

Chapter 72

Deep Convolutional Neural Networks in Detecting Lung Mass From Chest X-Ray Images

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ABSTRACT

There are more than one million cases of lung cancer per year in India alone. Early detection is vital in increasing the survival rate and decreasing treatment costs. This research is aimed at building a deep convolutional neural network which uses chest x-rays to identify lung mass, and then make a comparative study by tuning the hyperparameters. NIH Chest X-Ray Dataset containing more than 112,000 images were used for training and testing. The data was analysed and then fed to the neural network. Accuracy of over 96% was obtained in all the trials. A comparative study by varying the number of inputs and varying the number of hidden layers was carried out. The accuracies obtained were compared and was found that the accuracy increased with the increase in the number of hidden layers. A complete product was then ideated which when implemented would be a vital diagnostic tool and can be used in the remote locations of a country having just x-ray facilities and no other advanced medical equipment like CT.

INTRODUCTION

Lung cancer affects more than one million people in India per year. A lot of research is being carried out to detect and cure cancer. Detecting a Lung cancer initially requires detecting a lung mass which may be benign or malignant. Detecting a lung mass from the chest X-Ray can be challenging at times and often advanced medical imaging techniques like Computed Tomography (CT) is preferred. But this is not always possible for people at remote locations as they may not have access to such sophisticated medical equipment and/or expert Radiologists may not be available. Hence detecting a lung mass from a simple chest X-Ray is necessary. Convolutional Neural Networks (CNN) are preferred for working on Images. A comparative study is carried out by designing a CNN, varying the number hidden layers and

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the number of input images. The Network is designed, trained and used for prediction on a simple CPU, neither GPUs (Graphics Processing Unit) nor TPUs (Tensor Processing Units) are used.

Figure 1. Sample Chest X-Ray Image from the dataset used



Lung Cancer

Lung cancer is the most common cause of cancer related deaths in men and second most common cause in women (Br & Ng, 2017). Lung Cancer is also called as Lung Carcinoma. It is a malignant Lung Tumor or Lung Mass which is characterized by uncontrolled cell growth in the tissues of lungs. A chest radiograph or chest X-Ray is one of the most cost effective and immediate medical imaging technique available and can be used as the first step in diagnosing Lung Cancer. A Chest Radiograph can be used to detect tumors in the lungs and then, advanced medical imaging techniques like CT and techniques

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