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Survey on: Auto Framework for Nodule Lung Cancer Detection using Deep Learning

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ABSTRACT: Cancer is the most important cause of death for both men and women. The early detection of cancer can be helpful in curing the disease completely. So the requirement of techniques to detect the occurrence of cancer nodule in early stage is increasing. A disease that is commonly misdiagnosed is lung cancer. Lung cancer is the leadingcauseofcancer-relateddeathworldwide.Thisintroducesthehighpossibilityofhumanerrorinthedetection process which necessitate an automated process. Hence, this paper aims at early detection of cancer through an automated process to minimize human error and making the process more accurate and hassle-free. In the proposed work, image processing algorithms and artificial neural network have been employed to design an automated process for early stage detection of lungcancer.

KEYWORDS: disease*, lung cancer,* image processing artificial neural network**.**

I. INTRODUCTION

Manifestation of lung cancer in the body of the patient reveals through easy symptoms in most of the cases. Treatment and prognosis depend on the historical type of cancer, the stage(degree of spread), and the patient's performance status. Possible treatment include surgery, chemotherapy, radiotherapy survival depends on stage, overall health, other factors, but overall only 14% of people diagnosed with lung cancer survive 5years after the diagnosis. Symptoms that may suggest lung cancer includes:

- Dyspnea(shortness of breath withactivity)
- Hemoptysis(coughing ofblood)
- Chronic coughing or change in regular coughing pattern,wheezing
- Chest pain or pain inabdomen.
- Cachexia(weight loss, fatigue, loss ofappetite)
- Dysphonia(hoarsevoice).
- Bronchitis orpneumonia.

1,242,000 men were diagnosed worldwide in 2012, which is about 16.7% of all the cancers in the male population being a most dangerous, while 583,000 diagnosed cases in 2012 were women, which is 8.8% of the female population and the third most dangerous. Tackling this feral disease has always been a tedious procedure but with new technological advancement an improvement in the qualities of remission and detection has been accomplished, but it's still long and expensive procedure. It is also important to note that in developing countries, a large proportion of patients affected with cancer are poor. Imagine processes for cancer detection are quite expensive, which in turn makes it difficult for such patients to pay hefty consultation charges to getdiagnosed.

Thus, our design also aims to make the cancer detection process affordable for such a demographic scenario where one does not have a proper access to expensive healthcare.

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II. RELATED WORK

This study suggested an innovative and efficient automatic pulmonary detection system, which can reduce false positives extremely. Therefore, an automated lung wall mending mechanism is developed in this analysis to avoid missing a juxta-pleural nodule. Another significant preprocessing method in this work has been to remove the vascular disease which can illustrate nodules and weak vessels. To determine nodules accurately and quickly, four different types of CNN structures have been used and it is based on four nodule levels. In addition, the input of the CNN model is two classes of candidate nodules, containing pairs of images (Scene 1&2). Since the expertise of radiologists has been constantly increasing and improving, computer-aided systems must continue to learn from them. The automated nodule detection system for this study is used to help radiologists greatly improve detection accuracy when precious contextual relevance information from the large data is discovered.[1]

This study gives an overview of present technology for the lung cancer identification and also shows the advancement in the technology from past few years. There are few issues which are available and can be solved by advancing the technology. With enough discussion about the lung tumor detection according to my observation multiple times thresholding gives better result than the other detection methods and Texture features based approach found better for classification.[2]

Lung cancer is among the most fatal disease in developed countries, and early diagnosis of the disease is difficult. Lung cancer diagnosis and treatment has been one of the most daunting challenges humans have encountered in recent decades. Early tumor diagnosis will continue to save a vast amount of lives around the world on a daily basis. This paper describes a method for classifying lung tumors as malignant or benign that combines a Convolutional Neural Network (CNN) with the AlexNet Network Model. AlexNet CNN is one of the transfer learning models. As compared to accuracy achieved by conventional neural network systems, the proposed CNN achieves a high degree of accuracy, which is more effective.[3]

Lung cancer is the stereotypical cancer after breast cancer in this era. The survival rate in this cancer is less than other cancers as well. Lung cancer screening can help find cancer at an early stage. If the disease is found and treated at an early stage, the chances of recovery are more. Computed Tomography (CT) is the most preferred and effective way of lung cancer screening. However, visual interpretation of CT scan images is quite difficult, time consuming and may lead to wrong interpretation of the malignancy. Therefore, computer aided techniques are required for proper and accurate detection of the lung diseases. There are several techniques available in the literature. In this paper, a novel approach of lung cancer detection and classification by image processing of the CT scan.Applied different preprocessing techniques for smoothing and image enhancement.[4]

Early location of lung nodules in the underlying stage is a difficult issue, as a result of sophisticated structure of these cells where the majority of cells are covering with one another. In this work,investigated the utilization of Convolutional Neural Network architecture to categorize lung nodules in CT scanned images. Experimentation showed that CNN was highly efficient in performing this task and accuracy was further improved by optimizing the hyperparameters. Proposed methods beat the gauge work regarding different evaluation parameters. Results on the datasets have proven that, CNNs can work viably on the classification and recognition of lung nodules compared to any of the existing techniques. With the help of LIDC/IDRI dataset architecture, which will boost the performance.[5]

Lung carcinoma is a severe disease which is defined by growing of cells without any limitation in the lung's tissues. In recommended method, the lung carcinoma and its stages are described using various biomedical image processing and machine learning algorithms like, grayscale transformation, adjusting the contrast of the image, Saliency Enhancement, Logistic Regression and SVM algorithm. The above mentioned algorithms have been applied to preprocess the provided CT scan images and obtain the region of interest. Some features are taken out with the help of extracted ROI like., contrast, correlation, Mean, homogeneity , variance, standard deviation, kurtosis which are helpful in describing whether the lung is affected or healthy[6]

This study aims to develop a lung cancer detection system based on CT-scan images. This detection system has 4 main stages, namely pre-processing of CT-Scan images to improve image quality, segmentation to identify and separate the desired cancer object from the background, feature extraction based on area, contrast, energy, entropy, and homogeneity. The classification of lung cancer into cancer benign and malignant cancer. From the system trial,

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the accuracy level based on the system decision in determining the diagnosis of lung cancer is benign or malignant was 83.33%.[7]

CT screening has been proven to be effective for diagnosing lung cancer at its early manifestation in the form of pulmonary nodules, thus decreasing the mortality. However, the exponential increase of image data makes their accurate assessment a very challenging task given that the number of radiologists is limited and they have been overworked. analyzed the recently developed CNNs based systems for nodules classification with main focus on their methodologies, the datasets used for validation as well as their detection results.[8]

Cancer detection is generally carried out manually by trained professionals and these techniques are majorly helpful in the advanced stage detection, also it involves a very tedious procedure and highly dependent on the given individual. This introduces the high possibility of human error in the detection process which necessitate an automated process. Hence, this paper aims at early detection of cancer through an automated process to minimize human error and making the process more accurate and hassle-free. In the proposed work, image processing algorithms and artificial neural network have been employed to design an automated process for early stage detection of lung cancer.[9]

Generated nodule candidates using a local geometric-model-based filter and further reduce the structure variability by estimating the local orientation. The nodule candidates in the form of 3D cubes are fed into a deep 3D convolutional neural network that is trained to differentiate nodule and non-nodule inputs.Used data augmentation techniques to generate a large number of training examples and apply regularization to avoid overfitting. On a set of 99 CT scans, the proposed system achieved state-of-the-art performance and significantly outperformed a similar hybrid system that uses conventional shallow learning. The experimental results showed benefits of using a priori models to reduce the problem space for datadriven machine learning of complex deep neural networks. The results also showed the advantages of 3D CNN over 2D CNN in volumetric medical image analysis.[10]

In this paper, a lung cancer detection and prediction method using the deep neural network. The proposed technique is used to detect the lung cancer in its early stage and also to predict the lung cancer. The proposed method works in two phases: Firstly, the CT images are preprocessed through blurring and thresholding to improve the quality and simply the images. Then split the left and right lung for reducing the pattern as well as reducing the time complexity and increasing the accuracy that is used in deep neural network. From the experimental analysis, we illustrate that the MobileNet model gives the best performance while splitting the CT images than the VGG-8 and Inception-v3.[11]

This paper proposes an approach to improve upon the previous attempts to detect the likely cancerous lung nodules, estimate its probability and malignancy. The automatic detection of malignant lung nodules using DCNN helps radiologists identify malignant nodules that may be overlooked. Our attempt using the C3D architecture has increased the sensitivity of Malignant Lung Nodule Detection to 86 percent, which is 10 percent more than the previous effort at it. This progress was achieved through advanced preprocessing, additional training and better prediction techniques.[12]

In this paper, a Computer Aided Diagnosis system is studied for detecting the lung cancer at early stage. The CAD system makes use of Computer Tomography images. Firstly, the lung region extraction technique is done from those CT images. Several processing methods are studied in the lung region extraction. In the second stage, segmentation is done on the lung with the region based segmentation approach. The next stage is feature extraction technique in which the features are extracted from the partitioned image for the diagnosis. At last, classification method is done to identify the presence of cancer in the lung. This process shows the benefits of this system to detect the cancer in the lung. Thus we can distinguish between the images and help in diagnosis. It is observed that the efficiency is above 80%.[13]

In this paper, Presented a methodological approach to address the introduction of Big Data Analytics technologies into an integrated care provider. This approach allows us to deploy big data analytics to a wide range of scenarios

addressing the specific needs of an integrated care organization. Additionally, the proposed approach and framework allows us the introduction of new analytic practices and technologies in a gradual manner, coexisting with classic technologies but avoid the creation of technological silos which is often an undesired side effect of pilot-driven implementation approaches.[14]

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In this study, various optimization algorithms have been evaluated to detect the tumor. Medical images often need preprocessing before being subjected to statistical analysis. The objective of this paper is to explore an expedient image segmentation algorithm for medical images to curtail the physicians' interpretation of computer tomography (CT) scan images. Modern medical imaging modalities generate large images that are extremely grim to analyze manually. The consequences of segmentation algorithms rely on the exactitude and convergence time. In future studies, the use of more number of optimization algorithms will be included to improve the accuracy.[15]

III. ADVANTAGES

1. The proposed accuracy will be better than most of the systems.
2. It will be easy to use.
3. It is easy to maintain.
4. Security level is high

IV. LIMITATION

1. For use of the system, the machine should be connected to the internet

V. CONCLUSION

The early detection of can be helpful in curing the disease completely. Hence this system aims at early detection of cancer through an automated process to minimized human error and making the process more accurate and hassle free.

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