BREAKOUT SESSION

PRESENTATION DESCRIPTION

CHARLES E. SCHMIDT COLLEGE OF SCIENCE

fau.edu/data

Prediction of Radiobiological Outcomes in Radiotherapy of Lung Cancer through an Artificial Neural Network.

M Pudasaini[1*], T Leventouri[1], S Pella[1,2], W Muhammad[1]

1. **Department of Physics, Florida Atlantic University, Boca Raton, FL**
2. **21st Century Oncology, Boca Raton, FL**

Purpose: Recently various radiation therapy techniques have been employed to improve tumor dose conformity while sparing organs-at-risk (OAR) in lung cancer patients. The purpose of this research is to develop an artificial neural network (ANN) to predict radiobiological parameters in radiotherapy for lung cancer patients.

Methods: In this work, radiobiological parameters were predicted from treatment planning data of lung cancer patients. A total of 100 lung cancer patients' treatment plans treated with different techniques, were selected for this study. Normal tissue complication probability (NTCP) and tumor control probability (TCP) were calculated. The selected input plan parameters include the planning target volume (PTV), treatment modality, location of tumor, prescribed dose, number of fractions, maximum dose to tumor, and mean doses to the normal tissues. These parameters were used to predict the NTCP values for organs at risk (OAR) and TCP for tumor target. An artificial neural network (ANN) based on Scaled Conjugate gradient algorithm with one hidden layer is fitted with 11 inputs and 5 outputs. The available data are employed 70% for training and 30% for testing. The fitting error is analyzed by Mean square error (MSE) and regression values.

Results: The regression model neural network predicts NTCP for organs at risk and TCP for the target with 0.4% error as compared to those calculated by linear quadratic EUD based Niemierko's model . The fitted regression model has MSE values 0.007 and 0.024 for training and testing respectively. The regression values are 0.97 and 0.91 for training and testing respectively.

Conclusion: Preliminary results of this study shows that neural network can be designed to predict the radiobiological parameters without using advanced algorithm and can give equivalent results as given by other mathematical models. As regression values are closer to 1, the model is predicting radiobiological outcomes with 0.4% error for test data. To validate the performance of the neural networks in case of lung cancer treatment plan, further research is in progress.