SHIFT INVARIANCE IN UNMASKING NEO PLASMA

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***Abstract* - Automated defect detection in medical imaging has become the emergent field in several medical diagnostic applications. Automated detection of neo plasma in MRI is very crucial as it provides information about abnormal tissues which is necessary for planning treatment. Hence, trusted and automatic classification schemes are essential to effectively diagnose the person. Automated tumor unmasking techniques have been developed to save the radiologist time and obtain more accurate results. This research paper presents a deep learning technique to detect brain tumor.**

***Index Terms* – Artificial Intelligence, Image Processing, Neo Tech**

I. INTRODUCTION

Abnormal cell growth or rapid division of cells that forms a clot or a mass in the cerebral region may lead to brain tumor(benign or malignant). The rate of growth and location will determine the effect on the functioning of nervous system. MRI has become the go-to, standard choice for the diagnosis of brain tumor. However, automation of this process has been challenged by several factors such as heterogeneity of target structure, partial effect of volume and varying image noises. So after considering these affects a new computer aided technology can be used to design a system for diagnosis using digital image processing techniques.

II. PREVIOUS WORK

A research paper proposed a method that will replace the manual detection of brain tumor by MRI process, In order to perform computer aided detection, the boundary of target is approached on basis of edge and region for proper segmentation.[1]

Annisa Wulandari et al. proposed the method in which noise is removed from the image first using median filter, then watershed segmentation technique is used to segment out the brain from the skull, the resulting image is cropped and then threshold values are applied to meet the required pixel value to finally detect the target. The testing results show that the target computation error is 10%.[2]

To overcome the shortcomings of previous brain tumor databases like Kaggle, BRATS etc., a new database called BRAMSIT was developed by R.Tamilselvi et al, on basis of structure along axial position, Image Labelling and Manual Annotation. This data base showed decreased processing time and access time during some efficient image processing algorithms.[3]

A system was proposed in which, wavelet transforms to capture the frequency and location of the target in the images. Then a Support Vector Machine is trained and the MRI brain images are submitted to the trained SVMs and receive the predicted target as the outcome.[4]

A process was proposed in which the images are enhanced using contrast stretching and noise is removed using median filter, then Otsu's segmentation is used to convert the image to a binary image after which the ROI is approached on basis of area, circularity, and solidity. Finally, the ROI is detected using feature extraction.[5]

Fatemeh Derikvand et.al.proposed a system, in which a patch-based approach of Neural Networks is used to predict and label the patches after pre-processing the image using histogram equalization, feature mapping is performed using various layers of the CNN architecture. Finally, the exact position of the tumor is segmented out.[6]

The image is pre-processed in which noise and skull regions are removed, then segmented using threshold segmentation after which Gray Level Co-occurrence matrix is used to extract phase features. Finally, genetic algorithm is used to optimize the SVM parameters to improve classification.[7]

In this system the image is segmented assisted with treatment planning, segmented using an unsupervised approach, examining the accuracy of various Neural networks and support vector machines, a cascaded CNN architecture was chosen. This system shows a sensitivity of 0.8635.[8]

This research paper proposed a method in which the acquired images are pre-processed using non-linear median filter, the recognized and compressed by Principal Component Analysis after which Discrete Wavelet Transform coefficients are used as the characteristic vector and features are extracted used Gray level Occurrence matrix. Finally, classification is done using Bayes rule.[9]

III. PROPOSED SYSTEM

The proposed system contains the following modules:

1) GUI & Data Augmentation
2) Image Pre-processing
3) Feature Extraction & Prediction

GUI & Data Augmentation

This is the interface where the user or patient interacts with the application. This UI is built in a simple way so that it will be easy for the users to interact with. In this module, these input parameters are trained well, and a model is created. These input parameters have to be trained well in order to obtain a high accuracy. The features in the training data and the quality of labelled training data will determine how accurately the machine learns to identify the outcome. To accurately predict the case using ML we need our data to be cleaned and in a formatted way. Data augmentation consists of Grey Scaling (RGB/BW to ranges of grey), Reflection(vertical/horizontal flip),Gaussian Blur(reduces image noise),Histogram equalization(increases global contrast),Rotation(may not preserve image size),Translation(moving the image along x or y axis), linear transformation such as random rotation (0-10 degrees), horizontal and vertical shifts, and horizontal and vertical flips. Data Augmentation is done to teach the network desired invariance and robustness properties, when only few training samples are available.

Image Pre-processing

Using CNN, we do image pre-processing; the initial step is the convolutional layer and mostly flattened convolutions and 1 * 1 convolutions. but there are totally 7 type of convolutional layers. Then is the ReLU which is abbreviated as Rectified Linear activation function. It's a max function (x, 0) with the input as x. The main job of ReLU is to set all the negative values in the matrix to zero and all the other values will be kept as constant, and it is computed after convolution Pooling layers are used to reduce the dimensions of the feature maps. Thus, it reduces the number of parameters to learn, and the amount of computation performed in the network. The final layer is the FC (Fully Connected) layer and the last few layers are full connected layers which compiles the data extracted by previous layers to form the final output compiles the data extracted by previous layers to form the final output.

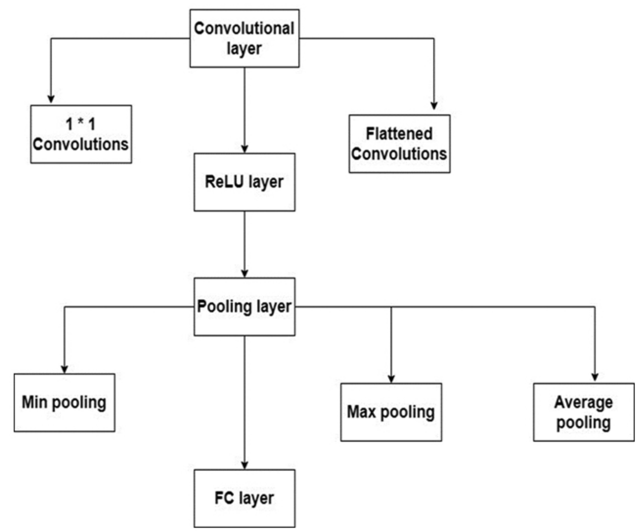


Fig.1 Steps in CNN

Table 1. Types of Convolutional layer

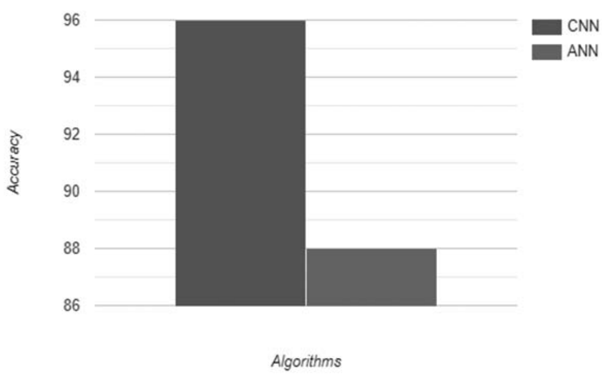
S. No	Types
1	Simple Convolution
2	1x1 Convolutions
3	Flattened Convolutions
4	Spatial and Cross-Channel convolutions
5	Depth wise Separable Convolutions
6	Grouped Convolutions
7	Shuffled Grouped Convolutions

In this implemented system, 2D convolutional layer is used followed by that max pooling is used. The reason why max pooling is chose over other techniques is, it reduces the computational cost by reducing the number of parameters to learn

Feature Extraction & Prediction

In this phase, the important features from the image are extracted. This is the final module in which the input image given by the user is predicted using the pre-trained model. If the input image has brain tumour, "brain tumour detected" text will be displayed indicating the presence of brain tumour and immediate action has to be taken and if the input image doesn't have brain tumor and if it is normal "healthy" text will be displayed indicating there is no need to worry .

COMPARISON WITH THE EXISTING SYSTEM



The 2 algorithms CNN and ANN are compared here and it has been found that CNN gives better accuracy than ANN.

IV. CONCLUSION AND FUTURE SCOPE

Thus a brain tumor disease prediction web application is implemented and by using CNN, the achieved accuracy is 96 %. The reason why this project is implemented by CNN is it learns distinctive features for each class by itself. It is also considered as computationally efficient. This system will be very much helpful to clinicians and doctors. This web application can be deployed in a cloud platform so that it is accessible to everyone and the accuracy of the system can be improved by analyzing and researching other algorithms.

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