

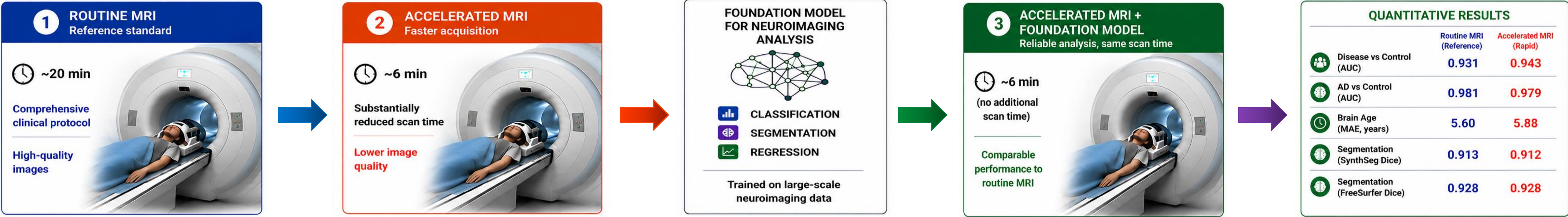
AI Analysis Demonstrates Ultra-fast MRI Matches Routine Scan Performance in Dementia Diagnosis

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INTRODUCTION

MRI as a Biomarker

MRI provides essential biomarkers for the diagnosis and monitoring of neurodegenerative diseases.

Accelerated MRI

Accelerated MRI reduces scan time from ~20 minutes to ~6 minutes, improving patient comfort and scanner efficiency.

Clinical Question

Can accelerated MRI preserve AI-derived diagnostic, structural, and brain-age biomarkers as reliably as routine MRI?

Study Objective

Evaluate whether accelerated MRI enables equivalent disease classification, brain-age estimation, and whole-brain segmentation using a pretrained foundation model.

REFERENCES

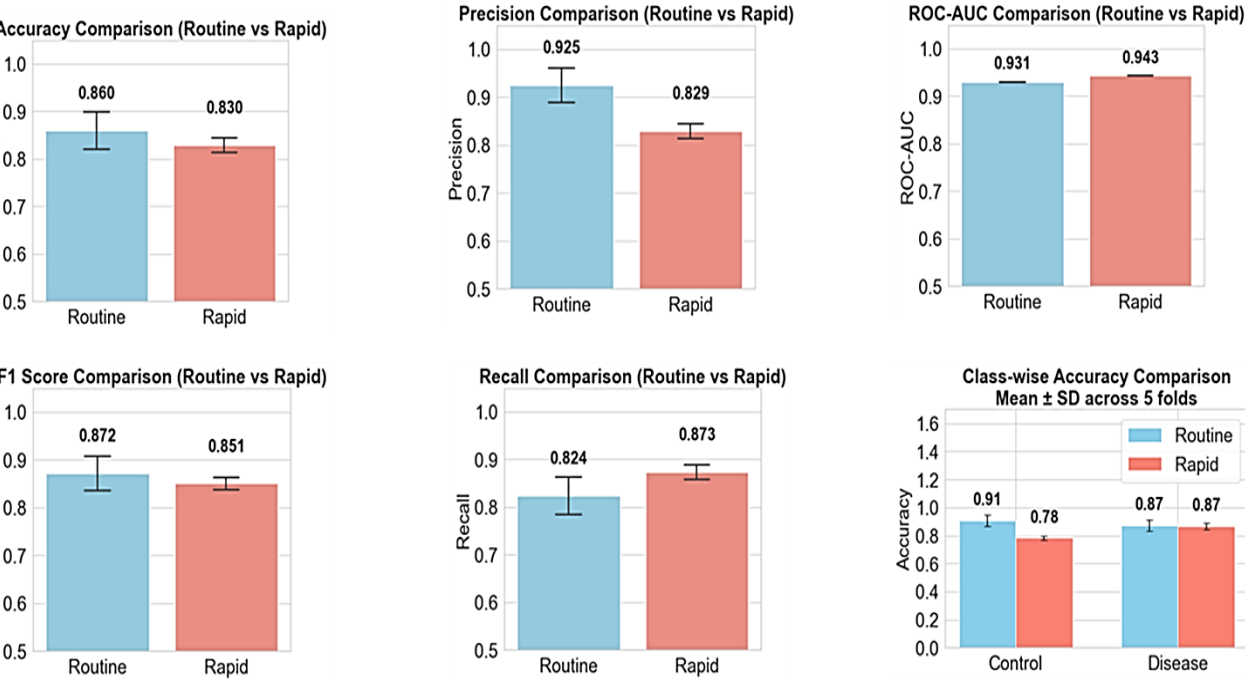
1. Rosa-Grilo et al., *Alzheimer's Dement.*, 2025.
2. Mazher et al., *MIDL*, 2025.
3. He et al., *CVPR*, 2022.
4. Munk et al., *arXiv*, 2025.

RESULTS

Disease Classification

Accelerated MRI achieved diagnostic performance comparable to routine MRI for neurodegenerative disease classification.

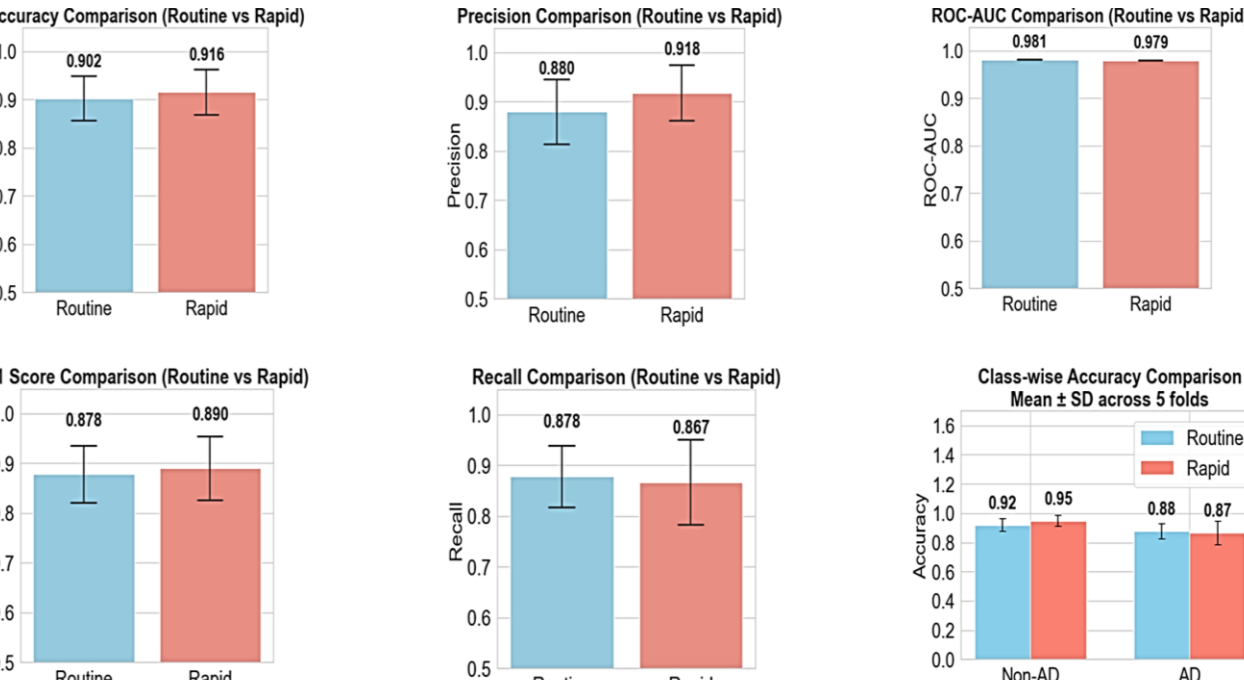
AUC: 0.931 ↔ 0.943
Accuracy: 85.9% ↔ 83.0%
Cohen's κ : 0.64



Alzheimer's Disease Classification

AI-based Alzheimer's disease detection remained highly consistent between acquisition protocols.

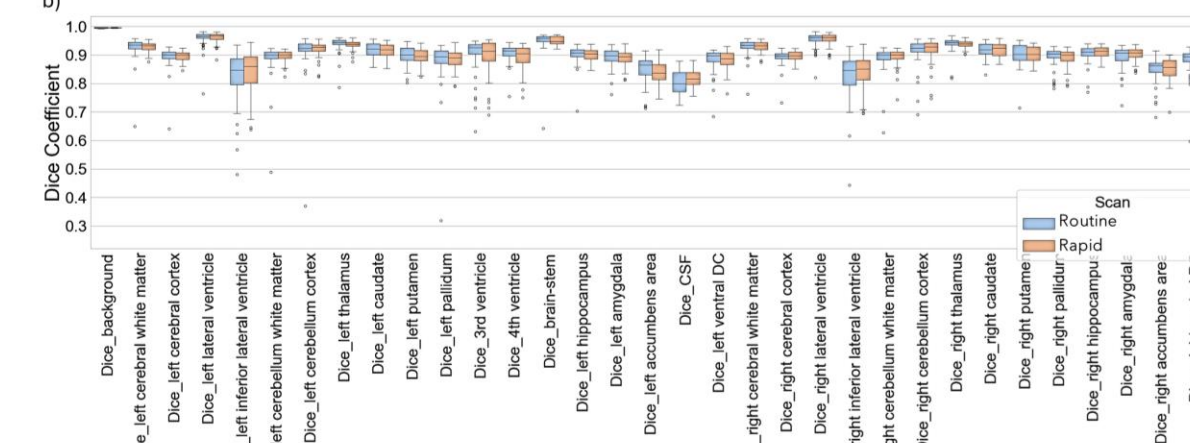
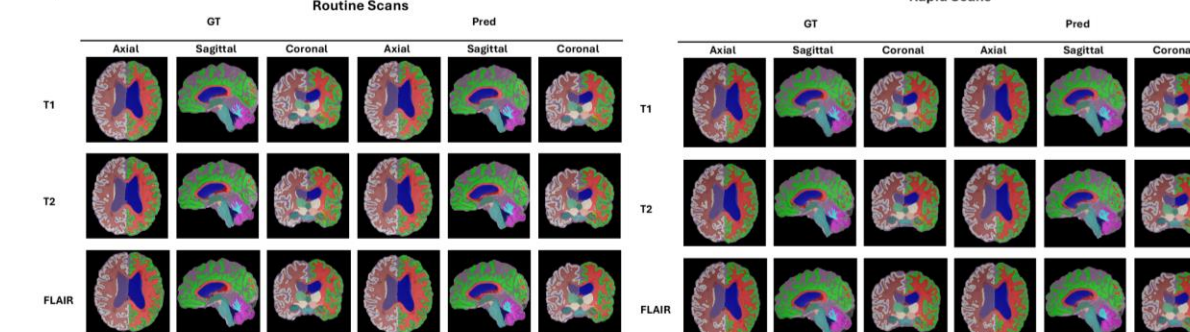
AUC: 0.981 ↔ 0.979
Accuracy: 90.2% ↔ 91.6%
Cohen's κ : 0.67



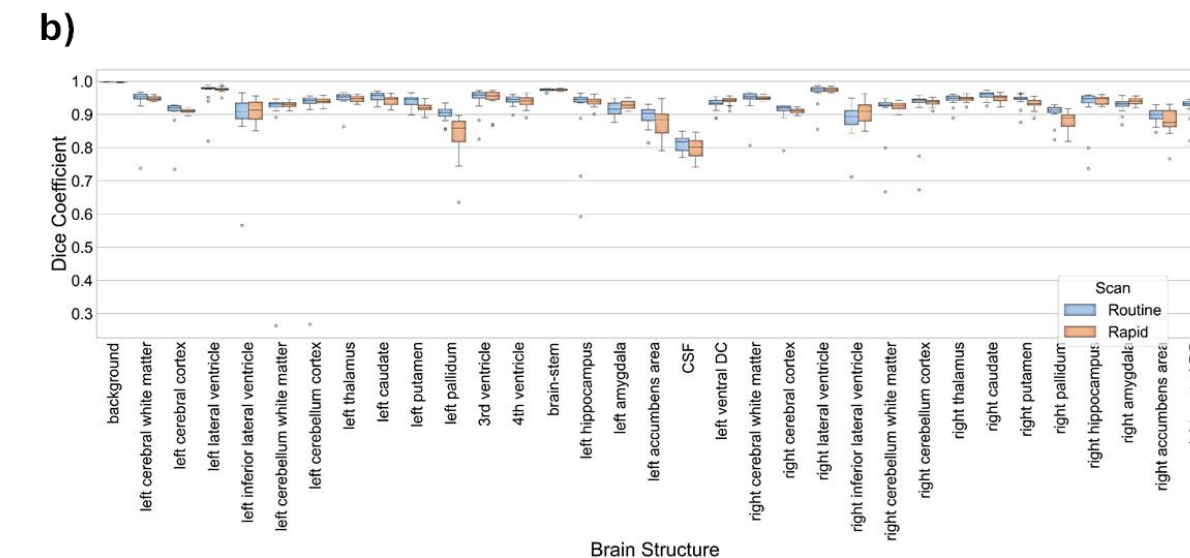
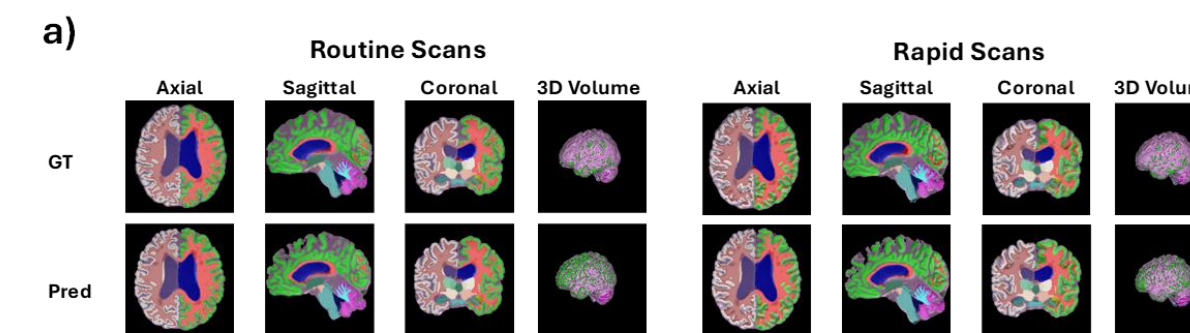
Whole-Brain Segmentation

Structural measurements were highly reproducible across acquisition protocols.

SynthSeg Dice: 0.913 vs 0.912 ($r=0.83$; $p=0.85$)



FreeSurfer Dice: 0.928 vs 0.928 ($r=0.873$; $p=0.552$)



CONCLUSIONS

Comparable AI-Based Dementia Diagnosis

Comparable AI diagnostic performance with substantial agreement (Cohen's $\kappa=0.64$ – 0.67).

Preserved Brain-Age Biomarkers

Brain-age estimates remained highly consistent across protocols (Pearson's $r=0.946$, Spearman's $\rho=0.832$).

Robust Whole-Brain Segmentation

Equivalent whole-brain segmentation with strong cross-protocol agreement (Pearson's $r=0.83$ – 0.87).

Three-Fold Faster MRI

Reduced scan time from 20 to 6 minutes while preserving AI-derived biomarkers.

Potential for Clinical Translation

Ultra-fast MRI combined with AI foundation models may enable faster, more accessible, and scalable dementia assessment in routine clinical practice.

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