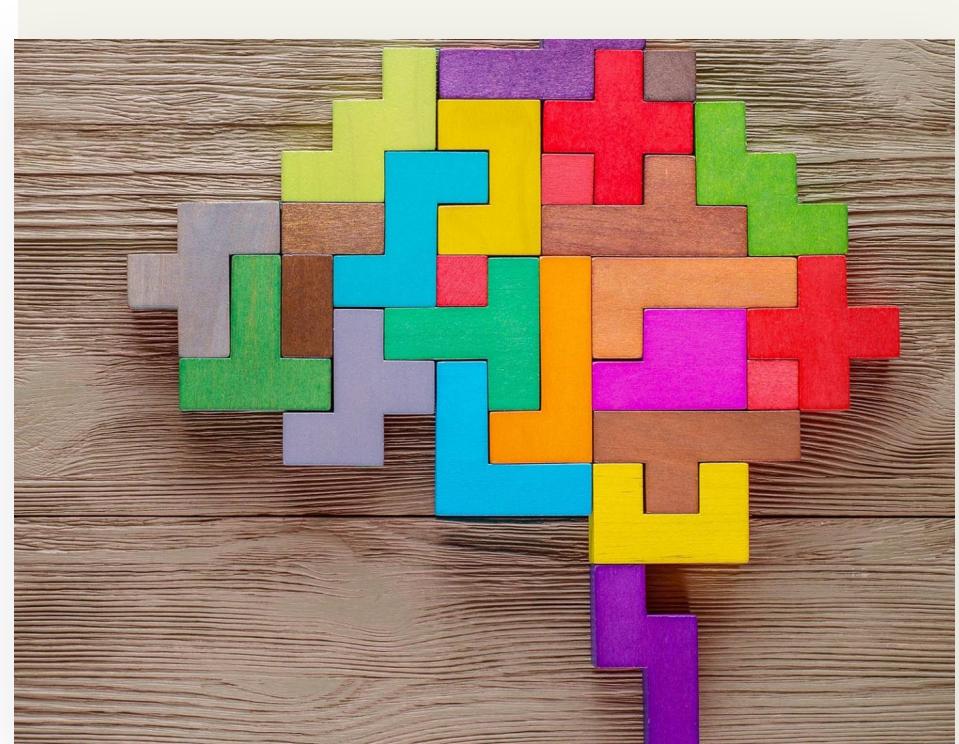


AI for better brain and mental health

Zoe Kourtzi, PhD

University of Cambridge
Alan Turing Fellow
Royal Society Industry Fellow



The
**Alan Turing
Institute**


The Alan Turing Institute –
Roche strategic partnership

The growing global challenge of brain diseases

- At least 1/3rd of all disease burden comes from neurological and psychiatric conditions and it is growing
- Dementia recently became the leading cause of death in the UK
- There is a growing mental health crisis, particularly in young people



Oleson & Leonardi, 2003
Office for National Statistics, 2021

Can we use AI to predict brain and mental health disorders early?

BBC | Sign in | Home | News | Sport | Weather | iPlayer | Sound

NEWS

Home | Coronavirus | Climate | UK | World | Business | Politics | Tech | Science | Health | Family & Education

Health

Artificial Intelligence may diagnose dementia in a day

By Pallab Ghosh
Science correspondent

© 10 August 2021 | [Comments](#)



BBC NEWS/CAMBRIDGE UNIVERSITY

THE TIMES

Today's sections ▾ Past six days Explore ▾ Times Radio

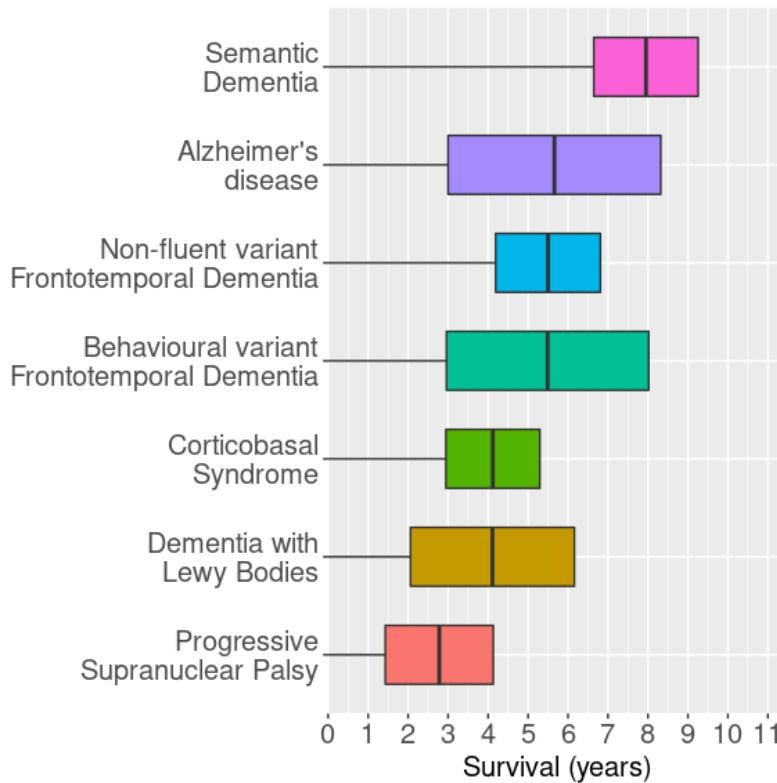
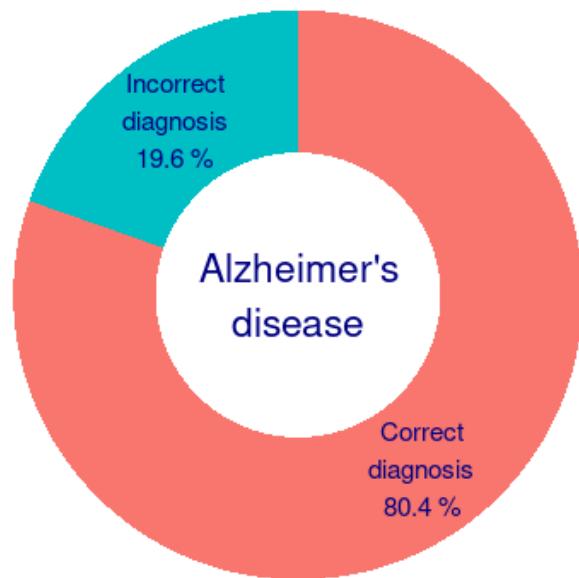
AI could diagnose dementia before symptoms show

Kaya Burgess, Science Reporter

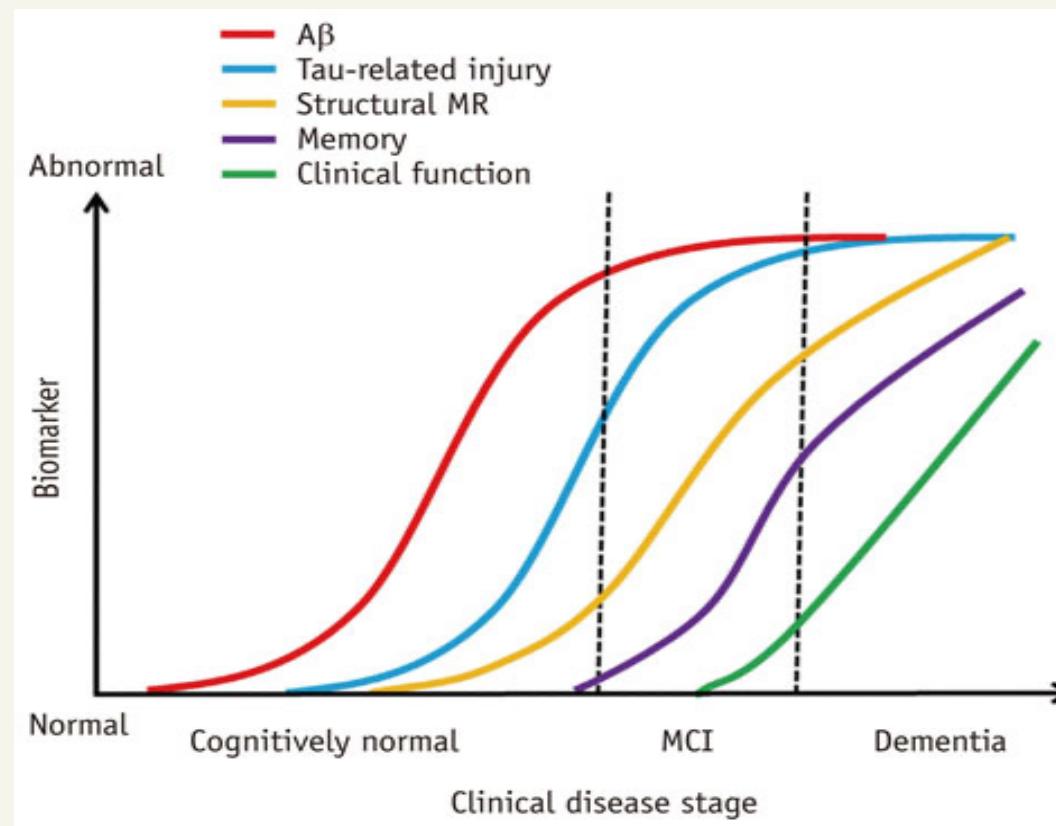
Tuesday August 10 2021, 12.00pm,
The Times



Challenges: precision diagnosis



Challenges: early prediction from non-invasive data



Why Early detection?

1. Understand disease processes
2. Precise patient stratification
3. Encourage lifestyle changes
4. Design personalised treatments early

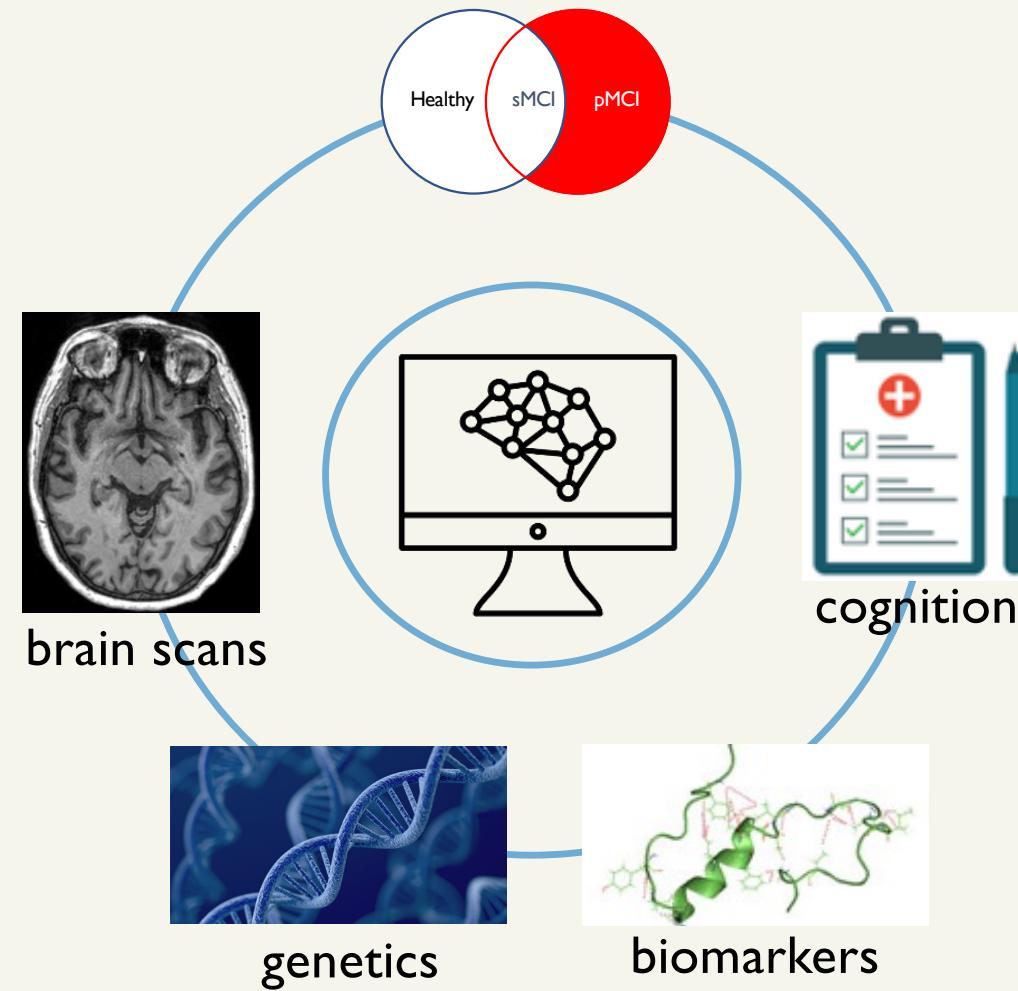


A cross-disciplinary vision to develop:

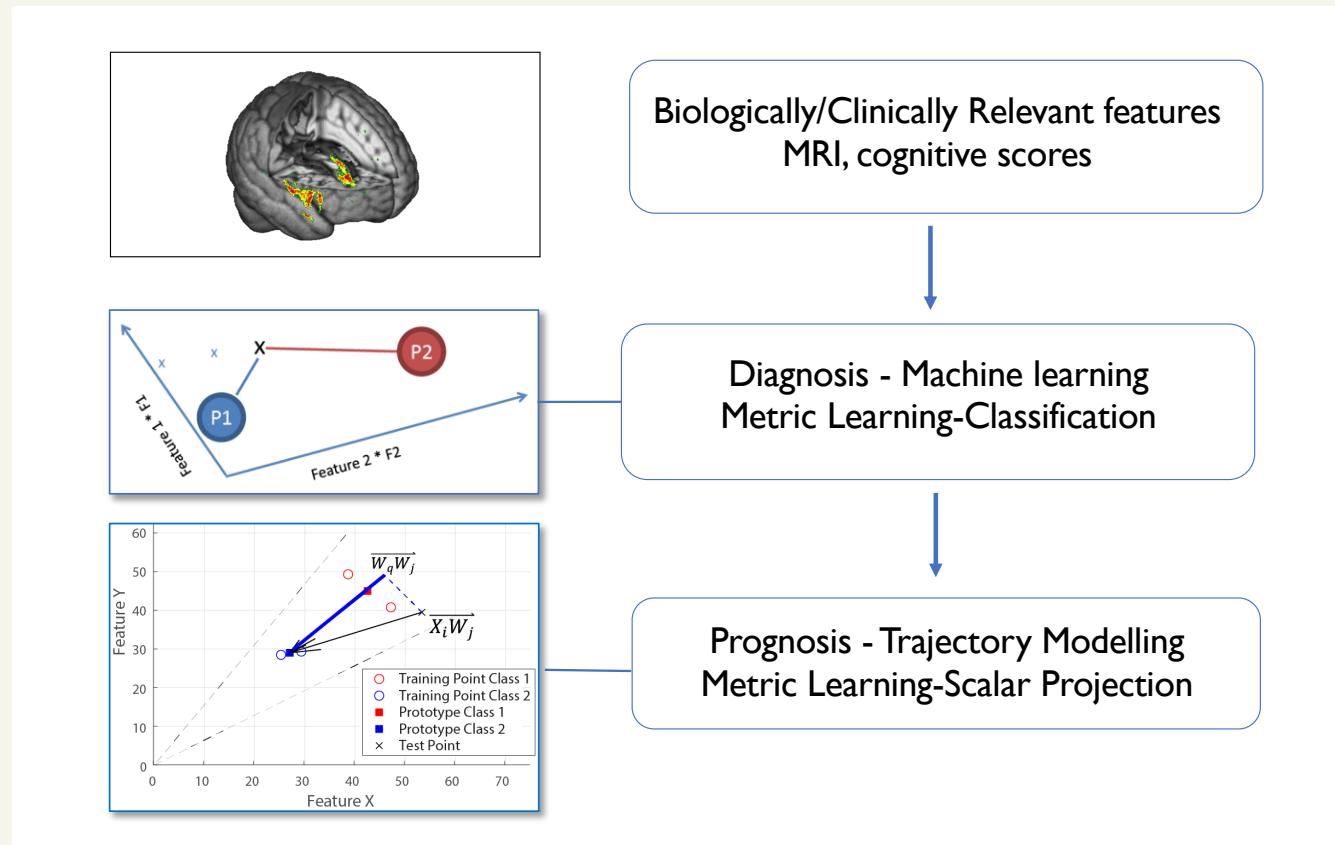
1. Biologically-informed AI with clinical utility
2. Interpretable AI-guided solutions for mechanistic understanding
3. Interoperable AI tools that generalize to global solutions



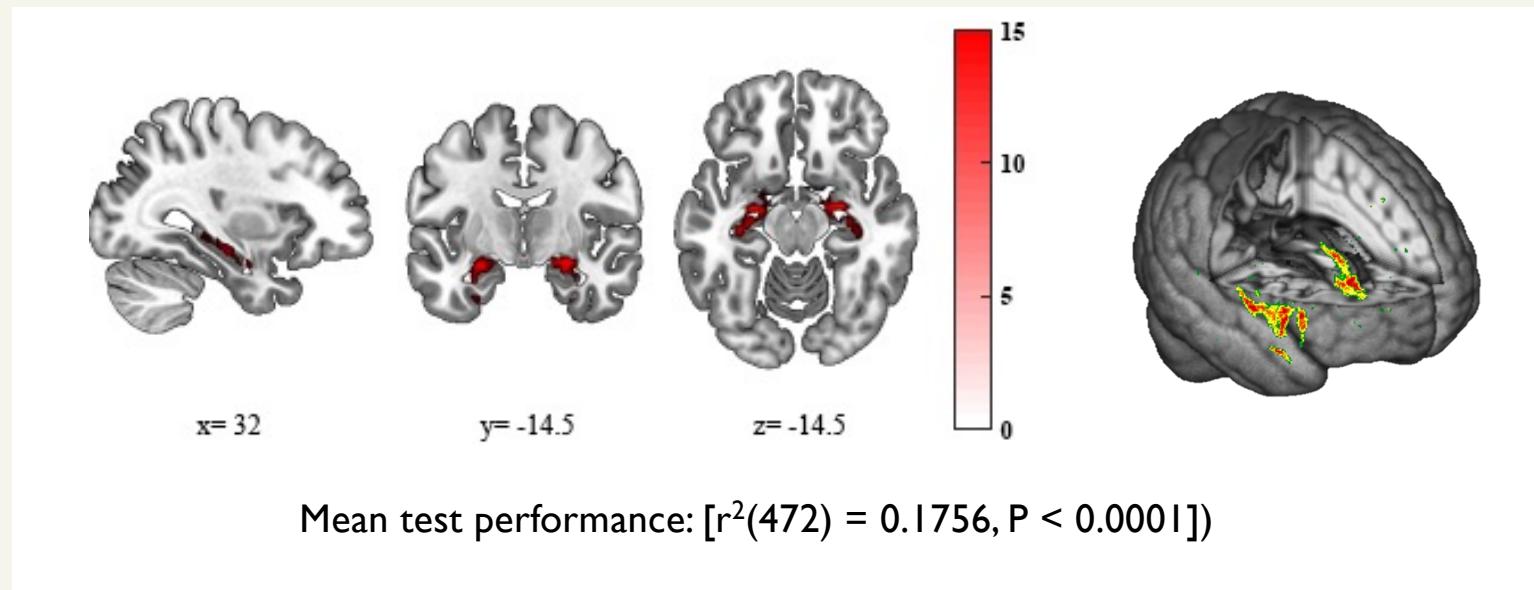
Multimodal Machine Learning



Predictive Prognostic Multimodal Modelling



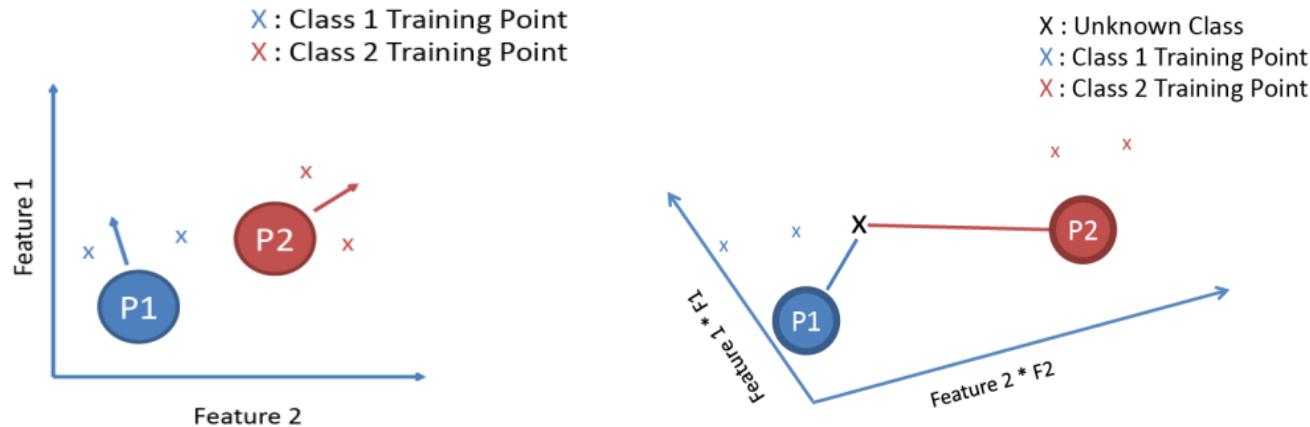
Extracting biologically relevant features



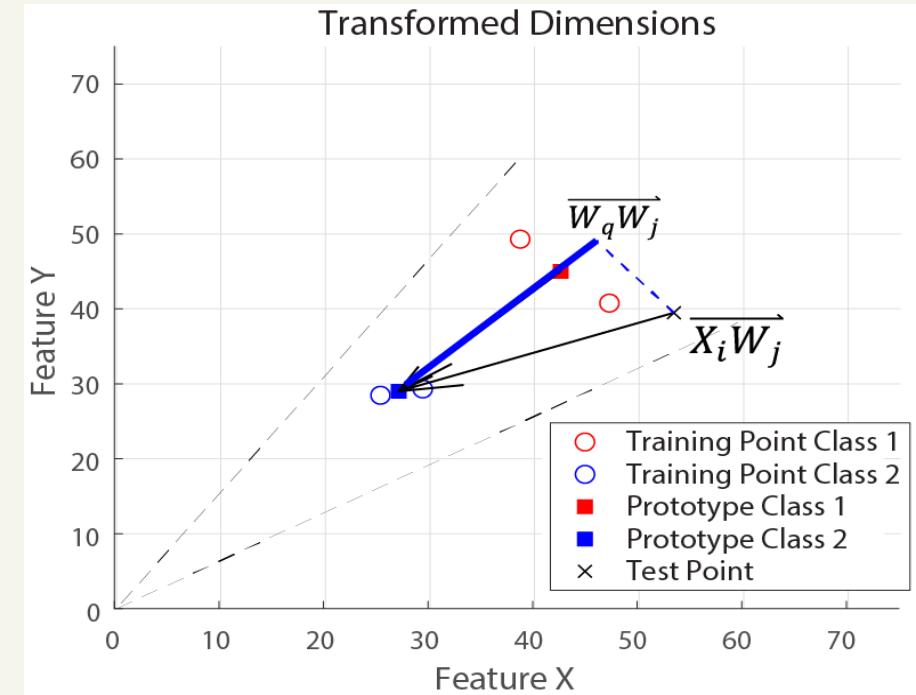
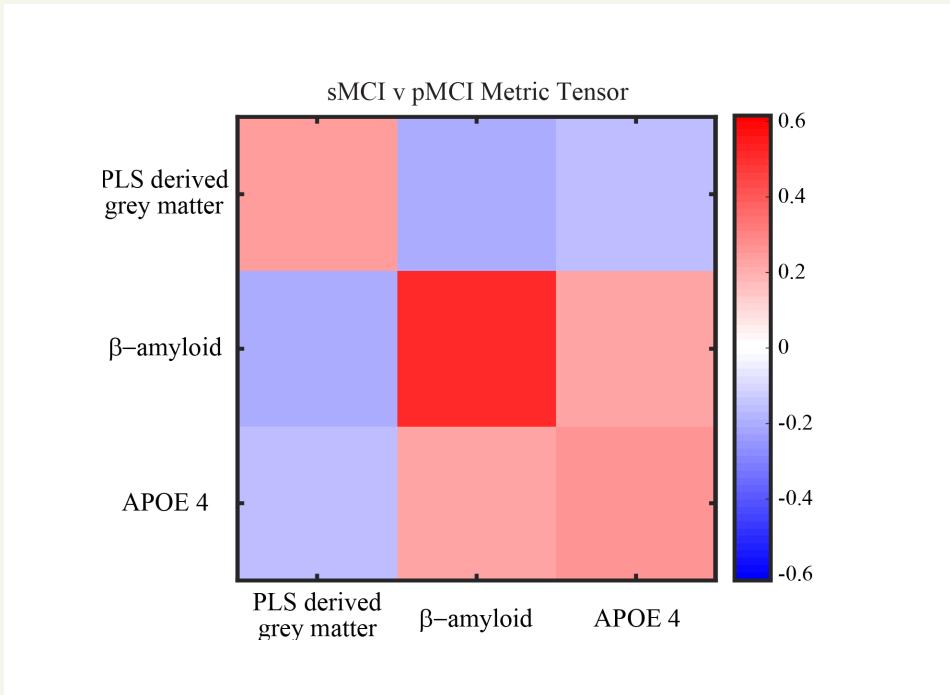
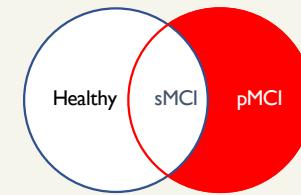
PLS-derived Grey Matter Score predicts cognitive decline (variance in ADNI-Mem scores)

Multimodal Machine Learning for patient classification

Generalised Metric Learning Vector Quantisation: GMLVQ

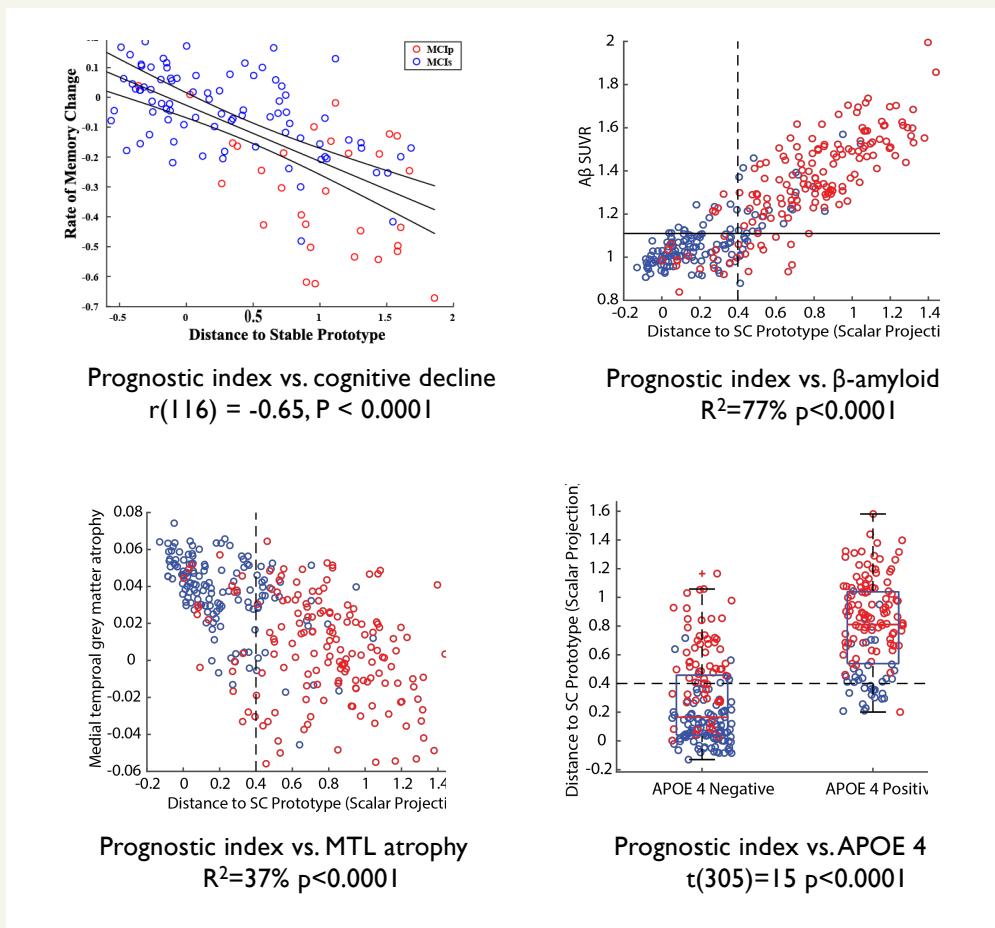


Trajectory modelling: deriving a multimodal prognostic index

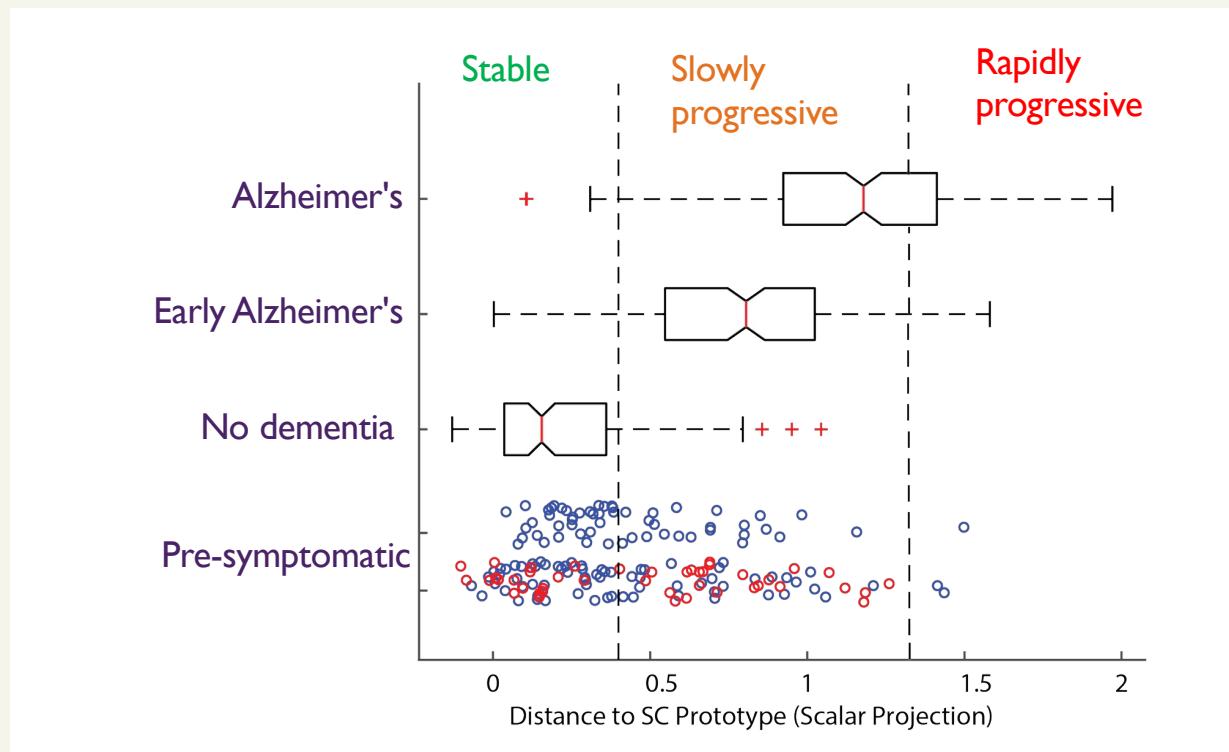


Multimodal prognostic index determines distance from stable MCI prototype

Multimodal prognostic index is clinically-relevant

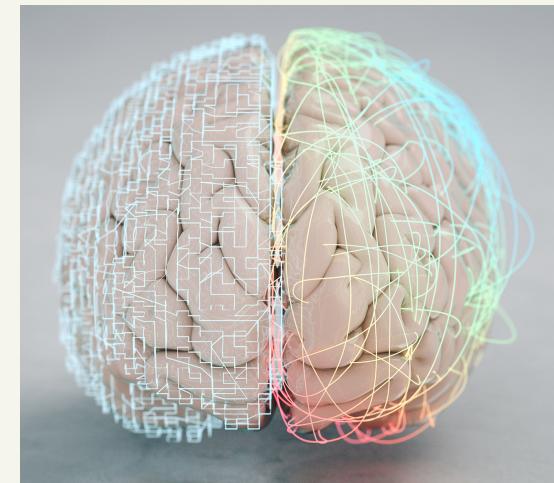


Precision stratification at pre-symptomatic stages

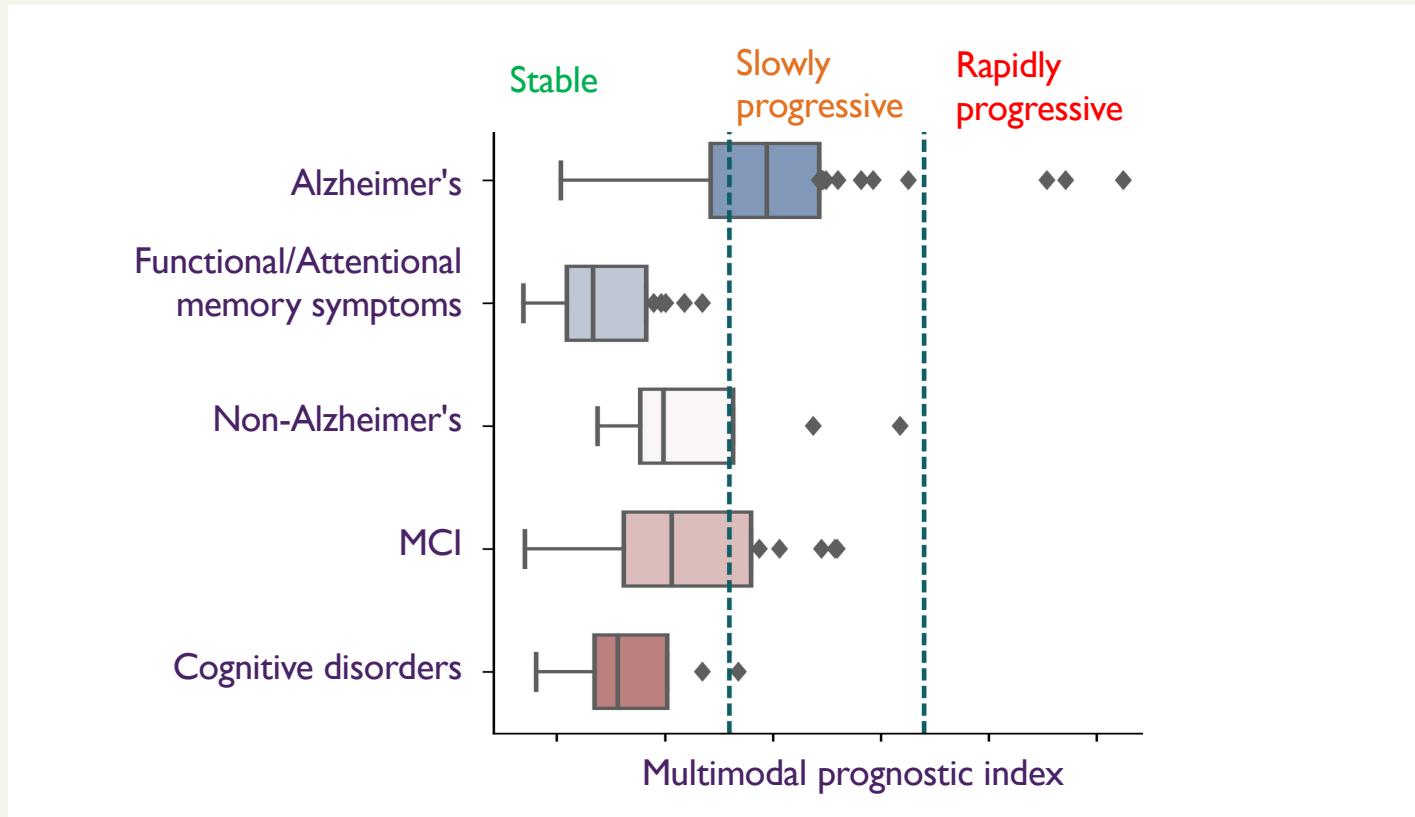


Clinical Utility: Translating AI from the cloud to the clinic

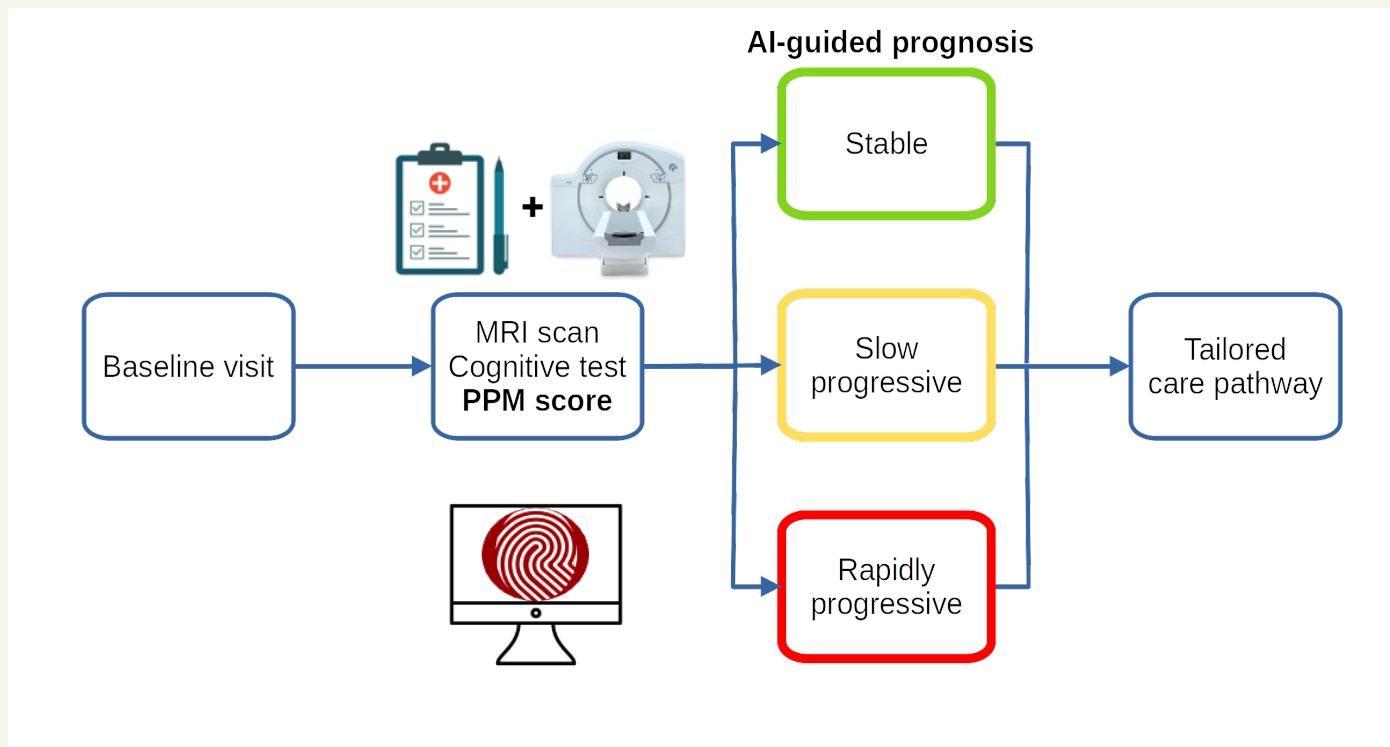
1. Precision patient stratification
2. Changing the clinical pathway
3. Enhancing clinical trial efficiency
4. Towards brain health checks: tracking brain health



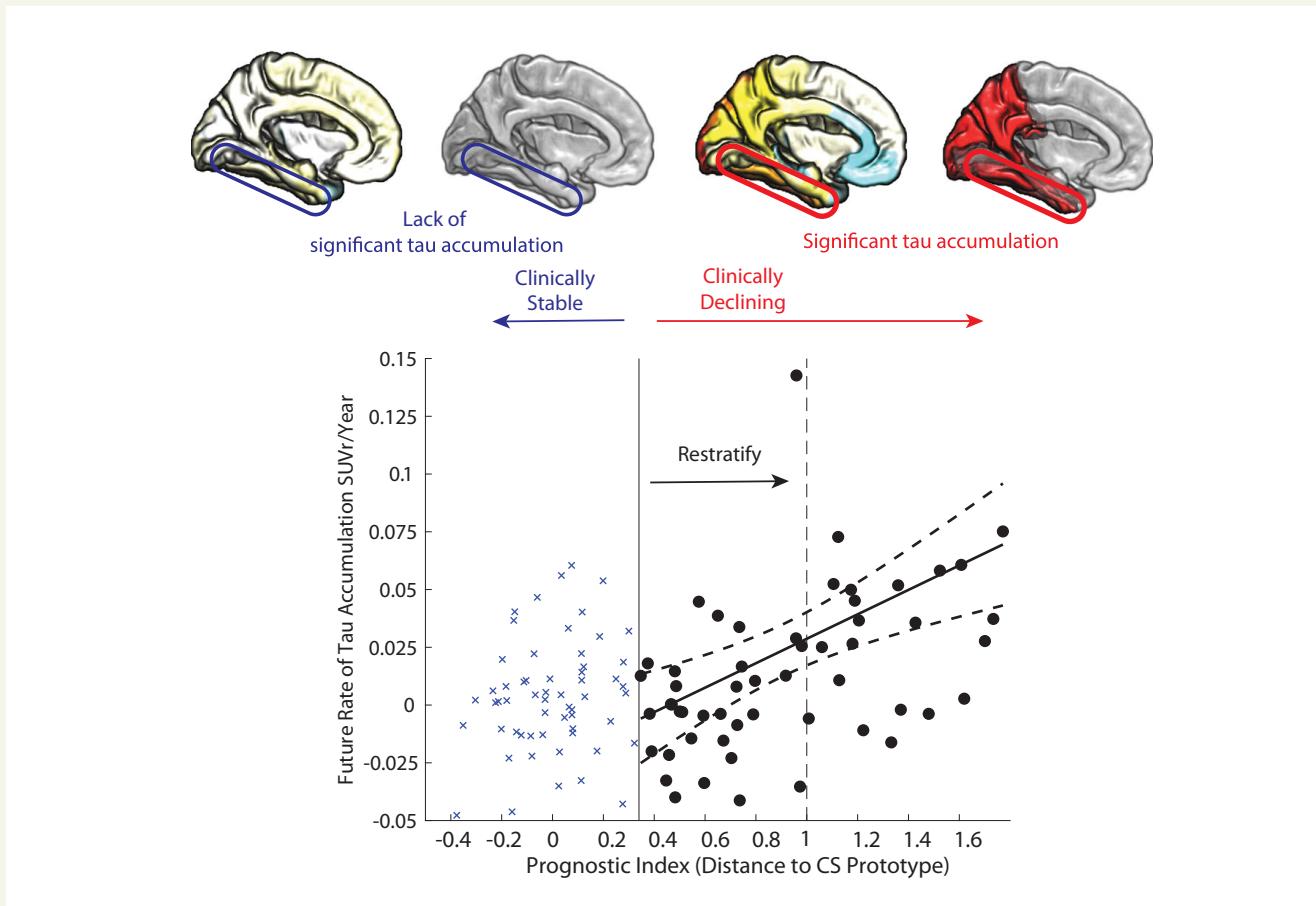
Changing the clinical pathway: Predicting dementia in the memory clinic



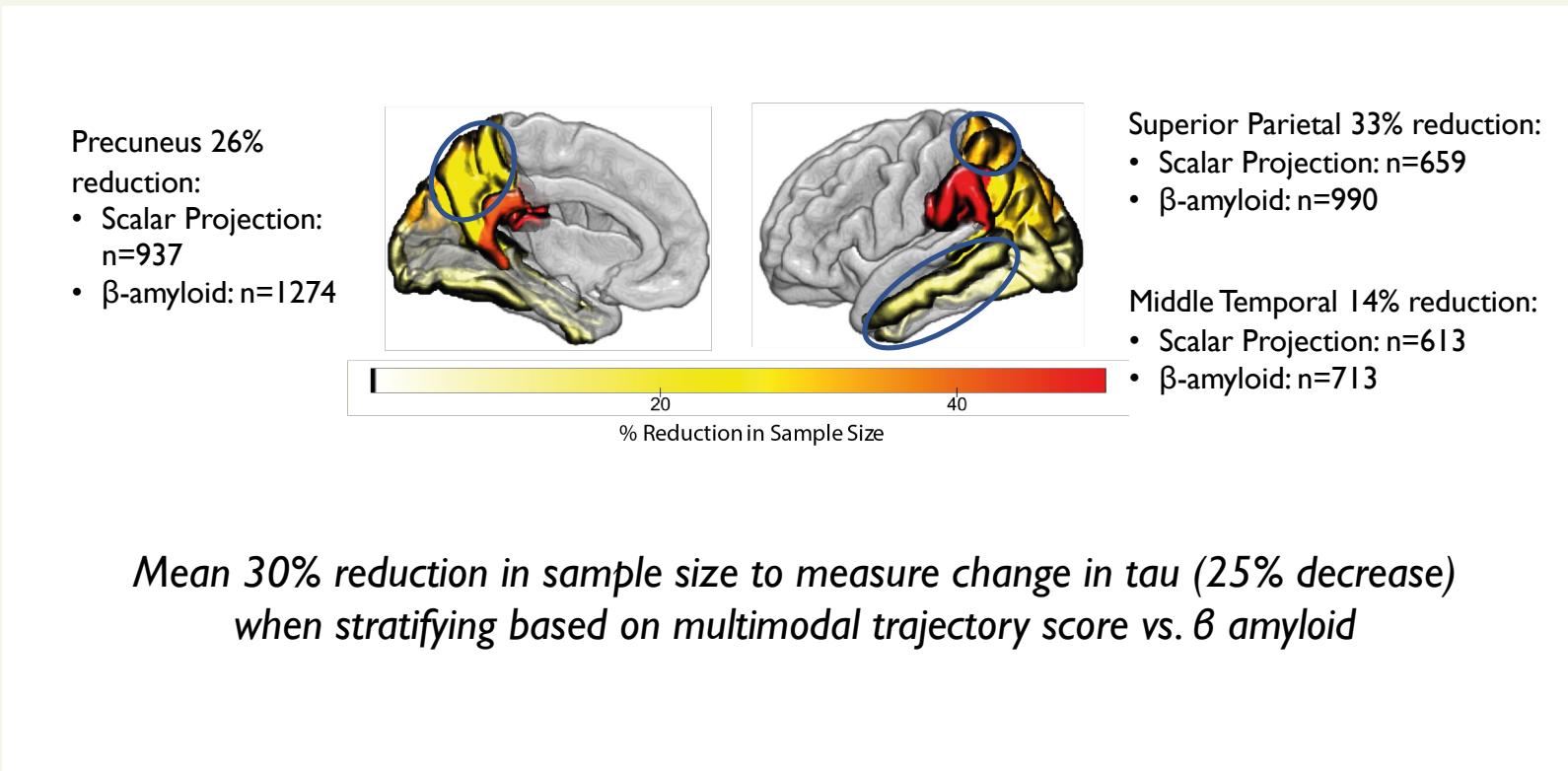
Translation into NHS clinical pathways



AI-guided patient stratification for clinical trials



Enhancing efficacy of clinical trials



AI-enabled clinical decision support systems

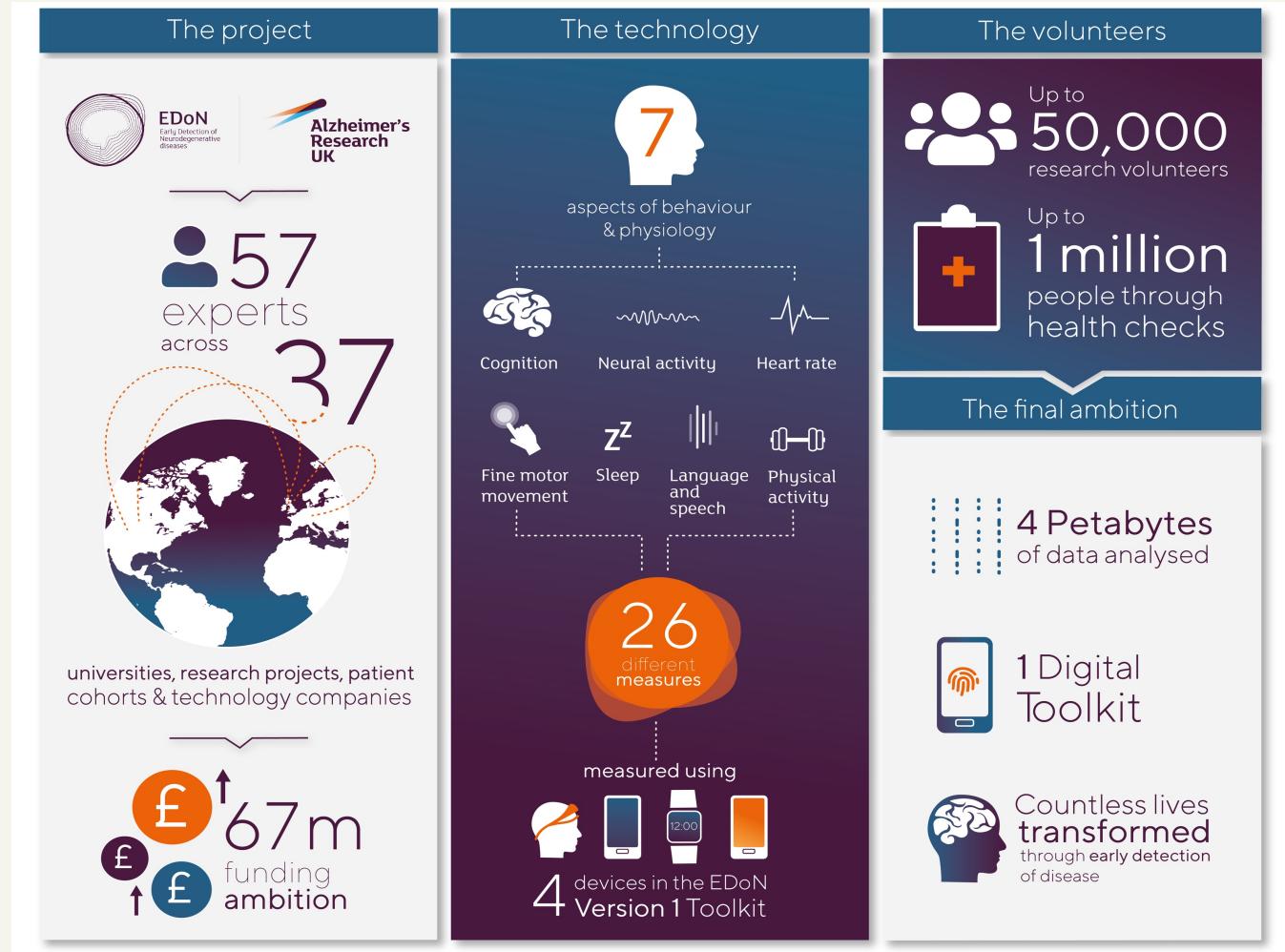
- Help clinicians assign the right patient at the right time to the right pathway
- Improve patient well-being and reduce healthcare costs, as patients undergo fewer, less invasive, less expensive diagnostic tests
- Guide patient selection for clinical trials to enhance their efficacy and pave the way to drug discovery



Outlook:

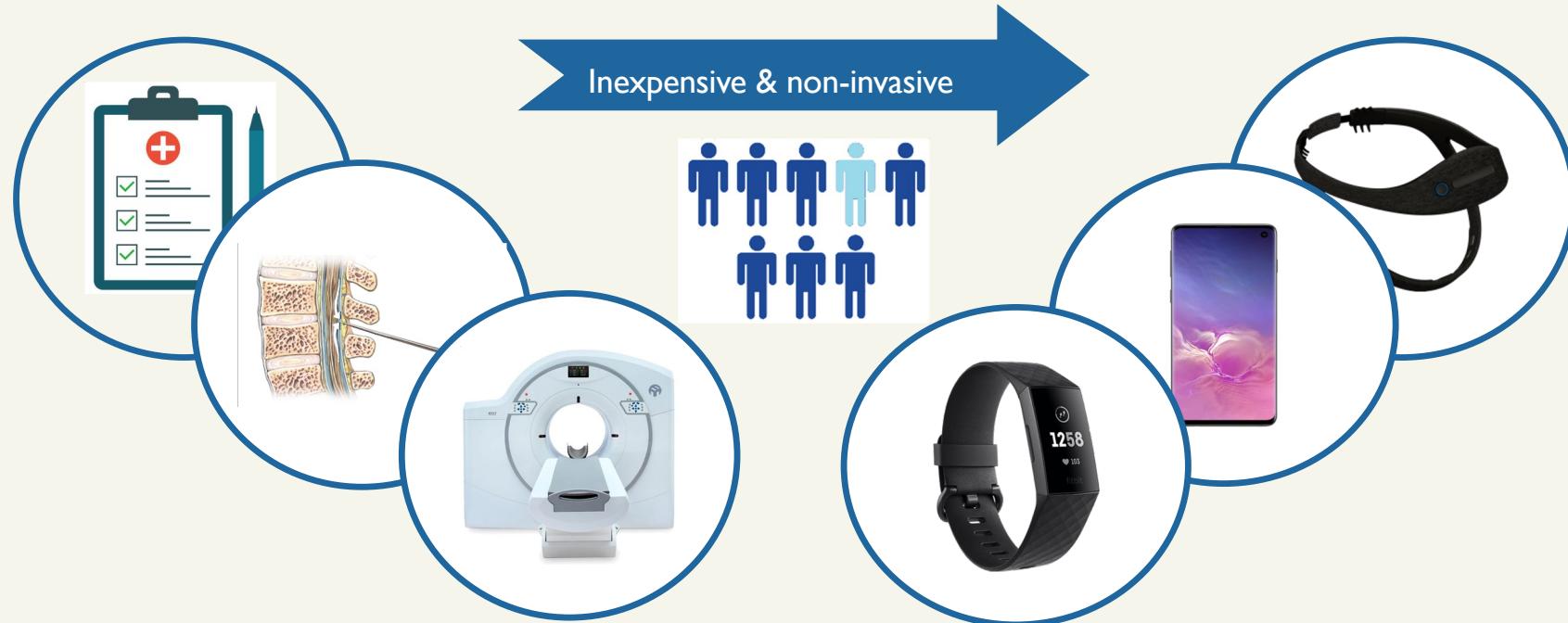
EDoN

Early Detection of Neurodegenerative Diseases



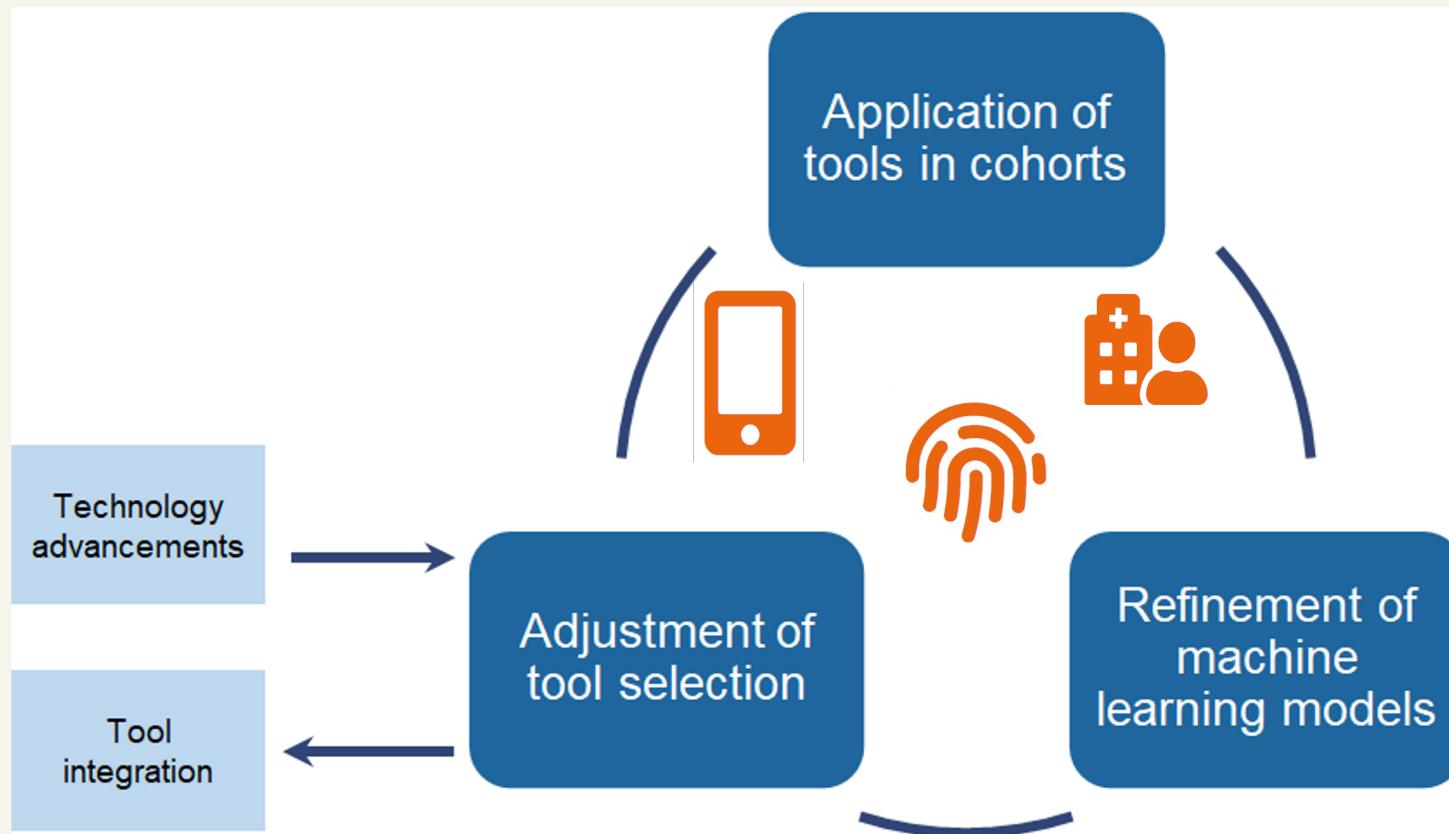
The EDoN challenge

Revolutionise the early detection of dementia-causing diseases



Develop an integrated digital fingerprint tool for detection of diseases that cause dementia 10-15 years before symptoms using: inexpensive, non-invasive, sensitive and scalable digital technologies

EDoN's iterative development process



EDoN
Early Detection of
Neurodegenerative
diseases

Thank you



The
Alan Turing
Institute

