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A Comparative Analysis of Various Images in Bio Medical Using Artificial Neural Networks

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Abstract
This paper Introduces a hybrid approach in selecting a best architecture of artificial neural networks to compare various medical images like lung segments, nodules, etc., Artificial neural networks are widely used for segmentation of tissues and structures from medical images. Through this study we can prove the effectiveness of the neuro Genetic approach in medical image segmentation.
The proposed method minimizes training time and have increased the accuracy when compared to the existing method.

Introduction

Medical imaging is the technique and process of creating visual representations of the interior of a body for clinical analysis and medical intervention, as well as visual representation of the function of some organs or tissues. Medical imaging seeks to reveal internal structures hidden by the skin and bones, as well as to diagnose and treat disease. Medical imaging also establishes a database of normal anatomy and physiology to make it possible to identify abnormalities. Although imaging of removed organs and tissues can be performed for medical reasons, such procedures are usually considered part of pathology instead of medical imaging

Medical imaging techniques produce very large amounts of data, especially from CT, MRI and PET modalities. As a result, storage and communications of electronic image data are prohibitive without the use of compression.

Measurement and recording techniques which are not primarily designed to produce images, such as electroencephalography (EEG), magnetoenceph alography (MEG),

electrocardiography (ECG), and others represent other technologies which produce data susceptible to representation as a parameter graph vs. time or maps which contain data about the measurement locations. In a limited comparison these technologies can be considered as forms of medical imaging in another discipline.

Basics of Artificial Neural Networks

New models of computing to perform pattern recognition tasks are inspired by the structure and performance of our biological neural networks . the terminology artificial neural networks is introduced by considering the structure and the operation of a basic computing unit of artificial neuron .

Characteristics of Neural Networks

Some attractive features of biological neural network that make it superior to even the most sophisticated AI computer system for pattern recognition tasks are the following .

(a) Robustness and fault tolerance.

(b) Flexibility

(c) Ability to deal with a variety of data situations.

(d) Collective computation.

Biological Neural Networks

The features of the biological neural networks are attributed to its structure and function. The information is stored in the connections and it is distributed throughout the network can function as a memory. this memory is content addressable , in the sense that the information may be recalled by providing partial or even erroneous input pattern. thus ANNs can perform the task of associative memory.

ANN – Terminology

Processing unit : an artificial neural network (ANN) as a highly simplified model of the structure of the biological neural network. An ANN consists of a summing part followed by an output part. The input and output could also be deterministic or stochastic or fuzzy.

Artificial neural networks (ANNs) or connectionist systems are computing systems inspired by the biological neural networks that constitute animal brains. Such systems learn (progressively improve performance) to do tasks by considering examples, generally without task-specific programming.

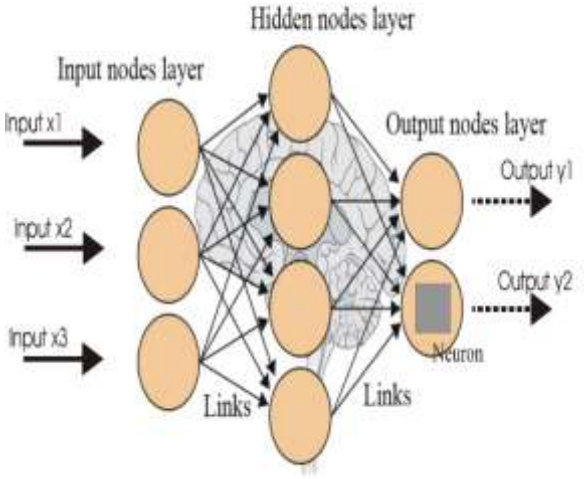
For example, in image recognition, they might learn to identify images that contain cats by analysing example images that have been manually labelled as "cat" or "no cat" and using the analytic results to identify cats in other images. They have found most use in applications difficult to express in a traditional computer algorithm using rule-based programming.

An ANN is based on a collection of connected units called artificial neurons, (analogous to axons in a biological brain). Each connection (synapse) between neurons can transmit a signal to another neuron. The receiving (postsynaptic) neuron can process the signal(s) and then signal downstream neurons connected to it. Neurons may have state, generally represented by real numbers, typically between 0 and 1. Neurons and synapses may also have a weight that varies as learning proceeds, which can increase or decrease the strength of the signal that it sends downstream. Further, they may have a threshold such that only if the aggregate signal is below (or above) that level is the downstream signal sent.

The original goal of the neural network approach was to solve problems in the same way that a human brain would. Over time, attention focused on matching specific mental abilities, leading to deviations from biology such as backpropagation, or passing information in the reverse direction and adjusting the network to reflect that information.

Interconnections:

In an artificial neural networks several processing units are interconnected according to some topology to accomplish a pattern recognition task. Therefore the input to a processing unit may come from the outputs of other processing units . The output of each unit may be given to several units including itself.



Topology

Artificial Neural networks are useful only when the processing units are organized in a suitable manner to accomplish a given pattern recognition task. ANN are normally organised into layers of processing units.

Artificial Neural Networks (ANN) have many different coefficients, which it can optimize. Hence, it can handle much more variability as compared to traditional models.

Learning Paradigms

The three major learning paradigms each correspond to a particular learning task. These are

- supervised learning,
- unsupervised learning
- reinforcement learning.

Group Method of Data Handling

The Group Method of Data Handling (GMDH) features fully automatic structural and parametric model optimization. The node activation functions are Kolmogorov-Gabor polynomials that permit additions and multiplications. It used a deep feedforward multilayer perceptron with eight layers. It is a supervised learning network that grows layer by layer, where each layer is trained by regression analysis. Useless items are detected using a validation set, and pruned through regularization. The size and depth of the resulting network depends on the task

Convolutional Neural Networks

A convolutional neural network (CNN) is a class of deep, feed-forward networks, composed of one or more convolutional layers with fully connected layers (matching those in typical ANNs) on top. It uses tied weights and pooling layers. In particular, max-pooling is often structured via Fukushima's convolutional architecture. This architecture allows CNNs to take advantage of the 2D structure of input data.

CNNs are suitable for processing visual and other two-dimensional data. They have shown superior results in both image and speech applications. They can be trained with standard backpropagation. CNNs are easier to train than other regular, deep, feed-forward neural networks and have many fewer parameters to estimate. Examples of applications in computer vision include Deep Dream.

Long Short-Term Memory

Long short-term memory (LSTM) networks are RNNs that avoid the vanishing gradient problem. LSTM is normally augmented by recurrent gates called forget gates. LSTM networks prevent backpropagated errors from vanishing or exploding. Instead errors can flow backwards through unlimited numbers of virtual layers in space-unfolded LSTM. That is, LSTM can learn "very deep learning" tasks that require memories of events that happened thousands or even millions of discrete time steps ago. Problem-specific LSTM-like topologies can be evolved. LSTM can handle long delays and signals that have a mix of low and high frequency components.

Stacks of LSTM RNNs trained by Connectionist Temporal Classification (CTC) can find an RNN weight matrix that maximizes the probability of the label sequences in a training set, given the corresponding input sequences. CTC achieves both alignment and recognition.

Genetic Algorithm:

In a genetic algorithm, a population of candidate solutions to an optimization problem is evolved toward better solutions. Each candidate solution has a set of properties which can be mutated and altered; traditionally, solutions are represented in binary as strings of 0s and 1s, but other encodings are also possible.

The evolution usually starts from a population of randomly generated individuals, and is an iterative process, with the population in each iteration called a generation. In each generation, the fitness of every individual in the population is evaluated; the fitness is usually the value of the objective function in the optimization problem being solved. The more fit individuals are stochastically selected from the current population, and each individual's genome is modified to form a new generation. The new generation of candidate solutions is then used in the next iteration of the algorithm. Commonly, the algorithm terminates when either a maximum number of generations has been produced, or a satisfactory fitness level has been reached for the population.

A Typical Genetic Algorithm Requires:

1. a genetic representation of the solution domain,
2. a fitness function to evaluate the solution domain.

A standard representation of each candidate solution is as an array of bits.[2] Arrays of other types and structures can be used in essentially the same way. The main property that makes these genetic representations convenient is that their parts are easily aligned due to their fixed size, which facilitates simple crossover operations. Variable length representations may also be used, but crossover implementation is more complex in this case. Tree-like representations are explored in genetic programming and graph-form representations are explored in evolutionary programming; a mix of both linear chromosomes and trees is explored in gene expression programming.

Once the genetic representation and the fitness function are defined, a GA proceeds to initialize a population of solutions and then to improve it through repetitive application of the mutation, crossover, inversion and selection operators.

Artificial neural networks are an information processing technique based on the way biological nervous system, such as the brain , process information . they resemble the human brain in the following two ways:

1. A neural network acquires knowledge through learning.
2. A neural network's knowledge is stored within inter-neuron connection strengths known as synaptic weights

A True power and advantage of neural networks lies in their ability to represent both linear and non-linear relationships and in their ability to learn these relationships directly from the data being modelled .

Related Works

Various artificial neural networks algorithms are used to classify the image segments .

In this paper we classified widely used neural network algorithms .

They may be

Genetic algorithms

Particle swarm optimization

Ant colony optimization

AUTOMATIC SEGMENTATION OF LUNG CT IMAGES BY CC BASED REGION GROWING A.PRABIN , DR. J.VEERAPPAN . This research reports on segmentation of the ROI by segmenting the CT lung images using supervised contextual clustering along with the combination of region growing algorithm. Region growing has been combined with CC in this work since it reduces the number of steps in segmentation for the process of identifying a tissue in the CT lung image. The performance of this proposed segmentation is proved to be better when it is compared with other existing conventional segmentation algorithms like 'Sobel', 'Prewitt', 'Robertz', 'Log', 'Zerocross'. From the experimental results, it has been observed that the proposed segmentation approach provides better segmentation accuracy.

A Neuro-Genetic System for Face Recognition V. Saishanmuga Raja, Dr. S.P. Rajagopalan The proposed approach uses Neural and Genetic algorithm that overcomes low recognition rate, low accuracy and increased time of recovery. Optimization of neural network parameters is done using Genetic algorithm. This increases recognition accuracy and reduced training time.

Detection of Lung Nodule from Computed Tomography Images M.Sundar Raj, S.Sanjay Lung nodules are classified with the help of CAD system. The CAD system can classify the lung nodule from CT images on the basis of nodule feature such as growth rate, density, shape and boundary of the nodule. These feature values are calculated in image processing tool by using image enhancement, segmentation, and feature extraction. The feature values are given as input to classifier to classify nodule. lung nodule detection The LIDC⁄IDRI Database is expected to provide an essential medical imaging research resource to spur CAD development, validation, and dissemination in clinical practice.

Particle Swarm And Neural Network Approach For Fault Clearing Of Multilevel Inverters Sivakumar, M. and R.M.S. Parvathi. This study presents a machine learning technique for fault diagnostics in induction motor drives. A normal model and an extensive range of faulted models for the inverter-motor combination were developed and implemented using a generic commercial simulation tool to generate voltages and current signals at a broad range of operating points selected by a Particle Swarm Optimization (PSO) based machine learning algorithm. A structured Particle Swarm (PS)-neural network system has been designed, developed and trained to detect and isolate the most common types of faults: single switch open circuit faults, post-short circuits, short circuits and the unknown faults. Finally, the authors show that the proposed structured PS-neural network system has the capability of real-time detection of any of the faulty conditions mentioned above within 20 milliseconds or less.

Enhancement of Voltage Stability by Optimal Location of Static Var Compensator Using Genetic Algorithm and Particle Swarm Optimization Kalaivani.R. and V. Kamaraj. This study investigates the application of Particle Swarm Optimization (PSO) and Genetic Algorithm (GA) to find optimal location and rated value of Static Var Compensator (SVC) device to minimize the voltage stability index, total power loss, load voltage deviation, cost of generation and cost of FACTS devices to improve voltage stability in the power system. Optimal location and rated value of SVC device have been found in different loading scenario (115%, 125% and 150% of normal loading) using PSO and GA.

A Study of Detection of Lung Cancer Using Data Mining Classification Techniques Ada , Rajneet Kaur- In this paper, we are going to use some data mining classification techniques such as neural network & SVMs for detection and classification of Lung Cancer in X-ray chest films. Due to high number of false positives extracted, a set of 160 features was calculated and a feature extraction technique was applied to select the best feature. We classify the digital X-ray films in two categories: normal and abnormal. The normal or negative ones are those characterizing a healthy patient. Abnormal or positive ones include types of lung cancer. We will use some procedures also Data Preprocessing, Feature Extraction etc. In this paper we well use classification methods in order to classify problems aim to identify the characteristics that indicate the group to which each case belongs.

A novel method for lung segmentation on chest CT images: complex-valued artificial neural network with complex wavelet transform .Murat CEYLAN, Y¨uksel ¨OZBAY, O. Nuri UC¸AN, Erkan YILDIRIM- This paper focuses on a new efficient method denoted as Complex-Valued Artificial Neural Network with Complex Wavelet Transform (CWT-CVANN) for the segmentation of lung region on chest CT images. In this combined architecture is composed of two cascade stages: feature extraction with various levels of complex wavelet transform and segmentation with complex-valued artificial neural network Each CT slice used in this study has dimensions of 752×752 pixels with grey level) In only two seconds of processing time per each CT image, 99.79% averaged accuracy rate is obtained using 3rd level CWT-CVANN for segmentation of the lung region. Thus, it is concluded that CWT-CVANN is a comprising method in lung region segmentation problem.

Study of Classification Algorithm for Lung Cancer Prediction- Dr.T.ChristopherP P, J.Jamera banuP this paper analyzed the lung cancer prediction using classification algorithm such as Naive Bayes, Bayesian network and J48 algorithm. Initially 100 cancer and noncancer patients' data were collected, preprocessed and analyzed using a classification algorithm for predicting lung cancer. The dataset have 100 instances and 25 attributes. The main aim of this paper is to provide the earlier warning to the users and the performance analysis of the classification algorithms.

Study of Techniques used for Medical Image Segmentation and Computation of Statistical Test for Region Classification of Brain MRI Anamika Ahirwar - In the paper; Segmentation and characterization of Brain MR image regions using SOM and neuro fuzzy techniques, we integrate Self Organizing Map(SOM) and Neuro Fuzzy scheme to automatically extract WM, GM, CSF and tumor region of brain MRI image tested on three normal and three abnormal brain MRI images. Now in this paper this scheme is further tested on axial view images to classify the regions of brain MRI and compare the results from the Keith,,s database. Using some statistical tests like accuracy, precision, sensitivity, specificity, positive predictive value, negative predictive value, false positive rate, false negative rate, likelihood ratio positive, likelihood ratio negative and prevalence of disease we calculate the effectiveness of the scheme.

Genetic Algorithm Parameter Optimization using Taguchi Robust Design for Multi-response Optimization of Experimental and Historical Data -Abhishek Majumdar , Debashis Ghosh- This paper presents a methodology for robust optimization of Genetic Algorithm (GA) involving complex interactions among the control parameters. Finding the Optimum GA parameters to solve an optimization problem for producing best results with least variability is still an open area of research. The proposed research approach

primarily covers the robust optimization of Genetic Algorithm control parameters using Taguchi Design of Experiment (DOE) with a special set of L25 orthogonal array (OA). The experimental design and the study is conducted with MATLAB Genetic Algorithm internal control parameters using real-coded Genetic Algorithm fitness functions operates directly on real values of two different case studies.

Artificial Neural Networks in Evaluation and Optimization of Modified Release Solid Dosage Forms Svetlana Ibrić , Jelena Djuriš, Jelena Parojčić and Zorica Djurić - . The aim of this paper is to review artificial neural networks in evaluation and optimization of modified release solid dosage forms.

Artificial Neural Networks for Surface Ozone Prediction: Models and Analysis Hossam Faris1, Mouhammd Alkasassbeh, Ali Rodan - In this paper, prediction of the surface ozone layer problem is investigated. A comparison between two types of artificial neural networks (ANN) (multilayer perceptron trained with backpropagation and radial basis functions (RBF) networks) for short prediction of surface ozone is conclusively demonstrated. Two models that predict the expected values of the surface ozone based on three variables (i.e. nitrogen-di-oxide, temperature, and relative humidity) are developed and compared.

Graph Cut Based Automatic Lung Boundary Detection in Chest Radiographs - Sema Candemir, Stefan Jaeger, Kannappan Palaniappan, Sameer Antani, and George Thoma- In this paper, we present a graph cut based robust lung segmentation method that detects the lungs with high accuracy. The method consists of two stages: average lung shape model calculation, and lung boundary detection based on graph cut. Preliminary results on public chest x-rays demonstrate the robustness of the method.

Ant Colony Optimization in Diverse Engineering Applications: an Overview R. Geetha G. Umarani Srikanth- This survey provides an overview of past and on-going research of ACO in diverse engineering applications pertaining to computer science fields such as mobile and wireless networks, sensor networks, grid computing, P2P Computing, Pervasive computing, Data mining, Software engineering, Database systems, Multicore Processing, Artificial intelligence, Image processing, Biomedical applications and also other domains relevant to Electronics and Electrical Engineering fields. We finally summarize the comprehensive study of applications in all these fields deployed ACO.

Iris Recognition System And Analysis Using Neural Networks - Dr. Sanjay R. Ganorkar Mirza Shujaur Rahman - The iris recognition technique consists of iris localization, normalization, encoding and comparison. The Neural Classifier will be a feed forward network with three hidden layers and be used after normalization and feature extraction phase. Simulation results will be very promising in person identification.

IRIS Recognition System using Neural Network and Genetic Algorithm V. Saishanmuga Raja , S.P.Rajagopalan Ph.D., - In this paper the author proposes a method for personal identification based on iris recognition using genetic algorithm . The simulation result show a good identification rate and reduced training time.

A COMPARATIVE ANALYSIS OF OPTIMIZATION TECHNIQUES FOR ARTIFICIAL NEURAL NETWORK IN BIO MEDICAL APPLICATIONS - V. Saishanmuga Raja and S.P. Rajagopalan - In this study we compare the performance of three evolutionary algorithms such as Genetic Algorithm (GA) Particle Swarm Optimization (PSO) and Ant-Colony Optimization (ACO) which are used to optimize the Artificial Neural Network (ANN). Optimization of Neural Networks improves speed of recall and may also improve the efficiency of training. Here we have used the Ant colony optimization, Particle Swarm Optimization and Genetic Algorithm to optimize the artificial neural networks for applications in medical image processing (extraction and compression). The aim of developing such algorithms is to arrive at near optimum solutions to large-scale optimization problems, for which traditional mathematical techniques may fail. This study compares the efficiency and results of the three evolutionary algorithms. We have compared these algorithms based on processing time, accuracy and time taken

to train Neural Networks. The results show that the Genetic Algorithm outperformed the other two algorithms. This study helps researchers to get an idea of selecting an optimization algorithm for configuring a neural network.

Neural networks using Genetic algorithms- Richa Mahajan , Gaganpreet kaur - Combining neural network with evolutionary algorithms leads to evolutionary artificial neural network. Evolutionary algorithms like GA to train neural nets choose their structure or design related aspects like the functions of their neurons. Along basic concepts of neural networks and genetic algorithm this paper includes a flexible method for solving travelling salesman problem using genetic algorithm. This offers a solution which includes a genetic algorithm implementation in order to give a maximal approximation of the problem with the reduction of cost.

Selecting a Best Architecture of an Artificial Neural Network Using Genetic Algorithm for Lung Segmentation Saishanmuga raja V. and Rajagopalan SP - This paper introduces a hybrid approach in selecting a best architecture of artificial neural network using genetic algorithm. Neural networks are powerful tools for classification and regression, but it is time consuming and costly to determine the best architecture. Artificial Neural Networks are widely used for segmentation of tissues and structures from medical image. Objective: Through this study we prove the effectiveness of the Neuro-Genetic approach in selecting a best architecture of MLP neural network which is used in medical image segmentation, treatment plans, and evaluation of disease progression

A New Approach to Lung Image Segmentation using Fuzzy Possibilistic C-Means Algorithm- M.Gomathi , Dr.P.Thangaraj - This paper presents an image segmentation approach using Modified Fuzzy C-Means (FCM) algorithm and Fuzzy Possibilistic c-means algorithm (FPCM). This approach is a generalized version of standard Fuzzy CMeans Clustering (FCM) algorithm. The limitation of the conventional FCM technique is eliminated in modifying the standard technique. The Modified FCM algorithm is formulated by modifying the distance measurement of the standard FCM algorithm to permit the labelling of a pixel to be influenced by other pixels and to restrain the noise effect during segmentation. Instead of having one term in the objective function, a second term is included, forcing the membership to be as high as possible without a maximum limit constraint of one. Experiments are conducted on real images to investigate the performance of the proposed modified FCM technique in segmenting the medical images. Standard FCM, Modified FCM, Fuzzy Possibilistic CMeans algorithm (FPCM) are compared to explore the accuracy of our proposed approach.

A Neuro-Genetic System for Face Recognition - Saishanmuga raja V. and Rajagopalan SP The proposed approach uses Neural and Genetic algorithm that overcomes low recognition rate, low accuracy and increased time of recovery. Optimization of neural network parameters is done using Genetic algorithm. This increases recognition accuracy and reduced training time.

Iris Recognition System And Analysis Using Neural Networks - Dr. Sanjay R. Ganorkar Mirza Shujaur Rahman - It is found that this method for Iris Recognition design offers good class discriminacy. The iris recognition technique consists of iris localization, normalization, encoding and comparison. The Neural Classifier will be a feed forward network with three hidden layers and be used after normalization and feature extraction phase. Simulation results will be very promising in person identification.

Table 1 : Comparative table for various ARTIFICIAL NEURAL NETWORKS by various authors

No	Title	Year	Author	Method	Advantage
1	A New Approach to Lung Image Segmentation using Fuzzy Possibilistic C-Means Algorithm	2010	M.Gomathi , Dr.P.Thangaraj	Fuzzy logic and Clustering Algorithm	• Tested on real images to implement the accuracy. • False positive and False negative ratio

					are determined.
2	A novel method for lung segmentation on chest CT images: complex-valued artificial neural network with complex wavelet transform .	2010	Murat CEYLAN, Yuksel OZBAY, O. Nuri UC¸AN, Erkan YILDIRIM	Complex-Valued Artificial Neural Network with Complex Wavelet Transform	• Able to make searching in the interested region only. • Complex discrete wavelet transform was used to reduce the size of input matrix of training and test images.
3	Lung Image Database Consortium and Image Database Resource Initiative : a complete reference database of lung nodules on CT scans	2011	Aramto , SG, McLennan, G,Bidaut,MF, Meyer,CR,Reeves	Lung Image Database Consortium (LIDC) and Image Database Resource Initiative (IDRI)	• Useful in CAD development, validation, and dissemination in clinical practice.
4	A Neuro-Genetic System for Face Recognition	2012	Saishanmuga raja V. Rajagopalan SP	Neuro-Genetic Algorithm	• Reduces the training time of the neural network. • And also reduces computational complexity.
5	Ant Colony Optimization in Diverse Engineering Applications: an Overview	2012	R. Geetha G. Umarani Srikanth	Grid and P2P computing	• Feasible task assignment solution and lowers the energy consumption
6	Graph Cut Based Automatic Lung Boundary Detection in Chest Radiographs	2012	Sema Candemir, Stefan Jaeger, Kannappan Palaniappan, Sameer Antani, and George Thoma	Graph cut method	• calculates the lung models in a simple and an effective way.
7	Artificial Neural Networks in Evaluation and Optimization of Modified Release Solid Dosage Forms	2012	Svetlana Ibrić , Jelena Djuriš, Jelena Parojčić and Zorica Djurić	Response Surface Methodology (RSM)	• The results obtained using this network were better, there were still shifting values of predicted drug release profiles compared to experimentally observed values at later time points.
8	Enhancement of Voltage Stability by Optimal Location of Static Var Compensator Using Genetic Algorithm and Particle Swarm Optimization	2012	Kalaivani, R. and V. Kamaraj	Particle Swarm Optimization(PSO) and Genetic Algorithm	• Minimize the object function • GA results are better than that of PSO and conventional methods.

9	A Neuro-Genetic System for Face Recognition	2012	V.Saishanmuga Raja, Dr.S.P.Rajagopalan	Optimization using Genetic algorithm	• Training time of neural network is reduced when it is optimized using genetic algorithm when compared with neural network without neural network
10	Neural networks using Genetic algorithms-	2013	Richa Mahajan , Gaganpreet kaur	Genetic algorithm and Cost matrix	• GA helps to generate better population from good parents, these results close to global optimum. • Important character of GA, it is robust.
11	IRIS Recognition System using Neural Network and Genetic Algorithm	2013	V. Saishanmuga Raja , S.P.Rajagopalan Ph.D.,	Genetic Algorithm	• High accuracy and reduce learning time.
12	Iris Recognition System And Analysis Using Neural Networks	2013	Dr. Sanjay R. Ganorkar Mirza Shujaur Rahman	Artificial Neural Network and Back prorogation Neural network	• Classification using neural networks gives best results. • This method has high accuracy rates.
13	Artificial Neural Networks for Surface Ozone Prediction: Models and Analysis	2013	Hossam Faris, Mouhammd Alkasassbeh, Ali Rodan	Multi layer perceptron(MLP)	• Short term prediction are used • good estimation and prediction capabilities in training and testing cases.
14	Study of Techniques used for Medical Image Segmentation and Computation of Statistical Test for Region Classification of Brain MRI	2013	Anamika Ahirwar	Atlas- guided approach, Confusion matrix	• automatically classifies the regions into WM, GM, CSF and tumor. • Effectiveness can be checked by applying statistical test
15	A Study of Detection of Lung Cancer Using Data Mining Classification Techniques	2013	Ada , Rajneet Kaur	Support Vector Machine(SVM), Neural networks	• Classification methods are highlighted
16	PARTICLE SWARM AND NEURAL NETWORK APPROACH FOR FAULT CLEARING OF MULTILEVEL INVERTERS	2013	Sivakumar, M. and R.M.S. Parvathi	Particle Swarm Optimization(PSO) and Ps-Neural Network for Diagnosis Faults	• PS-neural network system correctly detects and identifies all the faulty classes in less time than the single PS-Neural network system.
17	A COMPARATIVE ANALYSIS OF OPTIMIZATION TECHNIQUES FOR ARTIFICIAL NEURAL NETWORK IN BIO	2014	V. Saishanmuga Raja and S.P. Rajagopalan	Feed-Forward artificial neural networks, Particle swarm optimization and Ant colony optimization	• Increased accuracy, Training time and Testing time. • the Genetic algorithm is most suitable for training

	MEDICAL APPLICATIONS				the neural network with minimum time and minimum mean square error
18	AUTOMATIC SEGMENTATION OF LUNG CT IMAGES BY CC BASED REGION GROWING	2014	A.PRABIN , DR.J.VEERAPPAN	Contextual Clustering	• Effective segmentation of the CT lung image • The use of region growing along with the supervised contextual clustering.
19	Selecting a Best Architecture of an Artificial Neural Network Using Genetic Algorithm for Lung Segmentation	2015	Saishanmuga raja V. and Rajagopalan SP	Neuro-Genetic Algorithm	• This approach is effective for segmenting deep brain structures in 3D
20	Genetic Algorithm Parameter Optimization using Taguchi Robust Design for Multi-response Optimization of Experimental and Historical Data	2015	Abhishek Majumdar , Debashis Ghosh	Parameter Optimization, ANOVA method	• Signal-to-Noise ratio is calculated for the Nominal-The-Best type problem, which have been incorporated in the MATLAB GA code.
21	Detection of Lung Nodule from Computed Tomography Images	2015	M.Sundar Raj, S.Sanjay	Computer Aided Diagnosis(CAD) and Support vector machine	• Taking precise decision based on different classification images are possible. • Various techniques like Enhancement, Segmentation and feature extraction are used.
22	Study of Classification Algorithm for Lung Cancer Prediction	2016	Dr.T.ChristopherP P, J.Jamera banuP	WEKA tool	• Lung cancer prediction system can be further enhanced and expanded. • It can also incorporate other data mining techniques, e.g., Time Series, Clustering and Association Rules.

Table 2: Comparative various Artificial Neural Networks Technique with resource constraints

Scheme	Energy Consumption	Memory	Computation	Processing Time
Particle Swarm Optimization(PSO)	✓	✓		✓
Support Vector Machine(SVM)		✓	✓	
WEKA tool	✓		✓	✓
ANOVA method		✓		✓
Response Surface Methodology (RSM)		✓	✓	✓
Graph cut method	✓	✓	✓	
Artificial Neural Network(ANN)	✓	✓	✓	✓
Genetic Algorithm(GA)		✓	✓	
Ant colony optimization	✓	✓	✓	✓
Neuro-Genetic Algorithm		✓		✓
Fuzzy logic and Clustering Algorithm	✓		✓	

Conclusion:

In this paper, analysis of various techniques on various algorithms was done. This survey is useful for the future researchers to come up with best algorithms on different medical images and different mechanism that working with less energy consumption, less memory and less computation and make classification of medical images better to identify the symptoms at the earlier to predict the diseases .

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