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# PETAL-3D: Progressive Elimination of Noise Towards Accurate Ultra Low-Dose PET Images Using 3D U-Net

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Positron Emission Tomography (PET) is a functional imaging technique used in nuclear medicine to investigate metabolic and physiological activities. The dose delivered to the patient can be reduced by decreasing the injected activity of the radiotracer. However, this reduction would lead to increased noise levels in the reconstructed image. Several techniques, including image filters and Artificial Intelligence (AI) algorithms, can be employed to reduce the noise in the post-reconstructed images, thereby enhancing the quality of low-dose PET scans. In this work, we proposed a Progressive Elimination of Noise Towards Accurate Ultra Low-Dose PET Images Using 3D U-Net (PETAL-3D) for recovering images of dose reduction factor of 100. PETAL-3D operates by passing the low-dose PET image (the input) through multiple 3D U-Net networks. This helps eliminate the noise gradually from the image. PETAL-3D was trained on data obtained from both Siemens Biograph Vision Quadra PET/CT scanner and a United Imaging uEXPLORER PET/CT scanner. Scans from thirty subjects were utilized to assess the performance of PETAL-3D and draw a comparison with a 4 mm Gaussian filter. The results showcased strong performance in recovering the image quality compared to the Gaussian filter using global and local metrics without the introduction of artefacts within the image.

## Field

Software and quantification

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