Brain MoNoCle Version Notes

This file summarises the changes made in each version of Brain MoNoCle (*Brain Morphology Normative modelling platform for abnormality and Centile estimation*; https://cnnplab.shinyapps.io/BrainMoNoCle/).

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Version 1.0

Date deployed

07/05/2024

Associated publication

Little et al. 2025 https://doi.org/10.1162/imag_a_00438

Feature notes

Brain MoNoCle allows users to apply our normative modelling pipeline to their own neuroimaging data.

The app can handle the following data types:
- Freesurfer-generated measurements of cortical thickness (CT), cortical volume (CV), and surface area (SA); and
- Independent components of cortical morphology (K, I and S) at hemisphere-level.

The app produces:
- z-scores and centiles for each participant in the user dataset;
- summary statistics for each group in the user's data;
- scatterplots showing the user data plotted against the normative data for each structural metric and for each brain region;
- 'brain plots', showing the estimated abnormality (z-score for individual participants or Cohen's d for groups) for each brain region (for Freesurfer generated metrics only); and
- a downloadable html report summarising the outputs.

The normative models are generating using generalised additive models for location, scale and shape (gamlss) and account for biological and technical covariates (age, sex, and scanning site).

Normative Dataset

The normative dataset consists of **n=3,276** healthy individuals aged 5-95 years old, across 21 scanning sites.

Other notes

The website url was changed to https://cnnplab.shinyapps.io/BrainMoNoCle/ on 04/07/2024. The original url (https://cnnplab.shinyapps.io/normativemodelshiny/) was made redundant.

A JISC mailing list was created on 01/08/2024.

Version 1.1

Date deployed

07/11/2024

Associated publication

n/a

Feature notes

Added normative models for independent components of cortical morphology at **lobe-level** (frontal, parietal, temporal, and occipital lobes).

Added '**brain plots' for lobe-level** independent components of cortical morphology.

Added a **'Test Run' button**, allowing users to easily test the app functionality without having to upload data.

Updated **documentation** (instructions, FAQs, report) accordingly.

Normative Dataset

No updates.

Bug fixes

- summary stats not showing if user data contains only healthy controls (HC): now shows HC data

Other notes

n/a

Version 1.2

Date deployed

11/04/2025

Associated publication

TBC – paper in preparation

Feature notes

Added **normative models** generated with updated normative dataset (see details below).

Updated **documentation** (instructions, FAQs, report) accordingly.

Normative Dataset

The normative dataset was updated to include a total of n=6,862 healthy individuals aged 5-95 years old. The dataset includes a total of 50 scanning sites from 22 study datasets (see Table 1). Figure 1 illustrates the age distribution in the normative dataset.

study dataset	n	age				sex		scanning sites
		min	max	mean	SD	n female	% female	
ABIDE-1	168	6.5	39.4	16	5.85	37	22	3
ADHD1000	237	7.2	13.9	9.86	1.63	109	46	1
ADHD200	350	7.2	20.4	11.9	3.12	182	52	5
ADHDLytle	39	8.9	11.9	10.59	0.95	13	33.3	1
AOMIC-ID1000	904	19	26	22.85	1.7	476	52.7	1
AOMIC-PIOP1	205	18.2	26.2	22.19	1.8	118	57.6	1
AOMIC-PIOP2	217	18.2	25.8	21.96	1.8	126	58.1	1
BLISS	26	20	64	48.46	11.8	12	46.2	1
CamCAN	574	18.5	88.9	53.18	18.16	306	53.3	1
Chronotype	131	18	35	24.37	3.79	85	64.9	1
HCP	655	22	37	28.69	3.7	354	54	1
MCIC	53	18	60	30.77	12.34	10	18.9	2
MEGUK	340	18	81	35.25	17.74	208	61.2	6
NCL dementia	61	62	87.8	75.54	5.93	26	42.6	2
NIMH-IHV	142	18	72	34.63	13.03	96	67.6	2
NKI	792	6	85	38.76	22.1	492	62.1	1
OASIS3	659	42.7	95.7	71.64	8.59	398	60.4	8
QTAB	175	8	14	10.67	1.31	86	49.1	1
SALD	473	19	80	44.96	17.43	294	62.2	1
SRPBS	523	18	79	38.59	14.65	245	46.8	7
Stanford	41	5	27	16.32	7.58	20	48.8	1
UCLH	97	19	66	39.42	12.76	61	62.9	2
Total	**6862**	**5**	**95.7**	**35.3**	**21.24**	**3754**	**54.7**	**50**

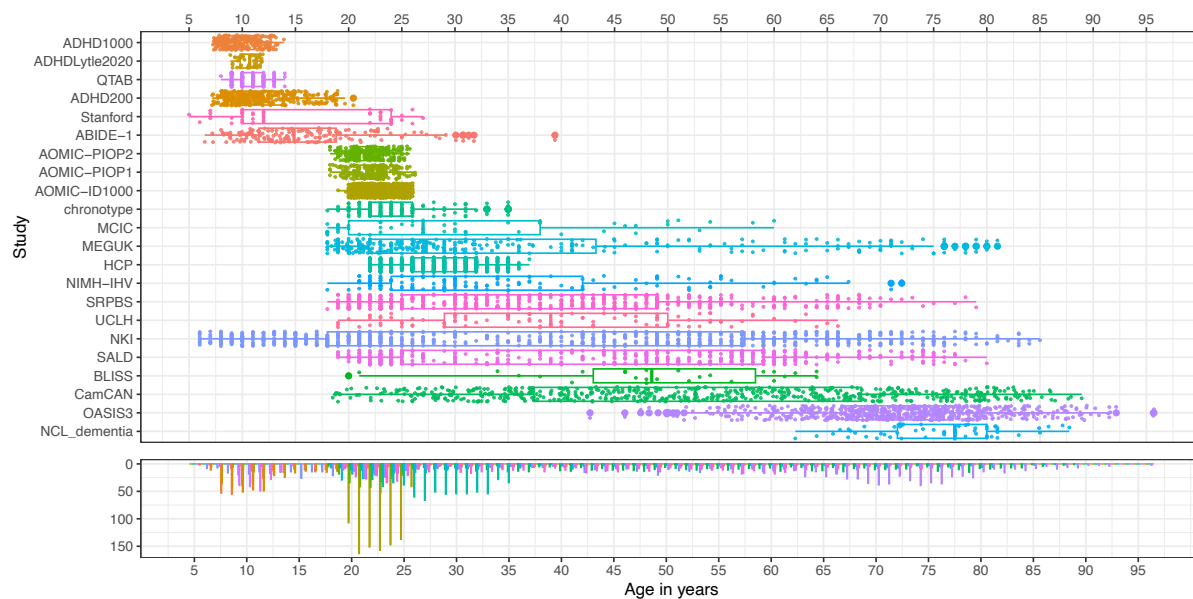*Table 1: Details of each study dataset included in the normative dataset.*

Figure 1: Distribution of age for each study dataset in the normative dataset.

Bug fixes

- models expected 'eTIV' in user data: the model will now run if these columns are not present
- case-sensitive metadata column headers: the app is now more flexible and can handle changes in upper and lower cases in the column headers
- numeric Subject IDs: the app will now run if the SubjectIDs are numeric rather than characters

Other notes

n/a

Version 1.3 (planned)

Date deployed

TBC

Associated publication

TBC

Feature notes

Add new **user interface** (UI), including data upload wizard with sanity checks of input data format.

Make available **predicted centiles** from the normative models for plotting.
Add option to download version of user data adjusted into 'Brain MoNoCle space' to allow plotting alongside normative centiles.

Add **subcortical volume** data as an option for the Freesurfer stream and add option to generate a 'brain plot' for subcortical areas.

Update **documentation** (instructions, FAQs, report) accordingly.

Normative Dataset

No updates.

Bug fixes

n/a

Other notes

n/a