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A comparative study of machine learning algorithms to detect the brain tumor

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Abstract
Now a day's brain tumor is very daunting and terrible problem in the society, often causing death. We can save a patient, if she/he is in early stage. There is abundant set of hidden information which is stored in the health care sector, with appropriate use of accurate data mining techniques in medical field, we can extract the patterns. The techniques of machine learning held a significant stand. This prediction can be done very efficiently using ML. By utilizing the machine learning techniques like Logistic regression, Decision tree, Random forest, MLP classifier, Naive Bayes, SVM, K-nearest neighbor identifies significant relations and patterns from the data can be extracted, from which disease can be predicted for a patient.

Keywords: Machine learning, brain tumor, logistic regression, decision tree, random forest, MLP classifier, naive Bayes, SVM, k-nearest Neighbor, accuracy, prediction

1. Introduction
Brain tumor is one of extremely risky reason for death among different kinds of the diseases. Legitimate and opportune conclusion can spare the life of a patient somewhat. Accordingly, we have proposed a competitive mechanized solid framework for the analysis of the brain tumor. Proposed framework is a two-level framework for brain tumor finding and tumor district extraction. To start with, commotion evacuation is proceeded as the pre-handling step on the brain MRI [1, 2, 11, 12, 13, 14] images. Surface highlights are extricated from these clamor free brain MR pictures. The examination centers around to manufacture a determination and expectation framework identified with brain tumor by consolidating prescient mining. Brain tumor can be identified with various ailments related with the heart. These anomalous wellbeing/clinical side effects directly affects the brain. By and by, brain tumor is considered as a chief medical problem. Next period of the proposed framework is Self-sorting out Mapping based element preparing is performed, trailed by some improved AI grouping calculations that depends on these removed highlights. In the proposed framework over 95% precision is accomplished by the order stage. Aftereffects of the proposed strategy show that tumor pictures are perceived precisely.

2. Related Work
The process of image segmentation is adopted for extracting abnormal of brain tumor region within the brain. In the existing system the magnetic resource image (MRI) [1, 2, 11, 12, 13, 14] segmentation of the brain tissues holds very significant in order to identify the presence of the brain tumor. Medical experts will do this job effectively now a days but a lot of manual expertise and intervention is needed. A traditional Data Mining algorithm also doesn't serve the purpose to the possible extent.
Machine learning intro ducing a new enhanced algorithms or techniques. By using those techniques, we will easily find out the specified result which is required to prove to the task of machine learning.

3. Proposed System
The method proposed assures to be highly efficient and precise for brain tumor detection and classification. By using the techniques of Machine Learning like Logistic regression, Decision tree, Random forest, MLP classifier, Naive Bayes, SVM, K-nearest neighbor an effective solution can be deployed for brain tumor detection and prediction at an early stage.

Performance metrics like Precision, Accuracy, Recall, F1-Score and Classification Report, Confusion Matrix are all assessed and documented.

3.1 Decision Tree

Decision trees are non-parametric directed learning Method utilized for classification. Decision Tree is can be utilized for both grouping and Regression issues, however generally it is favored for taking care of Classification issues. It is a tree-organized classifier, where interior hubs speak to the highlights of a dataset, branches speak to the decision rules and each leaf hub speaks to the result.

A decision tree essentially poses an inquiry, and dependent on the appropriate response (Yes/No), it further split the tree into sub-trees. The objective is to make a model that predicts the estimation of an objective variable by taking in straightforward decision rules derived from the information highlights.

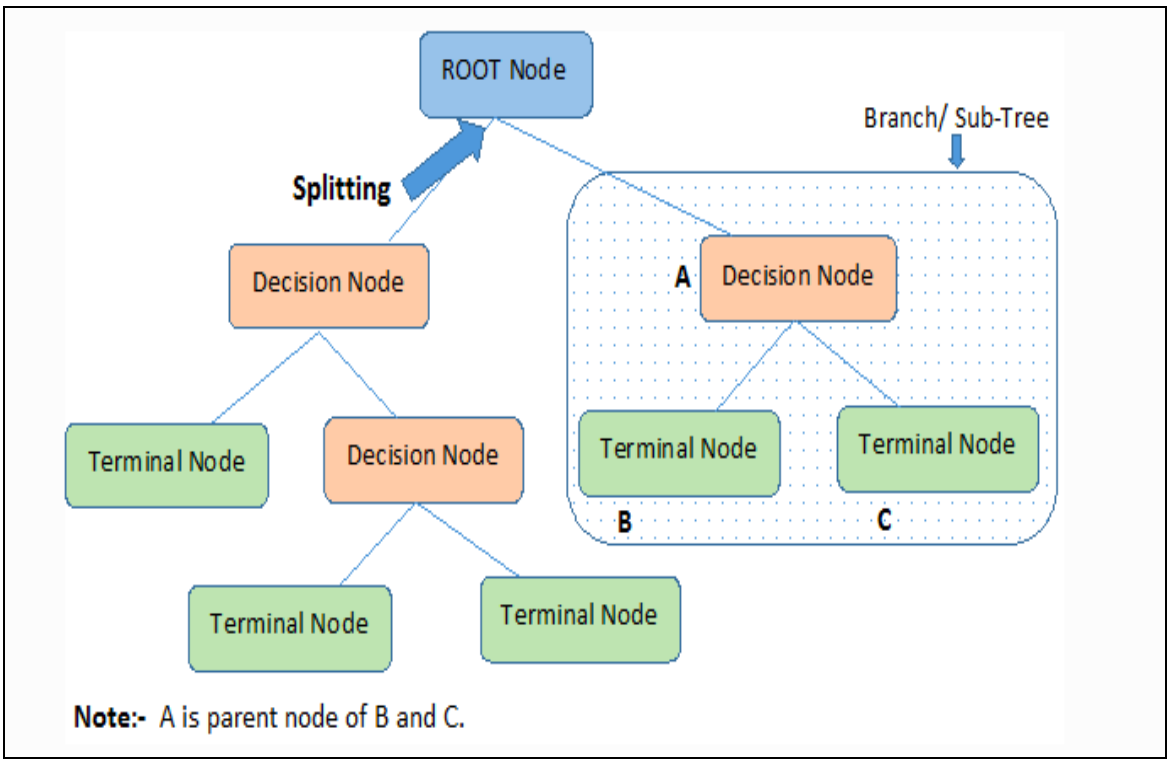

Fig 1: Decision tree

A decision tree is drawn topsy curvy with its root at the top. It is known as a decision tree in light of the fact that, like a tree, it begins with the root hub, which develops further branches and builds a tree-like structure.

In the picture on the left, the strong content in dark speaks to a condition or interior hub, in light of which the tree parts into branches or edges of the tree. The finish of the branch that doesn't part any longer is the decision or leaf.

3.2 Algorithm

Here in machine learning it uses step wise processing technique to make operations on the uploaded data set:

Step 1: Importing the data set and displaying the data set.

Step 2: Data cleaning. Here we are applying some other operations like finding the null values, filling the null values, removing the null values or duplicate values which make redundancy in the data set.

Step 3: If the data set contains any categorical values means we need convert those categorical values to numerical values for easy execution purpose.

Step 4: Slicing and identifying the dependent and independent variables, partitioning the whole data set into two parts for training and testing purpose.

Step 5: Applying the required algorithm (decision tree) on dataset for further performance.

Step 6: Calculating some mathematical issues to know that how our algorithm is performing on given data set.

Step 7: Predicting the result.

Advantages

1. Less time for processing.
2. Less maintenance is required.
3. Less cost.
4. More efficient.
5. The chances of saving a patient will become more.

4. Results and Discussions

By utilizing the all machine learning enhanced algorithms/ techniques easily we will get the prediction. In this project we used Logistic regression, Decision tree, Random forest, MLP classifier, Naive Bayes, SVM, K-nearest neighbor algorithms. Each algorithm will play a different role, based on their performance level we will get the accurate predicted outputs. Decision tree (98.82%) and random forest (98.81%) gives the good results as expected from the preprocessed data.

	Algorithms	Accuracy
0	Logistic regression	98.00
1	Random forest	98.81
2	Decision tree	98.82
3	k nearest neighbor	98.70
4	Naive bayes	98.70
5	Support vector machine	98.70
6	MLPClassifier	98.60

Fig 2: Algorithms that compares the accuracy

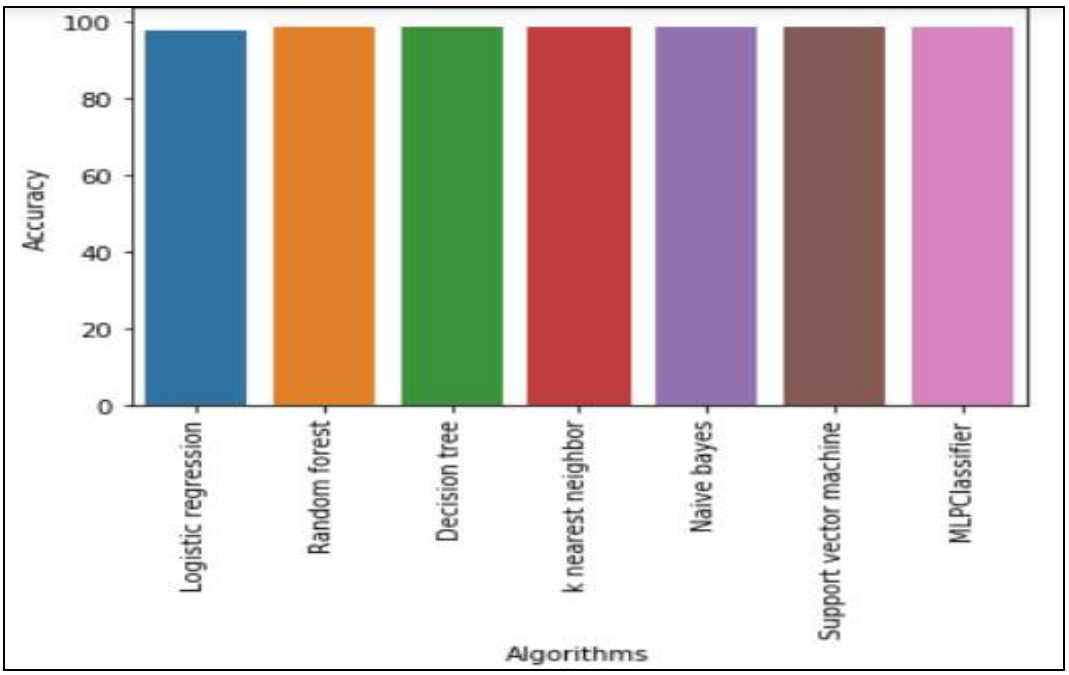

Fig 3: Graphical Representation of Accuracies

5. Conclusion

Referring the earlier section, it's revealed that output generated is quite precise and clear. Accuracy achieved at the end relies upon processing of every step. There are lot of exiting methods for every step, hence the methods that offer better results are selected. At the last, brain tumor classification takes place. To detect brain tumor detection here exist different classical approaches but the present work utilizes the traditional (mlp)neural network approach for detecting brain tumor, since the brain tumor detection images relies upon the neighborhood pixels.ML approach provides powerful brain tumor detection.

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