A MINI- PROJECT REPORT ON

"BRAIN TUMOR DETECTION USING MACHINE LEARNING"

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CERTIFICATE

This is to certify that, the Mini Project titled

"BRAIN TUMOR DETECTION USING MACHINE LEARNING"

is a bonafide work done by

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Project Guide

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Mini Project Approval

This is to certify that the Mini Project entitled ”**Brain Tumor detection Using Machine Learning***”* is a bonafide work done by **Muskan Lamba (17IT1064), Mahendrakumar Chaudhary(17IT1047), Sanket Datir(17IT1070)** under the guidance of Dr. Reshma Gulwani. This work has been approved as a Mini Project for Third-year Information Technology.

Examiners :

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Supervisors :

1. . . . . .

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Date:

Place:

Declaration

I declare that this written submission represents my ideas in my own words and where other's ideas or words have been included, I have adequately cited and referenced the original sources. I also declare that I have adhered to all principles of academic honesty and integrity and have not misrepresented or fabricated or falsified any idea/data/fact/source in my submission. I understand that any violation of the above will be cause for disciplinary action by the Institute and can also evoke penal action from the sources which have thus not been properly cited or from whom proper permission has not been taken when needed.

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Abstract

Nowadays, brain tumor detection has turned up as a general causality in the realm of health care. A brain tumor can be denoted as a malformed mass of tissue wherein the cells multiply abruptly and ceaselessly, that is there is no control over the growth of the cells. The process of Image segmentation is adopted for extracting abnormal tumor regions within the brain. In the MRI (magnetic resonance image), the segmentation of brain tissue holds very significantly in order to identify the presence of outlines concerning the brain tumor. There is an abundance of hidden information is stored in the Health care sector. With appropriate use of accurate data mining classification techniques, early prediction of any disease can be effectively performed. In the medical field, the techniques of ML (machine learning) and Data mining holds a significant stand. Majority of which is adopted effectively. The research examines the list of risk factors that are being traced out in brain tumor surveillance systems. Also, the method proposed assures to be highly efficient and precise for brain tumor detection, classification, and segmentation. To achieve this precise automatic or semi-automatic methods are needed.

Contents

Introduction

The advances in biomedical and human intelligences have overcome diverse diseases in the last few years but people are still, suffering from cancer due to its unpredictable behavior. This disease is still a significant problem for humanity. Brain tumor cancer is one of the serious and utmost emergent ailments.

Normally, the anatomy of brain can be viewed using an MRI scan or CT scan. The MRI scan is more comfortable than a CT scan for diagnosis. It does not affect the human body. Because it doesn't use any radiation. Tumor is due to the uncontrolled growth of tissue in any part of the body. The tumor is of two types namely primary and secondary as follow:

A) Primary Tumor:

A primary brain tumor originates in the brain. They can develop from our:

- Brain cells
- The membrane that surrounds our brain
- Nerve cells
- Glands

In adults, the most common types of brain tumors are gliomas and meningiomas.

B) Secondary Tumor:

Secondary brain tumors make up the majority of brain cancers. They start in one part of the body and spread, to the brain. The following and be metastasize to the brain:

- Lung cancer
- Breast cancer
- Kidney cancer
- Skin cancer

Secondary brain tumors are always malignant. Benign tumors don’t spread from one part of the body to another.

Literature Survey

[1] **Brain Tumor Segmentation and Its Area Calculation in Brain MR Images using K-mean Clustering and Fuzzy C-Mean Algorithm**
Authors: J.selvakumar, A.Lakshmi, A.Lakshmi.
In this paper, the proposed system has four modules namely pre-processing, segmentation, Feature extraction, and approximate reasoning. First, the pre-processing of MRI images is done using median filtering, then segmentation of images is done using advanced K-means and Fuzzy C-means algorithms and in feature extraction, the predicted tumor is extracted and it is given to the thresholding process. Finally, in approximate reasoning step the area of the tumor is calculated using the binarization method.

[2] **Efficient Quality Analysis of MRI Images Using Pre-processing Techniques**
Authors: S. Rajeshwari, T. Sree Sharmila.
In this paper, the proposed system is developed to improve the quality of images before processing them into an application. First, the images are pre-processed using denoising techniques like averaging filter, mean filter and median filter to extract the useful information then, the resolution enhancement is used to reserve the edges and contour information of filter image and after that wavelet transformation is done. Finally, in the quality analysis step the quality of the image is analyzed using the Peak Signal to Noise ratio (PSNR). This ratio is often used as a quality measurement between the original image and the denoised image.

[3] **Brain Tumor Detection and Segmentation from Magnetic Resonance Image Data Using Ensemble Learning Methods**
Authors: Agnes Gyorfi, Levente Kovac's and Laszlo Szilagyi.
In this paper, all data volumes went through a processing step, which included histogram normalization and feature generation. After dividing the volumes into train and test data, train data is sampled for the ensemble learning, which is fed to the training algorithm. The trained ensembles are evaluated using the test data. The prediction provided by the ensemble is post-processed to give the tumor a regularized shape of improved quality. Finally, the accuracy of the algorithm is evaluated using statistical measures.

[4] **Machine Learning Approach-Based Gamma Distribution for Brain Tumor Detection and Data Sample Imbalance Analysis**
Authors: Gunsekaran Manogaran, P.Mohamed Shakeel, Azza S. Hassanien, Priyan Malarvizhi Kumar, Gokulnath Chandra Babu.
In this paper, the proposed system is automated in identifying the tumor region through a proper segmentation with edge analysis. Co-ordinate matching using orthogonal gamma distribution and edge enhancement with identification were computed using machine learning algorithms. To facilitate the identification of minimum and high-level tumor images, they have been computed using fractional derivatives based on the orthogonal gamma distribution model.

[5] **Brain Tumor Detection based on Machine Learning Algorithms**
Authors: Komal Sharma, Akwinder Kaur, Shruti Gujral.
In this paper, the proposed system automatically detects the tumor in the MRI images. Using, pre-processing techniques the RGB images are converted into the grayscale image then, the median filter is applied for noise removal from the MRI images. The noise removal is needed for the high accuracy of the system. Then edges are detected from filtered images using a canny edge detector. After that, the segmentation of edged images is done using watershed segmentation to fi d the location of the tumor in brain images. Then feature extraction is done to extract the important features needed for classification of the images as normal or abnormal. And the classifier used in this system is the Naïve Bayes classifier.

Problem Statement

Brain tumors are a heterogeneous group of central nervous system neoplasms that arise within or adjacent to the brain. Moreover, the location of the tumor within the brain has a profound effect on the patient's symptoms, surgical therapeutic options, and the likelihood of obtaining a definitive diagnosis. The location of the tumor in the brain also markedly alters the risk of neurological toxicities that alter the patient's quality of life. At present, brain tumors are detected by imaging only after the onset of neurological symptoms. No early detection strategies are in use, even in individuals known to be at risk for specific types of brain tumors by virtue of their genetic makeup. Current histopathological classification systems, which are based on the tumor's presumed cell of origin, have been in place for nearly a century and were updated by the World Health Organization in 1999. Although satisfactory in many respects, they do not allow accurate prediction of tumor behavior in the individual patient, nor do they guide therapeutic decision-making as precisely as patients and physicians would hope and need. Current imaging techniques provide meticulous anatomical delineation and are the principal tools for establishing those neurological symptoms are the consequence of a brain tumor.

Objectives

- The aim of doing this project is primarily the interest of undertaking one of the best challenging projects connecting the science field to the technology field i.e. Brain Tumor Detection.
- We hope that this is the opportunity to learn about a new area of computing which will provide great help to another field.
- It will also help us to figure about more sections of the brain that can get infected and on what factors they are treated.

Proposed Framework

The proposed system is divided into the following part:

a) Load MRI Brain Image Sequence
b) Pre-processing
c) Tumor Segmentation using Different Filters
d) Tumor Identification based on grade

It was found that automated brain tumor detection is very necessary as high accuracy is needed when human life is involved. Automated detection of tumors in MR images involves feature extraction and classification using a machine learning algorithm. A system to automatically detect tumors in MR images is proposed.

Preprocessing: Preprocessing is needed as it provides an improvement in image data which enhances some of the image features which are important for further processing. A real-world data generally contains noises, missing values, and maybe in an unusable format which cannot be directly used for machine learning models. Data preprocessing is required tasks for cleaning the data and making it suitable for a machine learning model which also increases the accuracy and efficiency of a machine learning model.

Segmentation: Image segmentation is a critical process in computer vision. It involves dividing a visual input into segments to simplify image analysis. Segments represent objects or parts of objects, and comprise sets of pixels, or "super-pixels". Image segmentation sorts pixels into larger components, eliminating the need to consider individual pixels as units of observation.

Conclusion

Brain tumor diagnosis has become a vital one in the medical field because they are caused by abnormal and uncontrolled growth of cells inside the brain. Brain tumor detection is done using MRI and analyzing it. Machine learning is a very powerful strategy for the detection of the cancer tumor from MRI. Much higher accuracy can be achieved by gaining images taken directly from the MRI scanner.

References

[1] J. Selvakumar, A. Lakshmi, T. Arivoli, " Brain Tumor Segmentation and Its Area Calculation in Brain MR Images using K-mean Clustering and Fuzzy C-Mean Algorithm", IEEE-International Conference On Advances In Engineering, Science And Management, ICAESM, 2012.

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[5] Komal Sharma, Akwinder Kaur, Shruti Gujral, "Brain Tumor Detection based on Machine Learning Algorithms", International Journal Of Computer Applications.