Contribution ID: **14** Type: **Parallel Talk**

Development of clinically based prediction models using machine learning and Bayesian statistics

The massive development of photon radiation treatment techniques as well as the increase use of Hadron therapy has led to a difficult treatment evaluation since many parameters are in play. At the same time, there has been an increase of cancer clinical data generation in the form of clinical records and imaging data. As a response, biophysical models based on clinical data mining and machine learning are increasingly being developed, with the aim of evaluating clinical effects of radiotherapy treatments.

In this work, the framework for developing generic clinically based models is shown and illustrated with Bayesian statistics neurologic grade prediction models in order to exemplify the type of models that can be developed from a mathematical point of view. The models are based on clinical records of patients who underwent radiotherapy treatment due to glioblastoma which is an aggressive brain cancer. A first model requires as a parameter the neurologic grade of the patient before the treatment then predicts the grade after the treatment. A second, enhanced, model was developed with the aim of making the prediction more realistic and it uses the neurologic grade before the treatment as well, but it additionally depends on the Clinical Target Volume (CTV). Furthermore, with the aid of Bayesian statistic we were able to estimate the uncertainty of the predictions.

These models provide the guidelines for exploration of medical cancer data generated during treatments in order to determine which parameters play an important role in the outcome of clinical effects.

Authors: ZAMBRANO-RAMIREZ, Oscar Daniel (Universite Caen Normandie. Laboratoire de Physique Corpusculaire (LPC-Caen). France); FONTBONNE, Jean-Marc (Universite Caen Normandie. Laboratoire de Physique Corpusculaire (LPC-Caen). France)

Presenter: ZAMBRANO-RAMIREZ, Oscar Daniel (Universite Caen Normandie. Laboratoire de Physique Corpusculaire (LPC-Caen). France)

Session Classification: Parallel Session - MP

Track Classification: Medical Physics