

A Unified Deep Learning Framework For Cross-platform Harmonization Of Multi-tracer PET Quantification In Alzheimer's Disease



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Core Take-Home Message: Deep learning harmonization closes the cross-platform PET-MRI/PET-CT gap in AD biomarker quantification to within clinically negligible bounds, enabling reliable multicentre, radiation-sparing AD trials.

INTRODUCTION	METHODS	RESULTS	CONCLUSIONS	REFERENCES
Quantitative PET is essential for diagnosis and treatment monitoring in Alzheimer's disease (AD), yet systematic biases between PET-MRI and PET-CT preclude threshold transfer and cross-site comparability. These platform-dependent discrepancies can confound diagnostic decisions and reduce sensitivity to longitudinal change during anti-amyloid therapy monitoring. PET-MRI PET-CT	The framework was trained on prospective same-day paired PET-CT/PET-MRI acquisitions (N=70; ¹⁸F-FDG, ¹⁸F-florbetaben, ¹⁸F-florzolotau) with inter-scan intervals of 5-7 minutes to minimize tracer redistribution. Multicentre validation (N=303) encompassed three sites, four scanner configurations from three vendors, and both amyloid and tau imaging in AD-spectrum patients.	For amyloid PET, Centiloid discrepancies decreased from 23.6 to 4.1 units and well below the treatment effect of lecanemab. For tau PET, SUVR thresholds aligned from 1.5 (unharmonized) to 1.3 (harmonized) versus 1.2 (PET-CT reference).	By achieving quantitative equivalence within clinically acceptable bounds, this approach establishes a practical foundation for radiation-sparing PET-MRI integration into AD therapeutic workflows and multicentre clinical trials. The Unified Deep Learning Framework	1. Wang J, Zhong A, Xu Q, Huang H, Zhu Y, Lu J, Wang M, Jiang J, Li C, Ni M, Sun K. A unified deep learning framework for cross-platform harmonization of multi-tracer PET quantification in neurodegenerative disease. npj Digital Medicine. 2026 Mar 30. 2. Zhong A, Huang H, Wang J, Shen Z, Song H, Wu J, Zhu Y, Liu Y, Zuo C, Wang Q. Multi-tracer Uptake Correction for PET-MR via Aligned-Feature Guidance and Multi-scale Pixel-Adaptive Routing. In International Conference on Medical Image Computing and Computer-Assisted Intervention 2025 Sep 20. Cham: Springer Nature Switzerland.
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