DEPARTMENT OF PHYSICS

Professional Science Master in Medical Physics

Thesis Defense

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Detection and Categorization of Lung Cancer using Convolutional Neural Network

ABSTRACT

We developed a convolutional neural network that can detect abnormalities in lung using Computed Tomography (CT) scans and further categorize the abnormalities to benign, malignant adenocarcinoma and malignant squamous cell carcinoma.

Our network is based on DenseNet, which utilizes dense connections between layers (dense blocks), so that all layers are connected. Because of all layers being connected, different layers can reuse features from previous layers which speeds up the process and make this network computationally efficient. To retrain this network we used CT images for 314 patients (over 900 CT images) consistent of 42 lung adenocarcinoma and 78 squamous cell carcinoma, 118 non cancer and 76 benign was acquired from the National Lung Screening Trial(NLST). These images were divided to two categories of Training and Validation with 70% being training dataset and 30% as validation dataset. We trained our network on Training dataset and checked the accuracy of our model using the validation dataset. Our model was able to categorize lung cancer with an accuracy of 88%. Afterwards we calculated the the confusion matrix, *Precision (Sensitivity)*, *Recall (Positivity)* and F1 score for each category. This model is able to classify *normal* CT images with *normal accuracy* of 89% *precision* of 94% and F1score of 93%. For benign nodules the *Accuracy* was 92%, *precision* 97% and F1 score86%; for adenocarcinoma and squamous cell cancer the *Accuracy* was 98% and 93%, *Precision* 85% and 84%, and F1 score of 92% and 86.9%.

The relatively high accuracy of our model shows that convolutional neural networks can be a valuable tool for classification of lung cancer, especially in a small city or underdeveloped rural hospital settings and can play a role in achieving healthcare equality.

Thesis Advisor: Dr. Wazir Muhammad, Ph.D.

All Are Cordially Invited
A copy of the Thesis is available in the Physics Department office, SE 108