

## AbstractID: 5850 Title: Kernel Classification for Assessing Inter-Fraction Motion in IGRT

**Purpose:** To develop a method that identifies an IGRT imaging session as either normal or problematic based solely on the amount of right-left, anterior-posterior, and superior-inferior repositioning of the patient over the treatment session.

**Methods and Materials:** A retrospective data set containing over 1100 anterior-posterior, right-left lateral, and superior-inferior patient shift values for 29 prostate patients was examined using a non-parametric kernel regression classification method to determine if a patient was "normal" or "problematic." The treatment sessions were grouped as either being "normal", or affected because they were "overweight", or had "rectal filling", or were both "overweight and had rectal filling". In kernel regression, constants are fitted using a locally weighted criterion. The basis of kernel regression is to estimate a response using a weighted average of points, in a training set, which are local to the query point. A bandwidth is used to determine the definition of local. Leave one out cross validation (LOOCV) was used to select the optimal bandwidth and also evaluate the technique's performance.

**Results:** The method correctly classified 24 of the 29 patients using their respective shift data sets, with four of the misclassifications occurring when the technique correctly identified non-normal datasets, but assigned them to the wrong problem group. Only one patient was classified as normal incorrectly.

**Conclusion:** Using readily accessible shift data, the kernel regression classification method was able to correctly identify the cause behind IGRT positioning problems for individual prostate patients. This technique is fully automated and can be implemented on a treatment planning computer to determine the reason a patient is having positioning errors early during treatment.