© August 2021| IJIRT | Volume 8 Issue 3 | ISSN: 2349-6002

Early Detection of Lung Cancer

Dr.Karthick Raghunath K.M[1], Monish K[2], Nikhil N Y[3], M.Prashanth[4], Manjunatha M[5]
[1]*Assistant Professor, Department of Computer Science and Engineering, MVJ College of Engineering, Bengaluru.*
[2,3,4,5]*UG Student, Department of Computer Science Engineering, MVJ College of Engineering, Bengaluru*

***Abstract* - The project aims at early lung cancer diagnosis using deep learning technique. Lung cancer in recent times is considered to be the highest cancer mortality rate. The basic drawback for this rate is due to unavailability of voxel-based annotations for training, which are labour and time consuming. Computed Tomography Images (CT) is a crucial for detection of lung cancer which is high in efficiency and labour saving along with its major advantages of Visualizing small images or Low contrast nodules The survival rate for a person affected by lung cancer can be increased, if it is detected in its early stages. The detection of the cancer cells that cause the lung cancer, is one of the main concerns in the field of medical image processing. Nodules are one of the most usual signs of lung cancer. This paper proposes a system to detect lung nodule by using CT image. It consists of five stages, Pre-Processing, Lung Region Extraction, Nodule Segmentation, Feature Extraction, and Classification. The slice number which contains even the smallest nodules are also identified. This can help radiologists and doctors to detect lung cancer in early stages.**

***Index Terms* - Lung Cancer, Nodules, Deep Learning Technique.**

I.INTRODUCTION

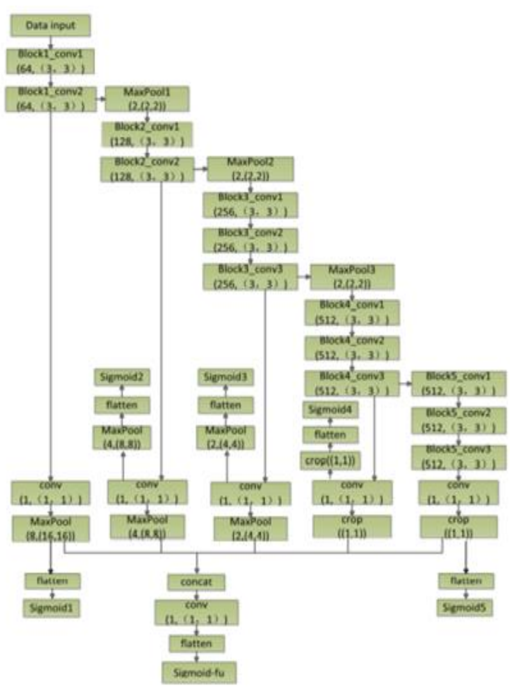
Lung carcinoma is another name for Lung cancer. It is a malicious tumour that grows inside the human lung which is associated with the uncontrolled increase in the growth of the tissue cells. By the process of metastasis, the above said growth can expand to the nearby tissues, which makes it even more dangerous to the body. Lung cancers are of two types, namely, non-small cell lung cancer (NSCLC) and small cell lung cancer (SCLC). The size of cancer cells in non-small cell lung cancer, are larger. This cancer forms malicious cells in the lung tissues. In small cell lung cancer, the cancer cells are small in size and which are mostly filled with the nucleus. Usually, this cancer is caused by smoking. SCLC comprise about 20% of lung cancers and are rapidly growing and the most aggressive of all lung cancers. Based on the size of tumour, the type of tumour and the location of the lymph nodes, lung cancer is of four stages; Stage I through IV. The main cause of lung cancer in most people is the consumption of poor-quality food and the intake of smoke from the polluted environment. Lung cancer morbidity is high and the cure rate is low. The chance of survival is higher, if the cancer is detected in its early stage. If the cancer can be detected with minimum delay in time, in its early stages, then there are better chances of providing solutions to reduce the tumour. Identification of lung cancer at the earliest stage is very important in the field of medical image processing. It is an area in the research field that is very active. The lung cancer detection can be done in several ways such as Magnetic Resonance Imaging (MRI), Bronchoscopy, Sputum images, Xray and Computed Tomography (CT). The electrical resistance tomography (ERT) technique is also used for early detection of lung cancer and it gives promising results.

The most challenging task of early diagnosis of lung cancer is detection of lung nodule. The shadows of the pathological changes in the lung cancer is referred to as the pulmonary nodules. These are detected more evidently by using a Xray CT than a chest X-ray examination. CT scan is the most popular imaging technique for the detection of the nodule, as it has the potential to supply definitive image textures for the small nodule detection. Therefore, one of the most common ways to detect lung cancer is by making use of Computed Tomography (CT) image. Three main processes used for the detection of lung cancer are pre-processing, feature extraction and finally the classification process. The lung nodules are roughly spherical with approximate diameter as 3cm and round opacity. CT image of lungs where the lung nodule is annotated. The paper is organized in a such way that first describe the Literature Survey, which includes the comparison of methods used for detecting lung cancer

II. RELATED WORK

A. Multi-resolution CNN and knowledge transfer for candidate classification in lung nodule detection.

Multi-resolution CNN to solve the challenging problems posed by radiological heterogeneity and variable sizes and shapes of nodules in the classification of lung nodule candidates using the method of knowledge transfer. They demonstrate the importance and effectiveness of bringing in multi-resolution feature information extracted from this network in the case of the classification task of lung nodule candidate. The experimental results on the LUNA16 data set show that the proposed method achieves a competitive score on the evaluation index of the classification performance. The network we have transferred is a network model that has been proved effective on edge extraction tasks, therefore in principle our approach is universal. First, a complete lung nodule is often distributed on multiple slices. However,2D CNN method is limited in capturing the contextual information between slices, but some types of nodules are not fully represented or not fully highlighted in the data set, which may lead to the false identification of nodules

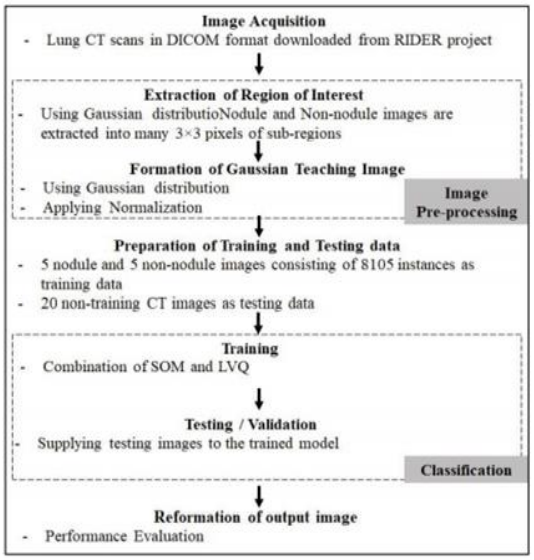


Structure of Multi Resolution CNN Model

B. GACM based segmentation method for lung nodule detection and classification of stages using CT images. In this paper, the gradient driven active contour level set model is proposed with the analysis of a CAD system for fully automated system of CT images for identification of various stages of affected lung region. The combination of Geometric deformable models provides greater robustness to boundary discontinuities than purely edge-based models. To improve the classification rate, CT images both multi-level domain transformation followed by multi-level texture classifications are used for geometric and texture characteristics accordingly. The unified wavelet decomposition-based texture classification method is used to extract the texture content from the ROI segmented lung regions from CT image. The texture features are extracted and its optimal discrimination is achieved for finite classification rate through consistency-based hierarchical feature selection algorithm which gives more robust and accurate results. The experimental results proved that proposed hybrid model outperforms when compared with existing methods in lung image classification. This work can be further extended to find the growth rate of the nodule, estimating the size and location of the nodule for classification of stages of lung cancer.

C. Lung nodules classification using massive training self-organizing map and learning vector quantization.

This paper presented the pixel-based machine learning algorithms that work on the enhancement and classification of lung nodules in CT images. The proposed model MTSOM-LVQ can be trained with a small number of training cases (10 nodule and 10 non-nodule images) with 8105 training sub-regions in the classification of lung nodules in CT images. For this purpose, massive training by scanning pixel by pixel over a huge amount of training sub-regions with the corresponding teaching value is the key for the training of MTSOM-LVQ. By directly using pixel values in the training process of MTSOM-LVQ, feature calculation from segmented objects is not required. The results show that the output image displaying nodule can be formed after applying on the new and non-training nodule CT images using the trained MTSOM-LVQ. In addition, the experimental result obtained showed that map size and training iteration of the MTSOM-LVQ have an impact on the training accuracy of the MTSOM-LVQ. Furthermore, experimental results proved that a decrease in the size of the training sub-regions also decreases the classification performance of the MTSOM-LVQ



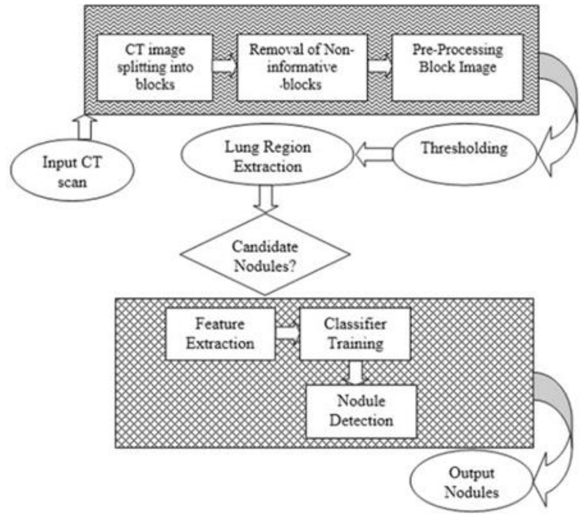
D. Super pixel and density-based region segmentation algorithm for lung nodule detection.

The reported work has focused on the detection of lung nodules from HRCT images based on a super pixel density-based region segmentation algorithm, followed by the extraction of different morphological features. An SVM classifier has been trained using the shape-based features for nodule detection. The work has been applied to the LIDC dataset and achieved a classification accuracy of 84.75%. However, the proposed system is not tested on other features, e.g., texture, statistical and intensity-based features. Therefore, a thorough investigation is required to improve the classification accuracy of the system by introducing new features combined with existing features. Morphological image processing plays an important role in object detection and segmentation. In the future, CAD systems will be developed by incorporating the concepts of morphological image processing.

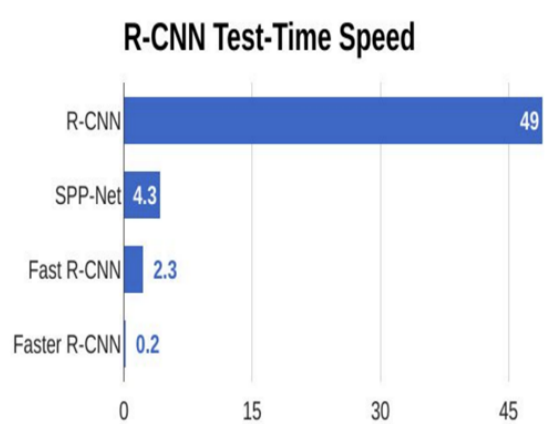
III. PROJECT ARCHITECTURE

The project architecture gives you the visual representation of the model structure built for the Detection of Lung Cancer in Early Stage.

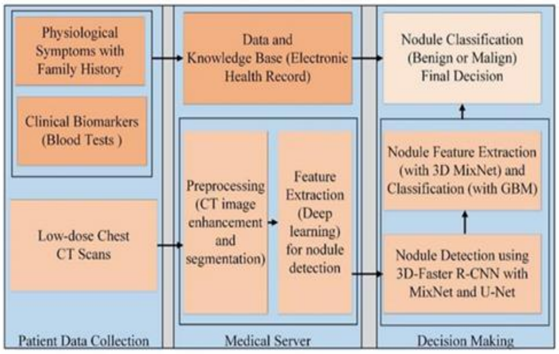
IV. PROPOSED SYSTEM



The proposed method uses FASTER RCNN algorithm which uses the region proposal networks which makes it even faster. In our system images which are classified are subjected to LABELIMG tool which is a graphical image annotation tool and used for label object bounding boxes in images and uses QT for its graphical interface followed by training and testing. Image training is done to simply the processing while also be able to identify the nodule present in the lung. TENSORFLOW is used to download the pre-trained model which is an end-to-end open-source platform for machine learning and Easy model building, robust ml production anywhere and powerful experimentation for research. Image acquisition is to group the number of novel nodules to form the data set. Image segmentation is performed through the U-NET convolutional neural network. Finally, the identified nodules are classified as benign and malignant.



Our proposed approach makes use of Deep Learning algorithms like faster R-CNN. Also, the features used are different and minimal compared to the base paper. Proposed system makes whole process simpler. The time consumed while both training and testing when other methods are followed is quite high whereas the proposed method consumes less time



Block Diagram of Patient Data Collection, Medical Server Decisioning

Faster RCNN is the modified version of Fast RCNN. The major difference between them is that Fast RCNN uses selective search for generating Regions of Interest, while Faster RCNN uses "Region Proposal Network", aka RPN. RPN takes image feature maps as an input and generates a set of object proposals, each with an object-ness score as output.

V. CONCLUSION

The process of detecting the nodules involves the following steps: A. Collection of Image: First an image of the nodule will be taken and a dataset will be formed for further process afterwards. B. Image Training: Image training is done to simplify the processing while also to be able to identify the nodule present in the lung. C. Image Acquisition: The number of novel nodules is grouped together in the form of data sets.

The expected outcome of the project is, by using deep learning technique in detecting the nodules which causes the lung cancer, we can diagnose the early stage of cancer and hence provide the appropriate treatment for the patient and also detecting the lung cancer at the earliest stage can increase the survival rate up to five years.

REFERENCES

[1] Hinisha, K.V. and Lijiya, A., 2019, July. Lung Nodule Identification. In 2019 2nd International Conference on Intelligent Computing, Instrumentation and Control Technologies (ICICICT) (Vol. 1, pp. 451-455). IEEE.

[2] Manickavasagam, R. and Selvan, S., 2019, April. GACM based segmentation method for Lung nodule detection and classification of stages using CT images. In 2019 1st International Conference on Innovations in Information and Communication Technology (ICIICT) (pp. 1-5). IEEE.

[3] Zuo, W., Zhou, F., Li, Z. and Wang, L., 2019. Multi-resolution CNN and knowledge transfer for candidate classification in lung nodule detection. Ieee Access, 7, pp.32510- 32521.

[4] Halder, A., Chatterjee, S. and Dey, D., 2020, February. Superpixel and Density Based Region Segmentation Algorithm for Lung Nodule Detection. In 2020 IEEE Calcutta Conference (CALCON) (pp. 511-515). IEEE.

[5] Weei, Y.S. and Pheng, H.S., 2019, September. Lung Nodules Classification Using Massive-Training Self-Organizing Map and Learning Vector Quantization. In 2019 1st International Conference on Artificial Intelligence and Data Sciences (AiDAS) (pp. 18- 22). IEEE.

[6] Larici, A.R., Farchione, A., Franchi, P., Ciliberto, M., Cicchetti, G., Calandriello, L., del Ciello, A. and Bonomo, L., 2017. Lung nodules: size still matters. European Respiratory Review, 26(146), p.170025.

[7] Schultheiss, M., Schober, S.A., Lodde, M., Bodden, J., Aichele, J., Müller-Leisse, C., Renger, B., Pfeiffer, F. and Pfeiffer, D., 2020. A robust convolutional neural network for lung nodule detection in the presence of foreign bodies. Scientific Reports, 10(1), pp.1-9.

[8] Zheng, S., Cui, X., Vonder, M., Veldhuis, R.N., Ye, Z., Vliegenthart, R., Oudkerk, M. and van Ooijen, P.M., 2020. Deep learning-based pulmonary nodule detection: Effect of slab thickness in maximum intensity projections at the nodule candidate detection stage. Computer methods and programs in biomedicine, 196, p.105620.

[9] Nasrullah, N., Sang, J., Alam, M.S., Mateen, M., Cai, B. and Hu, H., 2019. Automated lung nodule detection and classification using deep learning combined with multiple strategies. Sensors, 19(17), p.3722