AUCKLAND BIOENGINEERING INSTITUTE
THE UNIVERSITY OF AUCKLAND NEW ZEALAND

Functional assessment of bronchiectasis from lung imaging

Emily Her, Supervised by Dr. Alys Clark

Introduction

Bronchiectasis (BX) is a chronic, often progressive and irreversible respiratory disorder that is characterised by abnormal dilation of the pulmonary airways. Incidence of bronchiectasis is unacceptably high in New Zealand compared to other developed countries.

Current gold standard for diagnosis is by high resolution computed tomography (HRCT) but is of concern especially in young children due to ionizing radiation exposure.

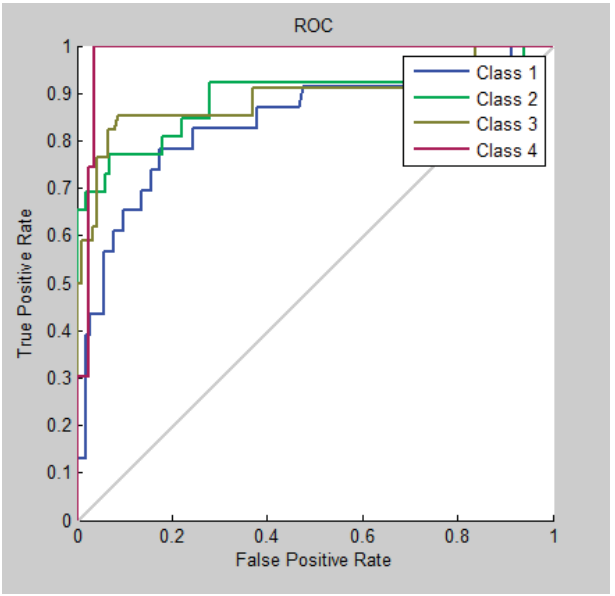
Aim

To develop a rigorous classification method to identify the abnormalities and thereby assist radiologists in detection, diagnosis and identification of pulmonary diseases from chest x-ray images in place of HRCT. The proposed method uses local textural analysis and artificial neural network (ANN) to analyse areas of bronchiectasis in paediatric patients

Results

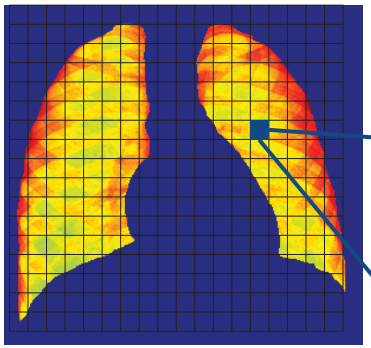
On average, the final method has accuracy of 75.12% in classifying 20x20pix textural blocks into correct class of **normal (1)**, **severe BX features (2)**, **dilation (3)** or **parenchymal abnormalities (4)**.

Parenchymal abnormalities showed highest classification accuracy, very likely due to numerically well-defined textural features as opposed to severe BX features and dilation on chest x-rays. Optimal number of hidden neurons of ANN was determined to be 500.

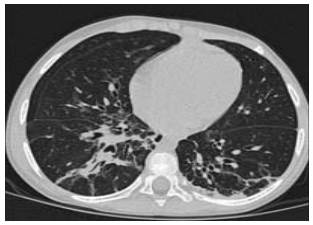


ROC curve for 20x20pix textural blocks classified by ANN with 500 hidden neurons

Method



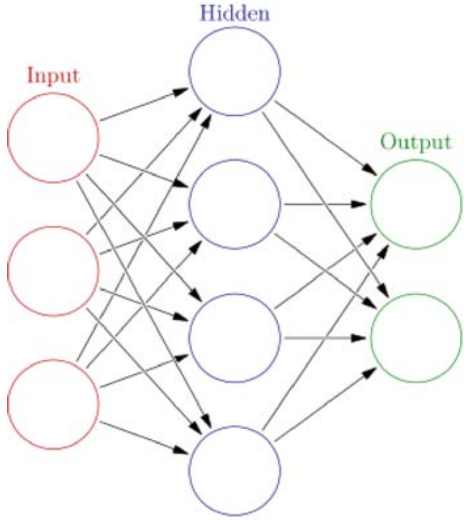
Divide segmented x-ray image into blocks



HRCT clinical assessment class data

Range, Co-occurrence sum of square, Co-occurrence sum variance, Long run emphasis, High grey-level run emphasis, Long run low grey-level emphasis…..

Compute feature vector for each block



Artificial Neural Network Training & Classification

Conclusion

A method for the classification of chest x-ray textural blocks of paediatric BX patients was developed. Classification has been performed by artificial neural network. The results show that local textural analysis of pulmonary abnormalities is promising. Future work could include further generation and testing of textural features, possibly with rib suppression.