Patient Disease Detection and Abnormality Prediction using x-ray images

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Abstract

Automatic defects detection in CT images is very important in many diagnostic and therapeutic applications. Because of high quantity data in CT images and blurred boundaries, tumor segmentation and classification is very hard. This work has introduced one automatic lung cancer detection method to increase the accuracy and yield and decrease the diagnosis time. The goal is classifying the tissues to three classes of normal, benign and malignant. In MR images, the amount of data is too much for manual interpretation and analysis. During past few years, lung cancer detection in CT has become an emergent research area in the field of medical imaging system. Accurate detection of size and location of lung cancer plays a vital role in the diagnosis of lung cancer. The diagnosis method consists of four stages, pre-processing of CT images, feature, extraction, and classification, the features are extracted based on DTCWT and PNN. In the last stage, PNN employed to classify the Normal and abnormal.

Keywords: Deep Learning, OpenCV, lung cancer, Dual-Tree Complex wavelet transformation.

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INTRODUCTION

Cancer is a group of diseases characterized by the uncontrolled growth and spread of abnormal cells. If the spread is not controlled, it can result in death. Lung cancer was the most common cancer in worldwide, contributing 2,093,876 of the total number of new cases diagnosed in 2018.The incidence rate has been declining since the mid1980s in men, but only since the mid-2000s in women, because of gender differences in historical patterns of smoking uptake and cessation. From 2005 to 2015, lung cancer incidence rates decreased by 2.5 per year in men and 1.2per year in women. Symptoms do not usually occur until the cancer is advanced, and may include persistent cough, sputum streaked with blood, chest pain, voice change, worsening shortness of breath, and recurrent pneumonia or bronchitis. Cigarette smoking is by far the most important risk factor for lung cancer; 80 of lung cancer deaths in the US are still caused by smoking. Risk increases with both quantity and duration of smoking. Cigar and pipe smoking also increase risk. Exposure to radon gas released from soil and building materials is thought to be the second-leading cause of lung cancer in the US. Other risk factors include occupational or environmental exposure to secondhand smoke, asbestos (particularly among smokers), certain metals (chromium, cadmium, arsenic), some organic chemicals,

radiation, air pollution, and diesel exhaust. Some specific occupational exposures that increase risk include rubber manufacturing, paving, roofing, painting, and chimney sweeping. Risk is also probably increased among people with a history of tuberculosis. Genetic susceptibility (e.g., family history) plays a role in the development of lung cancer, especially in those who develop the disease at a young age. We can cure lung cancer, only if you identifying the yearly stage. So here, we use machine learning algorithms to detect the lung cancer. This can be made faster and more accurate. In this study we propose machine learning strategies to improve cancer characterization. Inspired by learning from CNN approaches, we propose new algorithm, proportion-PNN, to characterize cancer types..

LITURATURE SURVEY

"Multi-Stage Lung Cancer Detection and Prediction Using Multi-class SVM Classifie" is paper of authors Janee Alam Dept. of Electrical and Electronic Engineering, University of Chittagong Chittagong, Bangladesh ; Sabrina Alam. This paper presents Recognition and prediction of lung cancer in the earliest reference point stage can be very useful to improve the survival rate of patients. But diagnosis of cancer is one the major challenging task for radiologist. For detecting, predicting and diagnosing lung cancer, an intelligent computer-aided diagnosis system can be very much useful for radiologist. This paper proposed an efficient lung cancer detection and prediction algorithm using multi-class SVM (Support Vector Machine) classifier. Multi-stage classification was used for the detection of cancer. This system can also predict the probability of lung cancer. In every stage of classification image enhancement and segmentation have been done separately. Image scaling, color space transformation and contrast enhancement have been used for image enhancement. Threshold and marker-controlled watershed based segmentation has been used for segmentation. For classification purpose, SVM binary classifier was used. Our proposed technique shows higher degree of accuracy in lung cancer detection and prediction.

[2] "Lung Cancer Detection using CT Scan Images" is a paper of Suren Makaju, this paper explains that Lung cancer is one of the dangerous and life taking disease in the world. However, early diagnosis and treatment can save life. Although, CT scan imaging is best imaging technique in medical field, it is difficult for doctors to interpret and identify the cancer from CT scan images. Therefore computer aided diagnosis can be helpful for doctors to identify the cancerous cells accurately. Many computer aided techniques using image processing and machine learning has been researched and implemented. The main aim of this research is to evaluate the various computer-aided techniques, analyzing the current best technique and finding out their limitation and drawbacks and finally proposing the new model with improvements in the current best model. The method used was that lung cancer detection techniques were sorted and listed on the basis of their detection accuracy. The techniques were analyzed on each step and overall limitation, drawbacks were pointed out. It is found that some has low accuracy and some has higher accuracy but not nearer to 100%. Therefore, our research targets to increase the accuracy towards 100%.

[3] "A Non-invasive Detection of Lung Cancer Combined Virtual Gas Sensors Array with Imaging Recognition Technique" is paper of Xing Chen. In this paper, we propose a non-invasive detection method of lung cancer combined with a sort of virtual SAW gas sensors array and imaging recognition method. A patient's breath goes through an electronic nose with solid phase micro extraction (SPME) and capillary column for pre-concentration and separation of volatile organic compounds (VOCs) respectively, a pair of SAW sensors one coated with a thin Poly-isobutylene (PIB) film is connected to the output of capillary column port for chemical compounds detection. A lung cancer tissues' culture medium study is also proposed for pathology validation. 11 VOCs which are considered as the biomarkers of lung cancer can be detected qualitatively and quantitatively. Finally these 11 VOCs are used to diagnose lung cancer patients in Run Run

Shaw hospital by our e-nose with an improved artificial neural network (ANN) algorithm combined with imaging method for pattern recognition.

AIM & OBJECTIVES

1. Convenience and Streamlined Cleaning: To simplify
• Improved Diagnostic Accuracy: Develop a system that can accurately differentiate between normal, benign, and malignant lung tissues in CT images, reducing the potential for misdiagnosis and improving patient outcomes.
• Efficiency Enhancement: Create a more efficient diagnostic process that reduces the time required for lung cancer detection and classification, enabling faster treatment initiation and increasing the chances of successful intervention
• Tumor Localization: Develop algorithms and techniques for accurately localizing lung tumors within CT images, enabling precise identification of tumor size and location.
• Advanced Image Pre-processing: Implement advanced image pre-processing techniques to enhance image quality, reduce noise, and mitigate the impact of blurred boundaries, improving the overall quality of CT scans

MOTIVATION

The motivation behind the presented project on automatic lung cancer detection in CT images is rooted in the pressing need for improved diagnostic and therapeutic applications in the field of medical imaging. With the ever-increasing volume of data generated by CT scans and the inherent challenges posed by blurred boundaries in the images, accurately identifying and classifying lung tissues into normal, benign, and malignant categories has become a critical objective. This research seeks to enhance accuracy, efficiency, and reduce diagnosis time, ultimately contributing to the early detection and treatment of lung cancer. In recent years, the field of medical imaging has witnessed a growing demand for precise lung cancer detection using CT, making it an emergent research area. The accurate localization and sizing of lung cancer are pivotal for successful diagnosis and patient care. The project employs a multi-stage approach encompassing image pre-processing, feature extraction, and classification, utilizing techniques like Dual-Tree Complex Wavelet Transform (DTCWT) and Probabilistic Neural Networks (PNN). The use of these advanced technologies aims to advance the state of the art in lung cancer diagnosis and contribute to the improvement of healthcare outcomes for patients.

APPLICATION:

- Treatment Planning
- Follow-Up and Monitoring
- Clinical Research
- Medical Education
- Second Opinion Services
- Telemedicine
- Quality Control in Radiology

SYSTEM ARCHITECTURE

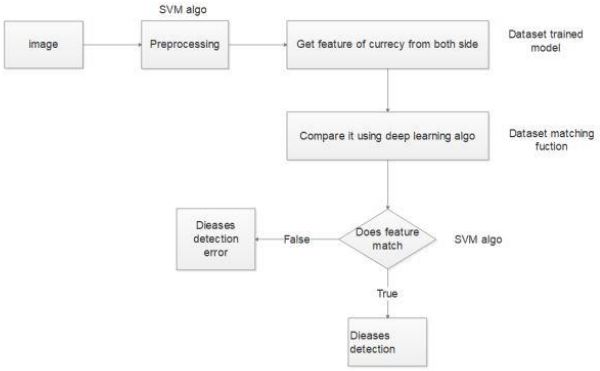
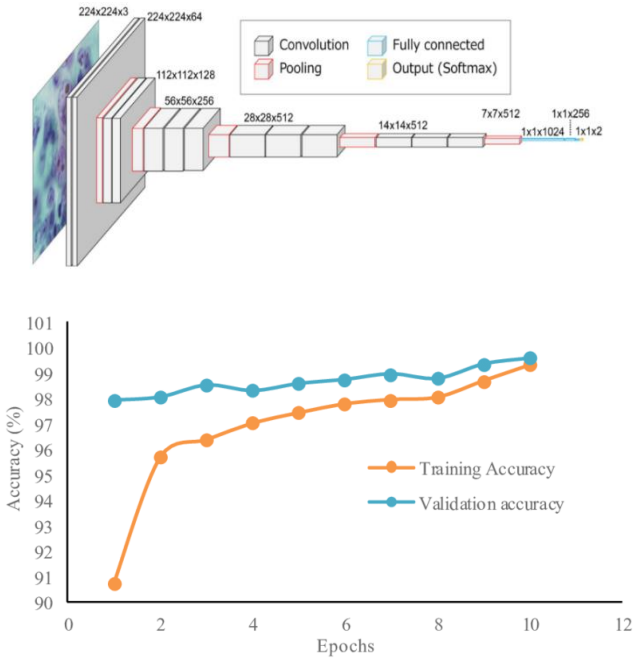


Fig -1: System Architecture Diagram

ALGORITHM



ADVANTAGES

1. Medical Impact: Lung cancer is a leading cause of cancer-related deaths worldwide. Early and accurate detection is crucial for improving patient outcomes. This research has the potential to contribute to the early diagnosis of lung cancer, which can significantly impact patient survival rates.

2. Automation: The method described in the abstract is designed for automatic lung cancer detection in CT images. This automation can help reduce the workload on healthcare professionals and speed up the diagnosis process, which is crucial in a field where time is of the essence.

3. Multiclass Classification: The proposed method aims to classify lung tissues into three classes: normal, benign, and malignant. This is a valuable feature as it provides more detailed information about the condition of the patient, allowing for a more precise diagnosis and treatment planning.

4. Feature Extraction Techniques: The use of Discrete Transform Continuous Wavelet Transform (DTCWT) for feature extraction is an advantage as it can help capture relevant information from CT images, especially

when dealing with blurred boundaries. This can potentially lead to improved accuracy in tumor segmentation and classification.

5. Pattern Recognition: The utilization of Probabilistic Neural Networks (PNN) for classification is advantageous. PNN is a powerful tool for pattern recognition tasks, and it can be effective in distinguishing between normal and abnormal tissues in CT images.

6. Efficiency: By automating the process of lung cancer detection and utilizing advanced techniques for feature extraction and classification, the proposed method may lead to quicker and more efficient diagnosis. This can be especially important in a field where timely treatment is critical**.**

FUNCTIONAL & NON-FUNCTIONAL REQUIREMENTS

Functional Requirement:

– Image Preprocessing: The system must perform noise reduction, contrast enhancement, and standardization of CT images as part of the preprocessing stage

– Feature Extraction: The system must employ the Dual-Tree Complex Wavelet Transform (DTCWT) to extract relevant features from CT images.

– Accuracy and Performance: The system should achieve a specified level of accuracy in the classification of lung tissues.

– User Interface: The system should offer an intuitive user interface for healthcare professionals to upload and analyze CT images.

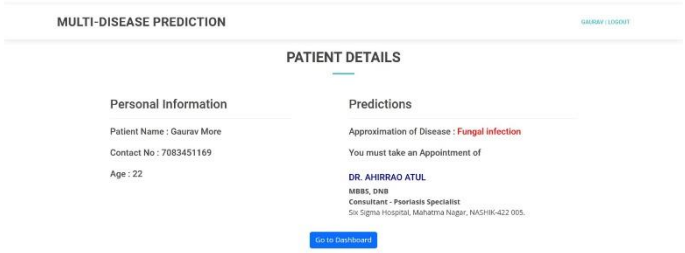
Nonfunctional Requirements

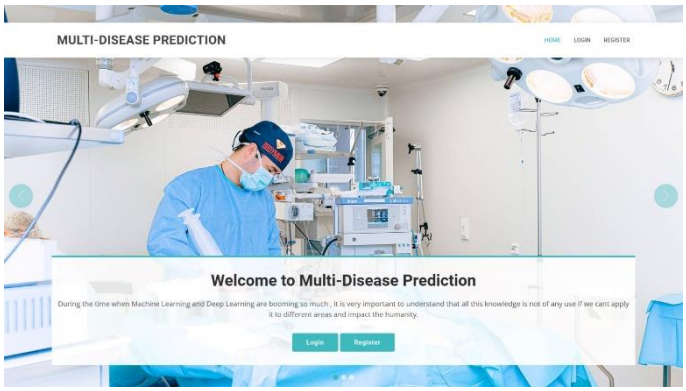
– Scalability:The system should be capable of handling a growing volume of CT images and data without significant degradation in performance. – Security and Privacy: It should ensure the security and privacy of patient data and comply with relevant healthcare data protection regulations. – Reliability: The system should be highly reliable, with minimal downtime and a low rate of errors or false positives/negatives in the classification. – Performance Efficiency:The system should be optimized for efficient resource utilization, including memory and processing power, to ensure timely diagnosis.

SYSTEM REQUIREMENTS

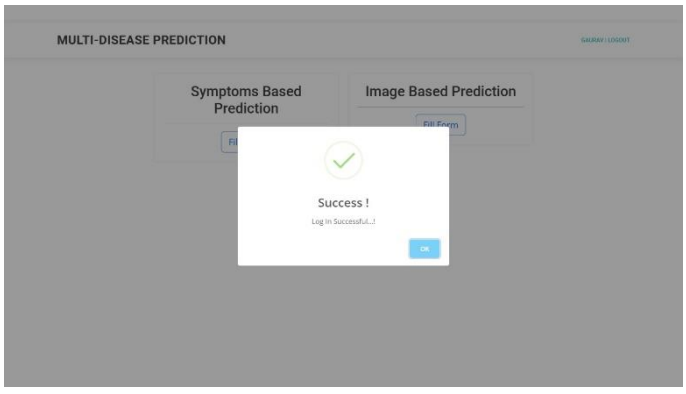
Software Used:
– Vs Code – Python 3.10 – SQLite Database
Hardware Used:
– Processor core i3 – RAM 4 GB – HDD 500 gb

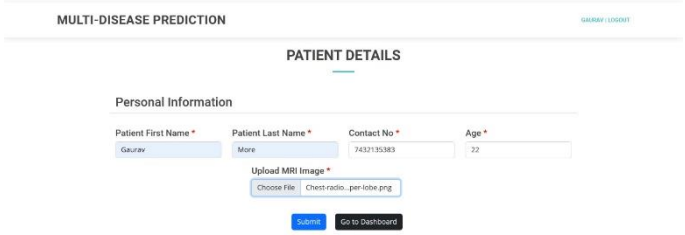
RESULTS

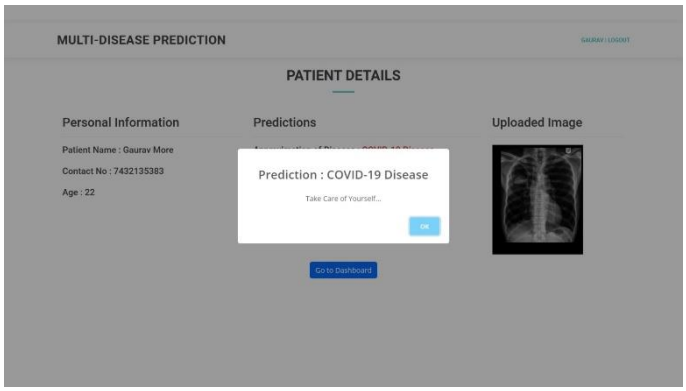

MULTI-DISEASE PREDICTION
PATIENT DETAILS
Personal Information
Patient Name : Gaurav More
Contact No : 7083451169
Age : 22
Predictions
Approximation of Disease : Fungal infection
You must take an Appointment of
DR. AHIRRAO ATUL
MBBS, DNB
Consultant - Psoriasis Specialist
Six Sigma Hospital, Mahatma Nagar, NASHIK-422 005.
Go to Dashboard

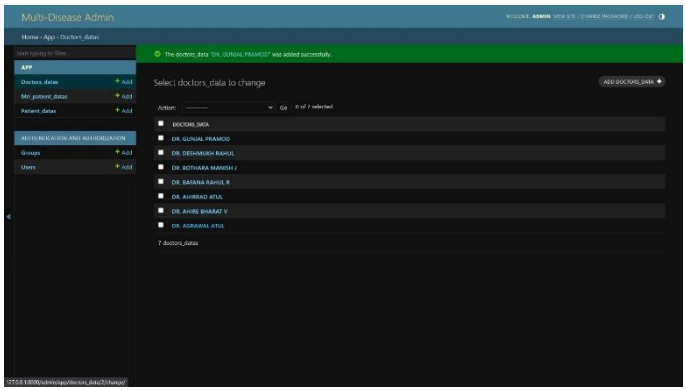

MULTI-DISEASE PREDICTION
HOME LOGIN REGISTER
Welcome to Multi-Disease Prediction
During the time when Machine Learning and Deep Learning are booming so much , it is very important to understand that all this knowledge is not of any use if we cant apply it to different areas and impact the humanity.
Login
Register


MULTI-DISEASE PREDICTION
HOME LOGIN REGISTER
USER REGISTRATION FORM
First Name *
Gaurav
Last Name *
More
Email *
gauravmore2002@gmail.com
Password *
Re-Enter Password *
Submit


MULTI-DISEASE PREDICTION
Symptoms Based Prediction
Image Based Prediction
Success !
OK







CONCLUSION

Proposed system is overcoming the drawbacks of existing system, and we are providing a smart system to reduce the work of physician and to provide quick results of diseases. It will allow user to get suggestion of treatments depending upon the diseases. With the CNN our system is more user friendly and giving more accurate result than existing system.

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