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DEEP LEARNING ALGORITHM FOR CLASSIFICATION AND PREDICTION OF LUNG DISEASES USING CT SCAN IMAGES

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ABSTRACT:- Lung Diseases is the most common Diseases that cannot be ignored and cause death with late health care. Currently, CT can be used to help doctors detect the lung Diseases in the early stages. In many cases, the diagnosis of identifying the lung Diseases depends on the experience of doctors, which may ignore some patients and cause some problems. Deep learning has been proved as a popular and powerful method in many medical imaging diagnosis areas. In this project, three types of deep neural networks (e.g., CNN, DNN, and SAE)are designed for lung Diseases classification. Those networks are applied to theCTimageclassificationtaskwithsomemodificationforthebenignandmalignant lung nodules. Those networks were evaluated on the LIDC-IDRI database. The experimental results show that the CNNnetworkarchivedthebestperformancewithanaccuracyof84.15%,sensitivityof83.96%,andspecificityof84.32% ,whichhasthe best result among the three netwo

1. INTRODUCTION

This section aims to give a brief over view into the project, the goals of the project, the challenges faced and the structure of there port

A. Lung Cancer Detection Application

A web application has been developed to demonstrate a proof of concept. The application requires a user to upload a CT Scan. The application then processes the file and displays the images to the user. The user then chooses which scan he or she wants to predict then the application pre-processes the CT Scan and infers the image to the predictive model. The output of the model is then displayed to the user. The user has the choice to view the images via a carousel or a gallery mode.

B.Large3DDatasetManagementandPreprocessing

Working with the dataset is the most difficult challenge that had to be over come for this project. The dataset is very large (around 70 Gigabytes) which makes managing and analysing the dataset and training the model very computation al heavy..

C. Deep Learning Integration

Integrating deep learning models into applications using Python is different compared to standard machine learning algorithms. Standard machine learning algorithms can be serialized into a file and loaded into an application. Deep learning models use Tensorflow as a framework. Integrating the model requires additional code to ensure that the model runs sequentially on the same thread as the application. This is further explained in the implementation chapter.

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2. MATERIALS AND METHODS

A. Report Structure

The research chapter details research about lung cancer, impact statistics, existing solutions, challenges that medical professionals face, technologies used and the dataset for the project. The main aim of this chapter is to introduce how lung cancer is an incredibly complex problem and that the current ways its being diagnosed.

The deep learning chapter deals with the Deep Learning intuitions needed to develop and train the deep learning model. This chapter introduces deep learning concepts including the research papers associated with the concepts to help debug neural network issues and identify problems during training.

B. Risk models

There have been a number of lung cancer risk models developed and validated that one may consider to be a form of CADx tool (6-9). Typically based on logistic regression, such tools aim to provide an overall risk of the patient having cancer based on patient meta-data such as age, sex and smoking history and nodule characteristics such as nodule size, morphology and growth, if a previous CT was available.

Although such tools currently require manual entry by the user, they do produce an objective lung cancer risk score which may be used in the decision- making process. However, despite their attraction and good performance, their adoption and performance as part of decision making has not been studied. The British Thoracic Society (BTS) guidelines on the management of incidentally detected pulmonary nodules (10), recommends the use of the Brock model (6). Anecdotally, many physicians report using them for patient communication only and feel that such

models do not add a great deal to their clinical expertise.

From a technical perspective, such models have a number of limitations. Foremost is the reliance on human interpretation of input variables such as nodule size, morphology and even the reliance on the patient's own estimate of factors such as smoking history. For example, under the Brock model, a 1mm increase in the reported size of a 5 mm spiculated solid nodule in a 50-year-old female almost doubles its risk, from 0.98% to 1.89%. However, inter-radiologist variability in reporting nodule size is typically greater than this (11)

that, while useful for clinical purposes, lack a precise definition.

C. Radiomic:.

The term Radiomics refers to the automatic extraction of quantitative features from

medical images (15,16) and has been the subject of a great deal of investigation with applications

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including automated lesion classification, response assessment and therapy planning. Nevertheless, their application to medical image processing research has in some areas yielded some significant insights, in particular in how such quantitative features relate to tumour pheno- and genotypes. The idea that such advanced quantitative techniques may add to the qualitative clinical interpretation of radiologists is gaining momentum and is likely to move into mainstream clinical practice in the coming 5 to 10 years.

The combination of CNN and LSTM architectures are discussed for the detection of lung Diseases using the LIDC dataset. CNN consists of convolution and max-pooling layers only. The max-pooling layers output is fed to the LSTM layer. Detecting malignant lung nodules from computed tomography (CT) scans is a hard and time-consuming task for radiologists. To alleviate this burden, computer-aided diagnosis (CAD) systems have been proposed. In recent years, deep learning approaches have shown impressive results outperforming classical methods in various fields. Nowadays, researchers are trying different deep learning techniques to increase the performance of CAD systems in lung Diseases screening with computed tomography. In this work, we review recent state-of-the-art deep learning algorithms and architectures proposed as CAD systems for lung Diseases

3. RESULTLS AND DISCUSSIONS

Lung cancer is a frequently lethal disease often causing death of human beings at an early age because of uncontrolled cell growth in the lung tissues. The diagnostic methods available are less than effective for detection of cancer. Therefore an automatic lesion segmentation method with computed tomography (CT) scans has been developed. However it is very difficult to perform automatic identification and segmentation of lung tumours with good accuracy because of the existence of variation in lesions.

Computed Tomography (CT) has outperformed conventional radiography in the screening of lungs because it generates very detailed high-resolution images and can show early-stage lesions that are too small to be detected by conventional X-ray. CT has been widely used to detect unumeros lung diseases, including pneumoconiosis, pneumonia, pulmonary edema, and lung cancer Early detection of diseases is very crucial for mages The application of image processing techniques for the analysis of CT scan images corresponding to lung cancer cells is gaining momentum in recent years. Therefore, it is of interest to discuss the use of a Computer-Aided Diagnosis (CAD) system using Computed Tomography (CT) images to help in the early diagnosis of lung cancer (to distinguish between benign and malignant tumors).

A. Doctor's Challenges during Diagnosis

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Dr. Linanne is part of a multidisciplinary team involving radiologists, oncologist, surgeons and other respiratory physicians and consultants at Beaumont Hospital to diagnose lung cancer. This multidisciplinary team uses a variety of data, CT Scans, X- Rays, Pet Scans and Biopsies to assess whether a patient has lung cancer. These tests help the tea to fully diagnose a patient and the approach would be to use all of them to gather data.

The improved accuracy of Diseases nodule detection;. Classifies the detected lung Diseases as malignant or benign;. Removes the noises that create false detection of Diseases. Features extraction where features like area, perimeter,
centroid, diameter, eccentricity and mean intensity are extracted from the image. These features are used as training features to develop the classifier.

B. CT acquisition and image pre-processing

CTs were acquired according to standardized scanning protocols at our institution, using a GE "Light speed" CT scanner (GE Medical System) for treatment, pre treatment, and follow-up scans.

C. Concept Evaluation

When doctors find small nodules (less than 3mm) the current practice suggests that they should wait and rescan in 6-12 weeks to see signs of growth. Depending on the tumour, a tumour can grow up to double its size and evolve to a more advanced form of cancer. It is also important to note that the second most frequent diagnosis is small tumours. The project demonstrates that it would be possible for Doctor's to use deep learning applications to aid their decision making process regarding whether a patient with a small tumour should perform a biopsy or rescan in a few weeks which to a patient could mean early treatment and a better prognosis.

4. CONCLUSION AND FUTURE ENHANCEMENT

The one who work in this field are prone to observer fatigue from viewing so many CT scan images. The research on that suggests that observer fatigue increases the risk of errors that can be made by doctors while analysing these scans. Many images in a CT scan also are irrelevant to Doctors e.g. for 200-300 images only 3 scans would show
cancer depending on the stage of the patient. Although this feature wasnot implemented on the website, a more efficient deep learning modelwould be capable of alleviating these additional challenges.Lung disease is the most risky and overall in the world. In this project by using the deep learning algorithm we get accurate result
.Stated with image enhancement, used histogram automatic thresholding method; Region growing different background from lung area. This method can be evaluated more effectively. For more accuracy we can used combine Multi-lay peptone, Support vector
machine classifier..The essential capability of CNN to capture the structure of the image in its feature maps. Further improvements are available in the areas where the abnormalities lie, possibly through the use of deep learning algorithm, and the versatility of an automated detection system.

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REFERENCE PAPERS:

1. Key Statistics for Lung Diseases, https://www.Diseases.org/Diseases/non-small-cell-lung-Diseases/about/key-statistics.html
2. A.C. Society, Diseases Facts and Figures, 2015, http://www.Diseases.org/acs/groups/content/@editorial/documents/document/acspc-044552.pdf.
3.. I. R. Valente, P. C. Cortez, E. C. Neto, J. M. Soares, V. H. de Albuquerque, and J. M. Tavares, "Automatic 3D pulmonary nodule detection in CT images: a survey," Computer Methods and Programs in Biomedicine, vol. 124, no. 1, pp. 91–107, 2016.View at: Google Scholar
4. 4.A. El-Baz, G. M. Beache, G. Gimel'farb et al., "Computer-aided diagnosis systems for lung Diseases: challenges and methodologies review article," International Journal of Biomedical Imaging, vol. 2013, Article ID 942353, 46 pages, 2013.View at: Google Scholar
5. H. Chen and W. WuH. Xia, J. Du, M. Yang, and B. Ma, "Classification of pulmonary nodules using neural network ensemble," Advances in Neural Networks, Springer, Guilin, China, 2011.View at: Publisher Site | Google Scholar
6. J. Kuruvilla and K. Gunavathi, "Lung Diseases classification using neural networks for CT images," Computer Methods and Programs in Biomedicine, vol. 113, no. 1, pp. 202–209, 2014.View at: Publisher Site | Google Scholar