniques and operations such as image gaining, storage, presentation, and communication. This process pursues the disorder identification and management. This process creates a data bank of the regular structure and function of the organs to make it easy to recognize the anomalies. This process includes both organic and radiological imaging which used electromagnetic energies (X-rays and gamma), sonography, magnetic, scopes, and thermal and isotope imaging. There are many other technologies used to record information about the location and function of the body. Those techniques have many limitations compared to those modulates which produce images.

LITURATURE SURVEY

In recent years, numerous and diverse types of work have been carried out in the field of medical image processing. Researchers from the various ground such as computer vision, image processing, machine learning came into a place in the field of Medical Image Processing. Here are some of the existing papers to find the most useful and advanced methods that were used in the existing articles in recent times. Literature survey total consist of 52 research articles that will discuss thoroughly about these papers and their working procedures which are related to the work.

- **Devkota, B. & Alsadoon, Abeer & Prasad, P.W.C. & Singh, A.K. & Elchouemi, A. (2018). Image Segmentation for Early Stage Brain Tumor Detection using Mathematical Morphological Reconstruction. Procedia Computer Science. 125. 115-123. 10.1016/j.procs.2017.12.017.**

B. Devkota et al. [5] have proposed that a computer-aided detection (CAD) approach is used to spot abnormal tissues via Morphological operations. Amongst all different segmentation approaches existing, the morphological opening and closing operations are preferred since it takes less processing time with the utmost efficiency in withdrawing tumor areas with the least faults.

- **S. Pereira, A. Pinto, V. Alves, and C. A. Silva, "Brain Tumor Segmentation Using Convolutional Neural Networks in MRI Images," in IEEE Transactions on Medical Imaging, vol. 35, no. 5, pp. 1240-1251, May 2016.**

S. Pereira et al. [6] presented that magnetic resonance prevents physical segmentation time in the medical areas. So, an automatic and reliable segmentation technique for identifying abnormal tissues by using Convolutional Neural Network (CNN) had been

proposed in the research work. The massive three-dimensional and underlying roughness amongst brain images makes the process of segmenting the image a severe issue, so a robust methodology such as CNN is used.

• **Sankari Ali, and S. Vigneshwari. "Automatic tumor segmentation using convolutional neural networks." 2017 Third International Conference on Science Technology Engineering & Management (ICONSTEM) (2017): 268-272.**

A. Sankari and S. Vigneshwari [7] has proposed a Convolutional Neural Network (CNN) segmentation, which principally based on the brain tumor classification method. The proposed work used the non-linearity activation feature that's a leaky rectified linear unit (LReLU). They primarily focused on necessary capabilities, which include mean and entropy of the image and analyzed that the CNN algorithm is working higher for representing the complicated and minute capabilities of brain tumor tissues present in the MR Images.

- **Minz, Astina, and Chandrakant Mahobiya. "MR Image Classification Using Adaboost forBrainTumorType." 2017 IEEE 7th International Advance Computing Conference (IACC) (2017): 701-705.**

Astina minz et al. [8] implemented an operative automatic classification approach for brain image that projected the usage of the AdaBoost gadget mastering algorithm. The proposed system includes three main segments. Pre-processing has eradicated noises in the datasets and converted images into grayscale. Median filtering and thresholding segmentation are implemented in the pre-processed image.

- **P.S. Mukambika, K Uma Rani, "Segmentation and Classification of MRI Brain Tumor," International Research Journal of Engineering and Technology (IRJET), Vol.4, Issue 7, 2017, pp. 683 – 688, ISSN: 2395-0056**

Mukambika et al. [9] proposed methodology for the subsequent stage's classification of the tumor, whether it is present or not. Their proposed work represents the comparative study of strategies used for tumor identification from MR images, namely the Level set approach and discrete wavelength transforms (DWT) and K-method segmentation algorithms. After that phase, feature extraction is done followed SVM classification.

- **Sobhaninia, Zahra & Rezaei, Safiyeh & Noroozi, Alireza & Ahmadi, Mehdi & Zarrabi, Hamidreza & Karimi, Nader &**

Emami, Ali & Samavi, Shadrokh. (2018). "Brain Tumor Segmentation Using Deep Learning by Type Specific Sorting of Images".

Zahra et al. [14] applied LinkNet network for tumor segmentation. Initially, they used a single Linknet network and sent all training seven datasets to that network for segmentation. They did not consider the view angle of the images and introduced a method for CNN to automatically segment the most common types of a brain tumor which do not require pre-processing steps.

AIM & OBJECTIVES

The main objective of this project is to build a model that can predict whether the medical images contain a tumor or not and find its properties. To build a model that can predict whether the medical images contains a tumour or not. Some useful information that also be extracted from this algorithm in simpler form in front of the users, for treating the patient. To develop an algorithm that will able to provide information like size, dimension and position of the tumour, which will provide the base for the medical staff for further treatment.

MOTIVATION

Observing the recent statistics of death rate caused by brain tumors, the automatic brain tumor detection and classification needs to be studied. Tumor detection in medical images are time consuming as it depends on human judgment. The experts in this field, such as radiologists, specialized doctors examine CT scan, MRI, PET scan images and give decisions upon which the treatment depends. This whole process is time consuming. Automated medical image analysis can help to reduce the time and effort taken here and the workload of a human as it will be done by machines

SYSTEM ARCHITECTURE

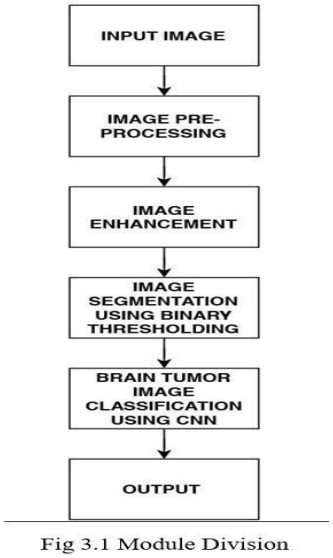

Fig -1: System Architecture Diagram

APPLICATION:
- Hospital
- Health care center

FUNCTIONAL & NON-FUNCTIONAL REQUIREMENTS

Functional requirements: may involve calculations, technical details, data manipulation and processing and other specific functionality that define what a system is supposed to accomplish. Behavioral requirements describe all the cases where the system uses the functional requirements; these are captured in use cases.

Nonfunctional Requirements: (NFRs) define system attributes such as security, reliability, performance, maintainability, scalability, and usability. They serve as constraints or restrictions on the design of the system across the different backlogs.

Functional requirements
- Registration
- User Login
- Creation of database: Users Mandatory Information

Design Constraints:
1. Database
2. Operating System
3. Web-Based Non-functional Requirements

Security:
1. User Identification
2. Login ID
3. Modification

Performance Requirement:
1. Response Time
2. Capacity
3. User Interface
4. Maintainability
5. Availability

SYSTEM REQUIREMENTS

Software Used:
- Python 3.9.0 or above, Kaggle and PyCharm

Hardware Used:
- I3 processor or above
- 150 GB Hard Disk or above
- 4 GB RAM or above

CONCLUSION

We proposed a computerized method for the segmentation and identification of a brain tumor using the Convolution Neural Network. The input MR images are read from the local device using the file path and converted into grayscale images. These images are pre-processed using an adaptive bilateral filtering technique for the elimination of noises that are present inside the original image. The binary thresholding is applied to the denoised image, and Convolution Neural Network segmentation is applied, which helps in figuring out the tumor region in the MR images. The proposed model had obtained an accuracy of 84% and yields promising results without any errors and much less computational time.

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