Heuron AD

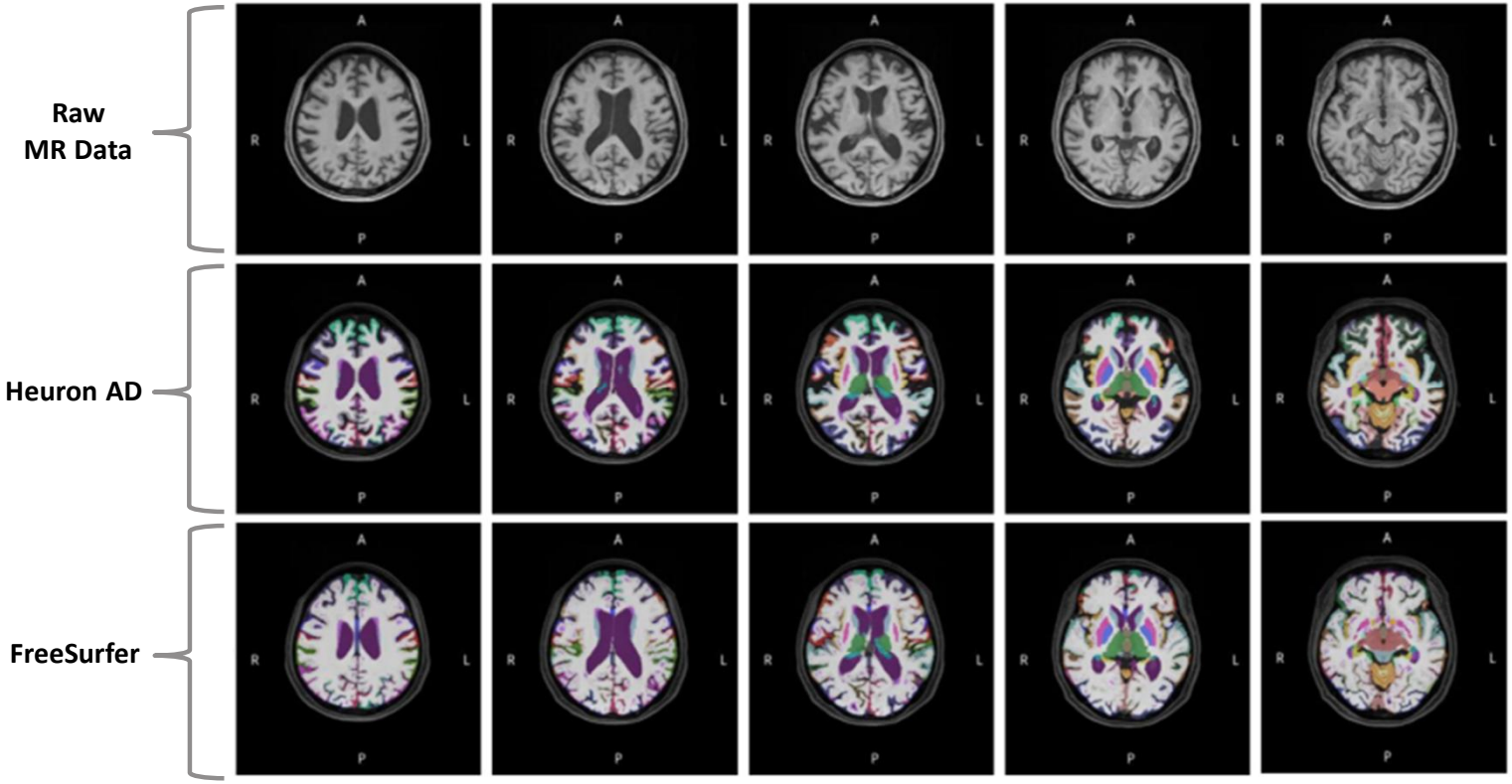
Heuron AD vs. FreeSurfer

A. Accurate Segmentation

Heuron AD *uses a deep learning-based algorithm to accurately segment brain regions using T1-weighted MR images*

Randomly selected, unbiased sample of MR database used to test the difference with ***FreeSurfer***

Age: 74
Gender: Female
Scan Date: May 16th, 2018
Scanner: Siemens Skyra
Strength: 3 Tesla



Deidentified, anonymized MR data (Case A) is available for further assessment

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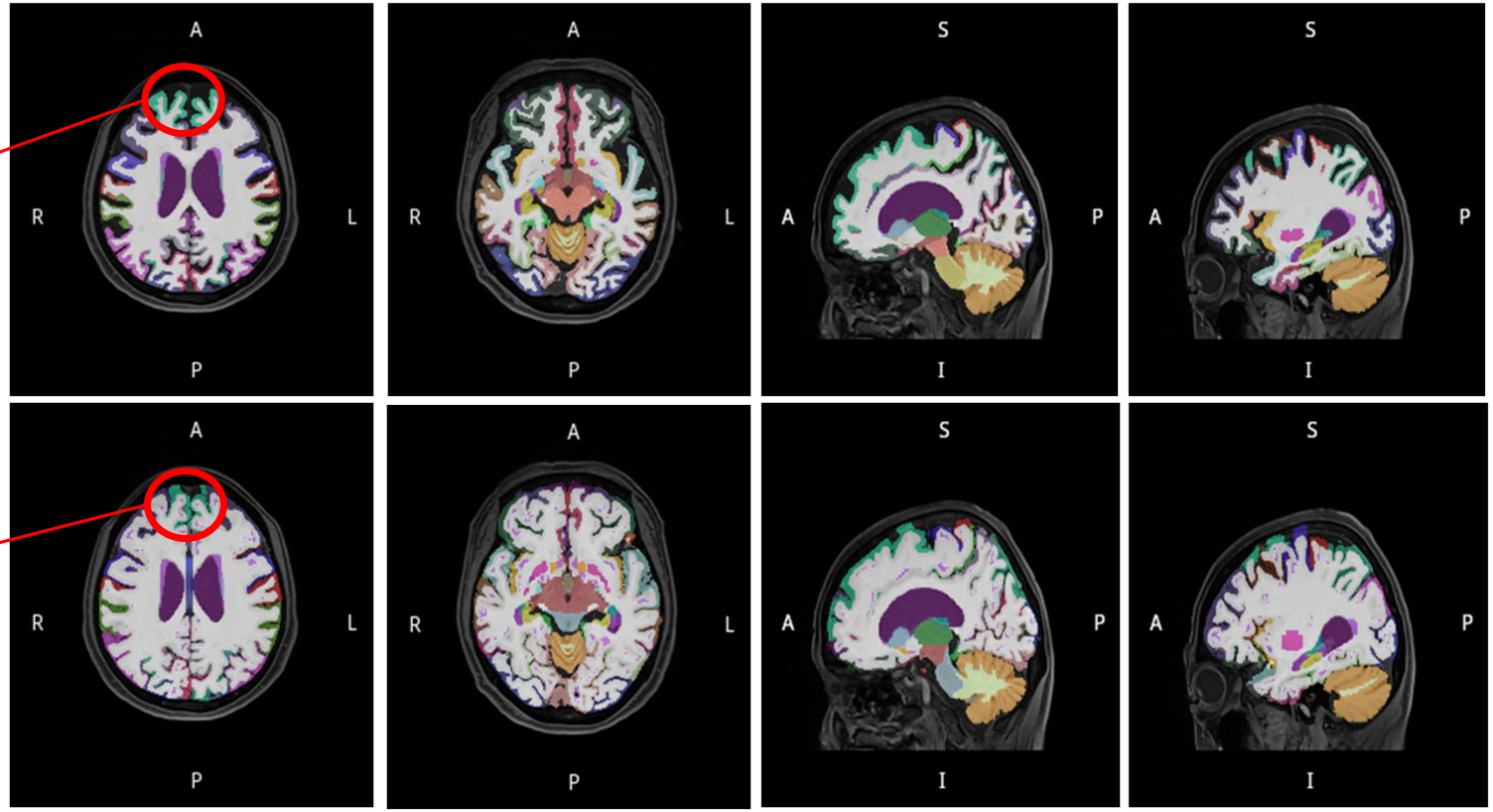
B. Less Artifact

Heuron AD

FreeSurfer



Clearer visualization of cortical thickness and brain segmentation with less artifact

Artifacts can lead to a misinterpretation and an error in volumetric assessment.

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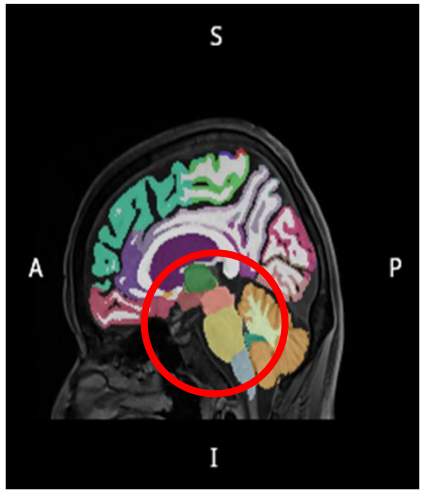
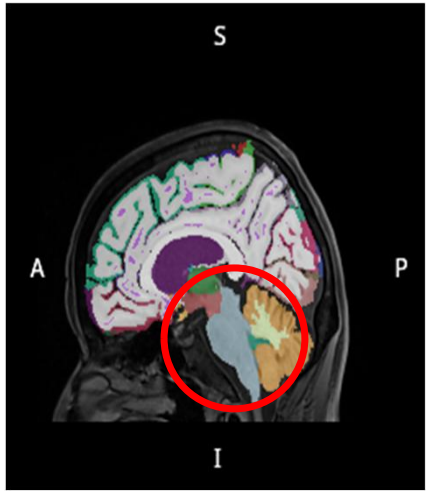
C. 99 Segmented Brain Regions



Heuron AD



FreeSurfer

Midbrain, pons, and medulla can be analyzed separately

Only the brainstem can be analyzed

#No.	Label Name:	R	G	B	A
0	Unknown	0	0	0	0
2	Left-Cerebral-White-Matter	245	245	245	0
4	Left-Lateral-Ventricle	120	18	134	0
5	Left-Inf-Lat-Vent	196	58	250	0
7	Left-Cerebellum-White-Matter	220	248	164	0
8	Left-Cerebellum-Cortex	230	148	34	0
10	Left-Thalamus-Proper	0	118	14	0
11	Left-Caudate	122	186	220	0
12	Left-Putamen	236	13	176	0
13	Left-Pallidum	12	48	255	0
14	3rd-Ventricle	204	182	142	0
15	4th-Ventricle	42	204	164	0
17	Left-Hippocampus	220	216	20	0
18	Left-Amygdala	103	255	255	0
24	CSF	60	60	60	0
26	Left-Accumbens-area	255	165	0	0
28	Left-VentralDC	165	42	42	0
31	Left-choroid-plexus	0	200	200	0
41	Right-Cerebral-White-Matter	245	245	245	0
43	Right-Lateral-Ventricle	120	18	134	0
44	Right-Inf-Lat-Vent	196	58	250	0
46	Right-Cerebellum-White-Matter	220	248	164	0
47	Right-Cerebellum-Cortex	230	148	34	0
49	Right-Thalamus-Proper	0	118	14	0
50	Right-Caudate	122	186	220	0
51	Right-Putamen	236	13	176	0
52	Right-Pallidum	13	48	255	0
53	Right-Hippocampus	220	216	20	0
54	Right-Amygdala	103	255	255	0
58	Right-Accumbens-area	255	165	0	0
60	Right-VentralDC	165	42	42	0
63	Right-choroid-plexus	0	200	221	0
77	WM-hypointensities	200	70	255	0
173	Midbrain	242	104	76	0

⋮

99 Segmented Brain Structures

Region	HCP_vol	Heuron AD_vol
Left-Lateral-Ventricle	27925.6	26283.5
Left-Inf-Lat-Vent	1288.6	1053.9
Left-Cerebellum-White-Matter	10906.7	11427.7
Left-Cerebellum-Cortex	43225.4	43679.6
Left-Thalamus-Proper	5070.9	5267.6
Left-Caudate	2671.1	3028.7
Left-Putamen	2966.2	2881.6
Left-Pallidum	1283.3	1236.2
3rd-Ventricle	2206	1843.5
4th-Ventricle	1804.7	1559.1
Brain-Stem	18996.4	
Midbrain		5079.7
Pons		13350
Medulla		4157.9
Left-Hippocampus	2029.9	2235.4
Left-Amygdala	699.6	868.8
CSF	1230.8	1054.5
Left-Accumbens-area	267.3	209.5
Left-VentralDC	3036.6	1665.7
Left-vessel	13.2	
Left-choroid-plexus	883.9	1104.8
Right-Lateral-Ventricle	19651.5	18531.1
Right-Inf-Lat-Vent	847.5	784.4
Right-Cerebellum-White-Matter	10523.9	10973.4
Right-Cerebellum-Cortex	43713.9	44476.7
Right-Thalamus-Proper	5184.5	5129.7
Right-Caudate	2571	2780.8
Right-Putamen	3336.8	3266.1

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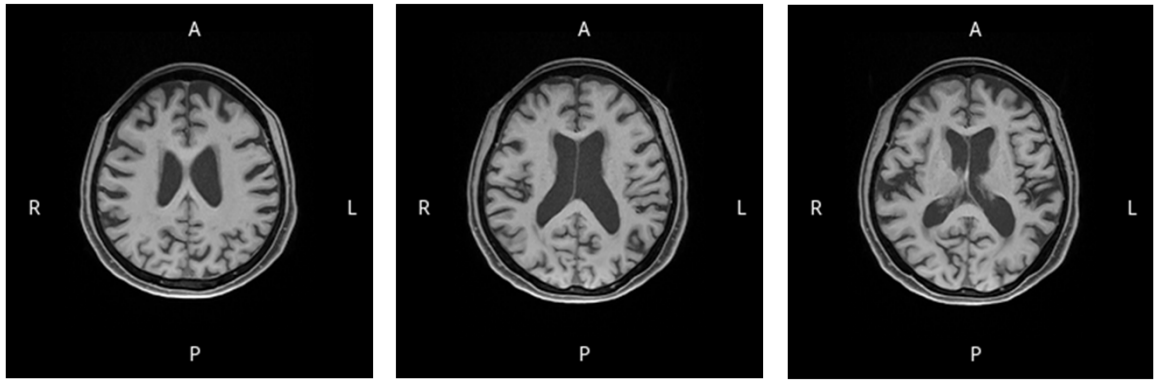
Regional Volume Comparison FreeSurfer vs. Heuron AD

Heuron AD

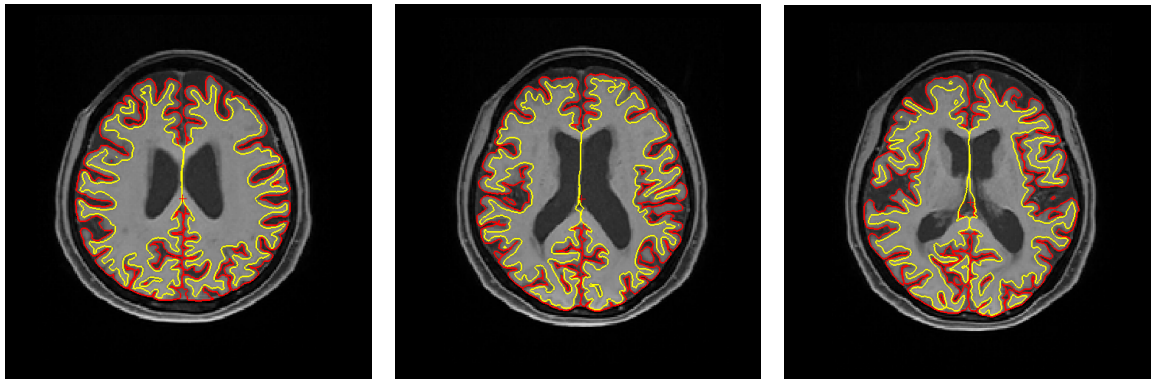
Heuron AD vs. FreeSurfer

D. Cortical Thickness Measurement

Raw MR Data

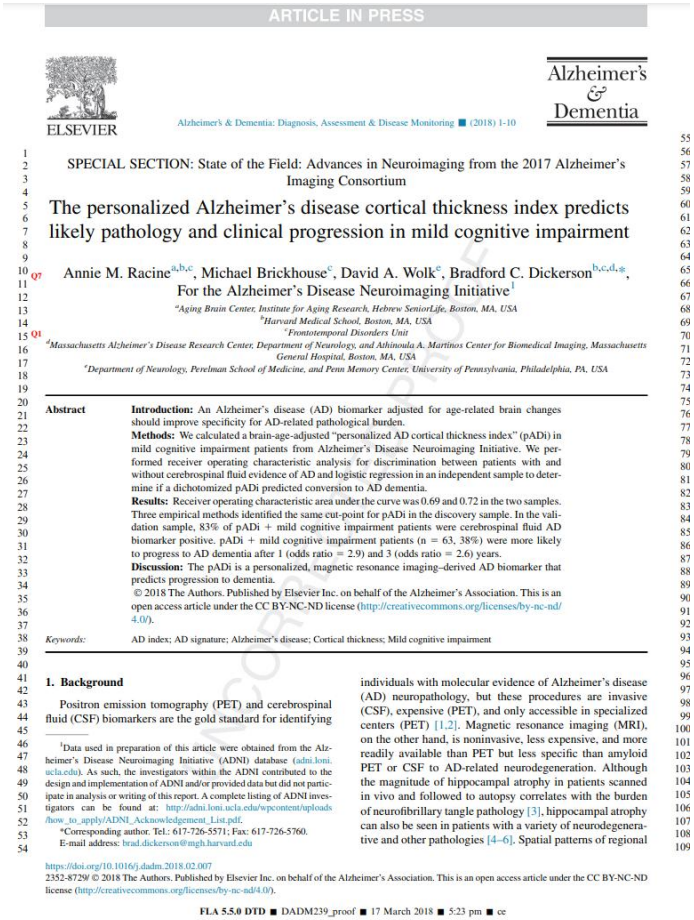


Heuron AD



Heuron AD automatically assesses and calculates the cortical thickness information.

*Recently, **cortical thickness** has been recognized as valuable information for clinicians*



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ELSEVIER

Alzheimer's & Dementia

Alzheimer's & Dementia: Diagnosis, Assessment & Disease Monitoring ■ (2018) 1-10

SPECIAL SECTION: State of the Field: Advances in Neuroimaging from the 2017 Alzheimer's Imaging Consortium

The personalized Alzheimer's disease cortical thickness index predicts likely pathology and clinical progression in mild cognitive impairment

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Abstract

Introduction: An Alzheimer's disease (AD) biomarker adjusted for age-related brain changes should improve specificity for AD-related pathological burden.
Methods: We calculated a brain-age-adjusted "personalized AD cortical thickness index" (pADi) in mild cognitive impairment patients from Alzheimer's Disease Neuroimaging Initiative. We performed receiver operating characteristic analysis for discrimination between patients with and without cerebrospinal fluid evidence of AD and logistic regression in an independent sample to determine if a dichotomized pADi predicted conversion to AD dementia.
Results: Receiver operating characteristic area under the curve was 0.69 and 0.72 in the two samples. Three empirical methods identified the same cut-point for pADi in the discovery sample. In the validation sample, 83% of pADi + mild cognitive impairment patients were cerebrospinal fluid AD biomarker positive. pADi + mild cognitive impairment patients (n = 63, 38%) were more likely to progress to AD dementia after 1 (odds ratio = 2.9) and 3 (odds ratio = 2.6) years.
Discussion: The pADi is a personalized, magnetic resonance imaging–derived AD biomarker that predicts progression to dementia.

Keywords: AD index; AD signature; Alzheimer's disease; Cortical thickness; Mild cognitive impairment

1. Background

Positron emission tomography (PET) and cerebrospinal fluid (CSF) biomarkers are the gold standard for identifying individuals with molecular evidence of Alzheimer's disease (AD) neuropathology, but these procedures are invasive (CSF), expensive (PET), and only accessible in specialized centers (PET) [1,2]. Magnetic resonance imaging (MRI), on the other hand, is noninvasive, less expensive, and more readily available than PET but less specific than amyloid PET or CSF to AD-related neurodegeneration. Although the magnitude of hippocampal atrophy in patients scanned in vivo and followed to autopsy correlates with the burden of neurofibrillary tangle pathology [3], hippocampal atrophy can also be seen in patients with a variety of neurodegenerative and other pathologies [4–6]. Spatial patterns of regional

[1]Data used in preparation of this article were obtained from the Alzheimer's Disease Neuroimaging Initiative (ADNI) database (adni.loni.ucla.edu). As such, the investigators within the ADNI contributed to the design and implementation of ADNI and/or provided data but did not participate in analysis or writing of this report. A complete listing of ADNI investigators can be found at: http://adni.loni.ucla.edu/wp-content/uploads/how_to_apply/ADNI_Acknowledgement_List.pdf.

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