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Positron-Range Correction for an On-Chip PET Scanner using Deep Learning

Monday, 20 May 2024 18:00 (5 minutes)

Background: Organs-on-Chips (OOCs) are a novel technology that aim to
mimic the functions and physiology of human organs in a laboratory setting. Positron Emission Tomography (PET) is a widely-used imaging modality that enables non-invasive monitoring of biological processes in vivo. However, the spatial resolution of current small-scale PET systems is not sufficient for OOC imaging. One of the main factors limiting the spatial resolution of a PET scanner is the positron range, which is the distance that a positron travels before it collides with an electron. In this study, we present a novel Deep Learning (DL)-based approach for correcting the positron-range effect in our previously introduced
On-Chip PET scanner.
Results: We created a dataset of pairs of non-corrected and corrected images using a Monte-Carlo simulation of a realistic OOC phantom and a fully three-dimensional Maximum-Likelihood Expectation-Maximization (MLEM) iterative reconstruction algorithm. Our results demonstrate the effectiveness of the DL-based positron-range correction algorithm in improving the overall quality of the reconstructed images.

Field

Software and quantification

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