AbstractID: 11562 Title: Automated Differential Diagnoses of CT Images from Healthy Lung and Three Pulmonary Diseases using a Simple Statistical Transform and a Probabilistic Neural Network.

Purpose: The viability of automated differential diagnosis of pulmonary diseases and healthy lungs in CT images using a simple statistical transform and a probabilistic neural network is demonstrated.

Method and Materials: We use statistical components and a probabilistic neural network (PNN) toward automated differential diagnosis of pulmonary alveolar proteinosis (PAP), cystic fibrosis (CF), sarcoidosis (SAR) and healthy lung (HL) CTs. Training is performed by selecting 50 points in a single representative image from the 4 categories and forming a 16 by 16 pixel ROI around each training point. The statistical components forming the feature vector are the mean, minimum and standard deviation of intensities from the 16 by 16 pixel ROIs. The feature vectors are then used to train a PNN. One patient image from each category is the only image from which all training vectors are drawn.

Results: The simple statistical feature vectors from a single patient image for each category perform surprisingly well using the PNN. Since PAP is a rare condition, only one patient was available. Training on one image from this patient produced perfect classification on the remaining images. There were 5 patients used for HL, 5 for CF and 3 for SAR. Twenty test vectors were then input to the PNN for classification. The 20 test vectors were drawn from the remaining patient images. Training on only 1 image from 1 patient for each category produced 80%, 65% and 90% classification success for HL, SAR and CF respectively for the remaining patient images. CF classified as SAR 35% of the time.

Conclusions: The results indicate that a statistical transform and a PNN may offer substantial advantage toward an automated differential diagnosis system in CTs of the tested lung diseases. Training on more patients while elaborating the feature space should continue to improve the classification success.