Genetic Algorithm and their applicability in Medical Diagnostic: A Survey

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Abstract— A genetic algorithm (Machine Learning approach) is one of the most important heuristic search techniques from Evolutionary programming languages. This paper is not anticipated to provide an inclusive overview but rather describe some subareas of medical diagnoses techniques like image processing, ECG with genetic algorithms and Artificial neural networks. The survey of this paper leads to the conclusion that the field of medical diagnosis currently uses genetic algorithms and its application increases day by day. The regular improvement of genetic algorithms will definitely help to solve various complex medical diagnoses application and medical image processing tasks in the future. Brain tumor or any other tumor detection is an important and needed challenging area in medical diagnosis field.

Keywords— GA (Genetic Algorithm), (EA) evolutionary algorithms, global optimization problem, QRS

1 Introduction

Genetic Algorithm is a Machine learning technique ues to find estimated solutions to search problems through significance of the ideology of heuristic search (Evolutionary biology. Genetic Algorithms (GAs) was reintroduced by Prof. John Holland (University of Michigan) during the 1960s era. [1-2] Genetic algorithms provide an inclusive search method for machine learning and optimization. It has been shown to be competent and powerful through many big data mining applications that use optimization and classification.

Genetic algorithms implemented in superior class of evolutionary algorithms (EA), which provide optimize solutions to problems using techniques stirred by natural evolution like mutation, inheritance, selection and crossover.

Medical diagnostic field uses machine learning techniques & algorithms such as Genetic Algorithms for the prediction of any diagnosis of disease. Basically Feature extraction & Classification based on genetic algorithm was proposed by [3]. They represented classification and feature extraction for high dimensionally pattern using genetic algorithm by their research work.

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2 Genetic Algoritm

In the early 1970, Holland proposed Genetic Algorithm using the concept of Darwin's theory of survival fittest and natural selection. Today a Genetic algorithm is extensively used in engineering, business, scientific area. We can get better solution of the previous answer but cannot get new solution. Feature selection is one of the most important search methods. The new better solution of previous result is only in contrast to other solutions. As a result, the stop measure is not clear in each problem. Genetic algorithms are generally used to spawn high-quality solutions to search and optimization problems by relying on biological stimulated operators like crossover, selection & mutation [1].

Structure of GA
{
First we initialize the population;
Then evaluate it;
Loop start while not reached the termination decisive factor
{
Choose solution for next;
Now do crossover;
Perform mutation;
Evaluate population;
}

3 Literature Survey

[4] Proposed a new algorithm for image segmentation. It is based on a genetic approach that allows user to consider the segmentation problem as a global optimization problem (GOP). A fitness function, based on the similarity between images, has been defined. The similarity is a function of both the intensity and the spatial position of pixels. Prelude results, obtained using real images, show a good performance of the segmentation algorithm.

[5] Proposed an architecture using genetic algorithms to predict diabetes symptoms in patient by using medical and personal condition.

[6] Proposed a hybrid Neuro-Genetic system for stock trading. They examine the system with 36 companies in stock exchange from 1992 to 2004. They used a recurrent neural network as a prediction model. They also optimize the weights of the neural network by Genetic Algorithm. The hybrid system showed prominent improvement on the average over the buy and hold approach.

[7] Used Genetic algorithm and Decision Tree data mining technique in their model to reduce the number of tests which were needed to be taken by a heart patient.

[8] Proposed architecture supported with genetic evolution to predict the heart attack.

[9] Proposed data mining and fuzzy system based techniques for incurable Type-2 diabetes disease. They used Genetic algorithms optimization of chromosome to restrict in new population to get chromosomal accuracy from old rate of old population diabetes.

[10] proposed diagnosis system for predicting the risk of heart disease (like Cardiovascular). They use Genetic Algorithms and multilayered neural network. In this work, Genetic algorithms used for determining the weights of NN, Because genetic algorithms finds tolerably good set of weights in fewer iterations.

[11] Proposed an improved hybrid genetic algorithms and multilayer perception in their study to get better accuracy of the intelligent diseases diagnostic system. They also proposed a novel crossover technique that is SMCC (Segmented multi-chromosome crossover) that allows offspring to inherit information from multiple parent chromosomes with maintaining the information contained in gene segments.

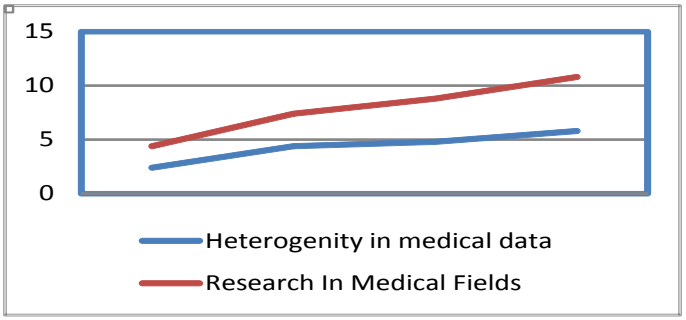
4 Medical Diagnosis

Currently Medical field and health care generated very large and complex data. Heart disease and cancer are the general cause of human death in the present world. Medical Data abstraction has been a great prospective for exploring hidden patterns in data sets of health care domain. Different classification techniques and data mining generate needful information that can play important for effective immunization and treatment. As population increasing rapidly, different types of disease also increased so their diagnosis is also important and complex task

5 Application for Medical Image processing

Image enhancement & classification is an important component of digital and medical image analysis. We can classify them as supervised an unsupervised. We use supervised classification tools for extracting quantitative information from the pruning image. Unsupervised classification uses clustering techniques and algorithms to classify data. A low level image processing job that aims at partitioning an image into homogeneous regions is segmentation.

Fig. 1 Progress in Medical Diagnosis



New Technology applied in Image Processing Techniques for Medical Diagnosis

- Image pruning techniques based on Neural Network.
- Statistical approach for texture analysis.
- Image Processing based on Expert system.
- Multispectral classification techniques.
- Fractals and Discrete Cosine Transformers techniques for Data compression.

TABLE 1 Previous Reseach work Analysis

Author	Year	Techniques	Invention
Anbarasi et. al	2010	Genetic Algo	Reduce the number of ECG test
Kiran et al	2011	Genetic Algo	Predict the Heart Attack
M Jafari[12]	2012	Genetic Algo	Automatic Tumor Detection
A Kaur[13]	2013	Genetic Algo	identify the image areas that can have maximum chances of tumor
I Bala	2014	Genetic Algo	Brain Tumor detection
G R Chandra [14]	2014	Genetic Algo	extract the abnormal tumor portion in brain

6 DIAGNOSIS of tumor through Genetic Algorithm

Human Body is composition of many cells. Each cell has precise duty. Brain tumors are self-possessed of cells that exhibit uncontrolled growth in the brain. Brain tumors can be either cancerous or non-cancerous.

6.1 Cancerous Tumor

Cancerous (Malignant) tumors are formed from unwanted cells that are highly unbalanced and travel through the blood stream, circulatory and lymphatic system. This tumor can also reoccur after they are removed.

6.2 Non Cancerous Tumor

A non-cancerous (Benign) brain tumor is a mass of cells that grows slowly in the brain. It usually stays in one place and doesn't spread in body.

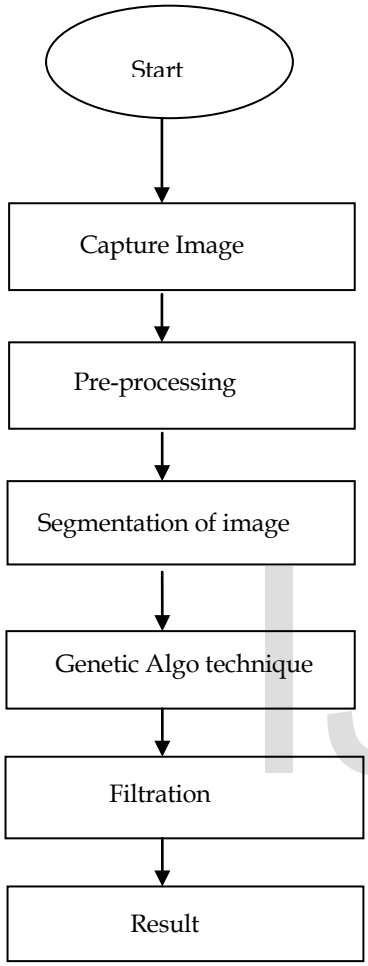


Fig 2: Basic flow for detection of tumour

7 Future Work and Conclusion

In this paper, we review Genetic Algorithms and their applicability in various fields of medical diagnosis. Due to the natural intricacy of medicine, optimization methods could be of great value for medical researchers and physicians. Researchers adopt GAs to solve a very big assortment of simple and difficult tasks. Every approach is unique, with different information encoding types, reproduction and selection schemes. So we hope that in future. Genetic algorithm will be played very important role in medical diagnosis

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