

Modelling prognostic cognitive declines due to Alzheimer's disease

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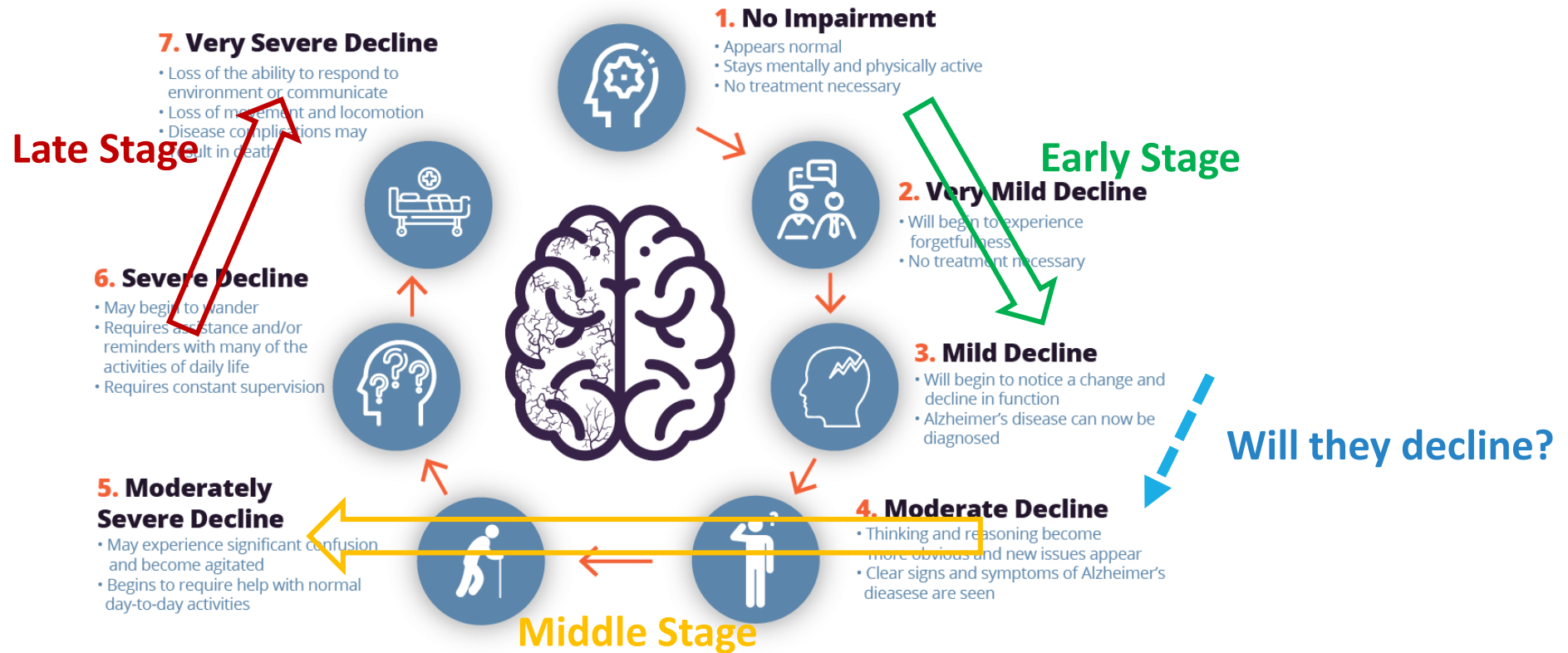
Dementia Global Prevalence

The number of people with dementia globally is estimated to be **55.2 million**.

Alzheimer's disease is the most common form and may contribute to 60-70% of cases.



Stages of Alzheimer's Disease (Global Deterioration Scale, GDS)



Source: Dr. Barry Reisberg of New York University

Alzheimer's Disease Neuroimaging Initiative

ADNI
Longitudinal
CN, MCI, AD

**Baseline
Syndromic Labels**



> 3 yrs

**Longitudinal
Syndromic Labels**



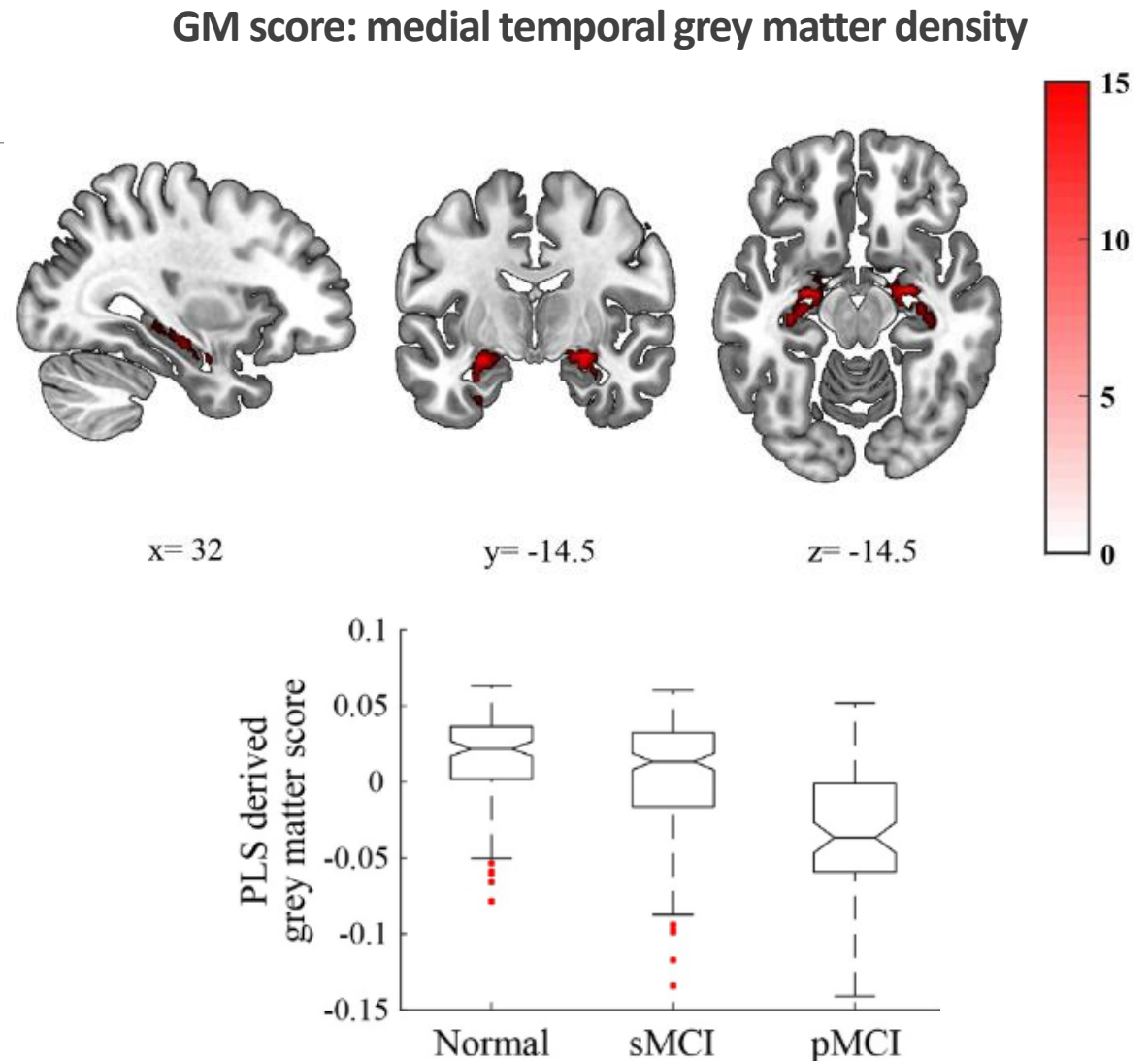
Stable MCI
(sMCI, 196)

Progressive MCI
(pMCI, 126)

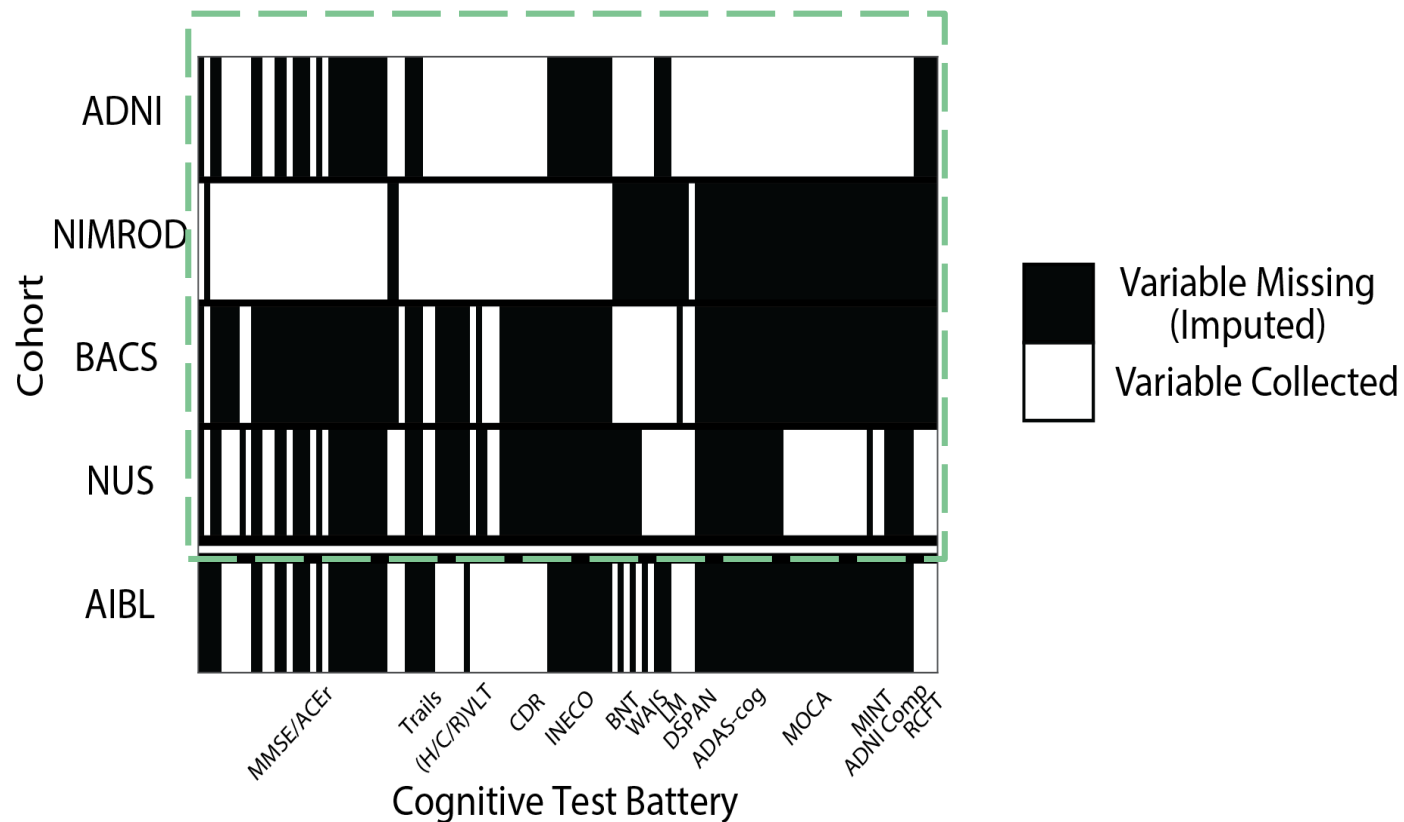
Feature Selection

Eight baseline biological markers

- GM score (structural MRI)
- MMSE
- ACE-R total score
- ACE-R attention/orientation subscale
- ACE-R memory subscale
- ACE-R fluency subscale
- ACE-R language subscale
- ACE-R visual-spatial subscale



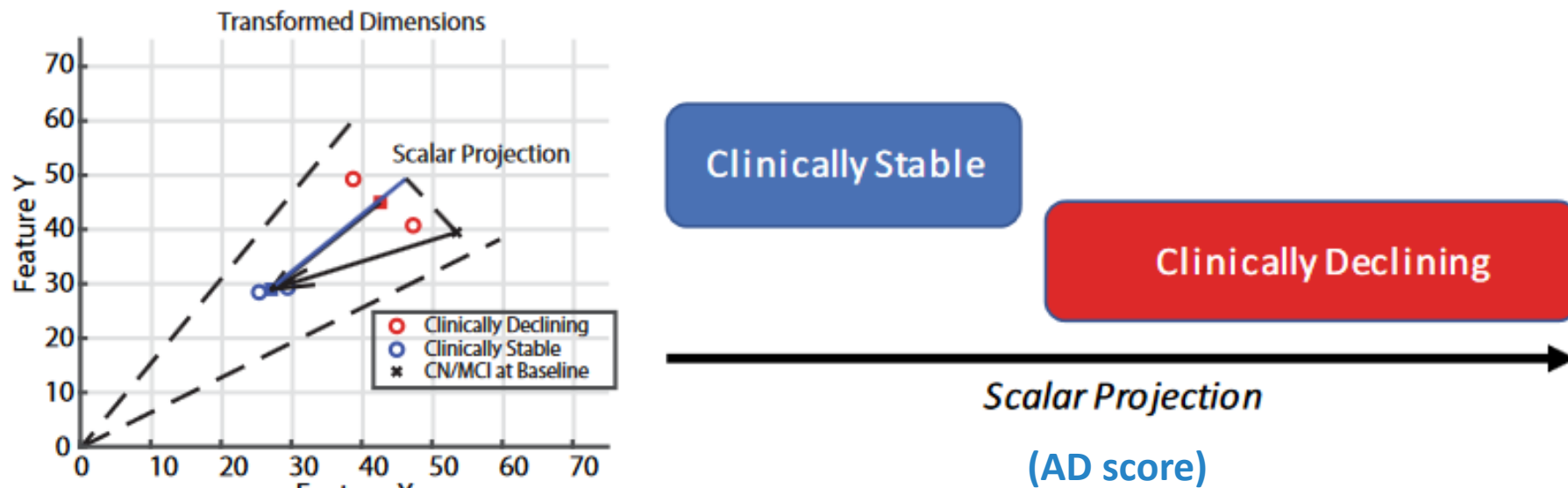
Cross-cohort cognitive data harmonisation



- Pool cognitive data from four international cohorts (CN, MCI, AD with 14,254 neuropsychological visits)
- Harmonise cognitive data with k-NN imputation
- K optimisation
- Validate in a fifth cohort (3920 neuropsychological visits)

Generalised Matrix Learning Vector Quantisation Scalar Projection (GMLVQ)

- GM score (structural MRI)
- Harmonised clinical scores



Model validation

- Memory Clinic, Cambridge University Hospitals (QMIN-MC)
- Berkeley Ageing Cohort Study (BACS)
- Memory Clinic, National University of Singapore (NUS)

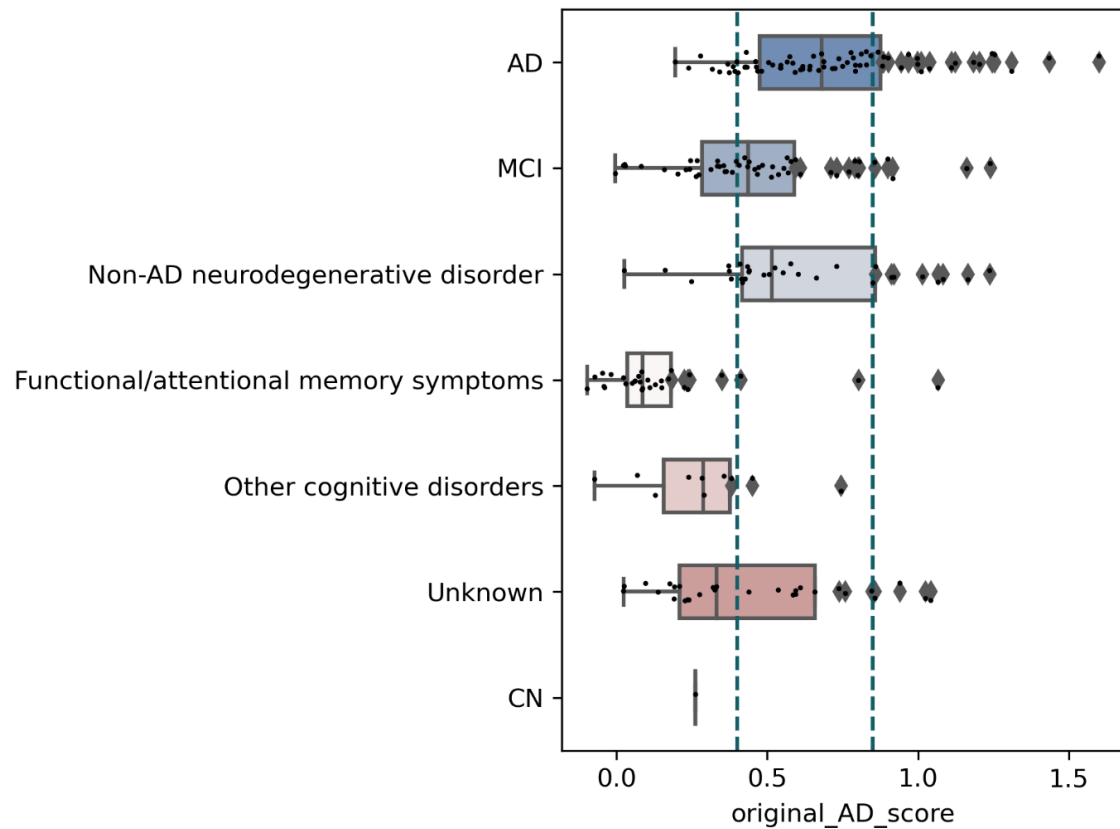
	QMIN-MC		NUS		BACS	
AD (119)	AD	72	AD	32		
			VAD	15		
MCI (145)	MCI	50	MCI moderate	42		
			MCI mild	53		
Control (337)	CN	1	NCI	27	CN (baseline)	185
Other (135)	Functional/attentional memory symptoms	30				
	Other cognitive disorders*	10				
	Unknown	29				
	Non-AD neurodegenerative disorder**	30				

**GM score
Data imputation**

*Other cognitive disorders: Depression, Anxiety, Stroke, Adjustment Disorder, etc.

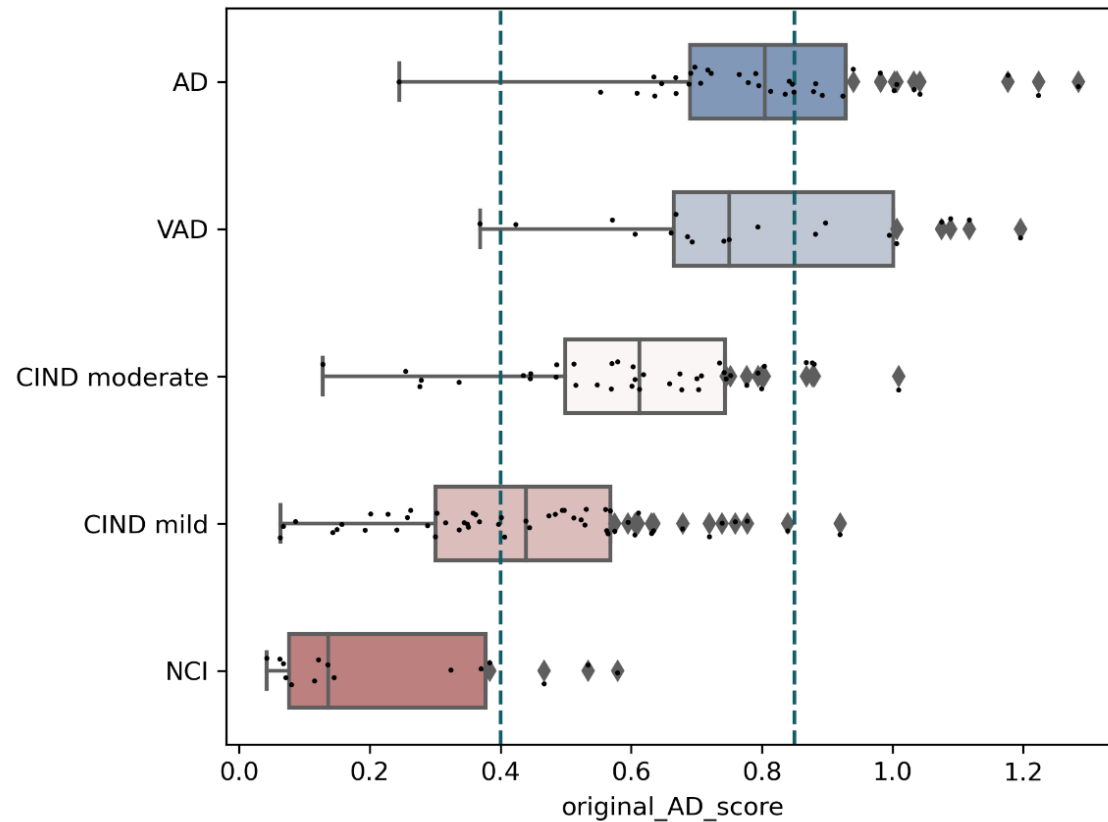
**Non-AD neurodegenerative disorder: Dementia with Lewy Bodies, Parkinson's disease, Mixed dementia, etc.

Memory Clinic, Cambridge University Hospitals



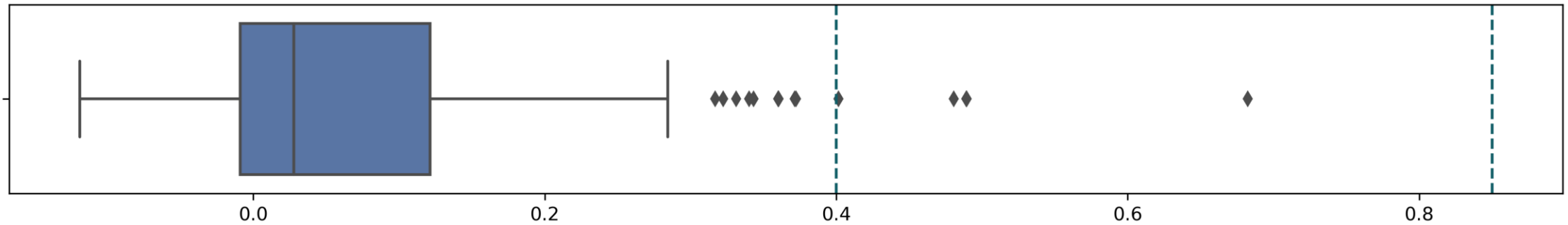
AD	72
MCI	50
Non-AD neurodegenerative disorder	30
Functional/attentional memory symptoms	30
Unknown	29
Other cognitive disorders	10
CN	1
TOTAL	222

Memory Clinic, National University of Singapore



AD	32
VAD	15
MCI_moderate	42
MCI_mild	53
NCI	27
Total	169

Berkeley Ageing Cohort



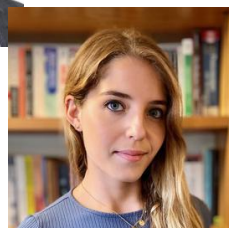
(sample size = 185)

Next steps

1. Biomarkers from functional connectivity, microstructure, etc.
2. Model optimisation
3. Training on different groups
 - AD vs MCI
 - Dementia subtypes



Acknowledgement



EDoN
Early Detection of
Neurodegenerative
diseases



UNIVERSITY OF
CAMBRIDGE



NHS
Cambridge
University Hospitals
NHS Foundation Trust



NUS
National University
of Singapore



MACC
Memory Ageing & Cognition Centre



Berkeley
UNIVERSITY OF CALIFORNIA