

QSM-based Assessment Of Amyloid- β Deposition Using Transformed Multi-space Channel Representations And Deep Learning

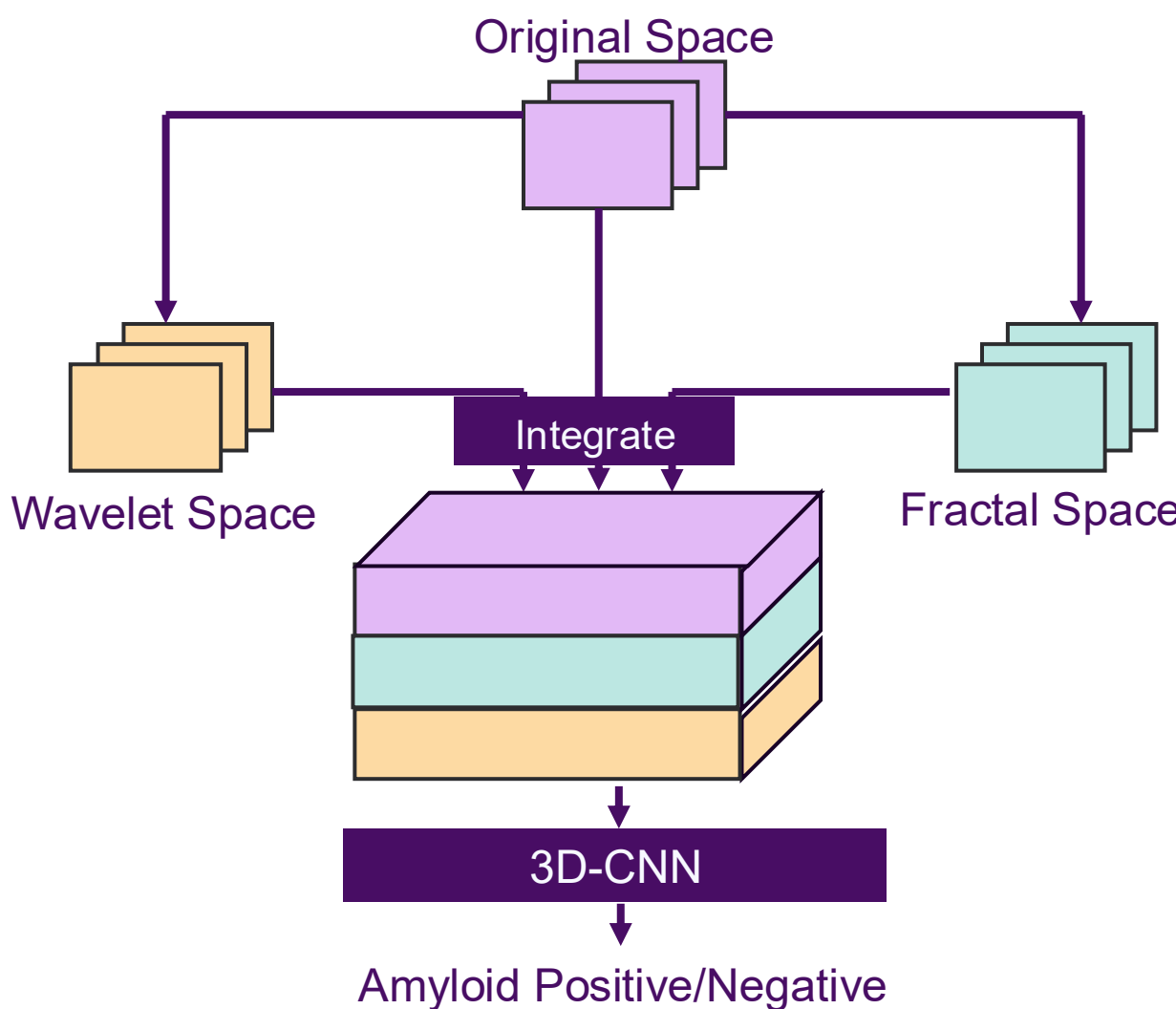
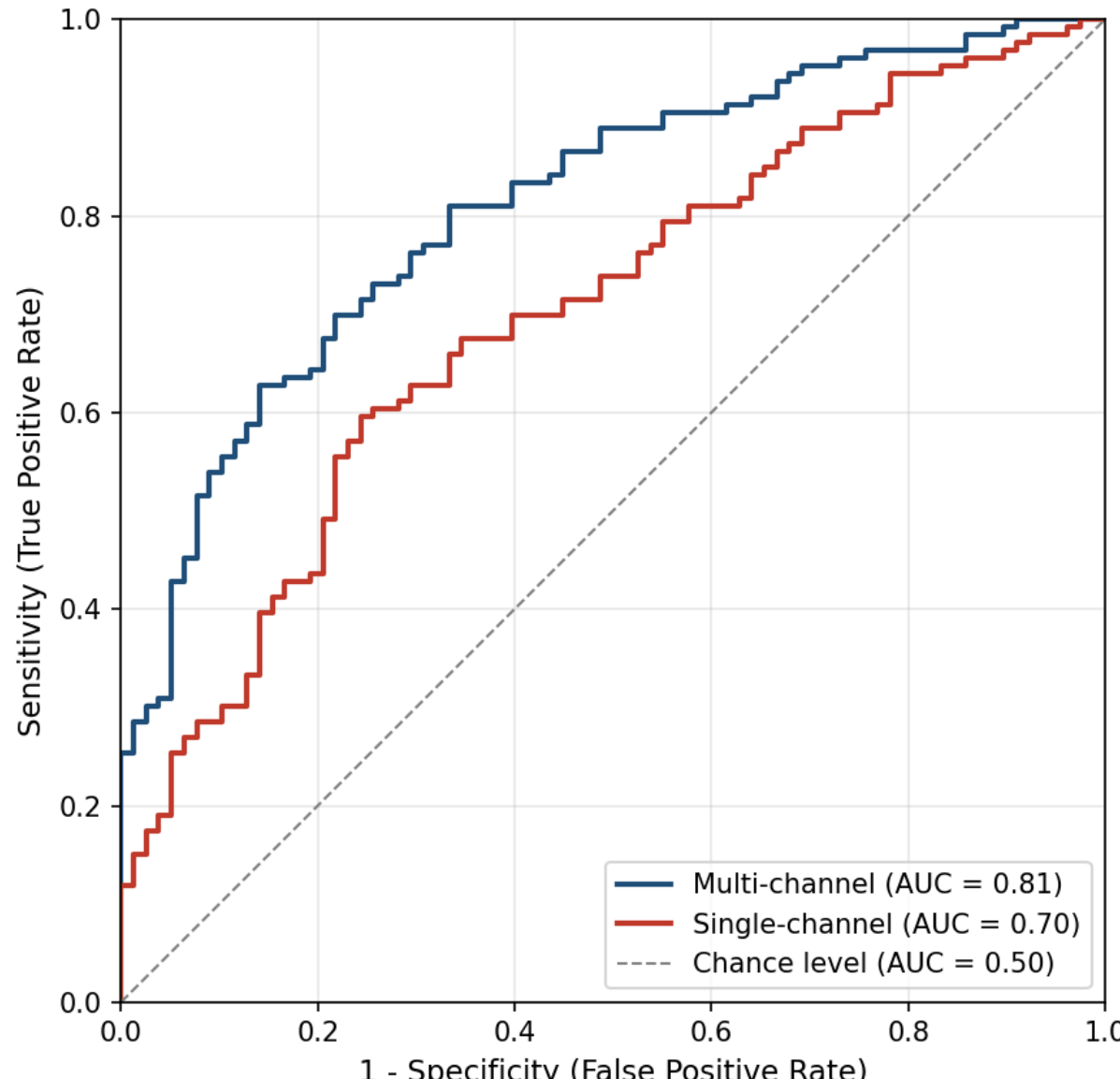


P1-09

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Multi-space transformation of QSM captures complementary spatial representations of amyloid-related imaging features for deep learning, improving cerebral amyloid- β classification and advancing MRI-based assessment toward PET-comparable evaluation.

INTRODUCTION	METHODS	RESULTS	CONCLUSIONS																												
Amyloid-β (Aβ) plaque assessment is essential for Alzheimer’s disease diagnosis.¹ Although amyloid PET is the reference standard, its cost and limited availability constrain clinical use.² Quantitative Susceptibility Mapping (QSM) is a promising MRI biomarker for amyloid pathology.³ Previous QSM-based methods have shown limited performance due to insufficient characterization of amyloid-related patterns.^{4, 5} Therefore, we develop a multi-space QSM framework for cerebral Aβ assessment.	A total of 204 participants (126 amyloid-positive, 78 amyloid-negative) who underwent QSM MRI(3T) and 18F-flutemetamol PET between December 2020 and October 2025 were included.(Table1) Amyloid status was determined by PET visual assessment. <table><caption>Table1 Summary of the patients</caption><tr><th></th><th>Amyloid Positive</th><th>Amyloid Negative</th><th>Total</th></tr><tr><td>Case, n</td><td>126</td><td>78</td><td>204</td></tr><tr><td>Mean Age, years</td><td>75 (63-84)</td><td>69 (60-86)</td><td>73 (60-86)</td></tr><tr><td>Sex, male/female</td><td>51/75</td><td>35/43</td><td>86/118</td></tr><tr><td>Mean MMSE</td><td>23.8 (19-27)</td><td>27.1 (25-28)</td><td>25.2 (19-28)</td></tr></table>		Amyloid Positive	Amyloid Negative	Total	Case, n	126	78	204	Mean Age, years	75 (63-84)	69 (60-86)	73 (60-86)	Sex, male/female	51/75	35/43	86/118	Mean MMSE	23.8 (19-27)	27.1 (25-28)	25.2 (19-28)	Wavelet⁶ and Fractal⁷ transformations generated multi-space representations combined with the original QSM (Fig. 1). A model was trained and evaluated using stratified 5-fold cross-validation (AUC).  Fig.1 Algorithm Overview	The proposed multi-channel QSM framework achieved a mean AUC of 0.81 (sensitivity 0.85, specificity 0.66), consistently outperforming conventional single-channel QSM (Fig.2) for amyloid detection.  Fig.2 Performance Comparison	Spatially transformed multi-channel QSM improved cerebral Aβ discrimination beyond conventional QSM, supporting more accurate and scalable MRI-based amyloid assessment toward PET-comparable evaluation. <table><caption>REFERENCES</caption><tr><td>1. Jack CR Jr et al. <i>Alzheimer's & Dementia</i>. 2018</td></tr><tr><td>2. Johnson KA et al. <i>Alzheimer's & Dementia</i>. 2013</td></tr><tr><td>3. Kim HG et al. <i>Frontiers in Neuroscience</i>. 2022</td></tr><tr><td>4. Spotorno N et al. <i>European Journal of Radiology</i>. 2020.</td></tr><tr><td>5. Tiepolt S et al. <i>Magnetic Resonance Imaging</i>. 2023.</td></tr><tr><td>6. Mallat S 3rd ed. Academic Press; 2008.</td></tr><tr><td>7. Lopes R et al. <i>Medical Image Analysis</i>. 2009.</td></tr></table> ALZHEIMER'S ASSOCIATION AAIC>26	1. Jack CR Jr et al. <i>Alzheimer's & Dementia</i> . 2018	2. Johnson KA et al. <i>Alzheimer's & Dementia</i> . 2013	3. Kim HG et al. <i>Frontiers in Neuroscience</i> . 2022	4. Spotorno N et al. <i>European Journal of Radiology</i> . 2020.	5. Tiepolt S et al. <i>Magnetic Resonance Imaging</i> . 2023.	6. Mallat S 3rd ed. Academic Press; 2008.	7. Lopes R et al. <i>Medical Image Analysis</i> . 2009.
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