

BVidAL SaMD converts longitudinal MRI case studies into interpretable geometry-state trajectories for review-only tracking of neurodegenerative progression

INTRODUCTION

Longitudinal tracking of Alzheimer's disease and related dementias requires interpretable methods that can follow neurodegenerative change across time. Conventional imaging workflows often separate MRI review, clinical interpretation, and progression modeling, making it difficult to visualize disease evolution as a structured trajectory. This poster demonstrates a BVidAL Clinical Software Suite workflow for mapping serial MRI observations into geometry-based state representations and tracking progression as deviation from stable neurobiological regions.

Objective : To demonstrate a review-only BVidAL workflow for interpretable clinical tracking of neurodegenerative progression using longitudinal MRI case studies

METHODS

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

Longitudinal MRI case-study data were imported into SaMD and organized across serial timepoints. Each visit was mapped into a geometry-state representation within the Bansal frameworks. SaMD then evaluated trajectory deviation, stability loss, and progression-related state change across time. The SaMD generated structured clinical tracking outputs and review-only reports to support transparent interpretation of neurodegenerative evolution without making standalone diagnostic claims.

RESULTS – SaMD : Neurodegeneration Measurements

Biomarker	Current evidence
Brain MRI panel: Final grade: Neurodegeneration measurement	BVidAL suggested; final biomarkers not verified
Whole-brain / brain parenchymal volume	BVidAL SaMD suggested 67616.493 mL
Hippocampus L/R volume	BVidAL SaMD suggested L 35.733 mL / R 44.267 mL / total 80.000 mL
Ventricle / CSF volume	BVidAL SaMD suggested 8340.153 mL
Cortical gray-matter volume	BVidAL SaMD suggested 32100.078 mL
White-matter volume	BVidAL SaMD suggested 35436.415 mL

Visit-state matrix

Green cells mean the visit has matched source pairs available for clinical-review tracking. Grey cells are missing/not supplied visits.

	MR1	MR2	MR3	MR4	MR5
OAS2_0017	100% complete 3/3 pairs hdr 3 - img 3	not supplied	100% complete 4/4 pairs hdr 4 - img 4	100% complete 3/3 pairs hdr 3 - img 3	100% complete 3/3 pairs hdr 3 - img 3
OAS2_0036	100% complete 4/4 pairs hdr 4 - img 4	not supplied	100% complete 4/4 pairs hdr 4 - img 4	100% complete 3/3 pairs hdr 3 - img 3	100% complete 3/3 pairs hdr 3 - img 3

This matrix verifies longitudinal source availability only. Final regional brain-volume measurements require verified ROI/volume input and clinician sign-off.

RESULTS – BVidAL Clinical Software Suite (Software as a Medical Device)

Reviewer-controlled MRI source evidence across 8 loaded OASIS-2 visits

MR1

MR3

MR4

MR5

OAS2_0017

OAS2_0017 MR1

OAS2_0017 MR3

OAS2_0017 MR4

OAS2_0017 MR5

OAS2_0036

OAS2_0036 MR1

OAS2_0036 MR3

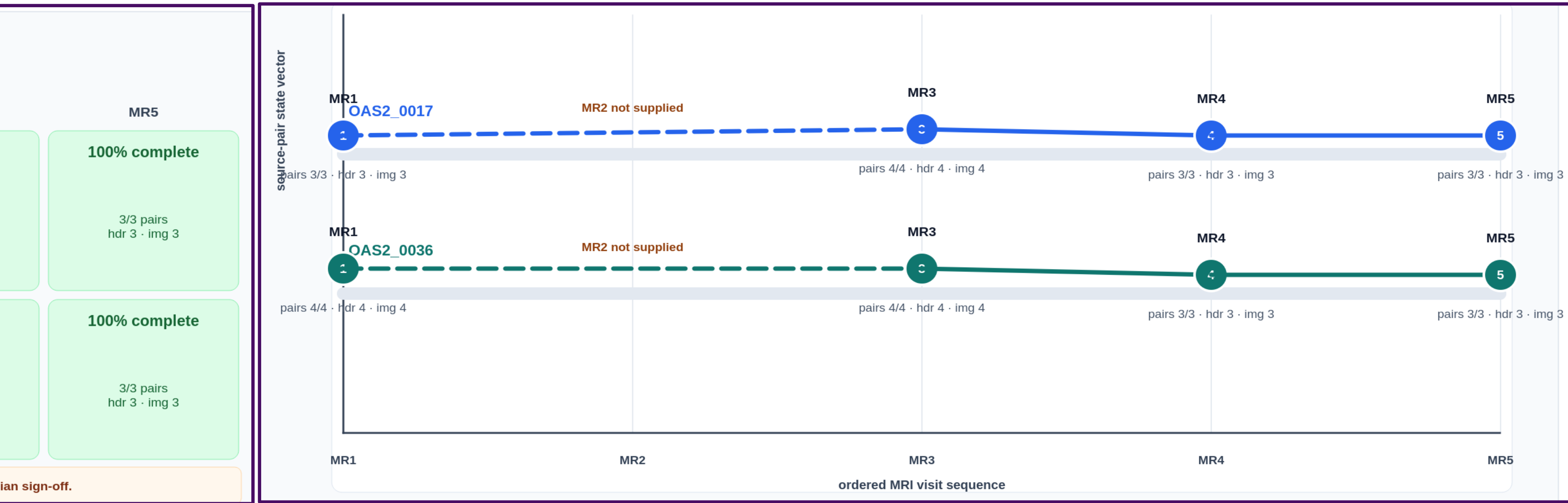
OAS2_0036 MR4

OAS2_0036 MR5

Clean processed viewer captures from BVidAL Visual viewer; MRI source images are shown for orientation/review only, not standalone diagnosis.

RESULTS – SaMD : Segmentation Measurements

Workflow item	Evidence / value	State
Segmentation clinical status	Candidate overlay only; verified ROI/label evidence not attached	Not final radiology segmentation
BVidAL suggested source volumetry	8643.202 mL foreground signal candidate from raw MRI	BVidAL SaMD suggested
BVidAL suggested signal classes	low 1756.206 mL; parenchyma-like 4729.438 mL; high 2157.559 mL	Clinician sign-off required
Mask overlay	Not loaded	Open label/GT
Current-slice label measurement	3 visible label class(es) on Axial slice 50	Measured from visible overlay plane
Label 1 current-slice area	10488 pixels 10488.00 mm² on current plane	Current-view measurement
Label 2 current-slice area	20972 pixels 20972.00 mm² on current plane	Current-view measurement
Label 3 current-slice area	47184 pixels 47184.00 mm² on current plane	Current-view measurement
Measurement source	Controlled imaging adapter returned measurement/QC rows	Available for reviewer verification
Source geometry for measurement	256 × 256 × 128 voxels spacing 1.000 × 1.000 × 1.250 mm orientation Axial	Decoded / needs reviewer confirmation
Required clinical measurement fields	label ID/name, voxel count, volume mm3/mL, current-slice area mm2, bounding box, slice co...	Review-only safety gate



Results -SaMD :Status Evidence

Status evidence

Concise source, segmentation, biomarker and sign-off gates.

Gate	Value	State
Clinical package level	Level 2S — BVidAL SaMD-suggested Grade-3 preparation package	Suggested evidence available; QC review required before final measurement
Source QC	PASS	Passed
Files loaded	62	Accounted by review request
Analyze/NIFTI pairs	27/27	Complete
Registration/provenance files	6	Accounted
Subjects / visits	2 subject(s), 8 visit(s)	Longitudinal review input

OAS2_0017 MR1

OAS2_0017 MR3

OAS2_0017 MR4

OAS2_0017 MR5

OAS2_0036 MR1

OAS2_0036 MR3

OAS2_0036 MR4

OAS2_0036 MR5

complete pairs

headers

image payloads

source file evidence count

Conclusion

This case-study demonstration shows that BVidAL Clinical Software Suite can support interpretable longitudinal tracking of neurodegenerative change by converting serial MRI inputs into geometry-based state trajectories. The workflow enables visualization of trajectory deviation, stability loss, and progression-related state change within the Bansal Bio frameworks. BVidAL SaMD output is intended for research demonstration and review-only clinical decision support, not standalone diagnosis, treatment recommendation, regulatory approval, or clinical validation.

REFERENCES

- Abhishek Bansal, "Data:B-Bio Models-2," , doi: 10.21227/pvxx-7p34
- Original Data provided by OASIS : OASIS-2 Longitudinal MRI Data in Nondemented and Demented Older Adults. Marcus DS, Fotenos AF, Csernansky JG, Morris JC, Buckner RL J Cogn Neurosci. 2010;22(12):2677–2684. doi:10.1162/jocn.2009.21407. Selected cases for demonstration: OAS2_0017_MR1/MR3/MR4/MR5 and OAS2_0036_MR1/MR3/MR4/MR5.

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