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From Signal Acquisition to Image Reconstruction: Potential Applications of Machine Learning in Positron Emission Tomography

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Positron Emission Tomography (PET) is a functional medical imaging technique that allows for the visualization and measurement of metabolic processes in the body by detecting pairs of 511-keV gamma rays originating from a tracer molecule
labeled with a positron emitter.

Despite its advanced capabilities, PET imaging faces significant challenges, including high noise levels and limited spatial resolution of the acquired data, which severely hampers the diagnostic quality of the reconstructed images.

In addition to classical algorithms traditionally used for signal processing, image reconstruction, and image post-processing, machine learning (ML) based algorithms are now being explored to enhance the quality of PET raw data and the quality of reconstructed PET images.

This talk provides an overview of the current applications of ML in PET imaging,
encompassing various stages from signal acquisition to image reconstruction and post-processing.

Additionally, the presentation addresses the current challenges in the field and explores future needs and directions for a sustainable and successful integration of ML in PET imaging.

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