Detection and Classification of Brain Hemorrhage Using Ensemble Learning

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Abstract: Brain Hemorrhage is a type of stroke, which occurs due to bursting of an artery in the brain, thus causing bleeding in the surrounding tissues. The factor responsible for brain hemorrhage are trauma, high blood pressure, smoking habits, alcohol usage, aneurysm, blood disorders like hemophilia, sickle cell anemia etc. Approximately more than 80% of people who are being born with weak spots in their major brain arteries are at the risk of brain hemorrhage.

I. Introduction

Brain Hemorrhage is a type of stroke, which occurs due to the bleeding in or around the brain tissues as a result of ruptured artery. Due to an accident, trauma may affect the brain tissues thus causing swelling which may lead to edema pooled blood from surrounding tissues. Hemorrhage literally means Blood bursting. Brain hemorrhages are also called Cerebral hemorrhages, intracranial hemorrhages, or intracerebral hemorrhages. They account for about 13% of strokes.
According to the brain portion in which
the bleeding occurs, brain hemorrhage is of four types. This is Subdural hemorrhage, Extradural hemorrhage, Subarachnoid hemorrhage, Intracerabal hemorrhage.

The purpose of this research paper is to do diagnosis of brain hemorrhage by feeding CT images and classify the type of hemorrhage using random forest algorithm along with machine learning.

II.Types of hemorrhage

1. Subdural hemorrhage (SDH) – blood accumulated in the potential space in the midst of the dura and arachnoid matter of the connective tissue membranes which line the vertebral canal and skull.

2. Extradural Hemorrhage (EDH) – bleeding in the regions between the skull and dura mater and is caused due to the fracture in skull caused by trauma.

3. Subarachnoid Hemorrhage (SAH) –occurs due to bleeding in the region around the brain and also due to lack of oxygen when there is an interruption in the supply of blood.

4. Intracerebral Hemorrhage (ICH) -
This type of stroke occurs when the brain is deprived of oxygen due to an
interruption of its blood supply. The location of ICH can be close to the surface or in deep areas of the brain. It is a type of stroke caused by bleeding within the brain
tissues itself.

III. Related Research

With the advancement in technologies in neural networks, image processing etc. All around the world and other researchers started doing research on integrating medical expertise with computer-aided system. Thus a
lot of research was done in segmentation of brain image using MRI and CT scan images to diagnose brain hemorrhages in past three decades.

R. Ganesan and S. Radhakrishnan (2009) had propose segmentation of CT brain image using Genetic Algorithm. In study, original images are enhanced by using Selective Median Filter and the Genetic Algorithm. The

performance is evaluate using receiving operating characteristics (ROC) curve analysis.

Liu et al. has presented an automated detection of CT scan slices which contain hemorrhages. The detection method consists of two parts. The first part splits the scan slices into encephalic region and nasal cavity region. The second part focuses on encephalic region and detects abnormal slices. In both parts, he had applied method by using Wavelet and Haralick texture model. The detection has accuracy 80% and recall 88%.

Myat Mon Kyaw (2013) introduced an automated method for detection and classification of an abnormality or stroke in brain CT images. The image is initially pre-processed to remove film artifacts and skull region. The image is subdivided into four regions to find region that has possibility of
inclusion of abnormal areas.

Vishal R. Shelke, Rajesh A. Rajwade, Dr. Mayur Kulkarni presented a approach for classification of intracranial hemorrhage. Geometrical and textural features used as input to neural network and support vector machine (SVM). This algorithm is tested on different classifiers like support vector machine and
neural network. By using support vector machine technique, precision value is 0.913 and accuracy is 0.88.

Amutha Devi and Dr. S. P. Rajagopalan has proposed a method for classifying the brain MRI images into stroke and non-stroke images. This method extracts features from MRI images of brain using watershed segmentation and Gabor filter. This method consists of a dataset of 52 scan images. Out of 52 images, 25 images are of positive stroke images. The best classification performance is achieved by Sigmoidal function with 80, 100 and 120 features. The classification of 88.46% was achieved.

IV. CONCLUSION

Brain images can be detected by MRI, CT scan etc., but they are not suitable for the proper diagnosis of brain hemorrhage. Various diagnosis techniques for brain hemorrhage were invented. Some of them required high
segmentation, noise removal, accuracy, etc. In this project, these problems are overcome by using machine learning which are advanced in terms of accuracy, speed. Under machine learning we will use ensemble learning technique, where the data will be first train and then the data will be test. The various features using the computing techniques have been detected with their advantages and limitations
and hence it provides a better framework for
development of medical systems.

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