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Cancer Detection: Survey

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Abstract— Skin cancer is the most prevalent cancer in the light-skinned population and it is generally caused by exposure to ultraviolet light. Early detection of skin cancer has the potential to reduce mortality and morbidity. Cancer is class of disease characterized by out-of-control cell growth. This paper present a survey of different type of cancer such as skin cancer ,breast cancer, Pancreatic cancer detection using different advanced technology such as Improved Genetic Algorithms, Artificial Neural Network, Hierarchical Clustering, Neuro-Fuzzy system, Raman Spectra. And we study all this technique to find such technique which provide a more accuracy.

Keywords— Neural Network, Improved Genetic Algorithm, Neuro-Fuzzy, Hierarchical Clustering, Raman Spectra.

I. INTRODUCTION

Skin cancer is the uncontrolled growth of abnormal skin cells. It occurs when unrepaired DNA damage to skin cells (most often caused by ultraviolet radiation from sunshine) triggers mutations, or genetic defects, that lead the skin cells to multiply rapidly and form malignant tumors. Skin diseases are now very common all over the world. For example the number of people with skin cancer has doubled in the past 15 years. "Currently, between 2 and 3 million non-melanoma skin cancers and 132,000 melanoma skin cancers occur globally each year. One in every three cancers diagnosed is a skin cancer and, according to Skin Cancer Foundation Statistics, one in every five Americans will develop skin cancer in their lifetime" [2]. Different kinds of allergies are also becoming more common. Many of these diseases are very dangerous, particularly when not treated at an early stage. Dermatologists have at their disposal large catalogues with pictures of skin segments, which they use as a reference for diagnosis of their patients cases' skin ailments [4].However it may be difficult even for experienced doctors, to make correct diagnosis because many symptoms look very similar to each other, even though they are caused by different diseases. All details such as color, size or density of the skin changes are important. Modern medicine is looking for solutions, which could help doctors with any aspect of their work using the new technology. Such tools already exist, to our knowledge they concentrate on analysis of the color of skin changes and UV photography [5]. Although these tools are commercially available, there seems to be a lot of room for further improvement. The goal of this project is to make a system to recognize skin diseases using Artificial Neural Networks (ANNs) and Genetic Algorithm (GA).After testing both methods results will be compared. System should learn from the set of skin segments images taken by digital camera. After that it should return the probability of existence of any recognized disease, based on the same type of image made by user. Images should have the same size and should be taken from the same distance. Some practical study may display need of using other information (not only pictures) to train the network, for example part of the body where the symptoms were found or if the patient feels pain or tickle. Program can also provide some tools that will be found as useful during the study. Artificial Neural Networks are one of the most efficient methods for pattern recognition [11, 10,]. They are used as a model for simulation of the workings of a brain. They cannot replace a doctor, but ANNs can help him in diagnosis [12]. Also SVM is used for pattern recognition and is achieving good accuracy. It expands very quickly and is more and more popular. It can be very useful in many types of applications, also in dermatology.

A. Computer science in medicine

Computer science has been widely adopted by modern medicine. One reason is that an enormous amount of data has to be gathered and analyzed which is very hard or even impossible without making use of computer systems. The majority of medical tools are able to send results of their work directly to a computer facilitating significantly collection of necessary information. Computer systems can also lower the risk of misdiagnosis. In the experiment described in an ANN-trained computer, an experienced dermatologist and an inexperienced clinician with minimal training were diagnosing melanoma. Results of the first two diagnoses were similar and were also better than the results of the inexperienced clinician. It shows that computer-aided diagnosis can be a very helpful tool, particularly in areas which lack experienced specialists. A large number of such tools already exist and they provide an aid to the doctors in their everyday work. In this paper we are concerned with dermatology, ANNs and SVM, therefore some tools applied in this area will be described.

II. LITERATURE REVIEW

A. Evaluation of Breast Cancer Susceptibility Using Improved Genetic Algorithms

When A genetic algorithm (GA) is developed to detect the association of genotype frequencies of cancer cases and

noncancerous cases based on statistical analysis. An improved genetic algorithm (IGA) is proposed to improve the reliability of the GA method for high-dimensional SNP-SNP interactions. The strategy offers the top five results to the random population process, in which they guide the GA toward a significant search course. The IGA increases the likelihood of quickly detecting the maximum ratio difference between cancer cases and noncancerous cases. The study systematically evaluates the joint effect of 23 SNP combinations of six steroid hormone metabolisms, and signaling-related genes involved in breast carcinogenesis pathways were systematically evaluated, with IGA successfully detecting significant ratio differences between breast cancer cases and noncancerous cases.

B. An Approach to Pancreatic Cancer Detection using Artificial Neural Network

This section present artificial neural network in pancreatic disease diagnosis based on a set of symptoms. The real procedure of medical diagnosis which usually is employed by physicians was analyzed and converted to a machine implementable format. This paper presents an approach to detect the various stages of pancreatic cancer affected patients. Outcome suggests the effectiveness of using neural network over manual detection procedure.

This paper presented a neural network based approach for pancreatic cancer diagnosis. Pancreatic cancer detection in its early stage is the key of its cure. The automatic diagnosis of pancreatic cancer is an important, real-world medical problem. In this paper it has shown how neural networks are used in actual clinical diagnosis of pancreatic cancer. Neural network model, a diagnostic system that performs at an accuracy level is constructed here. In this work, the performance of neural network structure was investigated. The designed system uses a set of fuzzy values incorporated into neural network system is more precise than the normal system. The system designed is an interactive system that informs the patient his current condition as regards pancreatic cancer. The prediction could help doctor to plan for a better medication and provide the patient with early diagnosis. The best performance and correct diagnosis was achieved using fuzzified symptoms and neural network with 20 neurons. Experimental results indicate that the proposed method can analyze data more efficiently than other manual methods. Future works should test the approach used for other similar tasks or other related data sets to evaluate its capability to produce a similar accuracy with IGA successfully detecting significant ratio differences between breast cancer cases and noncancerous cases.

C. Artificial Neural Network Based Detection of Skin Cancer

One advanced technology is the early detection of skin cancer using Artificial Neural Network. The diagnosing methodology uses Image processing techniques and Artificial Intelligence. The Dermoscopic image of skin cancer is taken and it is subjected to various pre-processing for noise removal and image enhancement. Then the image is undergone image segmentation using Thresholding. There are certain features unique for skin cancer regions. Such features are extracted using feature extraction technique - 2D Wavelet Transform method. These features are given as the input nodes to the neural network. Back-Propagation Neural (BPN) Network is used for classification purpose. It classifies the given data set into cancerous or non-cancerous.

Advantage: The proposed system is proved to be much convenient than the conventional Biopsy method. Since this method is Computer Based Diagnosis, there is no need for any skin removal for diagnosis. It requires only the Dermoscopic image. This methodology has got good accuracy also. By varying the Image processing techniques and Classifiers, the accuracy can be improved for this system.

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D. *Skin Cancer Recognition by Using a neuro-Fuzzy system*

Image processing techniques, a neural network system (NN) and a fuzzy inference system were used in this study as promising modalities for detection of different types of skin cancer. The accuracy rate of the diagnosis of skin cancer by using the hierarchal neural network was 90.67% while using neuro-fuzzy system yielded a slightly higher rate of accuracy of 91.26% in diagnosis skin cancer type. The sensitivity of NN in diagnosing skin cancer was 95%, while the specificity was 88%. Skin cancer diagnosis by neuro-fuzzy system achieved sensitivity of 98% and a specificity of 89%.

The results of testing the studied sample of images by using hierarchal NN system gave 90.67%, accuracy, while using neuro-fuzzy system gave better results than using the hierarchal NN system alone, with accuracy rate of 91.26%. Image processing is the primary foundation of this study, and the concept of improving the means of extracting features of the skin image is the main recommendation for researchers to follow in the future. The output of both hierarchal NN and neuro-fuzzy systems depends on these features. The more accurate these feature are, the better the results will be.

E. *Exploratory Consensus of Hierarchical Clustering for Melanoma and Breast Cancer*

Clustering is used to provide a hypothesis for the subtypes of a heterogeneous disease. However, there are usually discrepancies between the clustering produced by different algorithms. This work introduces a simple method which provides the most consistent clusters across three different clustering algorithms for a melanoma and a breast cancer data set. The method is validated by showing that the Silhouette, Dunne's and Davies-Bouldin's cluster validation indices are better for the proposed algorithm than those obtained by k-means and another consensus clustering algorithm. The hypotheses of the consensus clusters on both the data sets are corroborated by clear genetic markers and 100 percent classification accuracy.

A new method has been introduced for obtaining clusters in a data set (e.g., subtypes of a disease) by taking an exploratory "consensus" of a number of hierarchical clustering algorithms. Each cluster obtained by this method corresponds to sub trees of similar sizes in different hypothesized trees which agree on their elements, but may differ on the exact topology. This allows us to get rid of the general approach of cutting trees at certain heights and finding

clusters. This method also does not need to have any previous knowledge about the number of clusters unlike some other methods like k-means algorithm. In the future, this method will be further explored by using more clustering algorithms. The hypothesis on melanoma and breast cancer will be also validated by using other data sets[2].

F. *Detection of Skin Cancer by Classification of Raman Spectra*

Skin lesion classification based on in vitro Raman spectroscopy is approached using a nonlinear neural network classifier. The Classification framework is probabilistic and highly automated. The framework includes a feature extraction for Raman spectra and a fully adaptive and robust feed forward neural network classifier. Moreover, Classification rules learned by the neural network may be extracted and evaluated for reproducibility, making it possible to explain the class assignment. The Classification performance for the present data set, involving 222 cases and five lesion types, was 80.5% 5.3% correct Classification of malignant melanoma, which is similar to that of trained dermatologists based on visual inspection. The skin cancer basal cell carcinoma has a Classification rate of 95.8% 2.7%, which is excel- lent. The overall Classification rate of skin lesions is 94.8% 3.0%. Spectral regions, which are important for network Classification, are demonstrated to reproduce. Small distinctive bands in the spectrum, corresponding to specific lipids and proteins, are shown to hold the discriminating information which the network uses to diagnose skin lesions.

By applying this framework on the present data set, involving 222 cases and five classes, the Classification rate was 80.5% 5.3% correct Classification of MM, similar rates as obtained with visual inspection by experts in dermatology [6]. The most common skin cancer, BCC, had a Classification rate of 95.8% 2.7%, which is excellent. Taking both malignant lesion types as one group the networks classified 94.2% 3.1% of the cancer lesions correctly. The overall classification rate of skin lesions was 94.8% 3.0%. Sensitivity maps were shown to be a powerful tool for visualizing the learning of feed forward network. They were shown to reproduce and important frequency bands were identified, corresponding to specific lipids and proteins[3].

III. CONCLUSIONS

To conclude this paper; we have present a survey of different type of cancer such as skin cancer, breast cancer, Pancreatic cancer. And this cancer is detected using different advanced technology. In Future to find more accuracy for detecting the skin cancer we used Genetic Algorithm (GA) and Neural Network. This system dealt with feature selection and classification. There are certain features unique for skin cancer regions. Such features are extracted using genetic algorithm. These features are given as the input nodes to the neural network. Back-Propagation Neural (BPN) Network is used for classification purpose. It classifies the given data set into cancerous or non-cancerous.

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