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## Progress on the Development of the Emission Tomography Standardization Initiative (ETSI) Standard Format for List-Mode PET Raw Data (PETSIRD)

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The recent advancement of data science methods in emission tomography (ET) has highlighted the need for standardization in the access, use, and sharing of the unprocessed raw list-mode acquisition data to exploit their high fidelity spatio-temporal information before the production of the respective DICOM images. The Emission Tomography Standardization Initiative (ETSI) was founded in 2022 from an international consortium of academic and industry experts to define open, extendable, and vendor-agnostic ET data formats to facilitate: (i) inter-scanner data harmonization; (ii) building of large-scale raw data sharing repositories for the effective deployment of Artificial Intelligence models; and (iii) development of advanced data analysis and emission tomography imaging application methods.

ETSI is now focusing on the development of PETSIRD: an open standard format for Positron Emission Tomography (PET) list-mode raw data. The components of PETSIRD are (i) its data elements (coincidence events, geometry, correction factors, physiological signal etc.); (ii) a container of the data elements architecture and its access protocols built with Microsoft Research's YARDL meta-language; and (iii) a use-cases software toolkit facilitating the basic utility of the standard. ETSI successfully conducted its first hackathon in November 2023 where a group of about 30 international participants from industry and academia worked together to produce a basic use-cases toolkit of an initial PETSIRD version to support: (i) gating and sub-sampling of PETSIRD data; (ii) conversion of simulated raw data from ROOT to the PETSIRD format and building of a PETSIRD demo dataset; (iii) implementation in existing open-source PET reconstruction tools of a basic PETSIRD interface; and (iv) independent open-source reconstruction of PET images from PETSIRD demo data.

PETSIRD format can introduce a paradigm shift in PET imaging by enabling the standardized open access to the wealth of unprocessed information inherently encapsulated in list-mode PET data to spark innovation and wider AI technology deployment.

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