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A Survey on Deep Feature Learning For Medical Image Analysis for Detection of Brain Tumor

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***Abstract*:** Magnetic resonance imaging (MRI) is widely used to assist disease diagnosis so it is a great challenge to establish a brain data set for MRI analysis assistance, due to the privacy and security issues. We work on MRI scan medical images of human brain. First we apply the image pre-processing steps on input medical image. If the noise are present in given image then this noise removed using median filter technique. In addition, we used deep learning, that is an machine learning approach k-means clustering techniques, fuzzy c means clustering techniques respectively for medical image segmentation. After that extraction of image feature using image thresholding to find the brain tumor and also detection of range and shape of tumor in brain MR images and predicts the another disease risk details from the given area of tumor.

KEYWORDS*:* Deep Learning, Machine Learning, Medical image segmentation, k-means clustering, fuzzy c means clustering;

I. INTRODUCTION

A. Background

Deep learning concept is a subset of machine learning. It is a machine learning concept and functions in a similar way, but its abilities are different. Deep learning is a specially of machine learning concept that ac hive great powerand insensibility by learning to display the world as nested order of concepts, with each concept defined in relation toeasy concepts, and more abstract representations measure in terms of less abstractones.

Magnetic resonance imaging (MRI) is an effective approach to diagnose disease, by which the doctor can intuitively examine a patients body structure and efficiently analyze the possibility of illness. However, each patient has hundreds of medical images, so it is a great dare to processand analyze the large amount of medical image data. Therefore, creative health care is an important research direction to help doctors in control medical big data. Especially, it is difficult to find the images containing nodules, which should be analyzed for helping early brain cancer diagnosis, from a large number of MRI scanimages.

In this work, here two techniques are used for brain image segmentation, K-means clustering algorithm and Fuzzy C algorithm. So this technique gives the accurate and clear result for brain tumor detection and segmentation. Tumor is due to the uncontrolled progress of the tissues in any part of the human body. The tumor may be primary or secondary. If it is a basis, then it is known as primary. If the part of the tumor is expand to another place and build as its own then it is called as secondary. The specialist gives the treatment for tumor. So detection of tumor is very important for that further future treatment. The lifetime of the patient who affected by the brain tumor will grow if it is detected at current stage. That will grow the lifetime about 1 to 2 years. Normally the brain tumor cells are of two types specially that are Mass and Malignant. The detection of the malignant brain tumor is most hard to mass tumor because it can be spread of the tissues in any part of the human body. In this proposed work we build an

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application on detection of brain tumor with the help of Brain MRI images and predict the disease details from the given area of tumor.

B. Motivation

MR imaging has become a broadly-used concept of high quality medical imaging, particularly in brain imaging where MR's soft tissue difference are clear advantages. With the help of MR images can also to calculate the size of a brain tumor as it responds to future treatment. A reliable approach using deep learning for detecting and segmenting brain tumor would positively be a useful tool.

C. Objectives

1. To use deep learning of medical image analysis
2. To use MRI scan medical image dataset
3. To detect the brain tumor in MRI image
4. To calculate the area of brain tumor
5. To identify the stage of brain tumor
6. Top redict the disease risk based on area of tumor

II. REVIEW OF LITERATURE

This work presents to learn a set of high-level feature representations over deep learning, mention to as Deep hidden Identity features (Deep ID), for face verification. Author argue that Deep ID can be efficiently learned through challenging multi-class face detection and identification step, whilst they can be establish to other tasks (such as verification) and new characters unseen in the training set [1].

Presented work of image registration and data fusion theory which is suitable for the segmentation of MR images. This work has mainly focused on Clustering technique, specifically k-means clustering. This system provides an effective and fast way for analysis of the brain tumor using K-means technique [2].

Presented approach of Spatial Fuzzy C means (PET-SFCM) clustering technique on Positron Emission Tomography (PET) scan image datasets. Proposed technique is included the spatial neighborhood information with traditional FCM and renovating the objective function of each cluster. This technique is executed and tested on large amount of patient's data collection with brain neuro degenerative disorder such as Alzheimers disease. It has determines its effectiveness by testing it for real world patient datasets.[3].

This work directs the problem of segmenting an image into different regions. Author study two unsupervised learning techniques namely the K-means technique and EM technique and compare it with a graph based technique, the Normalized Cut technique. The K-means technique and EM technique are clustering techniques, which partition a data set into clusters according to some defines distance measure[4].

This work has mainly focused consideration on Clustering techniques, specifically k-means and fuzzy c-means clustering techniques. These both techniques were combined together to come up with another method called fuzzy k-c-means clustering technique, which has a better result in terms of time usage. These both techniques have been executed and tested with Magnetic Resonance Image (MRI) images of Human brain and the results have been examine and stored[5].

The K-means technique and Fuzzy C-means technique are two techniques to detect the iron in brain using SWI technique. An accurate result of iron accession is required for diagnosis and therapy of iron burden in

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various neurodegenerative diseases. Susceptibility Weighted Imaging (SWI) means information about any tissue that has a different perceptively than its neighboring structures.[6].

Presented deep study of brain tumor explained different type of diagnosis techniques. This work presents a systematic Type-II fuzzy expert approach for diagnosing the human brain tumors (Astrocytoma tumors) using T1-weighted Magnetic Resonance Images with difference. The work Type-II fuzzy image processing technique has four distinct steps: Pre- processing, Image Segmentation, Image Feature Extraction, and Approximate Reasoning. [7].

This presented work has mainly focused on Clustering technique that is k-means and fuzzy c-means clustering techniques. Different fuzzy techniques have been used as a suitable alternative and pattern recognition to the fundamental quandary of human idea and defect of standard mathematics to deal with its complex and unclearly defined work.[8].

Presented work has denoted a cooperative and an effective technique for the detection of brain tumors based on median filtering, K Means Segmentation, FCM Segmentation, and finally, threshold segmentation techniques. This approach improves the quality of the tumor images acquired by the aid of MRI and then to detect the size of the tumor[9].

Presented work is a study of the various techniques that are available for color images, text and gray scale images. The result of image segmentation is a set of image segments that all together cover the image, or a set of contours obtained from the image. Each of the pixels in a region is same with respect to some representative or computed features, such as color, intensity, or texture[10].

III. PROJECT METHODOLOGY

This approach is based on deep learning so we work on MRI scan medical images of human brain using k-means clustering and fuzzy c means clustering techniques.

First, image preprocessing step, we check the presence of noise in input medical image. If the noise is present in given image then we removed this noise using median filter technique. To remove the noise from image for further processing, we use median filter technique.

After that additionally, the image segmentation is carried out by using K-means and Fuzzy C-means techniques. Then the feature are extracted by using image thresholding and finally, approximate reasoning step to recognize the tumor area and stage in MRI image and also predict the disease risk from result area of brain tumor.

Advantages of Proposed System:

1. This system will use median filter for noise removal so will get accurate clear image.
2. This work on deep learning using k means clustering and fuzzy c means clustering.
3. It consist two algorithms for clustering which effectively able to extract tumor from image and gives the actual final result.
4. This proposed system effectively able to extract all the spatial characteristics of an Image.
5. This proposed system accurately calculate the brain tumor

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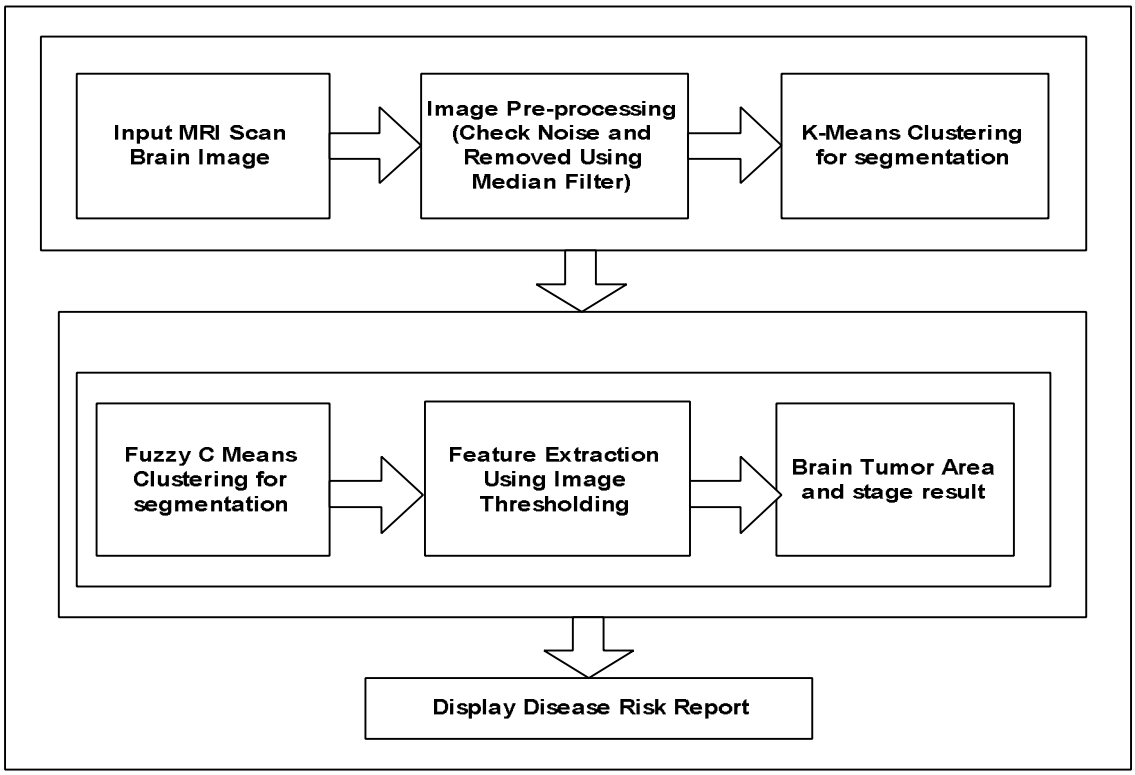

Fig: Proposed System Architecture

Explanation:

Pre-processing

According to the need of the next level the pre-processing step convert the image. It performs filtering of noise and other artifacts in the image and sharpening the edges in the image. RGB to grey conversion and Reshaping also takes place here. It includes median filter for noise removal. The possibilities of arrival of noise in modern MRI scan are very less. It may arrive due to the thermal effect. The main aim of this paper is to detect and segment the tumor cells. But for the complete system it needs the process of noise removal.

Segmentation using K-means

Steps:

1. Give the no of cluster value as k.
2. Randomly choose the k cluster centers
3. Calculate mean or center of the cluster
4. Calculate the distance b/w each pixel to each cluster center
5. If the distance is near to the center then move to that cluster.
6. Otherwise move to next cluster.
7. Re-estimate the center.
8. Repeat the process until the center doesn't move.

Segmentation using Fuzzy C means

The fuzzy logic is a way to processing the data by giving the partial membership value to each pixel in the image. The membership value of the fuzzy set is ranges from 0 to 1.

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Fuzzy clustering is basically a multi valued logic that allows intermediate values i.e., member of one fuzzy set can also be member of other fuzzy sets in the same image.There is no abrupt transition between full membership and non-membership.
The membership function defines the fuzziness of an image and also to define the information contained in the image.

Approximate reasoning

In the approximate reasoning step the tumor area is calculated using the binarization method. That is the image having only two values either black or white (0 or 1). And then classify the stage of tumor from the given area of tumor

IV. CONCLUSION

We propose a new variation global and selective segmentation system suitable for segmenting a range of medical images based on deep learning. We remove the noise of images using median filter technique. This technique is very effective to remove the noise from image. The noise removal image is given as an input to the k-means method and tumor is detected from the input MRI image. Also then using Fuzzy C means technique used for accurate tumor shape extraction of tumor and thresholding of output in feature extraction. Finally approximate reasoning for calculating tumor shape and position calculation and finally shows the disease risk from resultant area of tumor. I.e. lastly predicted the brain tumor risk level which is easier cost reducible and time savable.

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