



BRAIN TUMOR DETECTION USING DEEP LEARNING

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Abstract: Now a day's tumor is second leading cause of cancer. Due to cancer large no of patients are in danger. The medical field needs fast, automated, efficient and reliable technique to detect tumor like brain tumor. Detection plays very important role in treatment. If proper detection of tumor is possible then doctors keep a patient out of danger. The human brain is the major controller of the humanoid system. The abnormal growth and division of cells in the brain lead to a brain tumor, and the further growth of brain tumors leads to brain cancer. In the area of human health, Computer Vision plays a significant role, which reduces the human judgment that gives accurate results. CT scans, X-Ray, and MRI scans are the common imaging methods among magnetic resonance imaging (MRI) that are the most reliable and secure. MRI detects every minute objects. Our paper aims to focus on the use of different techniques for the discovery of brain cancer using brain MRI. In this study, we performed pre-processing using the bilateral filter (BF) for removal of the noises that are present in an MR image. This was followed by the binary thresholding and Convolution Neural Network (CNN) segmentation techniques for reliable detection of the tumor region. Training, testing, and validation datasets are used. Based on our machine, we will predict whether the subject has a brain tumor or not. The resultant outcomes will be examined through various performance examined metrics that include accuracy, sensitivity, and specificity. It is desired that the proposed work would exhibit a more exceptional performance over its counter parts. Convolutional neural network (CNN) architecture was developed for learning the intricate patterns in the Magnetic Resonance Imaging (MRI) scans for the detection of Brain Tumor. Therefore, the above approaches can provide a solid solution for the detection of Brain Tumor in the preliminary or early stage prediction of the Brain Tumor and can be able to increase the lifespan of the diseased patient with proper treatments and medications leads to peaceful life.

Keywords: Brain tumor, Magnetic resonance imaging, Adaptive Bilateral Filter, Convolution Neural Network.

I. INTRODUCTION

Brain tumor is one of the most rigorous diseases in the medical science. An effective and efficient analysis is always a key concern for the radiologist in the premature phase of tumor growth. Histological grading, based on a stereotactic biopsy test, is the gold standard and the convention for detecting the grade of a brain tumor. The biopsy procedure requires the neurosurgeon to drill a small hole into the skull from which the tissue is collected. There are many risk factors involving the biopsy test, including bleeding from the tumor and brain causing infection, seizures, severe migraine, stroke, coma and even death. But the main concern with the stereotactic biopsy is that it is not 100% accurate which may result in a serious diagnostic error followed by a wrong clinical management of the disease. Tumor biopsy being challenging for brain tumor patients, non-invasive imaging techniques like Magnetic Resonance Imaging (MRI) have been extensively employed in diagnosing brain tumors. Therefore, development of systems for the detection and prediction of the grade of tumors based on MRI data has become necessary. But at first sight of the imaging modality like in Magnetic Resonance Imaging (MRI), the proper visualisation of the tumor cells and its differentiation with its nearby soft tissues is somewhat difficult task which may be due to the presence of low illumination in imaging modalities or its large presence of data or several complexity and variance of tumors-like unstructured shape, viable size and unpredictable locations of the tumor. Medical imaging is the technique and process of creating visual representations of the interior of a body for clinical analysis and medical intervention, as well as visual representation of the function of some organs or tissues. Medical imaging seeks to reveal internal structures hidden by the skin and bones, as well as to diagnose and treat disease. Medical imaging also establishes a database of normal anatomy and physiology to make it possible to identify abnormalities. 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. An image processing technique is the usage of a computer to manipulate the digital image. This technique has many benefits such as elasticity, adaptability, data storing, and communication. With the growth of different image resizing techniques, the images can be kept efficiently. This technique has many sets of rules to perform in the images synchronously. The 2D and 3D images can be processed in multiple dimensions. 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 early stages. 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 its involves the four stages is 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. PROPOSED SYSTEM

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 tumors is not clear and neither is exact set of symptoms defined, thus, people may be suffering from it without realizing the danger. Primary brain tumors can be either malignant (contain cancer cells) or benign (do not contain cancer cells). Brain tumor occurred when the cells were dividing and growing abnormally. It is appearing to be a solid mass when it diagnosed with diagnostic medical imaging techniques. There are two types of brain tumor which is primary brain tumor and metastatic brain tumor. Primary brain tumor is the condition when the tumor is formed in the brain and tended to stay there while the metastatic brain tumor is the tumor that is formed elsewhere in the body and spread through the brain. The symptom having of brain tumor depends on the location, size and type of the tumor. It occurs when the tumor compressing the surrounding cells and gives out pressure. Besides, it is also occurring when the tumor blocks the fluid that flows throughout the brain. The common symptoms are having headache, nausea and vomiting, and having problem in balancing and walking. Brain tumor can be detected by the diagnostic imaging modalities such as CT scan and MRI. Both of the modalities have advantages in detecting depending on the location type and the purpose of examination needed. In this paper, we prefer to use the MRI images because it is easy to examine and gives out accurate calcification and foreign mass location. The MRI is the most regularly utilized strategy for imaging brain tumors and the identification of its vicinity. The conventional technique for CT and MR image classification and detection of tumor cells remains largely supported for the human reviewing apart from different other methods. MR images are mainly used because there are non-destructive and non-ionizing. MR imaging offers high-definition pictures that are extensively utilized in discovering brain tumors. MRI has diverse schemes such as flair, T1-weighted, T2-weighted images. There are many image processing techniques such as pre-processing, segmentation of images, image improvements, feature extraction, and classifiers. The main motivation behind Brain tumor detection is to not only detect tumor but it can also classify types of tumor. So it can be useful in cases such as we have to sure the tumor is positive or negative, it can detect tumor from image and return the result tumor is positive or not. 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.

III. OBJECTIVES

Objectives:

The objectives are as follows:

To discover this disease as early as possible .

If we discover this disease earlier, then the treatments are more likely to improve the quality life of the patients and their families.

Develop predictive models to differentiate between healthy people and people with Brain Tumor.



Study and analyse different deep learning models, including CNN.
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.

V.METHODOLOGIES

Planning:

It is performed by the senior members of the team with inputs from the customer, the sales department, market surveys and domain experts. This information is then used to plan the basic project approach and to conduct product feasibility study in the economical, operational and technical areas. Planning for the quality assurance requirements and identification of the risks associated with the project is also done in the planning stage

Defining:

Next step is to clearly define and document the product requirements and get them approved from the customer or the market analysts.

Designing:

Based on the requirements specified in SRS, usually more than one design approach for the product architecture is proposed and documented. This is reviewed by all the important stakeholders and based on various parameters as risk assessment, product robustness, design modularity, budget and time constraints, the best design approach is selected for the product. A design approach clearly defines all the architectural modules of the product

Building:

The actual development starts and the product is built. The programming code is generated. If the design is performed in a detailed and organized manner, code generation can be accomplished without much hassle. The programming language is chosen with respect to the type of software being developed

Testing:

This stage is usually a subset of all the stages as in the modern SDLC models, the testing activities are mostly involved in all the stages of SDLC. However, this stage refers to the testing only stage of the product where product defects are reported, tracked, fixed and retested, until the product reaches the quality standards defined in the SRS.

Deployment:

Once the product is tested and ready to be deployed it is released formally.

VI. SYSTEM ARCHITECTURE

CONVOLUTIONAL NEURAL NETWORK (CNN)

Convolutional Neural Network (CNN), is a highly effective machine learning algorithm potentially used in a variety of applications such as handwritten digit recognition, visual recognition, and image classification. It is a special kind of multi-layer neural network which extracts visual patterns from pixel images with minimal preprocessing. The architecture of CNN has been designed in a way such that it utilizes spatial relationships to encode certain properties and reduce the number of hyper parameters and thus improves general feed-forward back propagation training. CNN models combine weights into smaller kernel filters to simplify the learning model.

VII. ADVANTAGES

It is used over feed forward neural networks as it can be trained better in case of complex images to have higher accuracies.

It reduces images to a form which is easier to process without losing features which are critical for a good prediction by applying relevant filters and reusability of weight

It can automatically learn to perform any task just by going through the training data i.e. there no need for prior knowledge

There is no need for specialised hand-crafted image features like that in case of SVM, Random Forest etc.



VIII.CONCLUSION

In this Paper, we discussed the concepts of Convolutional Neural Network while we outlined their application in Brain Tumor. We proposed a computerized method for the segmentation and identification of a brain tumor using the Convolution Neural Network. The included studies showed that MRI analysis was performed for the detection of Brain Tumor using convolutional neural network has significant impact on early detection of Brain Tumor with high accuracy rate. However, most of the proposed methods are still in development and not tested in a clinical setting. Our work is mainly focused on advancement of predictive models to achieve good accuracy in predicting valid disease outcomes using deep learning methods. Prediction, based on Convolutional Neural Network (CNN). In this paper, using CNN techniques were proposed for the prediction of Brain Tumor in early stage.

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