

# BRAIN IMAGE CLASSIFICATION USING NAÏVE BAYES CLASSIFIER

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## Abstract

*A brain tumor is an abnormally growing cell in the brain. Replicating a tumour cell is uncontrollable. Early diagnosis is dependent on the size and location of tumor. A technique is explored in this study to extract entropy features of sample entropy by the Magnets of Resonance Imaging (MRI) sample entropy, Dual Tree Wavelet Transform (DTWT), sample entropy and NB classifier. The experimental results illustrate the efficiency of the device proposed. The DTWT, sample entropy and NB classifier produces 96% precision, sensitivity and specificity.*

*Keywords: Dual tree wavelet transform, Sample entropy, Naïve bayes classifier*

## Introduction:

In [1], the brain classification was defined with wavelet form and SVM. Next the median filter is used to reduce noise from the brain pictures. The transform wavelet is then used for extracting features. Brain pictures are eventually classified by the SVM. Brain tumor identification and segmentation in [2] Using the SVM Classification and Convolutional Neural Network (CNN).

Classification of brain images in [3] for mining algorithms. The Gray Level Co-occurrence Matrix (GLCM) is used to extract the features of brain image. The SVM classification is discussed with wavelet's dependent radial base functions MRI brain recognition [4]. Classification of the brain image MRI using the SVM search algorithm, and feature selection based on Particle Swarm Optimising (PSO) is discussed in [5]. In [6] the topic focuses on automated brain classification with the use of discrete wavelet transformation (DWT). First, DWT decomposes the input brain images. The PCA eliminates these features and the classification is based on SVM [7-8].

This paper explains how the DTWT transformations with sample entropy and the NB classification approach to the MRI brain classification. Section 2 outlines the techniques and materials used to classify the MRI brain system. The article is organized as follows. The findings of the MRI brain rating system are correctly presented in section 3. The last session begins with the brain imaging device MRI.

## Methods and Materials

The MRI brain grading system is composed of three different phases: DTWT decomposition, sample entropy feature extraction and NB prediction.

### DTWT based brain image decomposition

In the frequency domain more discriminatory features can be derived in DTWT. The Hilbert pair of waves composes the MRI images, and the m-band filter banks render dual decomposition [9]. The one-dimensional scaling function  $\xi_0 \in A^2(D)$  and  $(M-1)$  mother wavelet is defined by one dimensional image belongs to space  $A^2(D)$ . DTWT breaks down the MRI images and creates the higher and lower frequency sub bands.

### Sample entropy feature

The time series and cardiac dynamics are calculated by entropy of the sample [10]. The negative natural algorithm of the conditions that the sample entropy defines subseries with the tolerant  $v$  matching next stage.

### NB Prediction

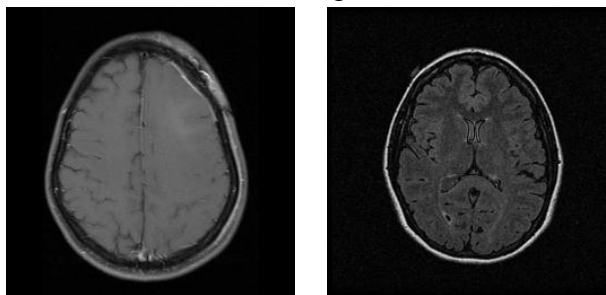
NB is a simple algorithm for classifying machines. NB classifier is used to identify spam, to classify text. The Bayes rule is,

$$P(K/L) = \frac{P(L/K)P(K)}{P(L)} \quad (2)$$

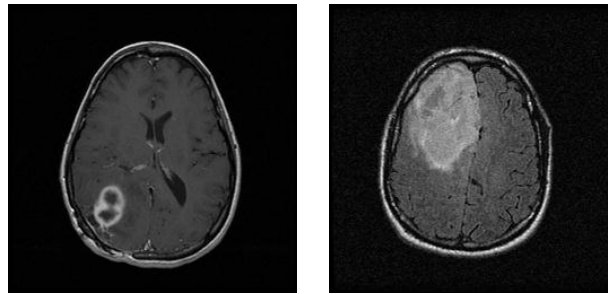
NB classificatory fits well for several data points as probability parameters can be easily found.

## Results and Discussion

The REMBRANDT (REMBRANDT) collection selects a option of 50 brain images in both categories typical and abnormal [11] for performance evaluation. The file resolution is 256x256. Figure 1 and 2 shows the MRI brain images from the database.



**Figure1 Sample images in REMBRANDT database - normal**



**Figure 2** Sample images in REMBRANDT database – abnormal

DTWT is used for breakdown and entropy characteristics and are categorized according to the NB classification. DMWT, sample entropy features are extracted together with the NB Classifier achieve precision, sensitivity and specificity. Table 1 shows the accuracies from 1 to 4 entropy sample levels for the NB classification.

**Table 1** Performance of brain image classification using NB classifier

Sample Entropy Feature	NB Classifier performance (%)			
	L1	L2	L3	L4
Accuracy (%)	76%	84%	96%	89%
Sensitivity (%)	74%	86%	96%	90%
Specificity (%)	78%	82%	96%	88%

Table 1 shows a higher 96% precision, 96% sensitivity and 96% specificities of a sample entropy for the 3rd stage of DMWT decomposition of the MRI brain image ranking.

## Conclusion

An successful approach is provided with REMBRANDT database for the MRI brain image classification. For breakdown, DTWT provides higher and lower frequency sub bands. The input for classification is the derived sample entropy features. The classification of derived characteristics from one to four DTWT degradation rates is performed by the NB classifier. Experimental Results show that classification precision generates the sample entropy characteristic and NB classificatory of 96 %by using sample entropy and NB classifier.

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