

# To Achieve Software Quality Assurance in Brain Tumor Detection Using Artificial Neural Networks

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**Abstract**— Quality assurance is a way of preventing errors and avoiding problems when distributing software to clients. The term quality assurance is refers to ways of ensuring the quality of a product. Here we detect the brain tumor detection with segmentation using genetic algorithm and testing that application output by ANN. Brain is the central nervous system of a human being one of the major causes of death among people is brain tumor. In medical field like this kind of causes are struggling to detect automatically with quality. Here provided solution to detect the tumor automatically the same way testing the automated output by ANN for improving the quality of software. Proposed method integrates image pre-processing, feature extraction, segmentation, classification and testing.

**Keywords**— Quality assurance, Artificial Neural Networks, Pre-processing, Segmentation, Feature extraction, Classification, testing.

## I. INTRODUCTION

A brain tumor is a disease in which cells grow uncontrollably in the brain [6]. Now a day's brain tumor is one of the major causes of death among human beings. And this kind of causes is struggling to detect automatically. At the same time one of the main things in medical field is software quality. MRI is the most important technique, in detecting the brain tumor [1]. So in this paper main goal is to detect the brain tumor automatically with good quality. Here I used image pre-processing, segmentation, feature extraction and classification techniques to detect brain tumor. And I ensure quality through the software testing. Software testing is contains three major steps:

- Test data generation.
- Application of the data to the software being tested.
- Evaluation of the results.

An artificial neural network (ANN), generally called neural network (NN), is a mathematical model or computational model that is inspired by the structure and/or functional aspects of biological neural networks. A neural network contains of an interconnected group of artificial neurons (processing element), working in unison to solve specific problems. ANNs, like people, learn by example. The neuron has two modes of operations: The training/learning mode and the using/testing mode. In mainly cases an ANN is an adaptive system that converts its structure based on external or internal information that flows through the network in the

learning phase. Recent neural networks are non-linear statistical data modeling tools. They are generally used to model complex relationships between inputs and outputs or to find patterns in data [4].

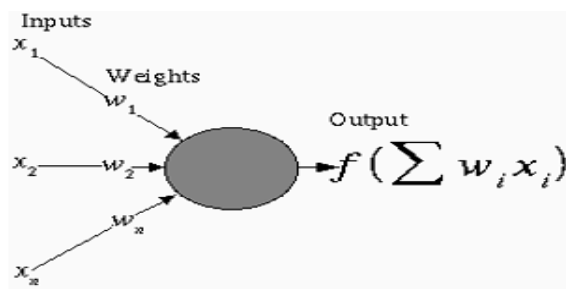


Figure 1. Structure and functioning of single neuron

In this paper chapter I refers to Introduction about the brain tumor, software testing and ANN. Chapter II deals with the working principle of proposed system, Chapter III explains the detection of brain tumor using ANN with software quality, IV refers to results and discussion, V is the conclusion.

## II. PROPOSED SYSTEM

The proposed work starts by reading the input brain MRI images and follows six major steps. In first step starts with pre-processing of MRI images using wiener filter for make it more suitable to analyze such as reduce and remove noise. Second step is processing of images segmentation using

Genetic Algorithm, Third step is feature extraction using GLCM, Fourth step is classification of MRI into normal and timorous using SVM. Fifth step, the artificial neural network as automated brain tumor detection for testing the SVM classification result for improves the quality. And final step compare these two results and suggest the decision. Fig. 1 shows the steps included in propose system.

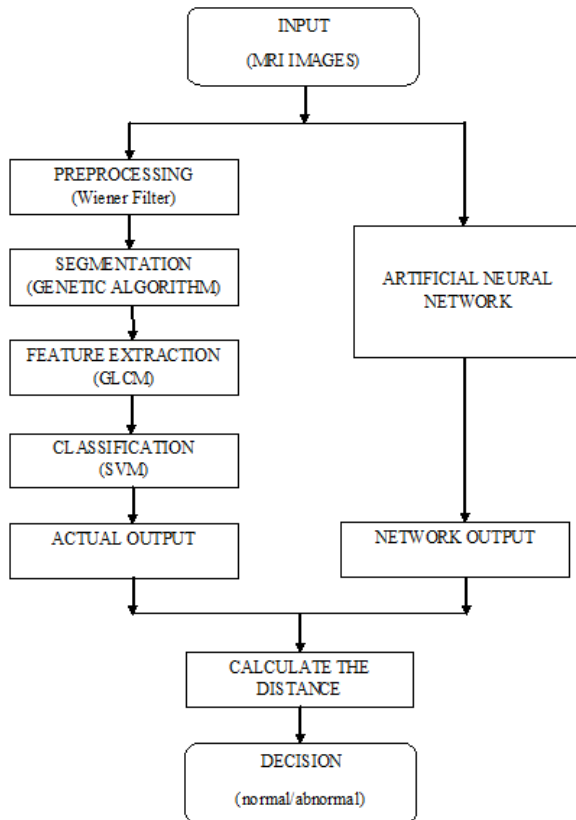


Figure 2. Method overview

### III. METHODOLOGY

#### A. Image preprocessing using wiener filter

The aim of pre-processing is an improvement of the image data that suppresses unwanted distortions or enhances some image features important for further processing. It removes additive noise and de-blurring simultaneously. It includes two sections are (i) Filtering (ii) Noise smoothing.

#### B. Image Segmentation using Genetic Algorithm

It refers to the process of partitioning an image into meaningful regions. The goal of image partition is to simplify the image and also change its representation to make them easy to understand and more meaningful. The role of image segmentation is to locate objects bound in images, which results in a set of regions that communally

natural covering the entire image. Every pixel in a region is similar in some characteristic such as color, intensity, or texture. Adjacent regions are significantly different with esteem to the same characteristics.

Genetic Algorithm (GA) is a population based stochastic inquire procedure after find precise and fairly options in conformity with optimization and search problems. Modeled on the mechanisms concerning evolution and natural genetics, genetic algorithms provide an alternative in conformity with traditional optimization techniques with the aid of the usage of directed loosely searches in imitation of hit upon most advantageous solutions into multimodal landscapes. Each chromosome between the populace is a dynamic answer in conformity with the problem. Genetic Algorithm creates an annex on populations because of every subsequent generation through the use of a choice mechanism and selection operators such so crossover and mutation as like primary search mechanisms the aim of the algorithm being to optimize a attached objective and fitness function. An encoding mechanism maps each dynamic solution according to a chromosome. An objective characteristic and health feature is ancient according to evaluate the capability of every chromosome in imitation of grant a satisfactory solution to the problem. For crossover, couple chromosomes are randomly choice beside the population.

The time period genetic algorithm is derived beside the reality that its operations are loosely based regarding the mechanics about genetic adaptation into biological systems. Genetic algorithms do remain quickly characterized by way of ternary main concepts:

- Darwinian thinking on health yet energy who determines an individual's likelihood concerning affecting after generations through reproduction.
- Reproduction action as produces latter folks via combining selected members concerning the current population.
- And genetic operators as originate modern kiddie based totally concerning the structure concerning their parents.

A genetic algorithm continues a constant-sized population regarding candidacy solutions, regarded as like individuals. The initial bunch population out of who the genetic procedure starts off evolved be able be elected randomly and about the groundwork about heuristics, proviso reachable because of a devoted application. At each iteration, known namely a generation, every odd is evaluated then recombined including others regarding the basis concerning its general multiplication yet fitness. The predicted variety concerning times an odd is select because recombination is proportional

in accordance with its fitness friend in conformity with the rest about the population.

New individuals are made utilizing two principle genetic recombination administrators known as hybrid and transformation. Hybrid works by choosing an arbitrary area in the hereditary string of the guardians and linking the underlying portion of one parent with the last section of the second parent to make another youngster. A moment kid is at the same time produced utilizing the rest of the portions of the two guardians. The string portions gave by each parent is the building pieces of the hereditary calculation. Change accommodates periodic unsettling influences in the hybrid operation by rearranging at least one hereditary component amid propagation. This operation guarantees assorted variety in the hereditary strings over drawn out stretches of time and counteracts stagnation in the joining of the streamlining method. The people in the populace are commonly spoken to utilizing a twofold documentation to advance effectiveness and application freedom of the genetic operations.

### C. Feature Extraction using GLCM

Feature extraction is the technique of data reduction according to find a subset of beneficial variables primarily based concerning the image. In this work, seven textural services primarily based seven textural features based on the gray level co-occurrence matrix (GLCM) are extracted out of every image. Co-occurrence matrices are thought for four directions: 0°, 45°, 90° and 135° degrees. The seven Haralick texture descriptors are extracted out of each co-occurrence matrices which are computed within each of four angles.

It is an area of image processing which involves using algorithms to detect and isolate various desired portions of a digitized image or video stream.

- 1) Feature extraction involves finding features of the segmented image.
- 2) Usually performed on a binary image produced from a thresholding operation.
- 3) Common features include:
  - a) Area.
  - b) Perimeter.
  - c) Center of mass.
  - d) Compactness.

### D. Classification using SVM

The purpose of image classification scheme is to assign each input to decide brain tumor detection. It is the process of assigning a label to each unknown input image. In this work, the Support Vector Machine (SVM) is a state-of-the-art classification method. Due to its high accuracy, the SVM classifier is widely used in bioinformatics. It deals with high-dimensional data such as gene expression, and flexibility in

modeling diverse sources of data. SVMs belong to the general category of kernel methods. An algorithm that depends on the data only through dot-products is kernel method. The dot product can be replaced by a kernel function that computes a dot product in some possibly high dimensional feature space.

### Advantages:

- First is, the ability to generate non-linear decision boundaries using methods designed for linear classifiers.
- Second is, the use of kernel functions allows the user to apply a classifier to data that have no obvious fixed-dimensional vector space representation.
- Training for a support vector machine has two phases: Transform predictors (input data) to a high-dimensional feature space. It is sufficient to just specify the kernel for this step and the data is never explicitly transformed to the feature space. This process is commonly known as the kernel trick. Solve a quadratic optimization problem to fit an optimal hyper plane to classify the transformed features into two classes. The number of transformed features is determined by the number of support vectors.

### E. ANN

ANNs have three levels that are interconnected. The first level consists of input neurons called as input layer. Those neurons send data on to the second level called as hidden layer or intermediate layer, which in turn sends the output neurons to the third layer called as output layer.

### Procedure for training a neural network

To train a neural network, following steps to be made:

- Step 1: Normalize the data
- Step 2: Create a Neuroph project
- Step 3: Creating a Training Set
- Step 4: Create a neural network
- Step 5: Train the network
- Step 6: Test the network to make sure that it is trained properly

## IV. RESULTS AND DISCUSSION

Here presented result of Graphic User Interface (GUI) widow to describe the entire proposed algorithm for brain tumor detection from load image to detect the tumor step-by-step and implement the testing using neural network.

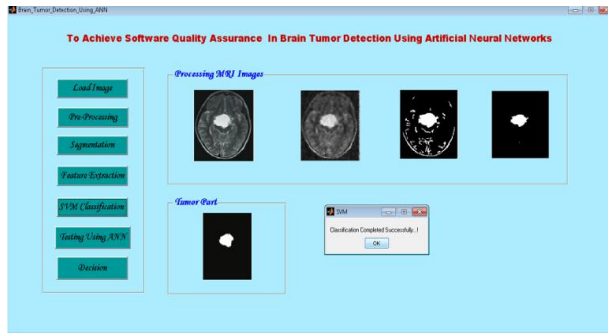


Figure 3. Tumor Detection through Classification using SVM

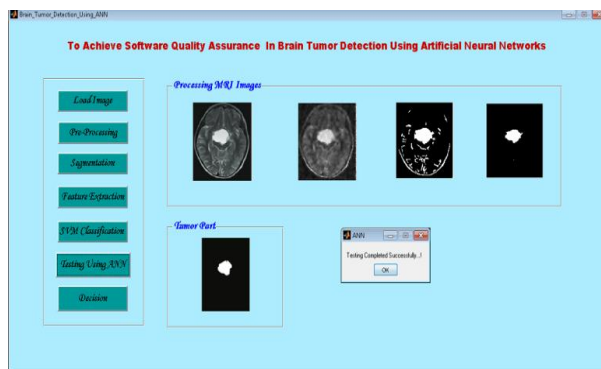


Figure 4. Tumor detection using ANN

It should include important findings discussed briefly. Wherever necessary, elaborate on the tables and figures without repeating their contents. Interpret the findings in view of the results obtained in this and in past studies on this topic. State the conclusions in a few sentences at the end of the paper. However, valid colored photographs can also be published.

## V. CONCLUSION

The proposed method, which based on the artificial neural networks has been successfully tested and achieved the best results with accuracy 99.3% and sensitivity 98.24%. And all the results of this study step by step were presented in the window of Graphic User Interface (GUI). The system is designed to be user friendly by creating Graphical User Interface (GUI). The proposed system efficiently classifies the MRI brain tumor images.

Finally, the brain tumor is isolated from the MRI brain images by using SVM classification and tested by ANN using MATLAB. The brain tumor detection and testing is successfully implemented by using the image processing algorithms, neural network tool box and graphical user interface.

## VI. FUTURE SCOPE

In Future, I would like to extend and evaluate the work in the following areas:

- Extending our proposed method for 3D images.
- Extend the proposed methodology to analyze the tumor detection simultaneously for other type of scanned images.

## REFERENCES

- [1] Parveen and Amritpal singh, "detection of brain tumor in MRI images using combination of fuzzy C-Means and SVM," 2015 2<sup>nd</sup> International Conference on Signal Processing and Integrated Networks, 978-1-4799-5991-4/15/\$31.00©2015 IEEE.
- [2] Anupurba Nandi, "detection of human brain tumor in MRI image segmentation and morphological operators," 2015 IEEE International Conference on Computer Graphics, Vision and Information Security, 978-1-4673-7437-8/15/\$31.00©2015 IEEE.
- [3] Kalpana U. Rathod and Y. D. Kapse, "MATLAB Based Brain Tumour Extraction Using Artificial Neural Network," International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169 Volume: 4 Issue: 3, IJRITCC | March 2016.
- [4] Shweta Jain, "Brain cancer classification using GLCM based feature extraction in artificial neural network," International Research Journal of Mathematics, Engineering and IT (IRJMEIT) ISSN: (2349-0322) Vol. 3, Issue 7, July 2016.
- [5] J. Mohana Sundaram and Dr. T. Karthikeyan, "general study on MRI scan for brain tumor using artificial neural network," International Research Journal of Mathematics, Engineering and IT, ISSN: 2349-0322 Vol.3, Issue 7, July 2016 © Associated Asia Research Foundation.
- [6] Vipin Y. Borole, Seema S. Kawathekar, "Study of various DIP Techniques used for Brain Tumor detection and tumor area calculation using MRI images", International Journal of Computer Sciences and Engineering, Vol.4, Issue.7, pp.39-43, 2016.
- [7] Sakshi and A. Kaur, "Secure Data Hiding Using Neural Network and Genetic Algorithm in Image Steganography", International Journal of Computer Sciences and Engineering, Vol.5, Issue.2, pp.95-99, 2017.