



UNIVERSITY OF SCIENCE AND TECHNOLOGY
FACULTY OF POST GRADUATE STUDIES

Faculty of Engineering, Department of Biomedical Engineering

**Computer-Aided Diagnosis (CAD) for the Detection pulmonary
nodules using Artificial Neural Network techniques**

By

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A Thesis

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Supervisor

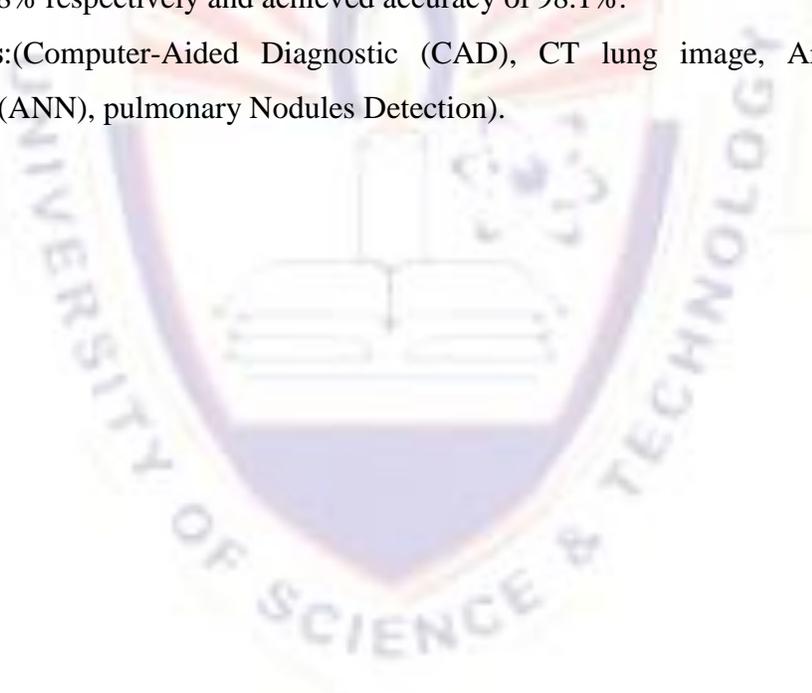
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ABSTRACT:

Medical Imaging plays an important role in the early detection and treatment of cancer. Computer Aided Diagnosis (CAD) system allows detection of lung cancer through analysis of chest CT images. The objective of this study is identifying all nodules from the chest CT lung images and classifying these nodules into tumor and non-tumor nodules, to reduce the false positive rate using Image processing and Neural Network techniques. First, noise is removed from the image and then converted into binary format. Features are extracted and these are fed to the neural network system for identifying true nodules. The proposed Computer-Aided Diagnostic (CAD) system is tested and validated using standard datasets. The results obtained from proposed CAD system are good compared to existing CAD systems. The sensitivity and specificity of the image were 100%, 95.8% respectively and achieved accuracy of 98.1%.

Keywords:(Computer-Aided Diagnostic (CAD), CT lung image, Artificial Neural Networks (ANN), pulmonary Nodules Detection).



الملخص:-

الصور الطبيه تلعب دور مهمه في كشف و علاج السرطان ونظام التشخيص عن طريق الكمبيوتر يسمح بالتعرف او الكشف عن سرطان الرئه بتحليل الصور المقطعيه للصدر.

الهدف من هذه الدراسه التعرف علي كل الحويصلات وعمل تحليل لتعرف على هذه الحويصلات هل يوجد ورم او لا استخدمت معالجه الصوره الرقمية وتقنيه الشبكات العصبية لتقليل معدل الخطا في تشخيص المرض .تستخدم معالجه الصوره في ازاله الضجيج من الصوره وتحويلها الي تمثيل ثنائي .وبعد ذلك استخدام قياسات هارلق المعروفه ودخولها للشبكه العصبية للتعرف علي نوع الحويصلات .

التشخيص عن طريق الكمبيوتر هو تقنيه عاليه لتاكيد الاختبار واعطاء النتائج على حسب المعلومات المعطاه .ومن هذه الدراسه تحصلنا على دقه عاليه تصل الي 98.1%.

مفاتيح البحث: (التشخيص بالكمبيوتر , صور مقطعيه للرئه , الشبكات العصبية الاصطناعيه ,الكشف عن الحويصلات الهوائيه).



Introduction:

A pulmonary nodule is a small round or oval-shaped growth in the lung. It is sometimes also called a spot on the lung or a coin lesion. Pulmonary nodules are generally smaller than 3centi meters in diameter. If the growth is larger than that, it is known as a pulmonary mass. A mass is more likely to represent a cancer than is a nodule. Pulmonary nodules are among the most common focal pulmonary lesions [1]. The presence or absence of pulmonary nodules can be of great value in the differential diagnosis of lung diseases[2]. The survival rate is significantly improved but there is need to increase this survival rate more than the current value. This should be done without opening the patient body [3]

Medical imaging plays an important role in the early detection and treatment of cancer. It provides physicians with information essential for efficient and effective diagnosis of various diseases. Presently, Computed Tomography (CT) are said to be more effective than plain chest x-ray in detecting and diagnosing the lung cancer. There are 2 main types of lung cancer: Small cell lung cancer (SCLC),Non-small cell lung cancer (NSCLC)[4]

In using the CT diagnosing .the major problems are in interpreting the images. Thus an Artificial Neural Network (ANN) is proposed for the classification of lung cancer in CT images. An ANN was developed to differentiate the cancerous nodules from other suspected nodule areas in the CT images. To improve the accuracy of this ANN a pre-processing stage was introduced that involves various image enhancement techniques [5].

1.1 Objectives:-

To design a computer aided detection (CAD) software to aid in detection pulmonary nodule and normal features of lung using artificial neural net work.

1.2 Problem Statement:-

The goal of this dissertation is the investigation of the various components and development of an automated CAD system to assist radiologists in the classification (characterization) of lung nodules on CT scans. Therefore, early and accurate detection of a lung is critical to plan appropriate care and improving life for further survival.

1.3 Significant of study

A computer aided diagnosis (CAD) system would be to enable the scans of patients in third world regions that lack experienced radiologists to be analyzed quickly and reliably.

Additionally, in recent years large pulmonary studies that involve the collection of multiple CT scans from thousands of patients have been funded. Each of these scans needs to be analyzed by a radiologist, and the analysis of these scans can be prohibitively expensive and time consuming.

1.4 Thesis layout

Chapter I: Provides an introductory view of the thesis, problem statement, the concerned objectives, and significant of the study.

Chapter II: Provides some anatomical and physiological, a quick overview of all the concerned topics and general talking of technique for uses in this research.

Chapter III: Is a brief recollection of the various works of image processing and enhancement and pattern recognition and classification of lung.

Chapter IV: Includes a detailed assembly of the various algorithms and methodologies that have been manipulated and implemented for the achievement of the research objectives.

Chapter V: Demonstrates the gathering of results, the respective discussions for the created systems and the evaluation of the efficacy of the results obtained.

Chapter VI: Provides the overall conclusions drawn up from the thesis and some directions that could present as useful suggestions for future work.