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Identification of Diagnostic Expert System in Bioinformatics to Cut Down the Medication Prescription Errors.

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ABSTRACT

Diagnostic expert System is a better way for improving diagnostic support decisions and performance with relevant to defined medical knowledge and patient information, to improve the early detection and to provide better treatment for harmful diseases like different types of cancer, heart disease and diabetes. Due to Manual decision making Medication prescription Errors have always often in patient diagnostic systems, so new techniques should be enhanced to cut down them is very necessary to facilitate enhanced performance. Our proposed method, aims to implement DES and Electronic Patient Records (EPRs), so we can cut down medication prescription errors, harmful side effects of frequent scans, other practical medication errors. Here, We proposed modules for context extraction from Clinical and imaging sources with Probabilistic Neural Network can be used to provide better diagnostic recommendation that eliminating the number of additional scans and blood tests while maintaining reliability of the results. The fuzzy logic system compares the real-time patients records with findings of past patient reports and other demo graphical factors (age, location of the patient, hereditary etc). DESs will be most useful in the near by future when diagnosis systems facilities are thoroughly electronic in terms of real-time patient medication, thus cut down the number of frequent scans and modification to ensure that all the systems are up to date in all cases.

Keywords: Diagnostic Expert System, Electronic Patient Records, Medication Prescription Error, Context Extraction

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INTRODUCTION

Lung cancer is the most dangerous to cause death among both men and women. More people die of lung cancer than that of other types. The lung cancer is caused by smoking. Most lung cancers are detected only any of the following symptoms occurs like suffocation of breath, coughing with blood, weight loss etc but at that time, it is too late to rescue the patient from death. Nowadays medication prescription errors are very high due to the inefficiency of manual analysis which fails to accurately find out the border line cases of complex diseases like cancer, heart disease and diabetics. Border line cases means the early stage of the disease. In early stages the symptoms are less or there is no symptoms. If we fails to detect them in early ,it will leads to death . And the findings from scan report varies from one radiologist to other. There is also possibilities for false negatives and false positives. So it is important to design a intelligent diagnostic system to avoid the above mention medication prescription errors. In this paper we aims to minimize such errors by replacing the manual analysis of diagnostic system in to electronic diagnostic system. The objectives of this paper is given below.

- To reduce false positive and false negative ratio.
- To improve the reliability and accuracy of the decision making in diagnostic system.
- To reduce the additional test and scans while maintaining the accuracy of the system
- The variation lies among physicians and radiologist should be minimized with maximum reliability.
- To provide error free and hassle free treatment and classification techniques to categorize various stages of lung cancer.

By using the classification and clustering algorithms of data mining the scanned image and data sets will be analyzed and it may be useful to categorize the stages like in lung cancer TYPE-I to Type-IV and also borderline stage of such complex diseases[1-3]. This proposed technique aims to develop a probabilistic fuzzy logic ,the input given to the system may be Contextual information extracted from the scanned image, Electronic health records of the current and old patients, factors like age ,hereditary ,location etc. The output provided by this fuzzy logic will be the result which include current stage of the lung cancer.

Doctors use several tests to find out the stage lung cancer, including blood tests, X-rays, CT scans, bone scans, and PET scans[4][5][6]. Some abnormal blood chemistry test also one of the signs to identify the spread of cancer in the bone or liver. Radiological reports simply having the size of a tumor and also its growth in other organs.

Non-small cell lung cancers (NSCLC) are involving stage from I to IV in order of severity.

- In stage I, the cancer is limited to the lung itself.
- In stages II and III, the cancer is also to the lung and, sometimes having the lymph nodule.
- Stage IV cancer has introduced or spread to outside of the lung to other organs.

Small cell lung cancers (SCLC) are classified in to two types:

- In the Limited stage (LS) SCLC cancer is limited to the lung and lymph nodes.
- At extensive-stage (ES) SCLC, the cancer has introduced beyond the to other parts of the body.

RELATED WORK

(a)Computer-aided diagnosis (CAD) system for lung cancer using image source: The input of a CAD system is the medical image of chest X-rayed image. The first step is used to minimize the search space for lung nodules, hence the affected node is detected. . The detected nodules are segmented. Then, trained data set having the context , such as density, size, appearance features, are extracted and used for diagnosis. The feature extraction of lung tissues on chest images is a first step in developing the CAD system . Then the diagnosis decisions are made according to the output of the CAD System[7][8].

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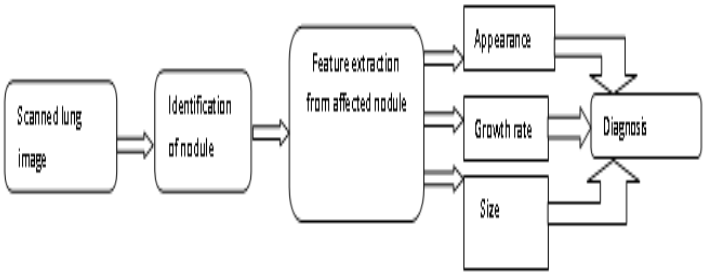

Fig.1.Typical CAD System using X-rayed Image as source

(b)Computer aided diagnostic system uses artificial neural networks: A computer aided diagnostic system uses artificial neural networks do classify the cancerous and non cancerous patients. The input of this Neural network is feature extraction from the real time patient information, past findings, demo graphical factors like age, living place, hereditary information etc and the hidden layer is the classification or clustering layer. The output layer produce the result severity of the disease and the accurate stage of the disease[9][10].

(c) Computer aided diagnostic System with Thresholding And Fuzzy Clustering Algorithm: The easiest image processing method is Thresholding method which uses Threshold value. It is used to change the gray-scale image in to binary image. There are plenty of popular methods are used including the maximum entropy method, Otsu's method (maximum variance), and k-means clustering. Recently, thresholding method is used in computed tomography (CT) images for this approach. These methods are less effective and it has greater robustness to noise. The thresholding is not suitable to produce an optimal value, measuring the cluster quality is difficult and not work well for all lighting condition of images. The HNN detect the changes at cytoplasm and nuclei level.So the HNN method is used in Computer aided diagnosis system. And this method used Rule based thresholding classifier as preprocessing step[11][12].

METHODOLOGY

In our proposed methodology ,two phases are used. They are (i)Detection System (ii) Diagnosis System. Detection System involves the following methods: (1)Discrete Wavelet decomposition (2) Feature Extraction

Diagnosis System involves the following methods : Classification Using Probabilistic Neural Networks.

1. Diagnosis Evaluation
2. Diagnosis Recommendation

Detection System

Discrete Wavelet decomposition

The scanned image is transformed by using Multi scalar tool like Discrete wavelet decomposition. The DWT returns a data vector of the same length of the input . Usually, even in this vector many data are almost zero. This corresponds to the fact that it decomposes into a set of wavelets (functions) that are orthogonal to its translations and scaling. Therefore we decompose such a signal to a same or lower number of the wavelet coefficient spectrum as is the number of signal data points. Such a wavelet spectrum is very good for signal processing and compression, for example, as we get no redundant information here. By using this module ,the scanned image can be denoised as well as compressed into segments of approximation with horizontal and vertical details.

Feature Extraction

This module uses texture to extract the details presented inside the CT Scan. Texture is an important tool to identify the nodules or lumps inside a CT Scan. It is also use in much more fields like Object Shape determination, Scene Classification etc. The texture of the affected tissue is always different from the healthy one. This behavior based on texture is taken in account to determine the affected tissues inside the CT Scan. In medical point of view, the nodule present at the edge is difficult to determine. Most of the related works used gray level co-ocurrence matrix (GLCM) method[13]. The GLCM is a used to enhance the details and frequency is used to define an image, as different combinations of brightness values of pixels.

Diagnosis System

Classification Using Probabilistic Neural Networks

It uses artificial neural networks do classify the cancerous and non cancerous patients. The input of this Neural network is feature extraction from the real time patient information, past findings, demo graphical factors like age, living place, hereditary information etc and the hidden layer is the classification or clustering layer. The output layer produce the result severity of the disease and the accurate stage of the disease. This neural network have the ability to integrate the various inputs like current extraction results as well as past extraction result with demographical factors like age of the patient, patient previous diagnosis results like hereditary ,sensitivity to some drugs and also the working and living place of the patient etc. So this system will analyze each possibilities with the extracted image source data. It is very important to build the candidate set with all type of border line cases, early to all possible stages[14].

Diagnosis Evaluation

This Module Collects the feedback or outcome of the patients from classification results. The result will be either 0 or 1,1 represent cancerous nodules where as 0 represent non cancerous.The evaluation is always based on the past history also, it analysis the past false negative ratio as well as past false positive ratio. So the evaluation always produce more or less accurate results.

Diagnosis Recommendation

This module uses Diagnosis recommendation algorithm which uses a set of active cluster to covet the total contextual space. The aim of this algorithm is to maintain reliability as well as accuracy while maintaining less false positive and false negative results.

SYSTEM DESIGN

The work flow of our Diagnosis Expert System can be understood by the use of following block diagram. In this block diagram, the discrete wavelet decomposition method is used. This is used to decompose the given input image in to small pixels. So we can exactly identify the affected nodule then preprocessed image also compared with the current result .

The classified stage will produce the results based on the Trained network classifier which is designed by the Probabilistic artificial neural network. This neural network have the ability to integrate the various inputs like current extraction results as well as past extraction result with demographical factors like age of the patient, patient previous diagnosis results like hereditary ,sensitivity to some drugs and also the working and living place of the patient etc[15]. So this system will analyze each possibilities with the extracted image source data. It is very important to build the candidate set with all type of border line cases, early to all possible stages. Then only the maximum accuracy will be obtained. In case of DES system fails to find the accurate results then we have to update our trained dataset to ensure that the same thing will not occur in future. By using this methods we may achieve the following results.

- Identify the nodule having cancer cells from the lung's image accurately.
- It is useful to identify the exact stage and border line cases exactly.
- We can accurately detect the lung cancer in early stage.

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The probabilistic neural network uses trained candidate set. This set is contained the classified data base of images which include normal and abnormal nodules. So our current patient's extracted details are checked along with those images as well as the results of the images regarding cancerous or non cancerous.

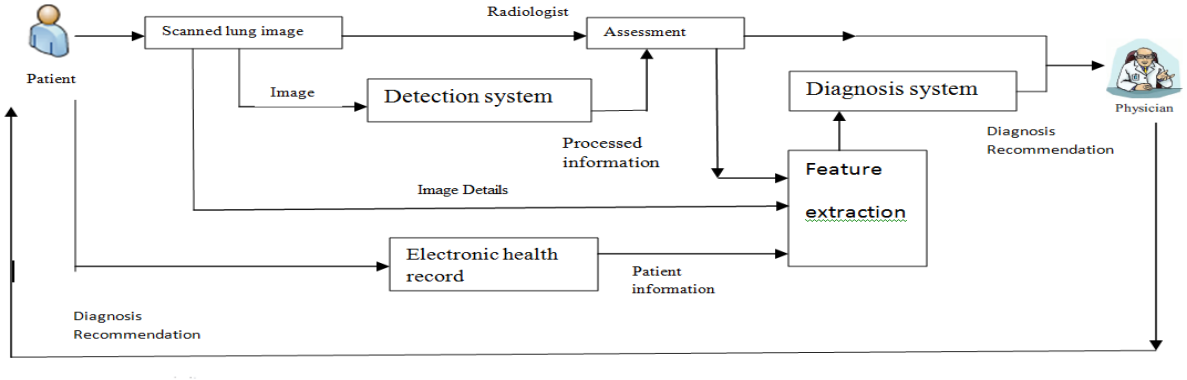

Fig.2. Des System Block Diagram

CONCLUSION

In this paper, proposed a Diagnostic Expert system for early detection of lung cancer by analyzing scanned lung images using various steps. This system begins by extracting the lung nodule regions from scanned lung image using efficient image processing techniques in MATLAB (i.e) Wavelet transform based Gray level statistical Features. This is used in the initial steps in the extraction process to identify the affected or abnormal nodule faster. After the extraction step, the extracted features used to find the cancerous and non-cancerous nodule in decomposed images. To make sure the cancerous nodules from suspected nodule from scanned images, a probabilistic artificial neural network is developed. This consists of classifying the cancerous with non cancerous using the trained data set. To improve the better performance the new findings are added by replacing some of the unreliable data. This system may be helpful to the radiologist and physician to identify cancerous nodules as earliest possible and also useful to the patient to get the better health care services with minimized medication prescription errors.

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