Purpose: Positron emission tomography (PET) presents a valuable resource for delineating the biological tumor volume (BTV) for image-guided radiotherapy. However, accurate and consistent image segmentation is a significant challenge within the context of PET, owing to its low spatial resolution and high levels of noise. Active contour methods based on the level set methods can be sensitive to noise and susceptible to failing in low contrast regions. Therefore, this work evaluates a novel active contour algorithm applied to the task of PET tumor segmentation.

Methods: A novel active contour segmentation algorithm based on maximizing the Jensen-Rényi Divergence between regions of interest was applied to the task of segmenting lesions in 7 patients with T3-T4 pharyngolaryngeal squamous cell carcinoma. The algorithm was implemented on an NVidia GEFORCE GTV 560M GPU. The cases were taken from the Louvain database, which includes contours of the macroscopically defined BTV drawn using histology of resected tissue. The images were pre-processed using denoising/deconvolution.

Results: The segmented volumes agreed well with the macroscopic contours, with an average concordance index and classification error of $0.6 \pm 0.09$ and $55 \pm 16.5\%$, respectively. The algorithm in its present implementation requires approximately $0.5-1.3$ sec per iteration and can reach convergence within 10-30 iterations.

Conclusions: The Jensen-Rényi active contour method was shown to come close to and in terms of concordance, outperforms a variety of PET segmentation methods that have been previously evaluated using the same data. Further evaluation on a larger dataset along with performance optimization is necessary before clinical deployment.