



Analyzing brain tumor disease from MRI Using Random Forest

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Abstract: Brain tumor is a disorder caused by the development of abnormal cells or tissues in the brain. Cells generally reproduce and die in a regular sequence and each new cell replacing the previous one. Sometimes, some cells become abnormal and continue to grow that cause's severe damage to the brain function and leads to death. Early diagnosis of the disease is crucial for proper treatment. Diagnosis of brain tumors is usually done using images obtained through magnetic resonance imaging (MRI). MRI images can be classified using a Convolutional Neural Network (CNN) and Random Forest, these are the techniques in deep learning. It is suitable for classifying large image datasets used for prediction of brain tumor accurately. So, a CNN and Random Forest model is trained with the same dataset which would save radiologist time for prediction. Hence the objective is to bring the better accuracy and prediction results in this project

Keywords: MRI, machine learning, Brain disease, deep learning, convolutional neural network, regression, random forest

1. INTRODUCTION:

The brain is a most important organ in the human body which controls the entire functionality of other organs and helps in decision making. It is primarily the control center of the central nervous system and is responsible for performing the daily voluntary and involuntary activities in the human body. The tumor is a fibrous mesh of unwanted tissue growth inside our brain that proliferates in an unconstrained way. On

this year at age of 15 about 3,540 children get diagnosed with a brain tumor[2]. The right way of under standing of brain tumor and its stages is an important task to prevent and to carry out the steps in curing the illness. To do so, magnetic resonance imaging (MRI) is widely used by radiologists to analyze brain tumors. The result of the analysis carried out in this paper reveals whether the brain is normal one or diseased one by applying the deep learning techniques. the main purpose and objectives of the research is to develop learning based things for predicting the brain tumor[9]. here we are using large amount of data sets with ultra-modern methods to produce more accuracy. While coming to the methods and results, wehave used a deep learning methods like CNN and Random Forest. Our method is evaluated on a dataset of brain Magnetic Resonance Imaging (MRI) dataset collected from different sources and includes dataset of healthy individuals as well as the patients with various brain diseases.

2. EXISTING SYSTEM AND LIMITATIONS:

The existing system are not done with many images and also the exiting system has low accuracy and low efficiency in terms of loading time and implementation time[4]. Also the testing and training is not done with the proper test-train split ratio. In the existing system there are some divisions like

Manual image analysis

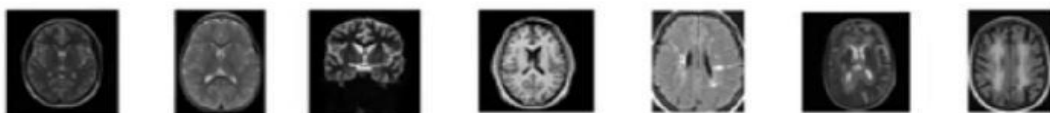
Limited Automation

Dataset limitations,

Interpretability

The main drawback is Dataset limitations, if we wanted to know about the more than some amount of data results it wont show the correct information because of some limitations. Here they used only one algorithm either SVM or CNN. These two algorithms are like in one we can solve crucial image dataset and in one we can solve large image dataset but to get a good accuracy rate we need both the things in a single system[3]. It is only possible with the combination of two algorithms. In the existing system the system requirements for a proper system is high .more cost is needed to implement those methods. the training data required more time

No Tumour (98 images)



With Tumour (125 images)

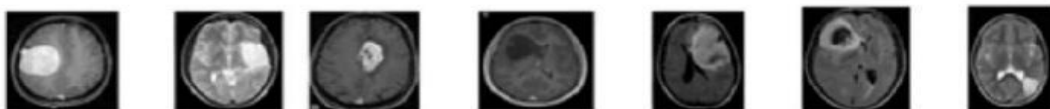


Fig 1. Sample images

The above Fig 1 shows how the brain tumor is identified by using MRI. The images shows the difference between tumor and without tumor[10]. the abnormally grown tissues are captured in the MRI and those images are sent to find whether those are tumor or some other cells. With the help of numeric data we can identify which type of cells are those .

3.PROPOSED SYSTEM:

The proposed system contains some list of modules

GUI

Images Preprocessing

Feature Extraction of the existing
methods Data Partitioning

Image Extraction

Test Set

Training and Validation

Combination of algorithms

Large and Diverse Dataset

Improved Accuracy

GUI & Data Augmentation 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 user to interact with. In this module ,these input parameters are trained and a model is created. These input parameters have to be trained well in order to obtain a high accuracy. To accurately predict the case using ML we need our data to be cleaned and in a formatted way.

Feature Extraction And 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[8].

If the input image has brain tumor, “brain tumor detected” text will be displayed indicating the presence of brain tumor 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[15].

Data augmentation consists of Gray Scaling, Reflection, Histogram equalization, Rotation, Translation, linear transformation such as random rotation, 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. We have taken a novel deep learning algorithms with the combination of CNN and RF(Random Forest)[5]. With the help of these two algorithms the accuracy will increase, these helps to decrease the analysis time[17]. Our large dataset of Brain MRI data collected from various data sources including healthy individuals and sick people. Hence the results will come so quick. . Our Proposed system will be the one of the best and leading to better patient outcomes.

OBJECTIVES:

- [1] The main objective of the work is to implement the good And best prediction model for brain tumor
- [2] The other objectives is to utilize the CNN and RF to improve accuracy in the prediction

4. METHODOLOGY:

We used different methodologies to analyse the brain tumor and classified and process the dataset .

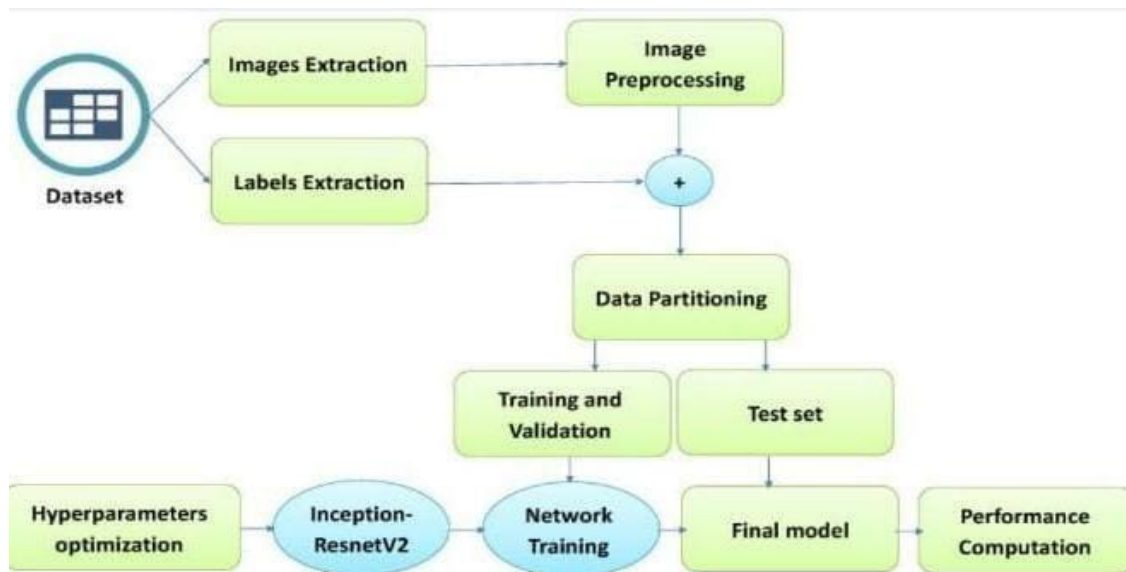


Fig 2.Architecture

The above figure shows the architecture of how the Brain tumor is analysed by taking dataset as an input. The dataset is analysed into two categories that are Image Extraction and Labels Extraction[11]. The images that are Extracted are Preprocessed .The Preprocessed Images and Extracted labels are collected as a data. That data is partitioned into Training and Validation , Test set[18]. The Training and Validation is done by training the network and taking some parameters.

Here in our work the validation of data is taken with the help of Convolutional Neural Network and Random Forest[13]. The main part of work is taking numeric values from the image. Those values are divided into different different parameters. Based on those the results will come. At first all the numeric data will go through the CNN and Random Forest algorithms .there the testing and training data is divided.

Mean	Variance	Standard deviation	Entropy	Skewness	Kutosis	Contrast	Energy	ASM
23.44517	2538.985627	50.388348	0.651174	1.984202	5.421042	181.467713	0.781557	0.610831

Homogeneity	Dissimilarity	Correlation	Coarseness	PSNR	SSIM	MSE	DC	Target
0.847033	2.765411	0.968576	7.460000e-155	97.974630	0.777011	0.171163	0.303989	1

Fig 3.Parameters

The above Fig 3.shows the parameters that we used to optimize the data .The test set test the data and gives the final model and shows performance computation. We use Max pooling techniques the reason why we choose over other techniques is, it reduces the computational cost by reducing the number of parameters to learn. We have used 18 different parameters namely Mean, Variance, Standard Deviation, Entropy, Skewness, Kurtosis, Contrast, Energy, ASM, Homogeneity, Dissimilarity, Correlation, Coarseness, PSNR, SSIM, MSE, DC, Target

5. RESULTS AND DISCUSSION

By measuring the parameters and dataset by using several machine learning algorithms for analysing the brain tumor detection using Random Forest which achieved an accuracy of 87%. The other algorithms, including LR, SVM, and RNN, achieved lower accuracy scores ranging from 70% to 85%.

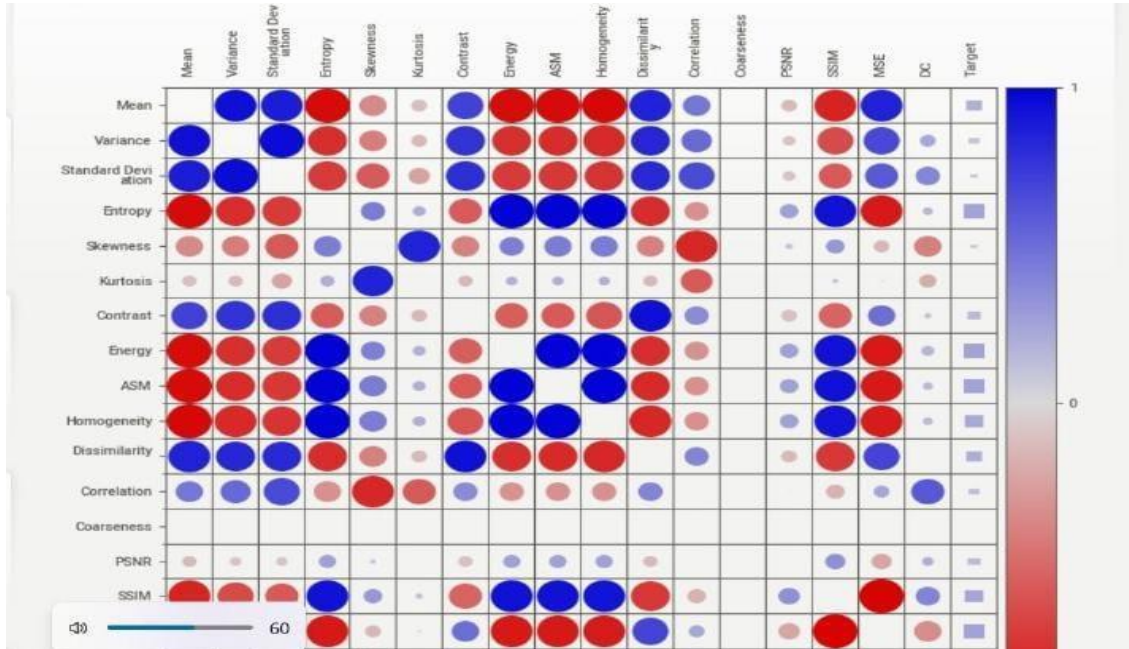


Fig 4. Analysing brain tumor

In the above Fig 4. it shows how the brain tumor is analysed by using parameters and how it is classified .It plots the tumor analysis by blue and red dots and shows some of the graphical representation of given parameters and the brain tumor is identified in this way. In that 18 parameters, each and every parameters are having a limit[12]. If the obtained numeric data set is crossed that parameters limit. It will point the red colour dot in the graph , if not if will plot the blue colour dot in the graph. Generally

red indicates danger so We conclude if the red dots are overlapping the blue dots than we can say that there is a tumor present in the brain. We designed these for easy understanding through visually. through this way, by looking at the graph it self we can say the results.



Fig 5.Coarseness

The above Fig 5.shows about one of the parameters graphical Representation We also tested the combination of SVM and CNN but there we Face a challenge ,it takes more time to analyse. the data. And the complexed images are not processed, few of the results are also got wrong,basically SVM works on the small data but with the complexed once. Where as coming to the CNN it works on the large data set but not on the complexed once. SVM can be used for both regression and classification tasks, but generally they work best in classification problems

Where as in the combination of CNN and RF. Random forest combines the out of multiple decision trees to reach a single result. It cross checks so many and all possible results just to give a single perfect result.it handles both regression and classification problems. Along with the CNN the max pooling is used[14] . the reason why max pooling is choose over other techniques is, it reduces the computational cost by reducing the number of parameters to learn.

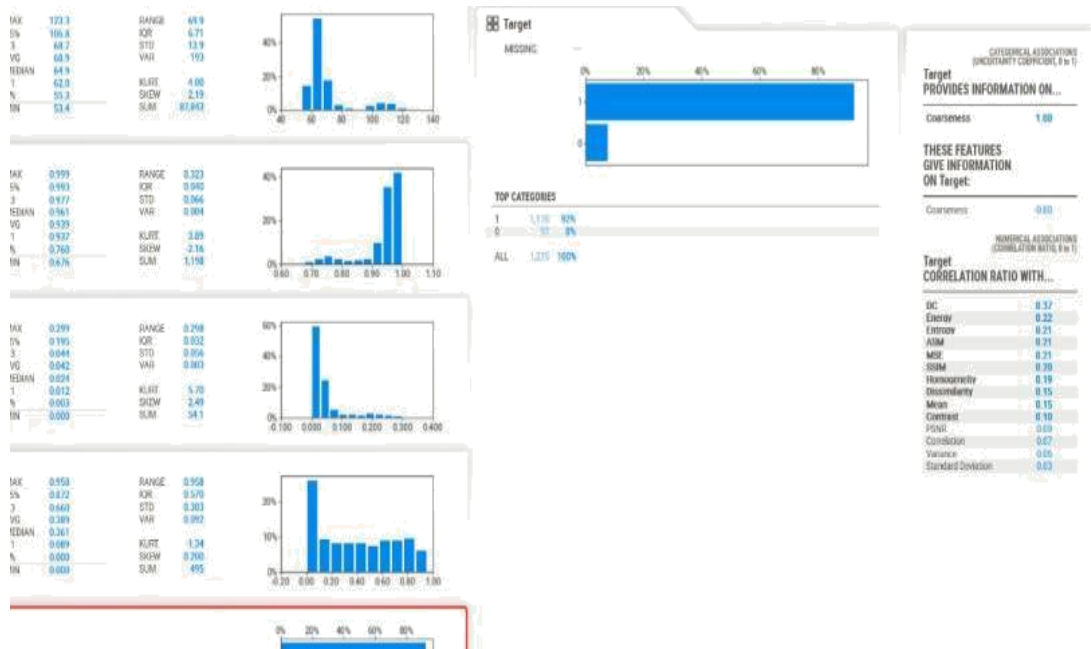


Fig 6.Target

Our results propose that ML algorithm have the potential to accurately analysis brain diseases from MRI dataset.

6. CERTIFICATES



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Certificate of Presentation

This is to certify that Mr/Mrs/Dr..... **Peddisetty Naga Vigna** from
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7. CONCLUSION & FUTURE WORK

The previous study, the degree of correlation is comparable to that of the previous study. Since the degree of correlation is already high, it is expected that the estimation accuracy will be higher and the age estimation model with higher and higher generalization performance will become closer by increasing the volume of data through the implementation of the data collection method suggested in this study and further data augmentation methods.->In this study, analyzing the brain tumor was performed using deep learning techniques on dataset from individuals across a wide range of parameters, including infants, who had not been included in previous studies.

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