# AbstractID: 6901 Title: Assessment of Lung Tumor Response using CT-based Image Guided Therapy

**Purpose:** The purpose of this study was to develop and test a novel model for actively predicting the tumor's size, location, and mass while the patient is undergoing radiation therapy. Given that local failure represents the most common mode of failure for lung cancer, the ability to predict changes in the size and mass of the residual tumor mass has a high level of clinical significance. By predicting the tumor's future behavior, it is possible to prospectively design an integrated boost to the location of the residual tumor mass.

**Method and Materials:** For 23 easily visualized lesions, tumor volume was measured over the course of treatment using MVCT imaging. The masses of 15 lesions were also measured. Individual response models were created for these lesions using Locally Weighted Regression (LWR). Each model was created using the measured volumetric and mass responses for the remaining lesions. All data related to the lesion being used to test the model were excluded. The model inputs included the measured volume or mass from early in the treatment. Which variables to include, and the combination of observation days was determined using a genetic algorithm (GA) based optimization.

**Results:** The average error between the true and predicted final volumes was 4.5%, while the error for the final mass predictions was 14.6%. The LWR model was accurate in its predictions made at the end treatment. However, the uncertainty in the shape of the tumor response curve increased near the middle of treatment.

**Conclusion:** A novel technique has been developed for predicting lung tumor response. Even with a relatively small patient database, the predicted responses (and their associated uncertainties) at the end of treatment were in agreement with measurement. These results confirm the accuracy that can be achieved by this non-parametric model when applied to lung data.