



# A SURVEY ON CLASSIFICATION TECHNIQUES, USED FOR DETECTION OF BRAIN TUMOR

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**Abstract:** Brain Tumor is an abnormal and uncontrollable growth of brain cells inside the brain. The identification of a brain tumor is a challenge due to the complications in the structure of the brain. We can classify brain tumors in a human brain with the help of these MRI Images collected as Big Data. Classification is the best approach for the identification of images like any kind of medical imaging. Magnetic Resonance Imaging (MRI) which supports to diagnosis the disease easily. Much higher accuracy can be achieved by gaining a better data set with high - resolution images taken directly from the MRI scanner. Moreover, classification techniques can be used to raise the accuracy even higher and reach a level that will allow this tool to be a significant asset to any medical facility dealing with brain tumors. Classification is used for classifying data into different classes according to some constraints. Several major kinds of Classification Algorithms including Artificial Neural Network (ANN) and Support Vector Machine (SVM) are used for classification. On the comparative study towards the while, paper provides a comprehensive inspection of Changed Classification Algorithms and their topographies.

**Index Terms -** Magnetic Resonance Imaging (MRI), Classification, Machine Learning, Artificial Neural Network (ANN), Support Vector Machine (SVM).

## I. INTRODUCTION

The brain tumor is the main cause of cancer deaths worldwide. The brain tumor can affect people of any age. There are more than 100 billion nerves present in the human brain that are in an overlapped form. So the diagnosis of the tumor area in the brain is a challenging task. The tumor is due to the uncontrollable growth of cells in the brain. Two types of primary brain tumors that are Benign tumor and malignant tumor. A Brain tumor is small in size, grows slowly and it has well-defined borders. It does not spread in the spinal cord, other parts of the brain or other areas of the body and it can be removed completely by surgery. The malignant type of tumor is fast-growing, affects healthy brain cells and may spread to other parts of the brain or spinal cord. It is harmful and may remain untreated [1].

**Magnetic Resonance Imaging (MRI):** Many diagnostic imaging techniques can be performed for early detection of brain tumors such as Computed Tomography (CT), Positron Emission Tomography (PET) and Magnetic Resonance Imaging (MRI). A strong magnetic field is first applied and then radio waves are applied for a short time in a different direction in magnetic resonance imaging. This unexpected shift bases convinced particles in the patient's body to make unusual indications. The MRI scanner then detects those special signals caused by the radiation. The MRI scanner then sends the signal information to the computer, and then the computer creates an image of the inner body with the help of signal information. Fig. 1 shows the Magnetic Resonance Image (MRI) database is categorized into two distinct classes as a normal, abnormal brain tumor.

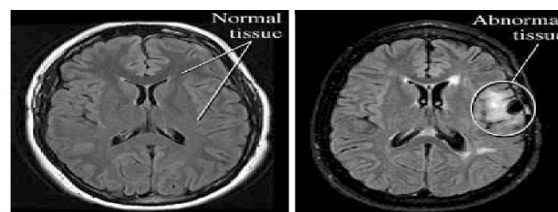


Fig. 1: MRI of the normal and abnormal images of the brain

## II. LITERATURE SURVEY

**Supervised Classification Techniques:** Classification technique supports to format and predict the factors based on the dataset which includes load, extract and analyses [3] as well as the classification is applied depends upon the essential requirements in the real life. Before actual classification begins, the required information is extracted from a large amount of data and then classification is done. This depends neither supervised nor unsupervised or both. Supervised classification techniques as shown in Fig. 2 are also known as predictive or directed classification. In this method set of possible classes is known in advance. Unsupervised classification techniques are sometimes defined as descriptive which indirectly applied in the any application as required. In this method set of the possible class is unknown, after classification, we can assign a name to that class [2]. In supervised classification Artificial Neural Network (ANN), and Support Vector Machine (SVM) are well-known classifiers and used widely.

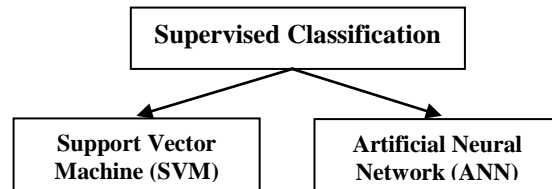


Fig. 2: Supervised Classification Techniques

**Artificial Neural Network (ANN) for Classification:** Artificial Neural Networks (ANNs) are types of computer architecture inspired by biological neural networks (Nervous systems of the brain) and are used to approximate functions that can depend on a amount of efforts and are usually indefinite. An Artificial Neural Networks operates by creating connections between many different processing elements each corresponding to a single neuron in a biological brain. These neurons may be constructed or simulated by a digital computer system. Each neuron takes many input signals then based on an internal weighting produces a single output signal that is sent as input to another neuron. The neurons are strongly interconnected and organized into different layers. The input layer receives the input and the output layer produces the final output. In general, one or more hidden layers are sandwiched in between the two. Artificial Neural Networks typically start with randomized weights for all their neurons. A back-propagation Artificial Neural Networks is trained by humans to perform specific tasks. During the training period, we can evaluate whether the Artificial Neural Network's output is correct by observing the pattern. Implemented on a single computer, an artificial neural network is normally slower than more traditional solutions of algorithms [5].

**Support Vector Machine (SVM) for Classification:** The Computer-based classification has remained largely experimental work with approaches, one of them is, Support Vector Machine (SVM). The determination of normal and abnormal brain images is based on symmetry which is exhibited in the axial and coronal images. Using feature vector gained from the MRI images, SVM classifiers are used to classify the images. The process consists of two components which are the training phase and a testing phase. The percentage of accuracy on each parameter in SVM will give the idea to choose the best one to be used in further works. After all, we are using Lab VIEW Advanced Signal Processing Toolkit as the software in our experimental work. They are the most difficult to classify. They have a direct bearing on the optimum location of the decision surface [6]. Many tools and techniques are analyzed to apply in the future exposes to highlight dimensional parameters using software's like as Mat lab, python with open source feature, which mainly depends on the proposed view with its approach.

## III. COMPARATIVE STUDY

In this we have done comparative study of Artificial Neural Network (ANN) and Support Vector Machine (SVM), Supervised Classification Algorithms, based on predictive accuracy, fitting speed, memory usage and area under curve is shown in Table 1. It mainly depends on big data as it seems to integrate the quantity and quality in an experimental method to reach the working hypothesis in an accurate way. The Further Table 2 shows advantages, limitations and applications of two Classification Algorithms. Finally Table 3 shows Description and Characteristic Features of Classification Algorithms.

Table 1: Comparison between Classification Algorithms (ANN & SVM)

Model	ANN	SVM
Predictive Accuracy	High	High
Fitting Speed	Fast	Medium
Memory Usage	Low	*
Easy to Interpret	Yes	Yes
Handles Categorical Predictors	*	No
Area Under the Curve (AUC)	Medium	Less

Table 2: Advantages, Limitations, Applications of Classification Algorithms (ANN &amp; SVM)

Model	ANN	SVM
Advantages	1.Easy to use 2.Easy to implement	1. Ability to learn dimensionality of the feature space
Limitations	1. Requires high processing time if neural network is large. 2. Learning can be slow	1.Kernel Selection 2. Parameter tuning
Applications	1.Text Categorization 2. Image Classification	1.Text Categorization 2. Image Classification 3. Hand written Recognition

Table 3: Description and Character Features of Classification Algorithms (ANN &amp; SVM)

Classification Algorithms	Descriptions	Characteristic Features
Artificial Neural Network (ANN)	<p>→ANN is a type of Artificial Intelligence that indicates some functions of the person mind.</p> <p>→ANN has the normal tendency for storing experiential knowledge.</p> <p>→ANN consists of sequence of layers each layer consists of a set of neurons.</p> <p>→All the neurons of each layer are linked by weighted connections to all neurons on the preceding and succeeding layers.</p>	→ANN is preferred for better performance in execution.
Support Vector Machine (SVM)	→SVM first builds a hyper plane of set of hyper planes in a high or infinite dimensional space, used for the classification.	→SVM makes use of nonparametric with binary classifier and it can handle more input data very efficiently.

To justify the comparative study of the above specified algorithms with classifiers surveys as like as are:

- ✓ To initiate the research work
- ✓ To analyze the attribute with its parameters usage.
- ✓ To study the purpose with description in detailed view.
- ✓ To analyze the limitations to apply
- ✓ To determine the betterment of vice versa

#### IV. CONCLUSION

This paper proposes the survey on the various classification algorithms that can be used for brain tumor classification. It focuses on the supervised classification techniques on the era of Big Data. Tables show the advantages, limitations and applications of the three (ANN and SVM) different classification techniques. The selection of the algorithm will depend on the need of the user. Each technique has a different accuracy, speed and predictors. The study indicates that the classification accuracy of SVM algorithm was better than ANN algorithm which also gives better classification datasets than ANN algorithm.

#### V. FUTURE SCOPE

Researchers are needed to give attention to improve the procedure of tumor detection by using the different form of classification techniques. Different parameters would be used for this investigation like accuracy, time, specificity, efficiency and many others. There is need to introduce an automated expert system which can identify the tumor at its earlier stage so that a better planning could be organized for treatment. The accurate detection of pre-cancer growth using automated tools will help the patient to get appropriate treatment well within time, as most of cancer is curable only if it is detected in early stages. Classification techniques can be used to raise the accuracy even higher and reach a level that will allow this tool to be significant asset to any medical facility dealing with brain tumors. Once the system achieves 100% accuracy in classifying the image, then this application can be deployed for the betterment of the hospitals.

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