BioGen and baba.vision

Deep dive into research, tech and possible collaborations

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Content

- Scientific background
  - Brain age predictions using deep learning
  - Explainable artificial intelligence and dementia
- Baba.vision tech
- Feasibility study

Brain age predictions using deep learning

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	Cross-sectional			Test–retest (<1 year)				Longitudinal (>1 year)	
	MAE (years)	*r*	*r*, PAD	MAD (years)	Adj MAD (years)	ICC (95% CI)	ICC PAD (95% CI)	Adj MAD (years)	Beta (95% CI)
brainageR	4.04	0.96**	−0.13*	1.27	1.2	0.98 (0.98–0.99)	0.94 (0.92–0.96)	1.82	1.17 (0.68–1.67)
DeepBrainNet	6.13	0.89**	−0.43**	4.25	4.24	0.57 (0.44–0.68)	0.25 (0.08–0.41)	4.93	1.93 (0.8–3.05)
brainage	6.39	0.89**	−0.59**	2.32	2.35	0.94 (0.91–0.96)	0.91 (0.87–0.94)	2.88	0.65 (−0.47 to 1.77)
ENIGMA	9.54	0.66**	−0.59**	6.05	6.0	0.65 (0.53–0.74)	0.69 (0.58–0.77)	6.49	1.47 (−1.12 to 4.07)
pyment	3.56	0.97**	−0.31**	1.18	1.17	0.98 (0.98–0.99)	0.94 (0.91–0.96)	1.7	0.84 (0.44–1.24)
mccqrnn	4.46	0.95**	−0.46**	1.76	1.73	0.97 (0.96–0.98)	0.92 (0.89–0.94)	1.98	1.14 (0.60–1.67)

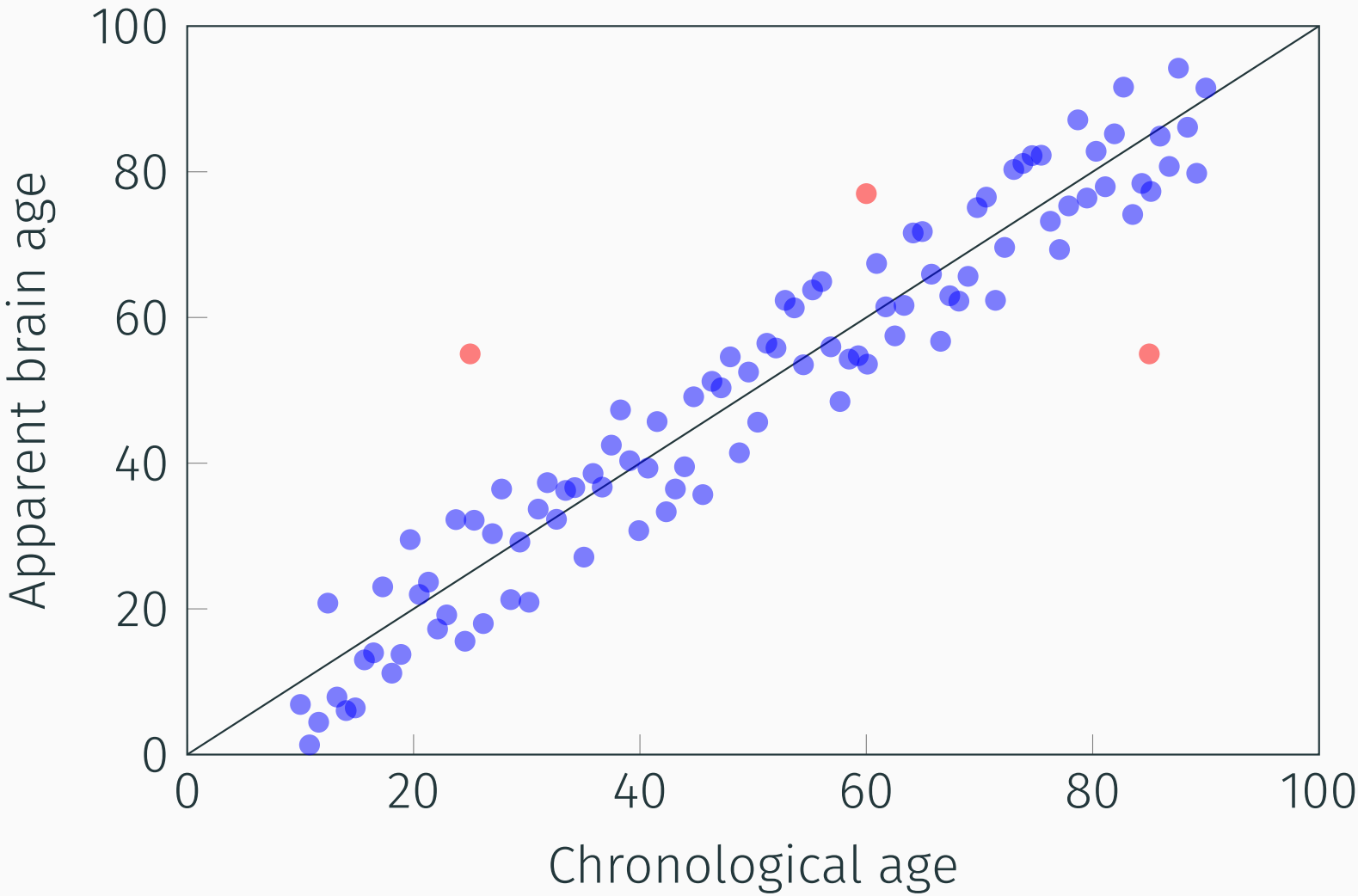
Dörfel, R. P., Arenas-Gomez, J. M., Fisher, P. M., Ganz, M., Knudsen, G. M., Svensson, J. E., & Plavén-Sigray, P. (2023). Prediction of brain age using structural magnetic resonance imaging: A comparison of accuracy and test–retest reliability of publicly available software packages. Human Brain Mapping, 44(17), 6139-6148.

Brain age predictions using deep learning

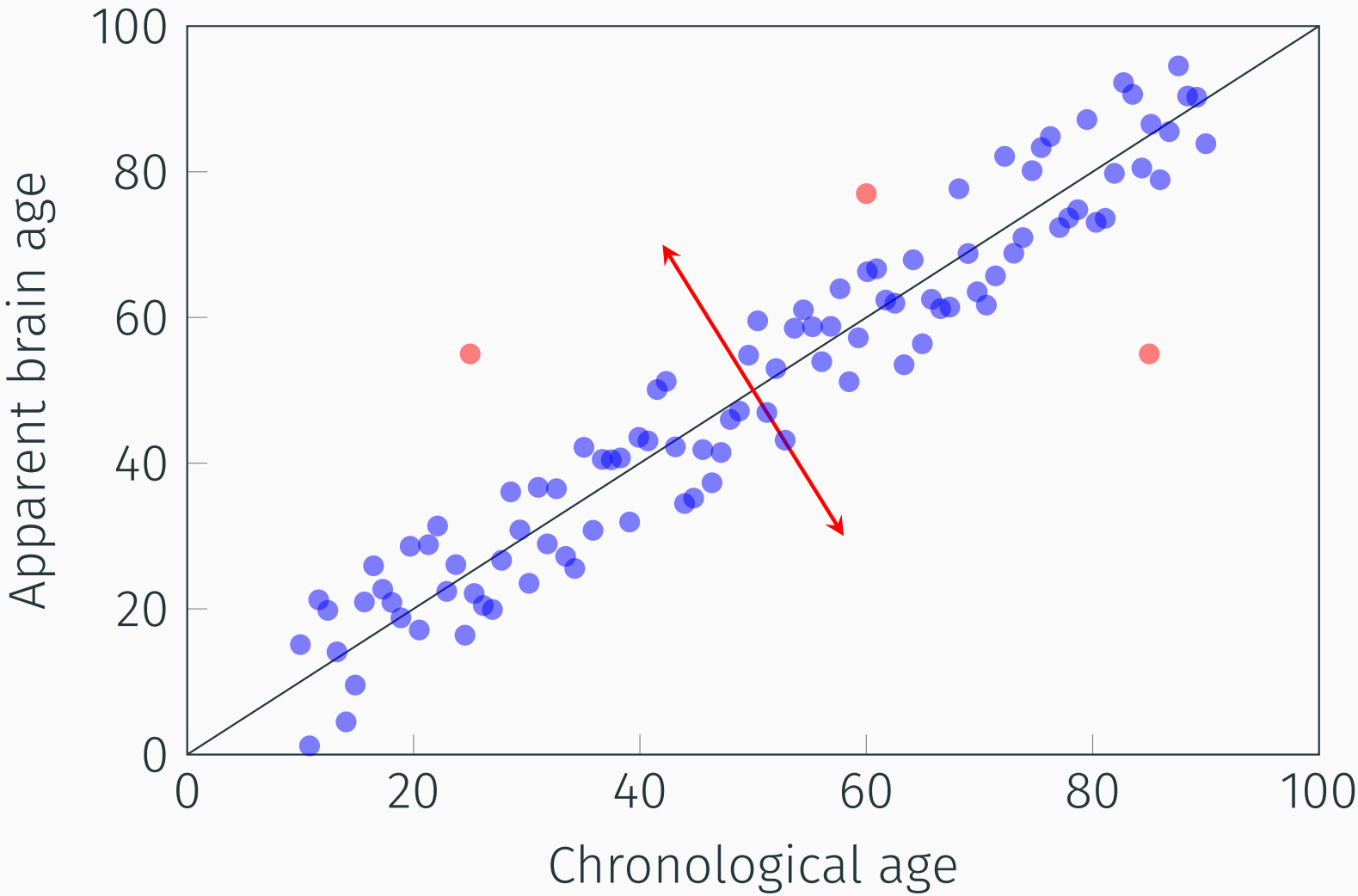
Predictive metrics (comparing chronological age and brain age)				
Algorithms		**No motion**	**Low motion**	**High motion**
brainageR	MAE	4.043	5.316	7.236
	RMSE	5.128	7.150	9.535
DeepBrainNet	MAE	3.497	3.937	4.019
	RMSE	4.629	5.121	5.230
XGBoost	MAE	6.927	7.642	9.021
	RMSE	9.025	9.647	10.757
ENIGMA	MAE	9.967	10.827	11.549
	RMSE	12.145	12.459	13.535
pyment	MAE	3.139	3.310	3.326
	RMSE	4.102	4.143	4.073

Hanson, J. L., Adkins, D. J., Bacas, E., & Zhou, P. (2024). Examining the reliability of brain age algorithms under varying degrees of participant motion. Brain informatics, 11(1), 9.

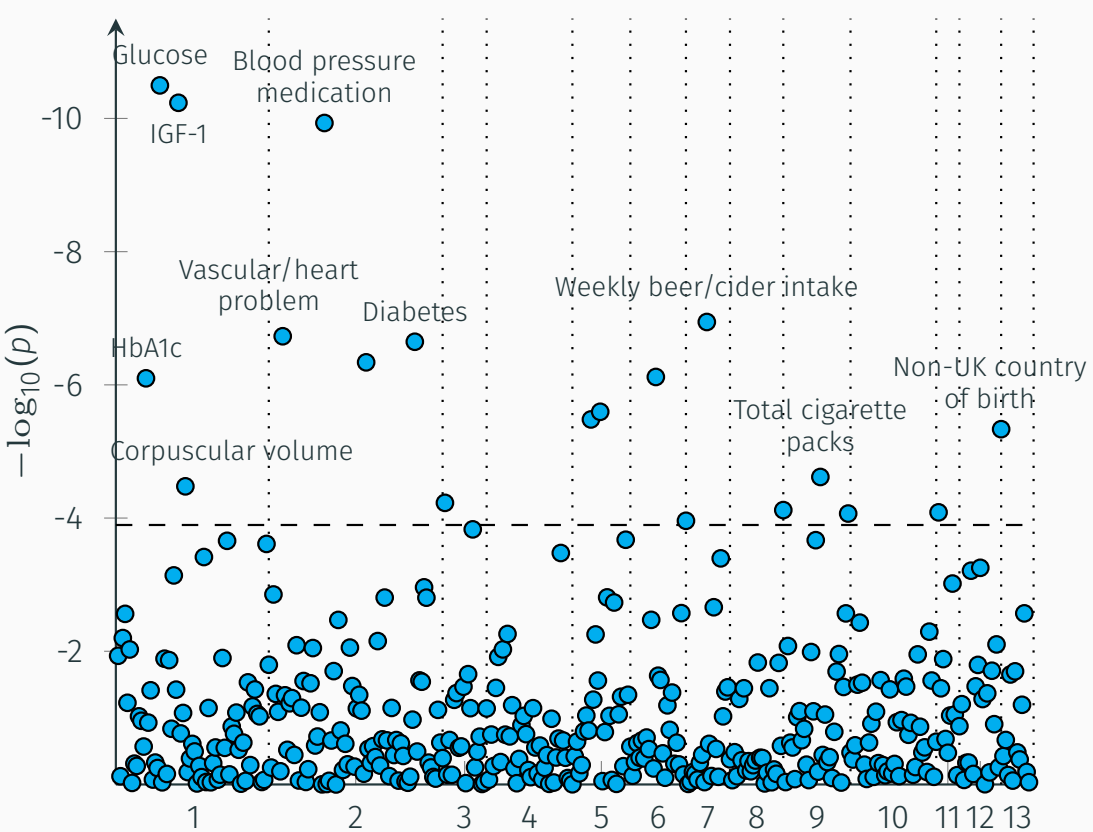
Brain age predictions using deep learning

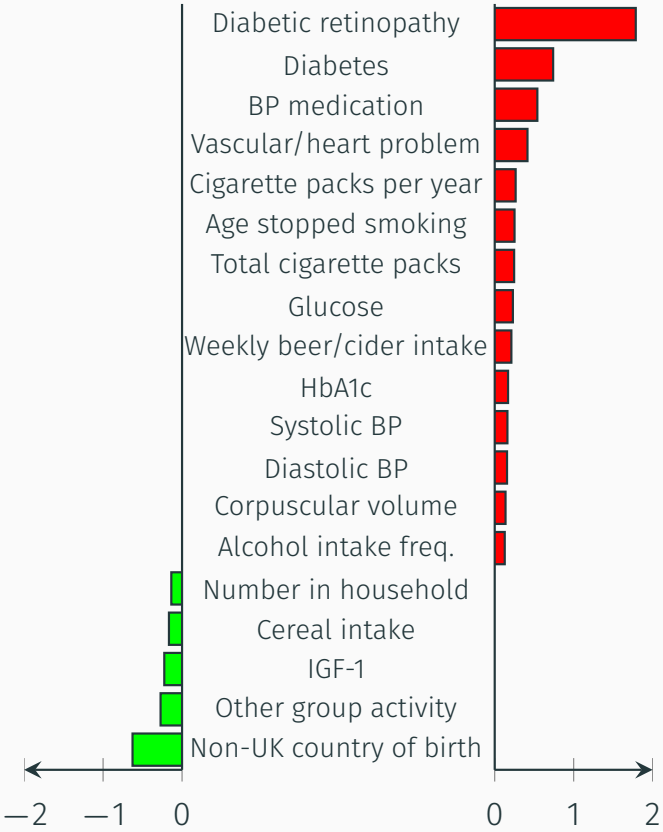


Brain age predictions using deep learning

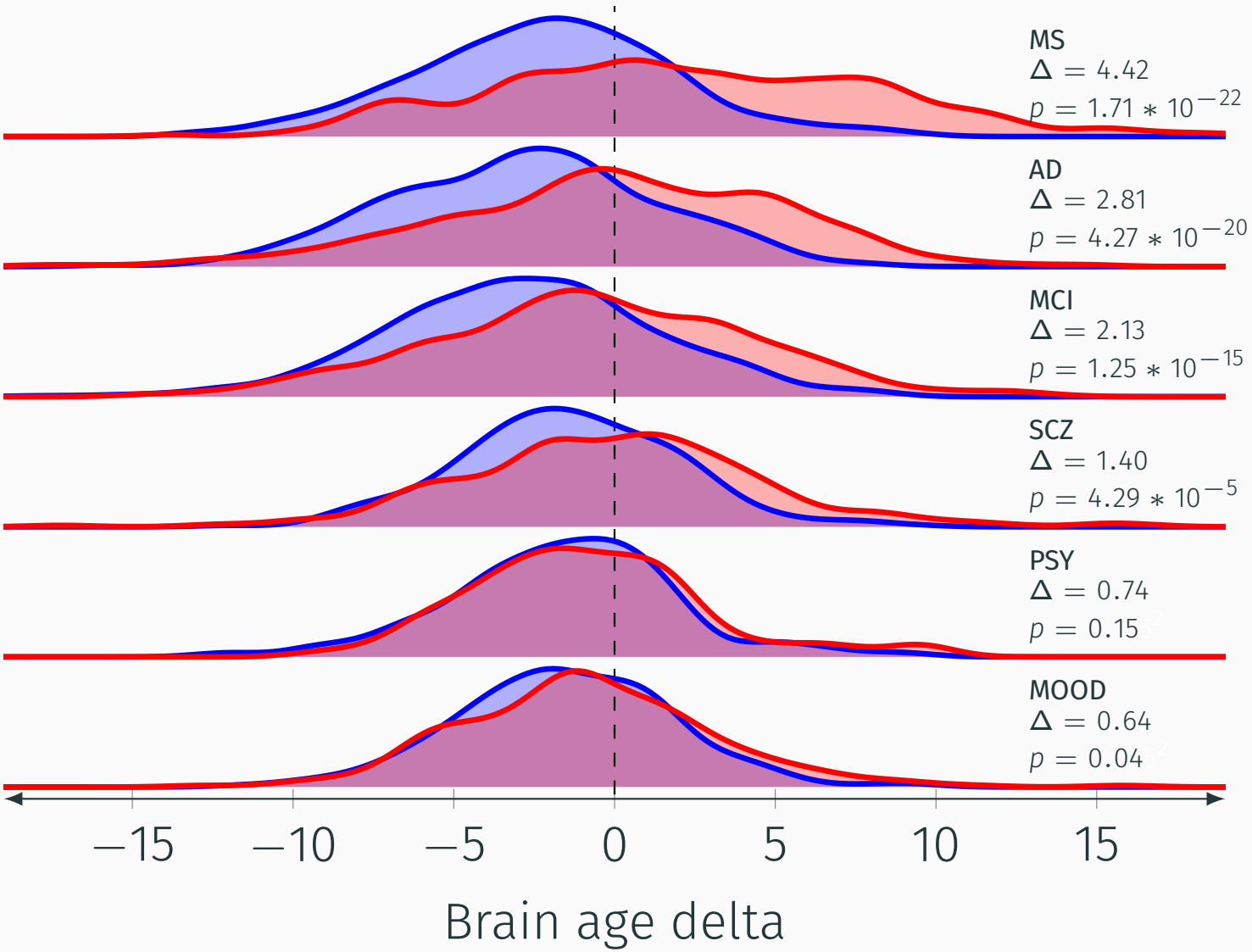


Brain age predictions using deep learning





Brain age predictions using deep learning



Brain age predictions using deep learning

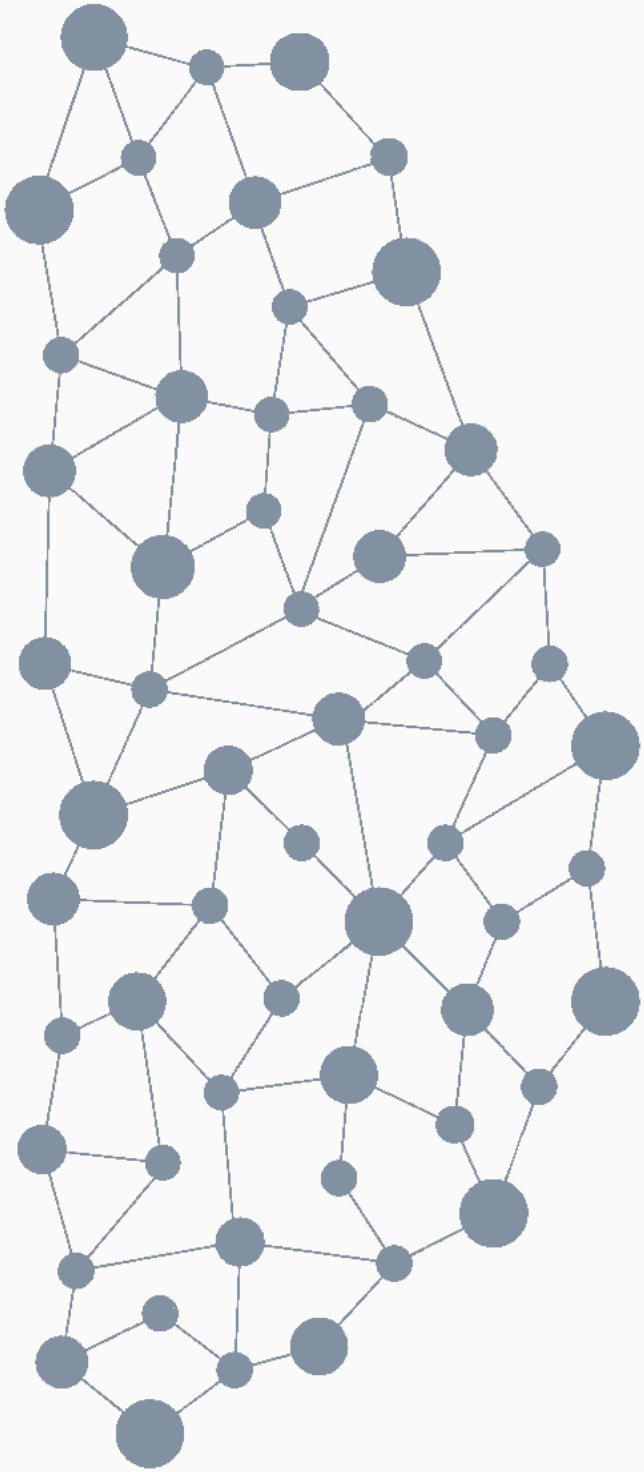
	AD, n 76	FTD, n 6	DLB, n 12	*p**	AD versus non-AD	FTD versus non-FTD	DLB versus non-DLB
					*p***	*p***	*p***
Age, years	72.3 (7.5)	64.7 (6.1)	70.2 (8.5)	0.050	**0.048**	**0.023**	0.505
Female, n (%)	41 (53.9%)	4 (66.7%)	2 (16.7%)	**0.039**	0.106	0.399	**0.013**
Education, years (n 84)	12.9 (3.5)	16.4 (3.1)	14.4 (3.4)	0.055	**0.030**	**0.042**	0.285
BAG, years	2.7 (5.2)	8.7 (4.9)	2.6 (3.0)	**0.019**	0.159	**0.005**	0.574
Forebrain parenchyma/ICV (%)	58.2 (3.2)	57.4 (2.2)	60.6 (2.2)	**0.034**	0.117	0.380	**0.012**
Hippocampi/ICV (%)	0.37 (0.07)	0.37 (0.04)	0.40 (0.06)	0.450	0.323	0.893	0.205
WMH/ICV (%)	0.61 (0.58)	0.30 (0.35)	0.53 (0.54)	0.419	0.295	0.215	0.574

Persson, K., Leonardsen, E. H., Edwin, T. H., Knapskog, A. B., Tangen, G. G., Selbæk, G., ... & Engedal, K. (2023). Diagnostic accuracy of brain age prediction in a memory clinic population and comparison with clinically available volumetric measures. Scientific Reports, 13(1), 14957.

Brain age predictions using deep learning

Brain age predictions using deep learning

- Our methodology has produced the most accurate and robust brain age models in the world
- Elevated brain age is a promising marker of general brain health associated with various biochemical measures, lifestyle factors, and diseases
- Patients with neurodegenerative diseases show accelerated brain aging



Thank you for your attention!

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