A Quantitative Histogram-based Approach to Predict Treatment Outcome for Soft Tissue Sarcomas Using Pre- and Post-treatment MRIs

Abstract - The goal of this paper is to show the use of data mining techniques to predict the Soft Tissue Sarcoma (STS) tumor progression. STS are cancers which occur in different parts of the body such as fat, muscle and nerves. The lack of effective treatments and the difficulty in predicting treatment response make them challenging for physicians, and has likely slowed the evolution of new therapeutic agents. To design a prediction model, we propose a novel quantitative histogram-based method to analyze the difference in histograms obtained from pre and post-treatment multi-modality magnetic resonance images. Here, we used Radiomics techniques as a non-invasive method for outcome prediction. This study could help physicians identify distinctive patterns within each tumor to find more patient-specific treatments. We demonstrated the new approach on two practical tasks: tumor recurrence prediction (metastasis) and rate of necrosis prediction. Our learned model shows 87.79% prediction accuracy for metastasis with a 0.73 AUC and 82.22% prediction accuracy for necrosis with a 0.65 AUC.