

Geometry-Admissible Modeling of Neurodegenerative Progression in Alzheimer's Disease and Related Dementias

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BVidAL SaMD demonstrates a review-only geometry-admissible workflow for tracking neurodegenerative progression from serial MRI data as staged transition from stability to deviation, instability, and structural disruption.

INTRODUCTION

Alzheimer's disease and related dementias are progressive disorders in which structural brain change, biological disruption, and clinical decline evolve over time. Conventional software outputs often present imaging or clinical variables as isolated measurements, making it difficult to interpret disease progression as an organized trajectory. BVidAL Clinical Software Suite is designed to represent neurodegenerative change as a review-only geometry-admissible progression workflow, where serial MRI evidence and supportive clinical-imaging variables can be mapped into interpretable disease-state transitions.

Objective : To demonstrate a BVidAL review-only workflow for modeling neurodegenerative progression in Alzheimer's disease and related dementias by mapping longitudinal OASIS-2 MRI case studies and supportive NACC MRI data into staged geometry-admissible disease trajectories: stable state, early deviation, intermediate instability, and advanced disruption.

METHODS

Proposed Novel B-Bio Theory, Frameworks and Pillars on SaMD- BVidAL Clinical Software Suite

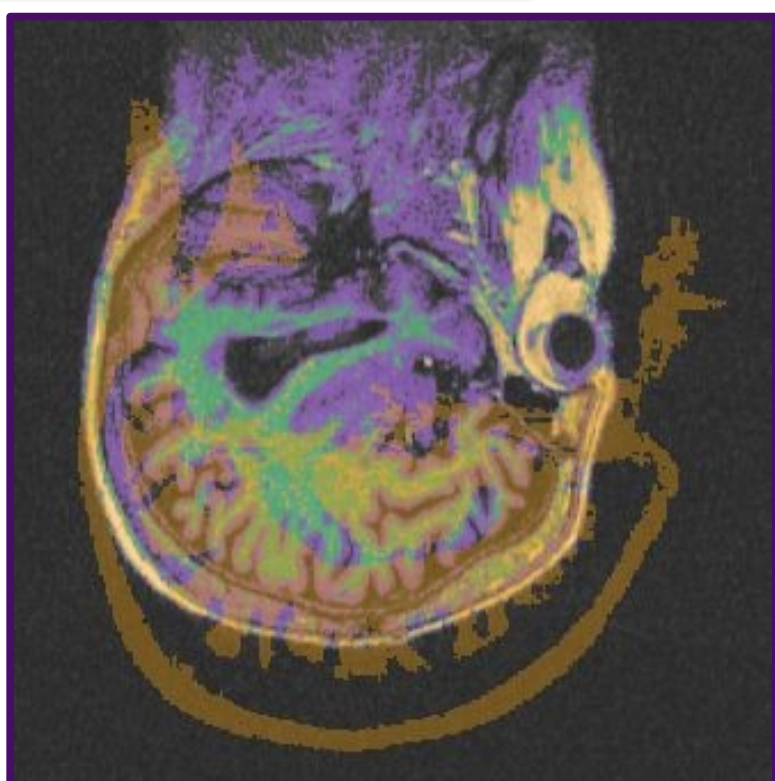
OASIS-2 [2] longitudinal MRI progression cases were used as the primary demonstration source across serial MR visits. Raw MRI visit files were imported into BVidAL SaMD, organized into subject-specific timelines, and converted into geometry-state representations for longitudinal progression tracking.

A supportive NACC MRI CSV source[3], is used to provide structured MRI context for the progression workflow. The BVidAL pipeline organized imaging evidence into staged progression states and visualized changes as trajectory deviation, stability loss, curvature burden, and progression-related structural disruption. Outputs are displayed as review-only trajectory panels, staged progression summaries, and clinical decision-support style reports.

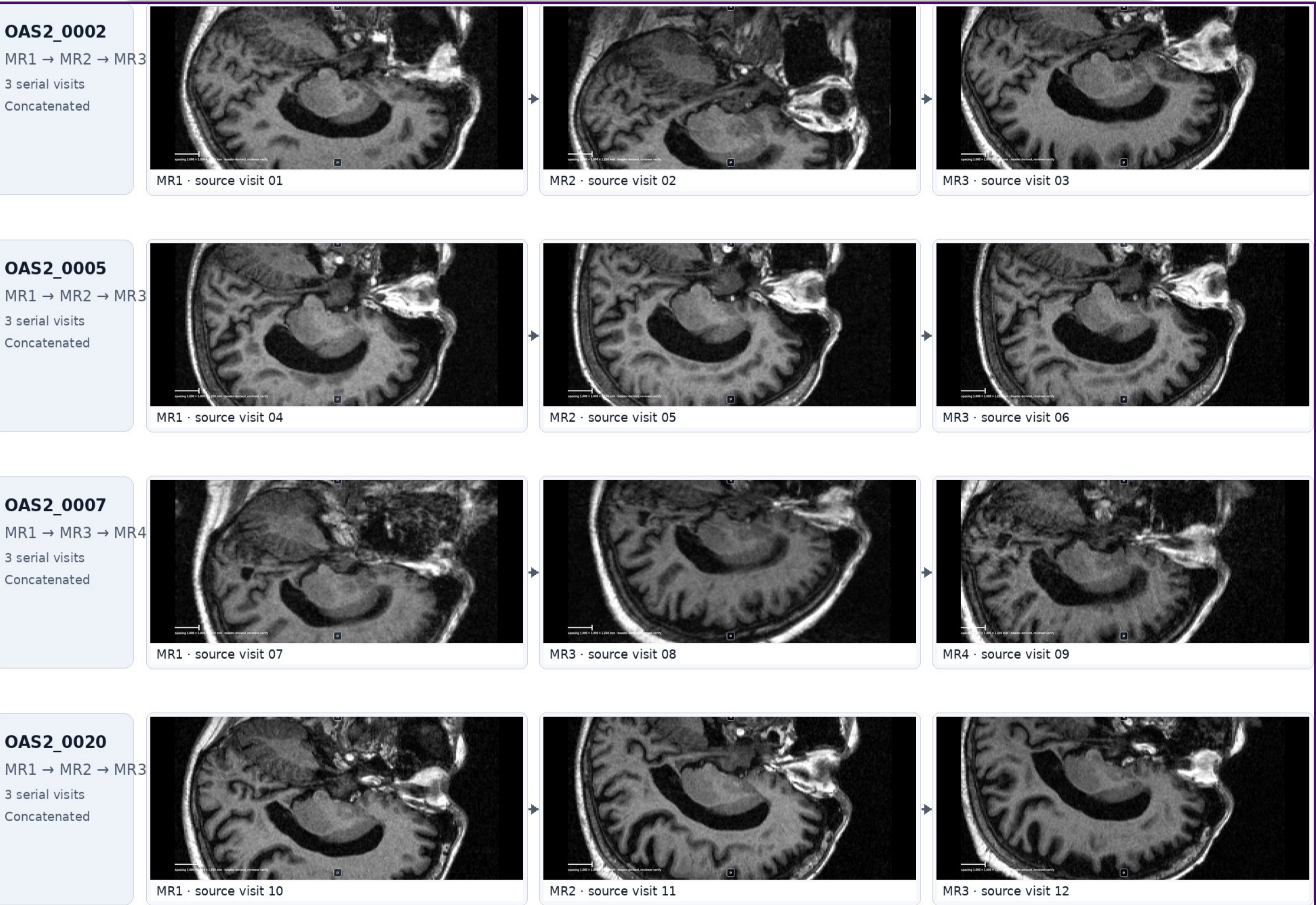
RESULTS – SaMD

Supportive NACC MRI CSV context

File: commercial_mri_nacc73.csv
Rows: 10,618
Columns: 191
Unique NACCID: 7,412
Study/scan groups: 14
MRI date coverage: 2000-01-01 to 2026-02-17
Numeric-profile columns: 191 (99.0%)



RESULTS, SaMD: Neurodegenerative progression



Note : OASIS [2] standalone data, NACC [3] standalone data, and an evidence-level merged dashboard were reviewed in BVidAL SaMD, Beta Version 0.16.600606. The OASIS and NACC are not claimed to represent the same patients. They are separate datasets, and the merge is an evidence-level integration, not a patient-identity merge.

Conclusion

The BVidAL SaMD demonstrates review-only modeling of neurodegenerative progression by organizing longitudinal MRI case studies and supportive structured MRI data into interpretable disease-progression trajectories. The workflow shows how serial imaging evidence can be represented as staged geometry-admissible transitions from baseline structural stability to early local deviation, increasing instability, and broader disruption. The poster emphasizes visual interpretability, trajectory tracking, and review-only reporting without claiming standalone diagnosis, treatment recommendation, regulatory approval, or clinical validation.

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3. NAAC : Selected NACC MRI CSV file for demonstration: commercial_mri_nacc73.csv.

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