
## "Comparing 18-FDG PET 3D texture attributes for the prediction of survival and recurrence in oropharyngeal cancers treated with radiotherapy"

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*Purpose:* In the context of locally advanced oropharyngeal cancer treated with definitive RadioTherapy (RT) (combined with chemotherapy or Cetuximab), the aim of this study is to compare three common volumetric texture analysis approaches for predicting Overall patient Survival (OS) and Disease Free Survival (DFS).

*Materials and methods:* A multi-centric cohort of 108 patients including 40 and 47 events for OS and DFS, respectively, were used to evaluate the predictive performance of texture analysis on PET volumes only[1]. Three groups of 3D texture attributes were compared: Gray-Level Co-occurrence Matrices (GLCM, used in LifeX)[2], Laplacian of Gaussians (LoGs, used in TexRad)[3], and combined Riesz wavelets[4,5] of order one and two. Each texture attribute was averaged over the core volume of the primary tumor used for RT targeting. A Cox-Lasso multivariate model was used to predict hazards[6]. A stratified 10-fold cross-validation with 100 Monte Carlo repetitions was used to estimate the predictive performance.

*Results:* Maximum Concordance (C) indices for OS and DFS of 0.73 and 0.67 were observed, respectively, using Riesz (27 attributes). For GLCMs (11 attributes) and LoGs (14 attributes), C-indices for OS and DFS were 0.64 and 0.59, and 0.63 and 0.53, respectively (see Fig. 1). An open-access web platform is freely available to anyone to compute these features in new patient batches[4] (https://radiomics.hevs.ch/).

*Discussions and Conclusions:* Riesz texture analysis in PET images is able to predict OS and DFS in oropharyngeal cancers in a clinically useful manner (C-index>0.7). The lack of locally rotation-equivariant and multi-scale analysis for GLCM and LoG image operators was found to be a critical issue in this study. They are fundamental properties for obtaining highly sensitive volumetric biomedical texture measures[7,8]. The open-access web platform will be further used to confirm the results obtained on an external validation patient cohort.

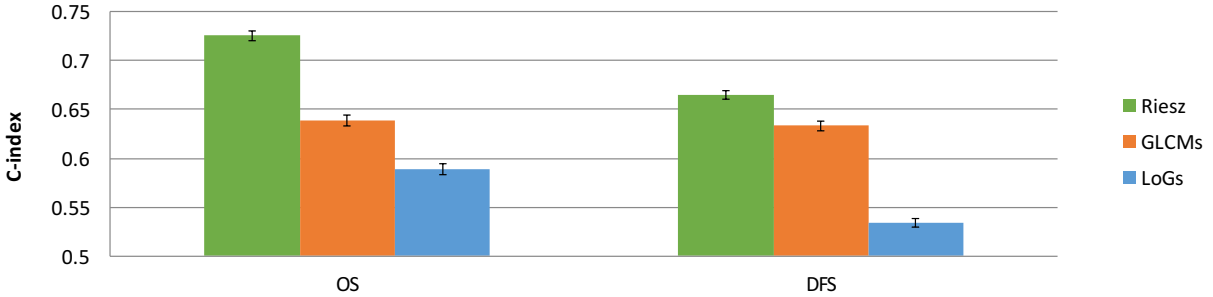


Fig. 1. Predictive performance of the three groups of 3D texture attributes.

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