

Evaluating pCASL-derived Radiomics Features for Alzheimer's Disease Stratification

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Introduction

- Arterial spin labeling MRI provides **non-invasive quantification** of cerebral blood flow (CBF), a potential marker for AD related perfusion alterations
- We analyzed 3D pCASL (pseudo-continuous ASL) CBF maps using radiomics features with machine learning to analyze AD using both cognition and amyloid status

Methods

Dataset

- 418 single post labeling delay (PLD) 3D pCASL from ADNI cohort
- GE scanners, PLD: 2025 ms, labeling duration 1800 ms, 3 repetitions

Disease stratification

- Clinical diagnostic criteria

CU	MCI	DE
234 cases	201 cases	65 cases

- Biomarker based criterion

	CU	MCI	DE
Amyloid negative	CUA- (39 cases)	CIA- (20 cases)	X
Amyloid positive	X	CIA+ (65 cases)	AD (57 cases)

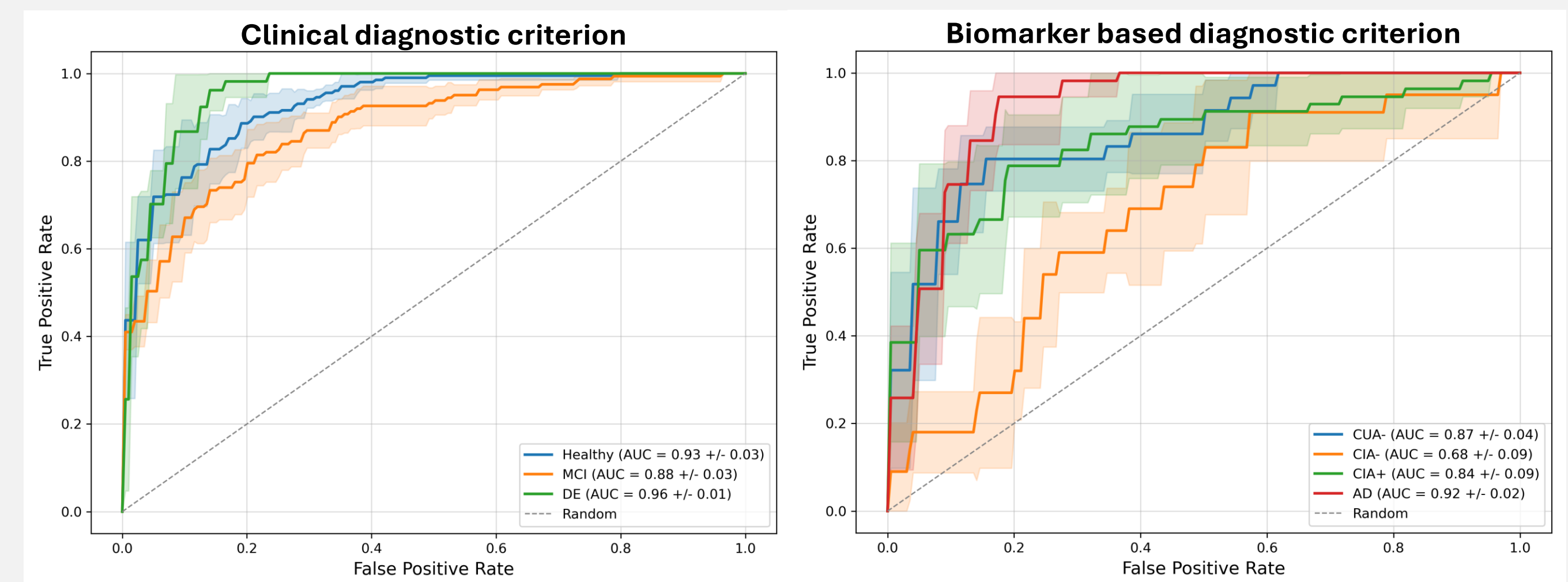
Method

- CBF map generation (OxfordASL) segmentation (FastSurfer)
- Feature extraction (Pyradiomics)
- total of 2970 radiomics features were extracted from 26 brain subregions
- XG boost classifier, 5 fold cross validation

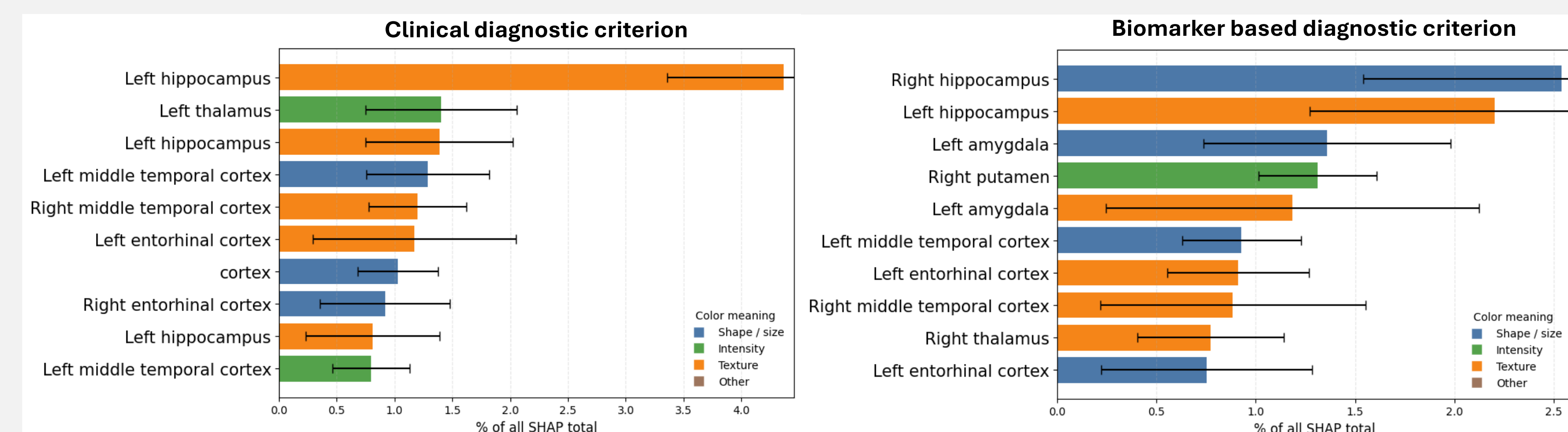
Results

- Diagnostic performance

	Accuracy	Balanced Acc	F1	ROC-AUC
Clinical criterion	0.780 ± 0.030	0.748 ± 0.042	0.748 ± 0.045	0.914 ± 0.02
Biomarker criterion	0.632 ± 0.070	0.552 ± 0.058	0.536 ± 0.062	0.851 ± 0.039



- Informative features



Conclusion

- Promising AD classification under clinical and biomarker-based diagnostic schemes using perfusion based radiomics features
- Informative features concentrated in hippocampus, amygdala, entorhinal, and temporal regions
- Strongest signals from shape/size and texture-based features, followed by intensity-based features
- Findings may reflect AD atrophy and altered regional perfusion heterogeneity



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