# AbstractID: 1932 Title: An Artificial Neural Network For Predicting The Incidence of Radiation Pneumonitis

The objective of this work is to study a classification method that predicts the incidence of radiation pneumonitis based on the patient dose-volume histogram data. Clinical data from 142 patients treated with external beam for lung cancer were classified into two clusters: with (N=26) and without (N=116) pneumonitis. An artificial neural network (ANN) is designed as a classifier. To perform the classification, a patient treatment outcome with and without pneumonitis was assigned a value of 1 and –1, respectively. A volume vector ($\mathbf{V_D}$), which describes the lung sub-volumes that receive more than threshold doses, was used as network input variables. Zero was used as the threshold to separate the output into –1 or 1. Two ANNs, each with three layers, were trained to perform this function. Radial basis function (RBF) was applied as the hidden neuron activity function and tan-sigmoid function was selected as the output neuron function. Backpropagation was used as a training algorithm. Two neural networks (ANN_1 and ANN_2) resulted by using different validation methods. ANN_1 was trained and tested by using the leave-one-out method. ANN_2 was trained by using 2/3 of the patient data, and tested by the remaining 1/3 of the data. The correct classification rate was 94%, 99% and 73% obtained from ANN_1 for the total, non-pneumonitis and pneumonitis cases. A corresponding correct classification rate obtained from ANN_2 was 81%, 89% and 44%, respectively. Preliminary results suggest that the ANN approach provides a useful tool for predicting radiation-induced lung injury.

Acknowledgement: Varian, NIH CA69579