Brief Literature Review

LUNG CANCER NODULE DETECTION & CLASSIFICATION USING DEEP CNN

Lung cancer is the most common forms of cancer in men and third most common form of cancer in women. In 2012, there were 1.8 million lung cancer cases worldwide, with 3.9% of those from India and the highest occurrences of 35.8% from China [1]. Cancerous tumours can be accurately detected by radiologists, however due to high infrastructure costs, these facilities are usually not affordable by lower and middle classes of the society, thereby leading to delayed cancer diagnosis and lower survival rates [2]. This project proposes to build a computer aided system that uses convolutional neural network (CNN) architecture to facilitate classification of lung cancer nodules into its types (benign or malignant) and further estimate the position of cancer nodules present in the computed tomography scans.

Stage I

The survival rate of a lung cancer patient depends on whether cancer detected is at an early stage or at a later developed stage. Therefore to determine if the patient has an early stage cancer or not, the system will have to detect a small nodule (<10mm in diameter for early stage cancers) from a large 3D lung CT scan (typical dimensions: 200mm*400mm*400mm). Furthermore surrounding tissues, bones and air cause noise in the CT scans. Methods

- Image preprocessing (normalisation, zero-centering, downsampling) is done to reduce/removal of noise.
- U-Net (a type of CNN) is trained to detect cancer nodule candidates [3].

Stage II

Previous work on lung cancer nodule classification have used Vanilla 3D CNN and Googlenet 3D CNN and each of these used Adam Optimiser, with ReLu activation function and dropout after each convolutional layer to reduce over-fitting. They use a learning rate of 0.0003 and 0.0001 respectively. This architecture produces a classification accuracy of 0.83 [3]. An eight layer (five convolutional and 3 fully

connected layers) AlexNet is used with ReLu activation function and dropout layer to produce an accuracy of 0.76. ResNets used to train and test produces an accuracy of 0.58. In these, softmax classifiers are used to classify the dataset into classes (presence or absence of cancer nodules) [4]. In another literature, artificial neural network was used with one input, hidden and output layer with 22 neurons or hidden units in the hidden layer. Input to this ANN were six features that were extracted from CT scans by feature extraction. The output was classification into benign or malignant. This architecture achieved an accuracy of 0.9063 [5].

References

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3. Chon, A., Balachandar, N. and Lu, P., 2017. Deep convolutional neural networks for lung cancer detection. tech. rep., Stanford University. (classification AUC of 0.83)
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