AI-enhanced Centiloid quantification of amyloid PET images

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Abstract:

Introduction: The Centiloid scale is the standard for amyloid (Aβ) PET quantification in research and clinical settings. However, variability between tracers and scanners remains a challenge.

Methods: This study introduces DeepSUVR, a deep learning method to correct Centiloid quantification, by penalizing implausible longitudinal trajectories during training. The model was trained using data from 2,129 participants (7,149 Aβ positron emission tomography [PET] scans) in the Australian Imaging, Biomarkers and Lifestyle Study of ageing (AIBL)/Alzheimer's Disease Neuroimaging Initiative (ADNI) and validated using 15,807 Aβ PET scans from 10,543 participants across 10 external datasets.

Results: DeepSUVR increased correlation between tracers, and reduced variability in the Aß-negatives. It showed significantly stronger association with cognition, visual reads, neuropathology, and increased longitudinal consistency between studies. DeepSUVR also increased the effect size for detecting small treatment related slowing of amyloid accumulation in the A4 study.

Discussion: DeepSUVR substantially advances Aβ PET quantification, outperforming all standard approaches, which is particularly important for clinical decision making and to detect subtle or early changes in Aβ.

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