

Exploring brain heterogeneity in patients with neuropsychiatric disorders using explainable artificial intelligence



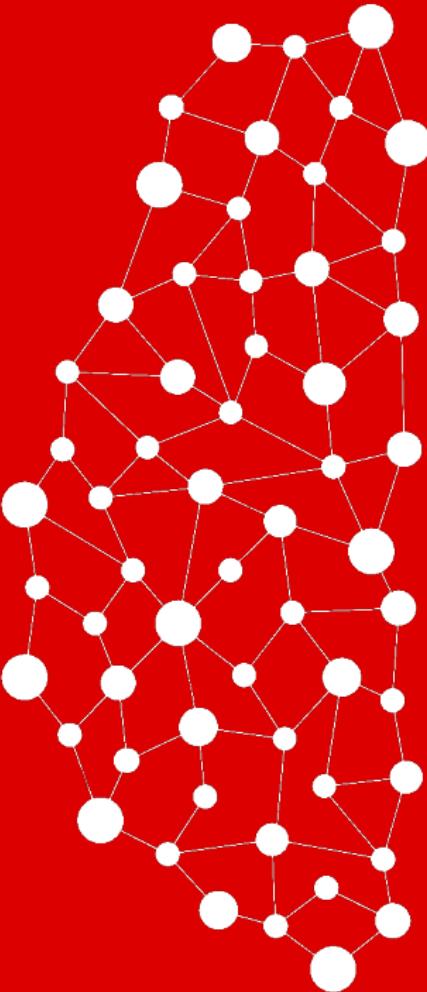
Esten H. Leonardsen

Post-doc at the Department of Psychology,
University of Oslo

Chief Scientific Officer, baba.vision



UNIVERSITY
OF OSLO



Overview

1. Background
2. Explainable artificial intelligence for dementia-prediction
3. Explainable brain age predictions



Explainability and dementia



UNIVERSITY
OF OSLO

Explainability and dementia: Dataset



FEMALE

MALE

55

60

65

70

75

80

85

90

95

n=1708

?? Controls
?? Patients



Explainability and dementia: Dataset



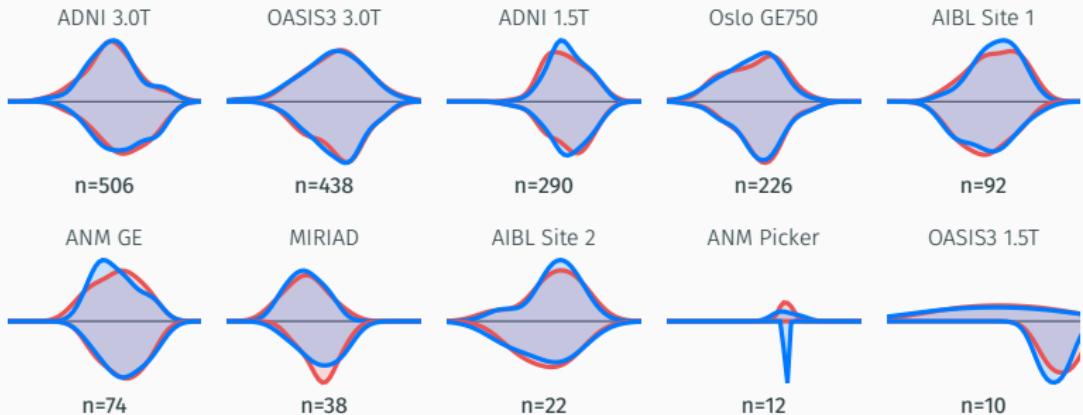
FEMALE

MALE

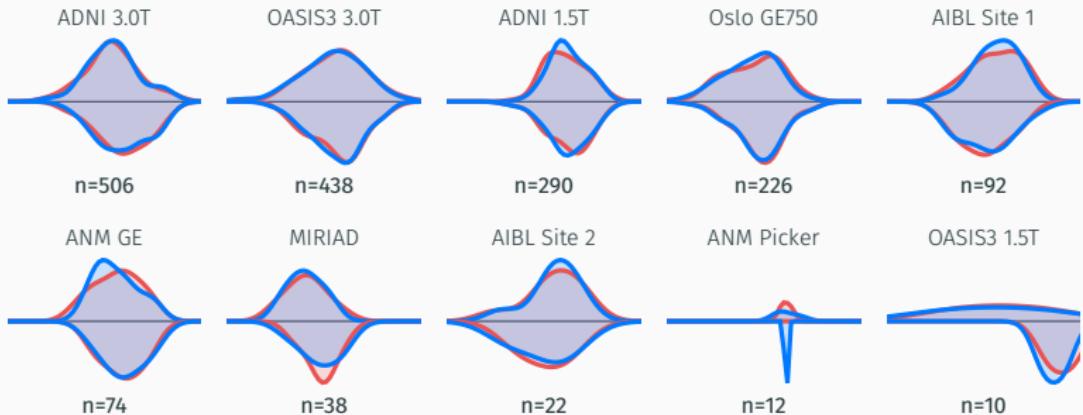
55 60 65 70 75 80 85 90 95

n=1708

?? Controls
?? Patients



Explainability and dementia: Dataset



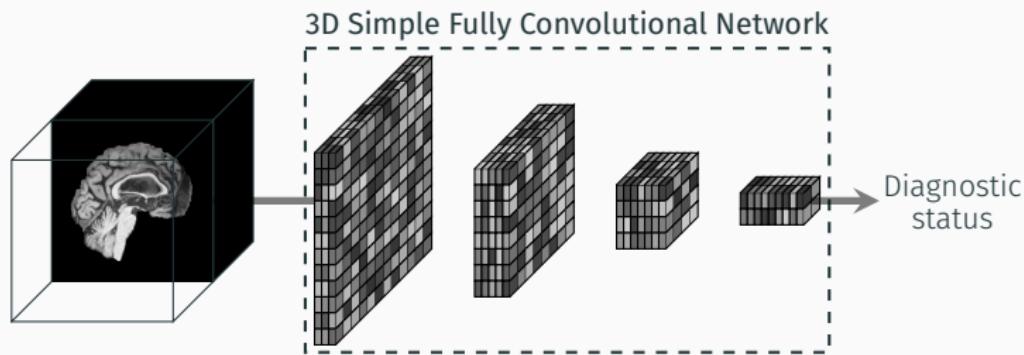
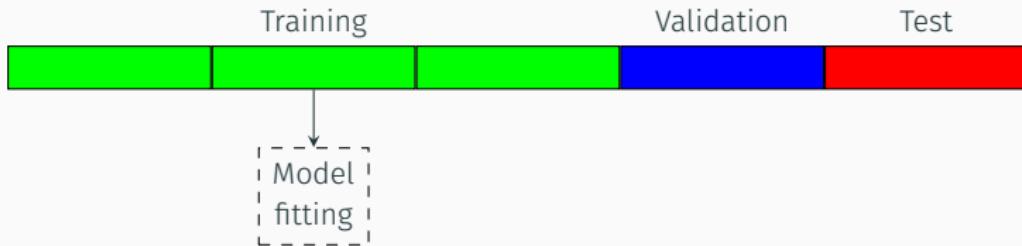
Explainability and dementia: Modelling



Explainability and dementia: Modelling



Explainability and dementia: Modelling



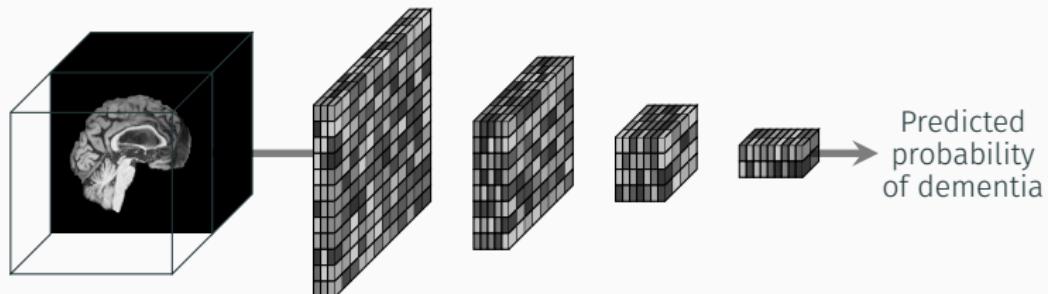
Explainability and dementia: Modelling



Hyperparameter	Values
Weight decay	$\{10^{-2}, 10^{-3}\}$
Dropout	{0.25, 0.5}
Learning rate schedule	{stepwise, cyclic, one-cycle}
Augmentations	{light, heavy}



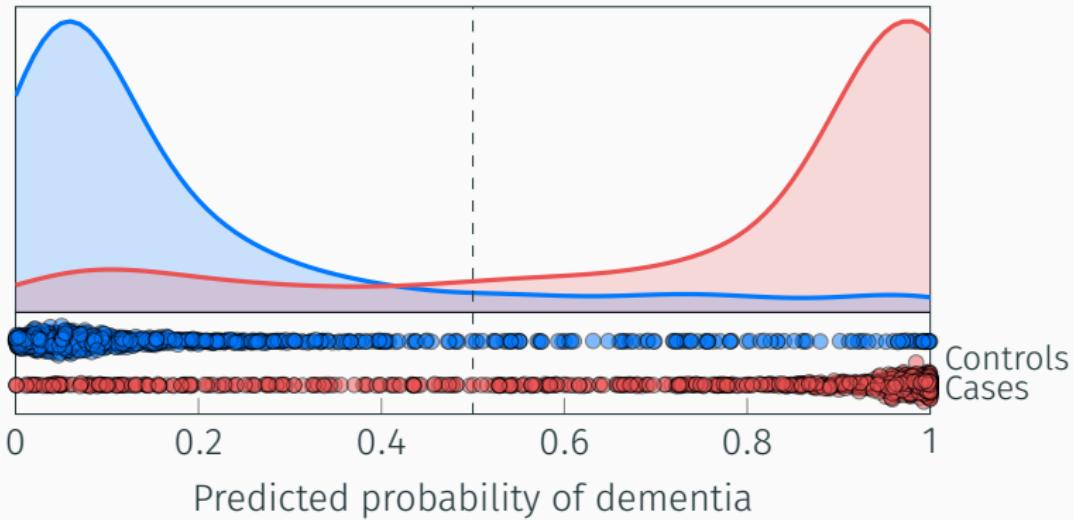
Explainability and dementia: Modelling



Explainability and dementia: Modelling



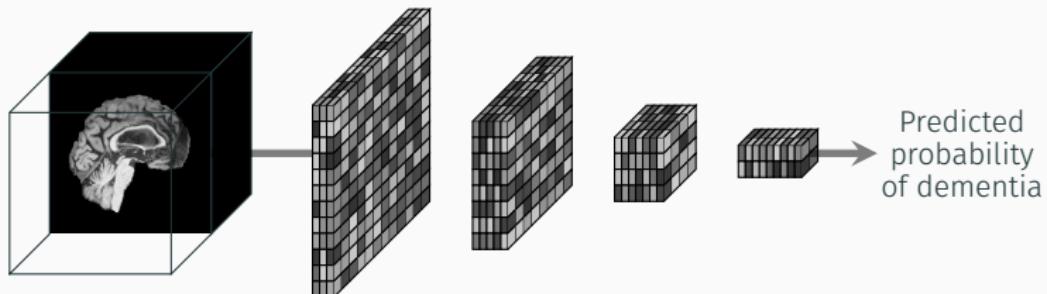
Explainability and dementia: Modelling



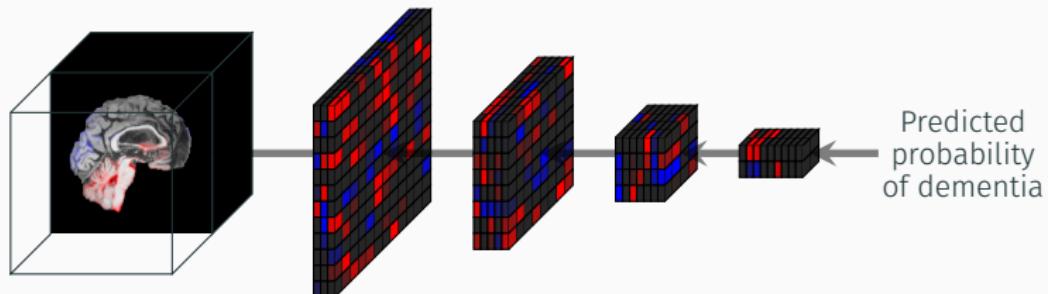
AUC=0.91, balanced accuracy=85%



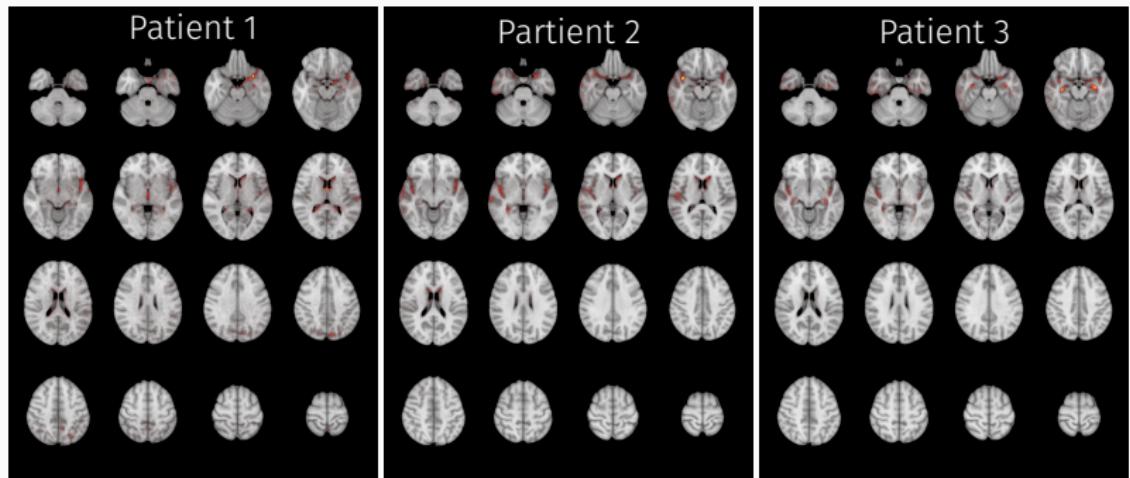
Explainability and dementia: Modelling



Explainability and dementia: Modelling



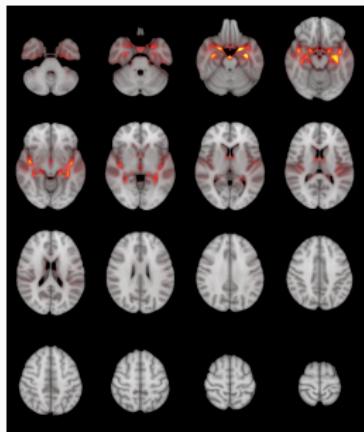
Explainability and dementia: Validation



Explainability and dementia: Validation



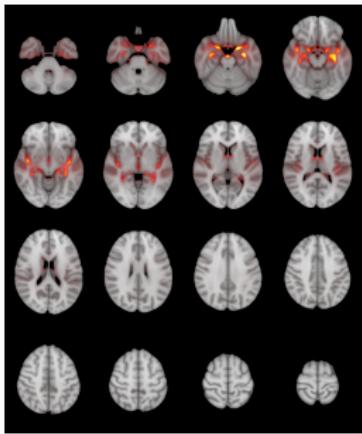
LRP



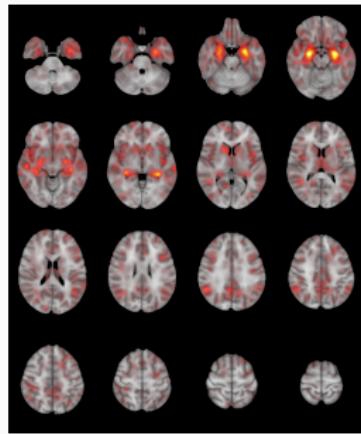
Explainability and dementia: Validation



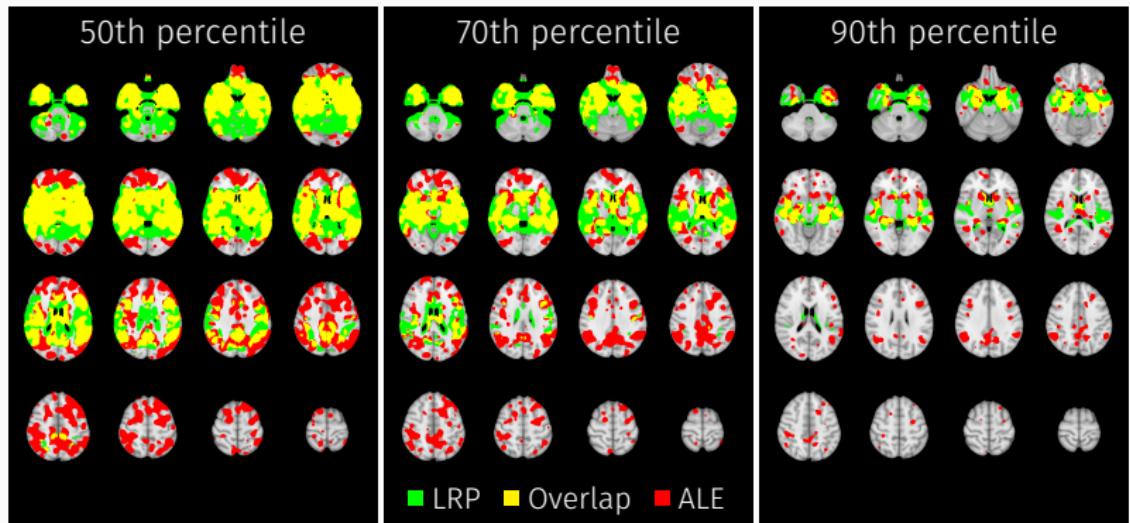
LRP



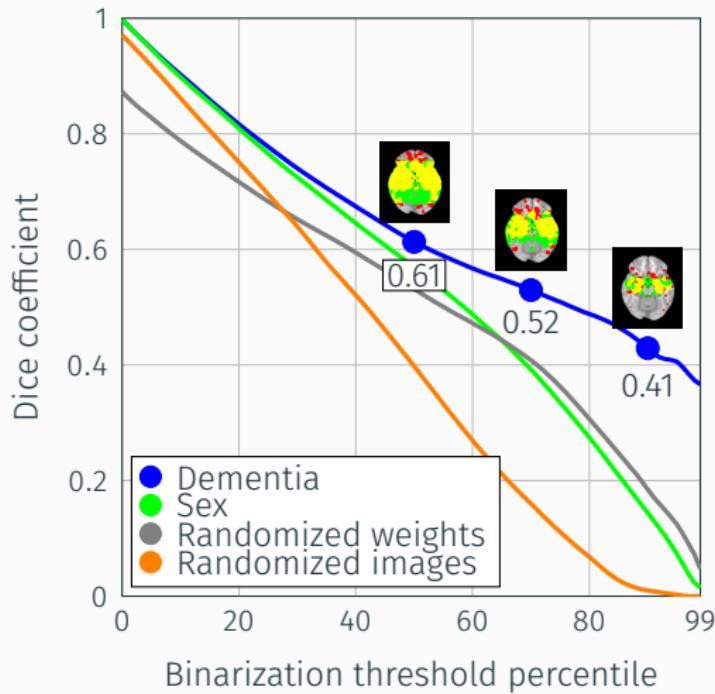
GingerALE



Explainability and dementia: Validation



Explainability and dementia: Validation



Explainability and dementia: Validation



AOPC



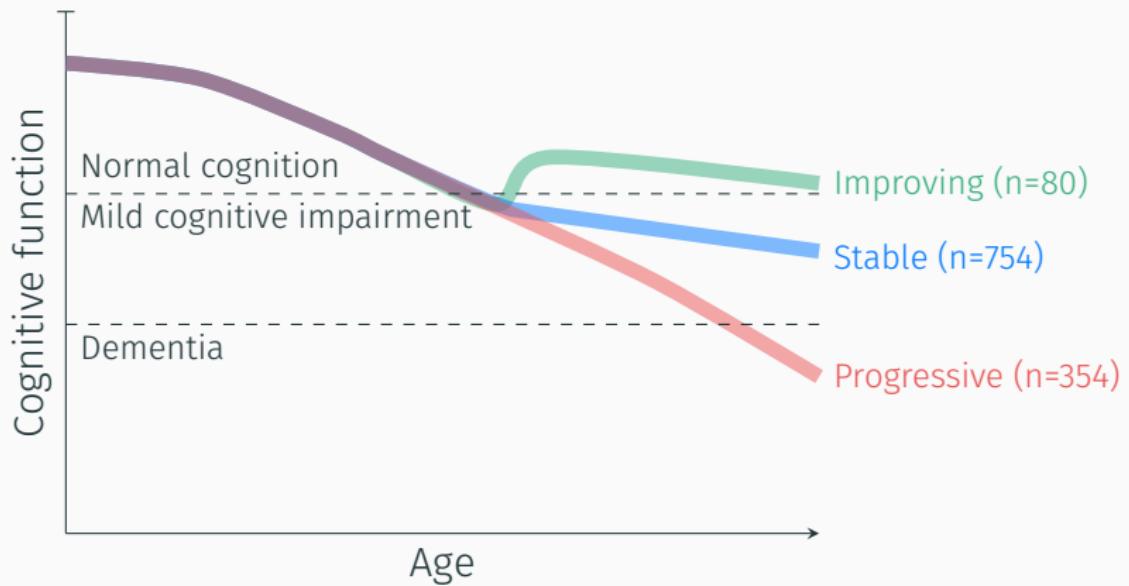
Explainability and dementia: Application



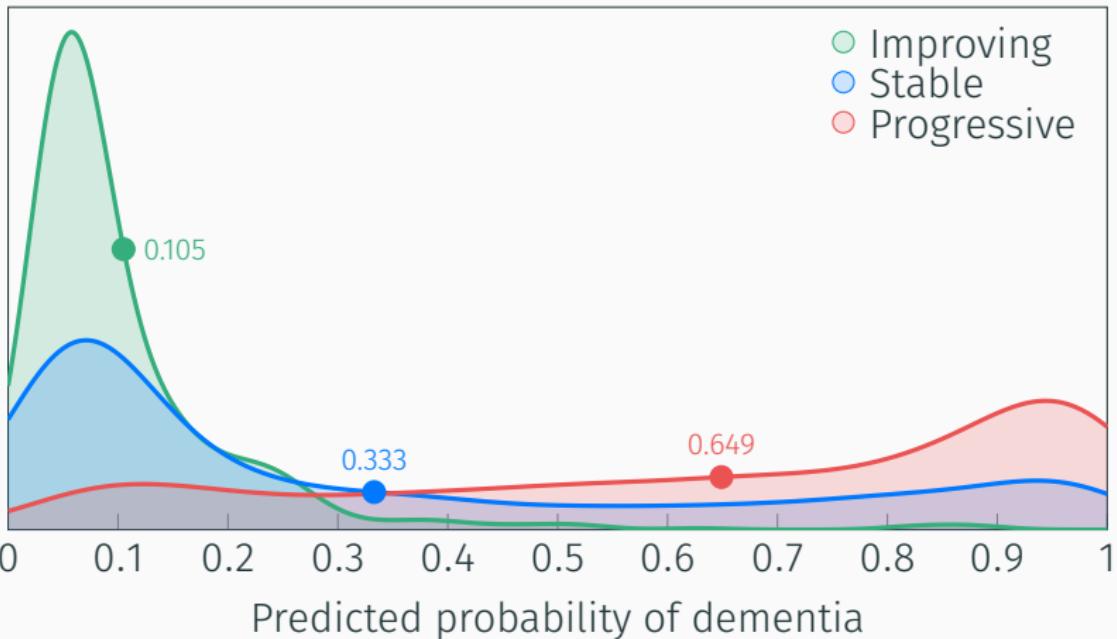
MCI dataset



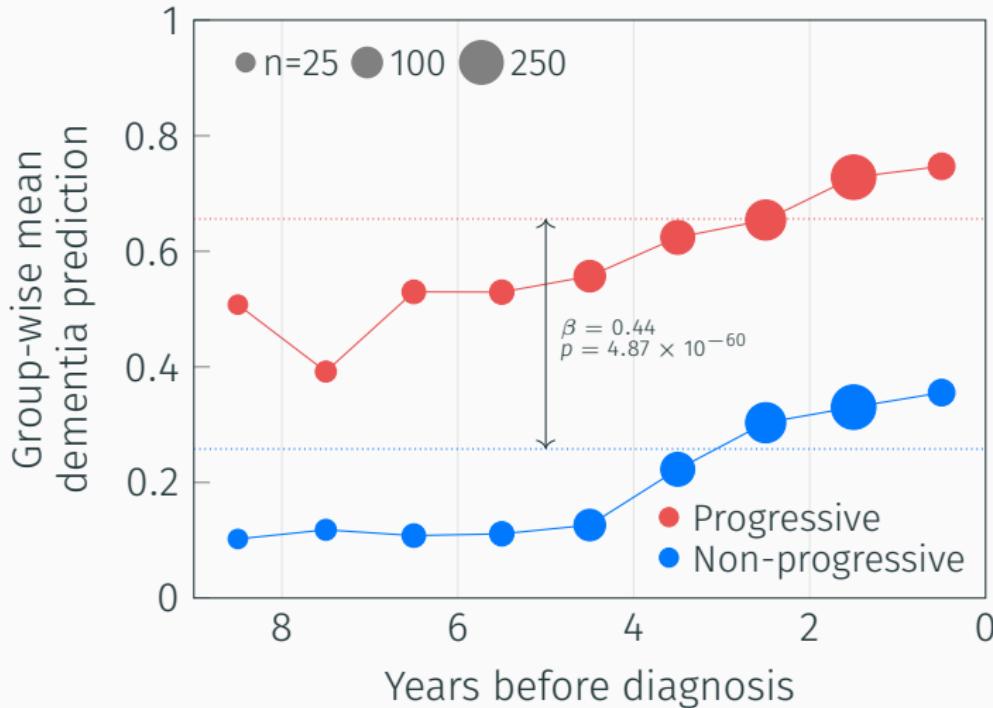
Explainability and dementia: Application



Explainability and dementia: Application



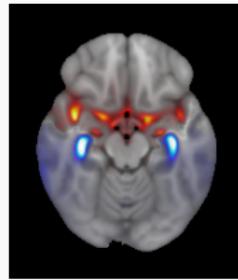
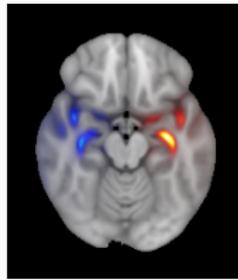
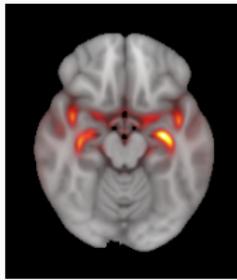
Explainability and dementia: Application



Explainability and dementia: Application



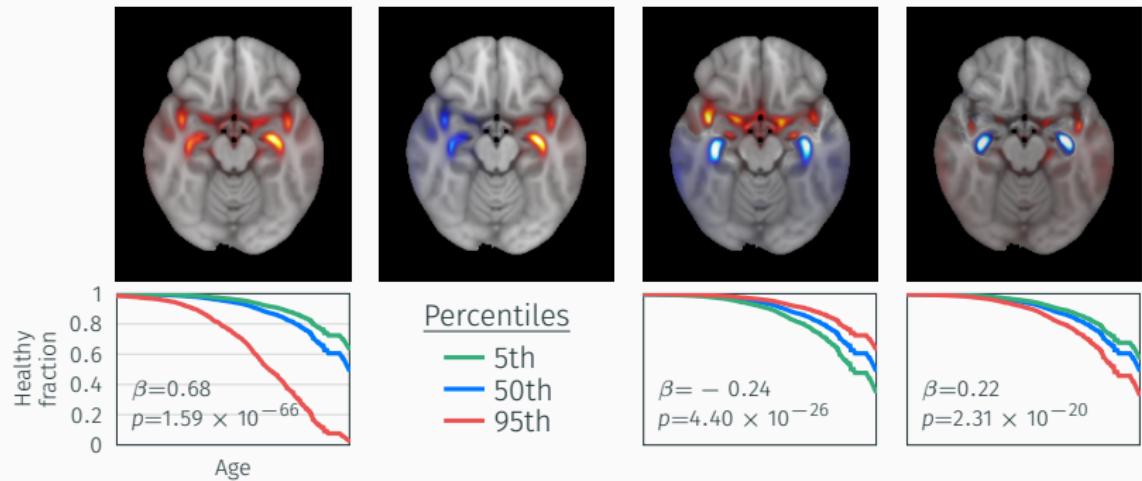
Component 0 Component 1 Component 2 Component 3



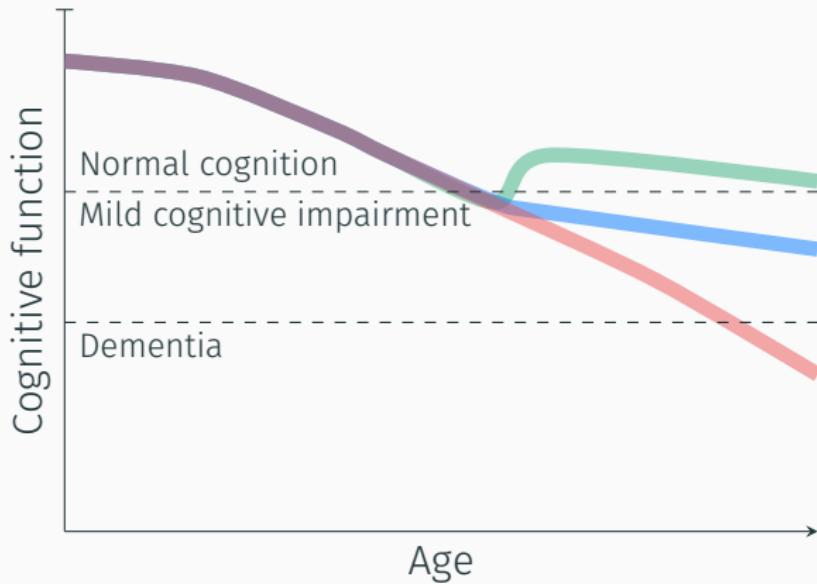
Explainability and dementia: Application



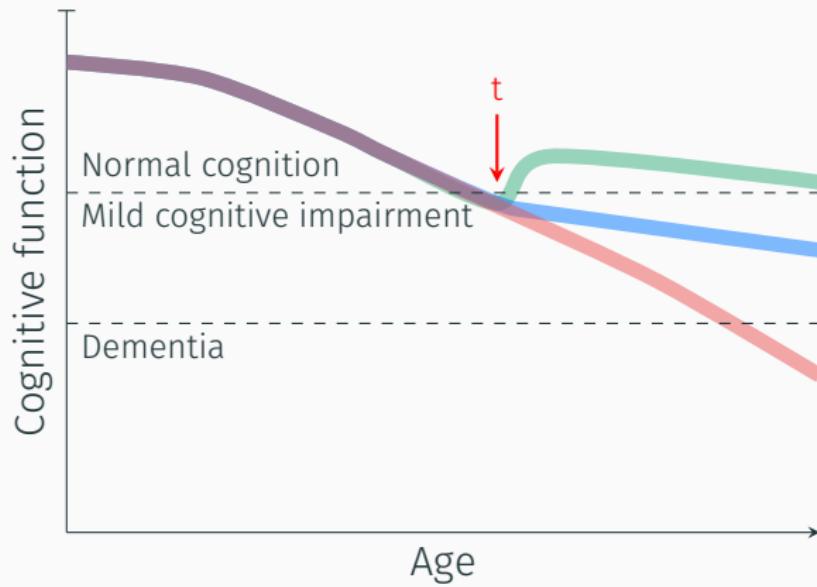
Component 0 Component 1 Component 2 Component 3



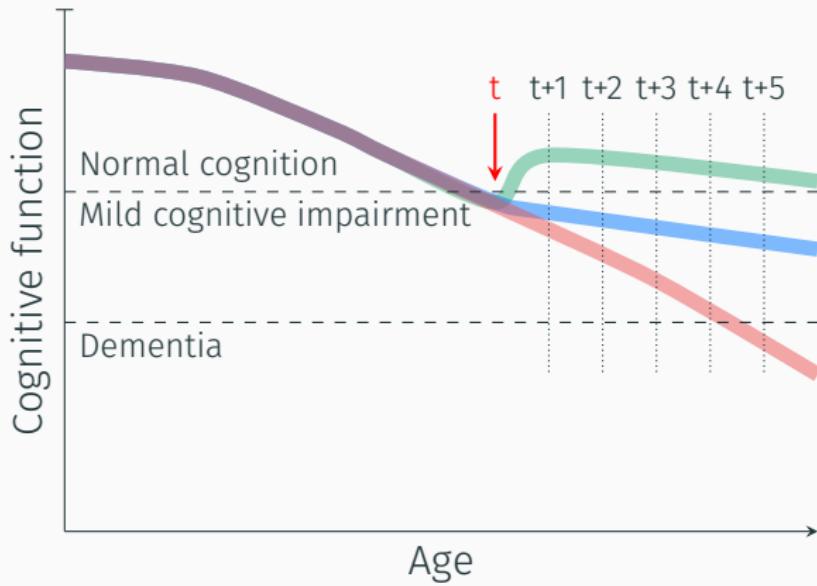
Explainability and dementia: Application



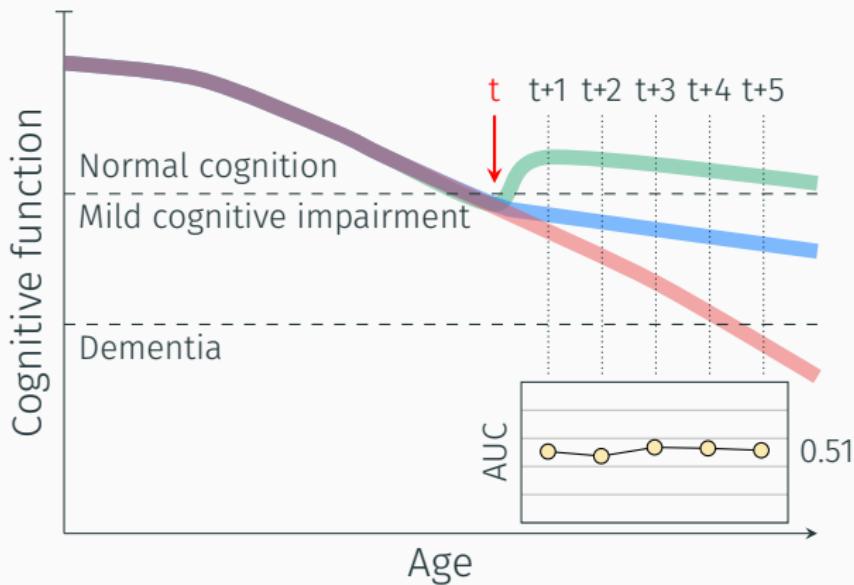
Explainability and dementia: Application



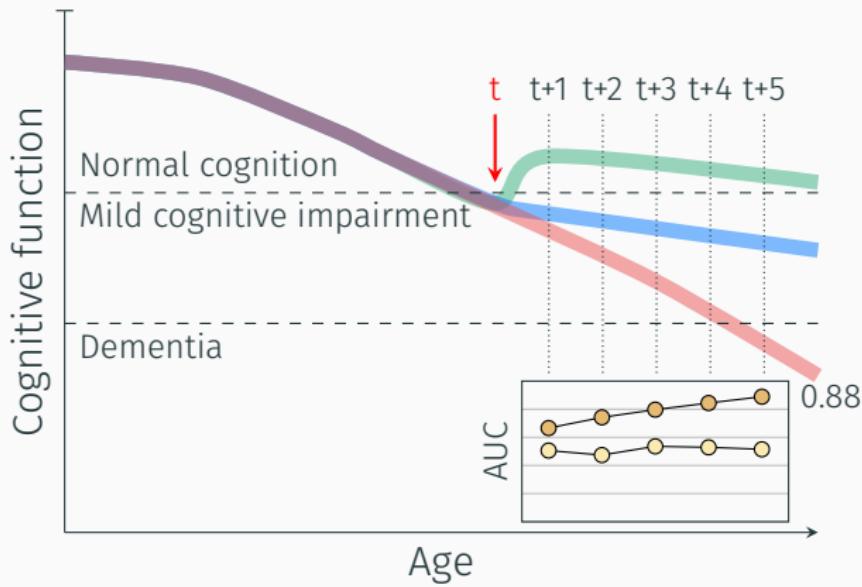
Explainability and dementia: Application



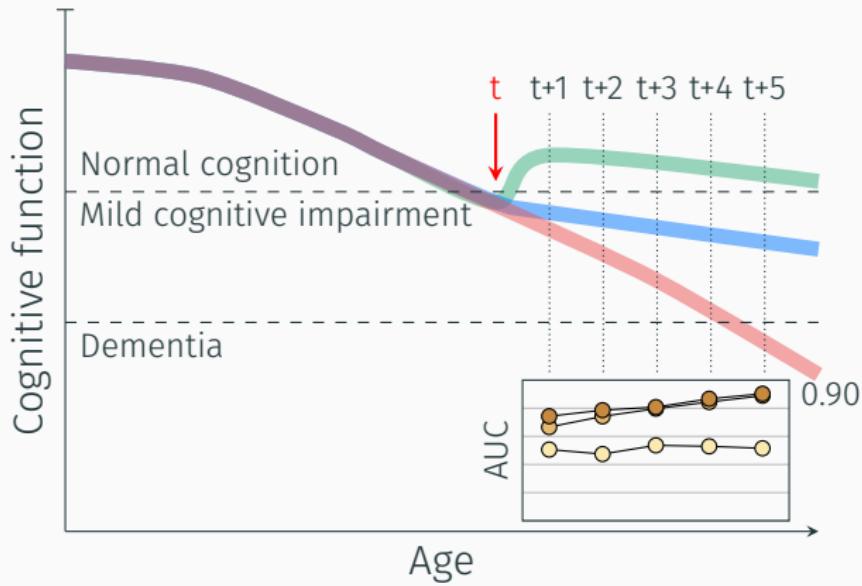
Explainability and dementia: Application



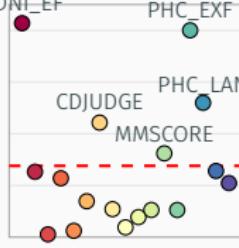
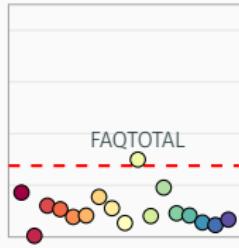
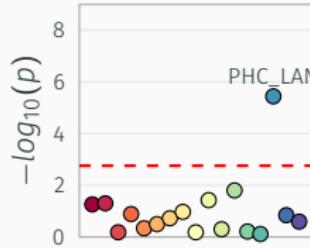
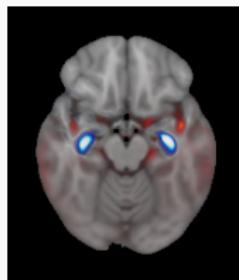
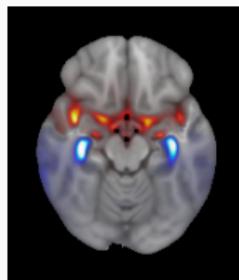
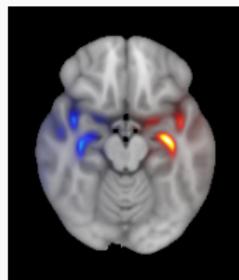
Explainability and dementia: Application



Explainability and dementia: Application



Explainability and dementia: Application



Explainability and dementia: Application



Morphological record

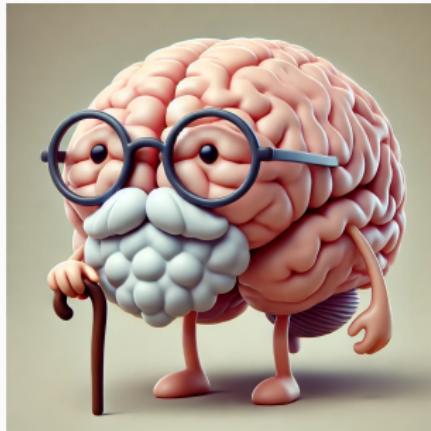


Explainable brain age



UNIVERSITY
OF OSLO

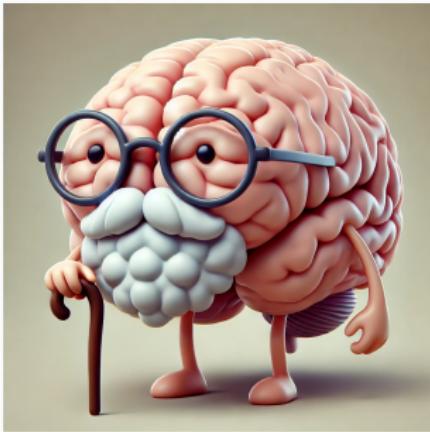
Explainable brain age: Motivation



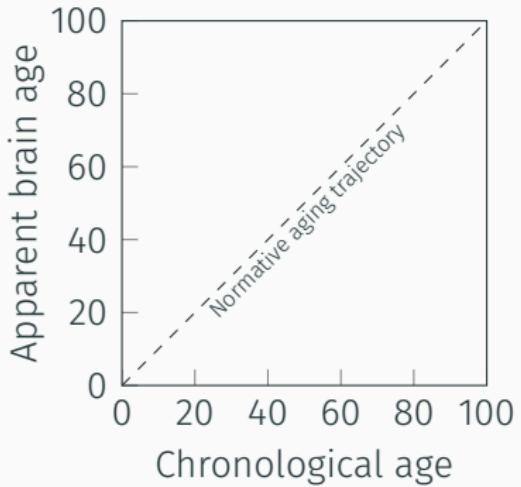
Generated by Dall-E 3



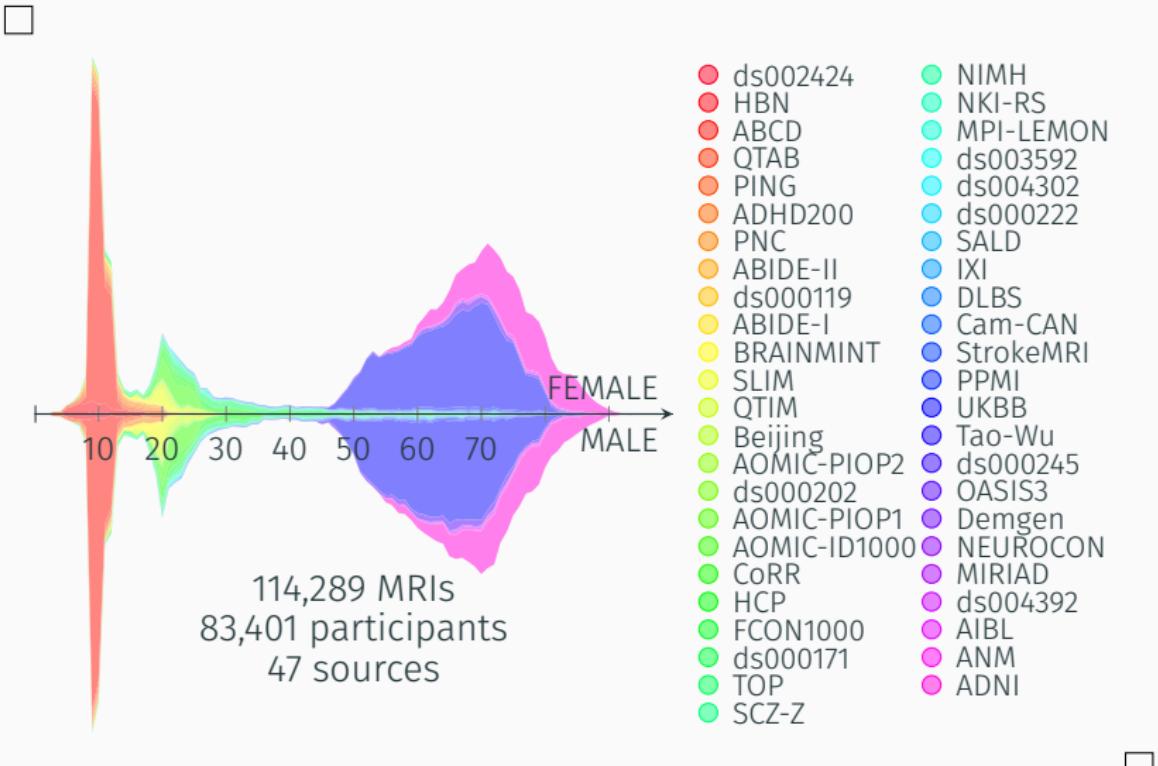
Explainable brain age: Motivation



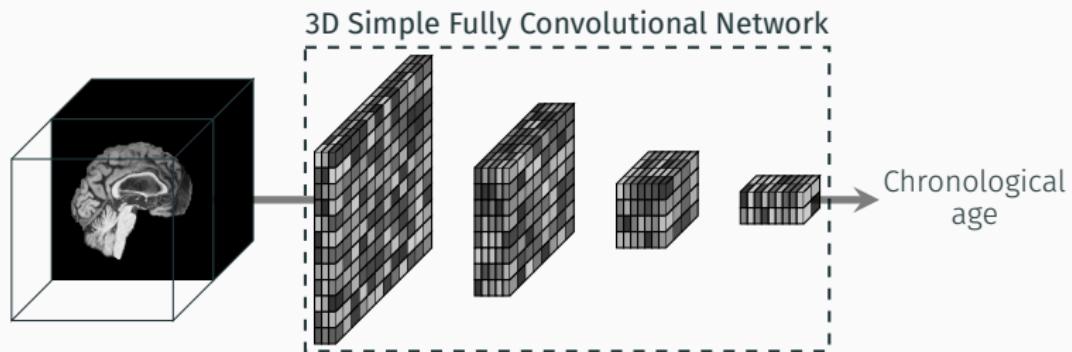
Generated by Dall-E 3



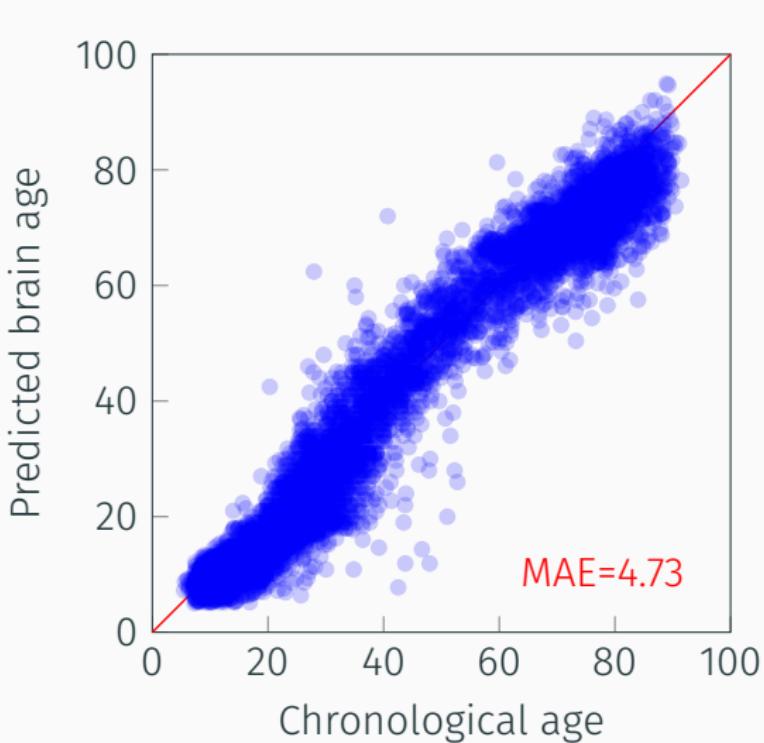
Explainable brain age: Motivation



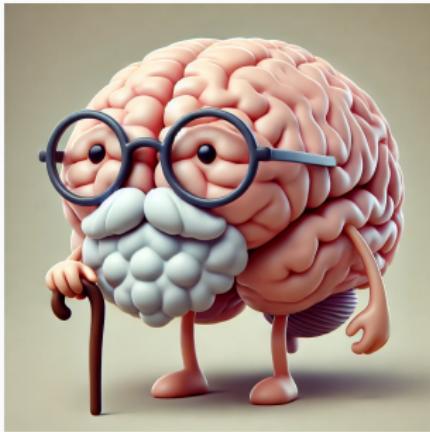
Explainable brain age: Motivation



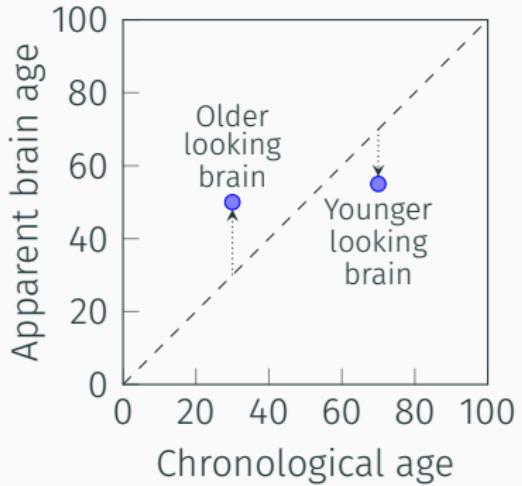
Explainable brain age: Motivation



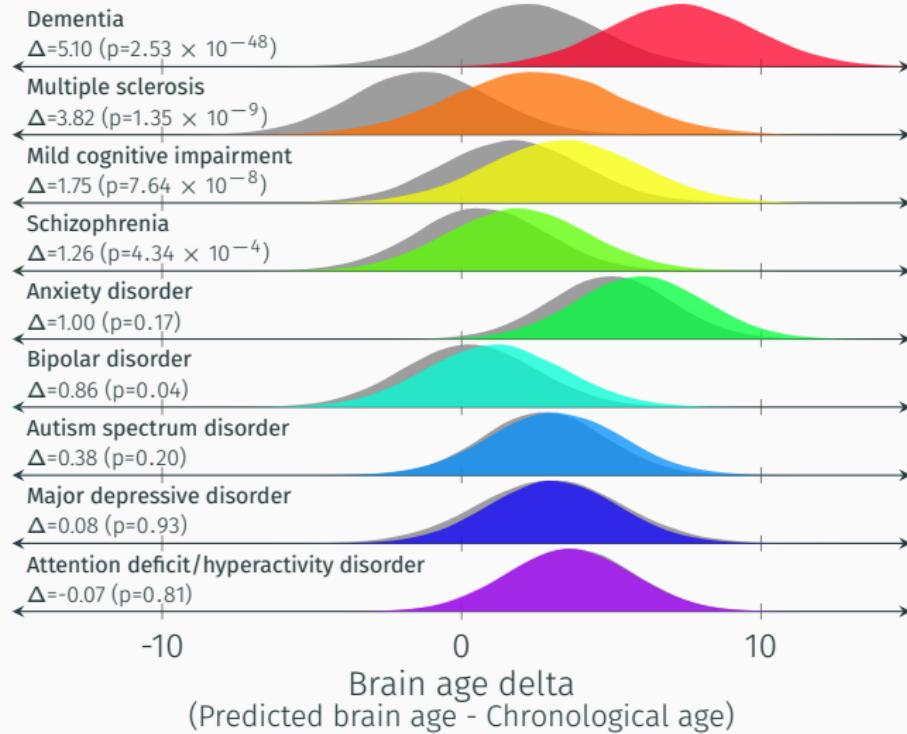
Explainable brain age: Motivation



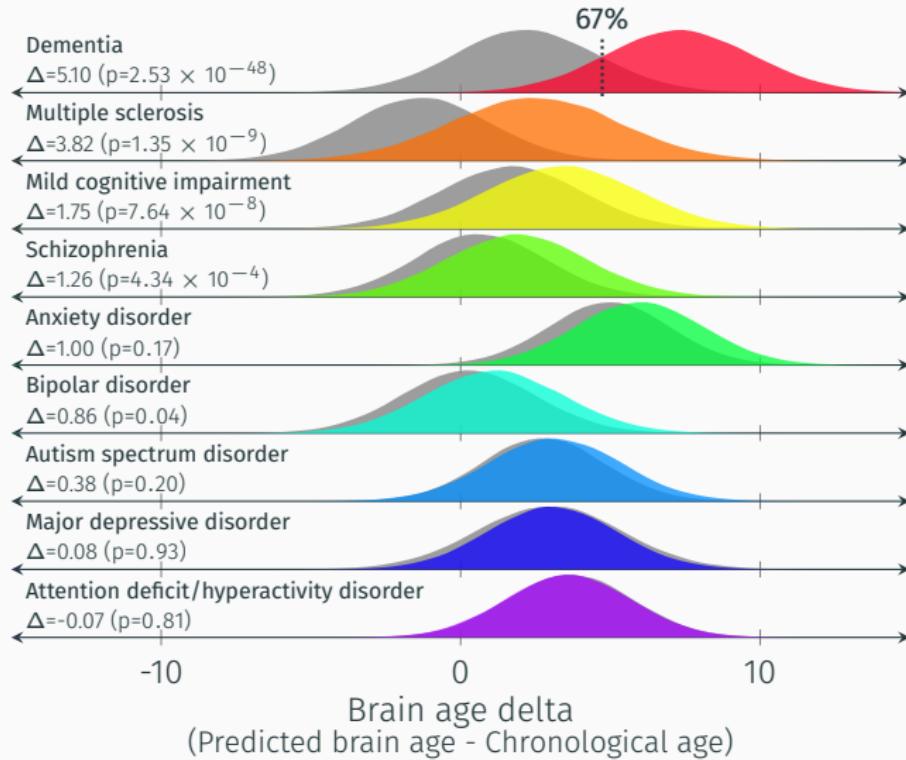
Generated by Dall-E 3



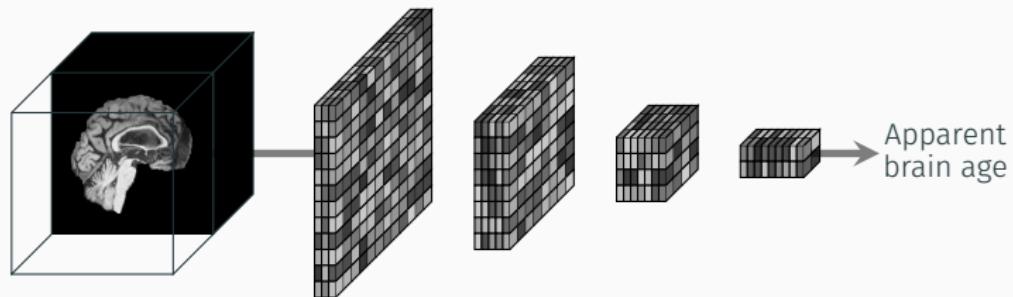
Explainable brain age: Motivation



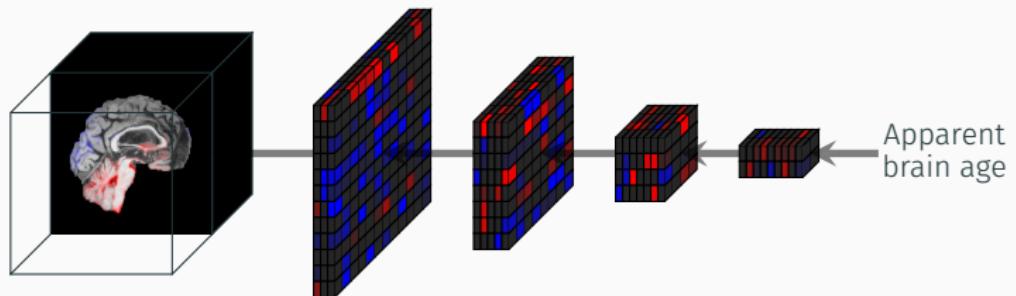
Explainable brain age: Motivation



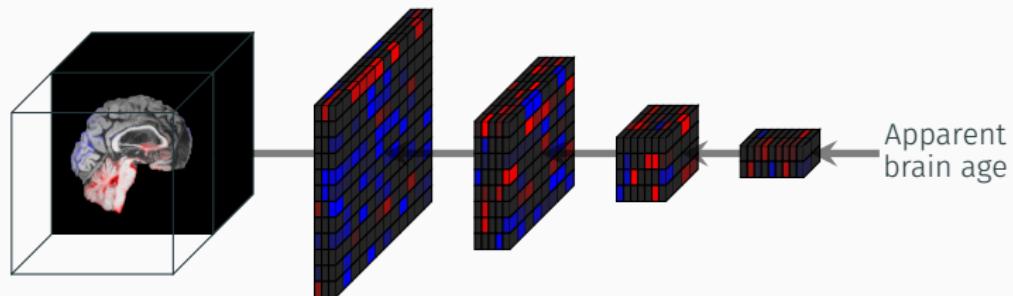
Explainable brain age: Methods



Explainable brain age: Methods



Explainable brain age: Methods



Filters



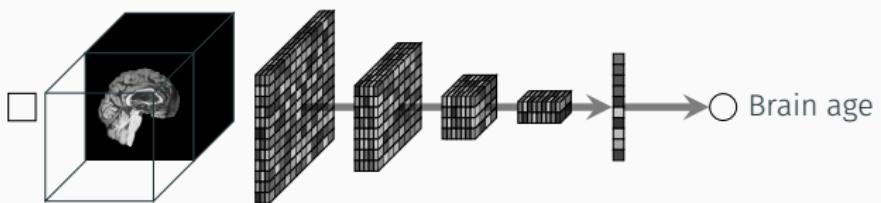
Explainable brain age: Methods



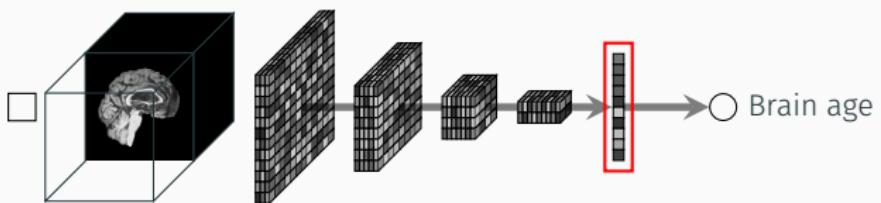
Feature correlation



Explainable brain age: Methods



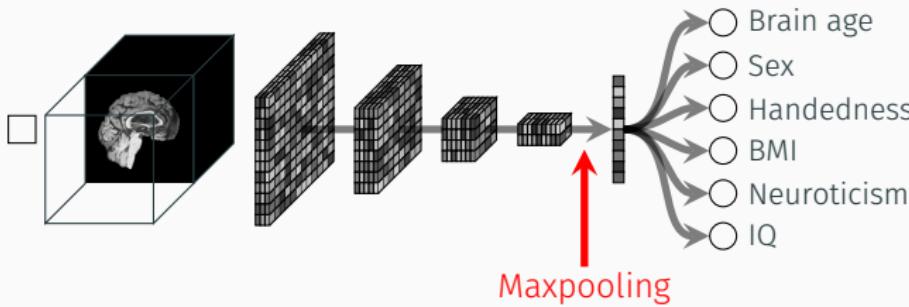
Explainable brain age: Methods



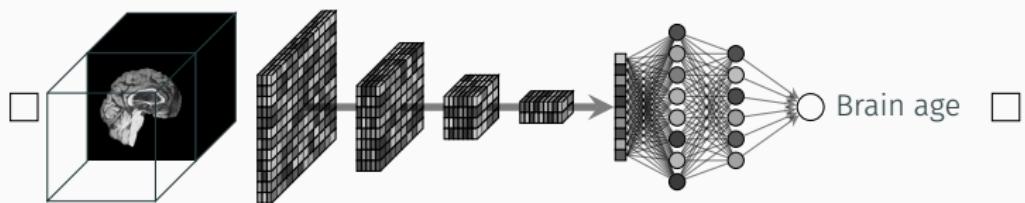
Explainable brain age: Methods



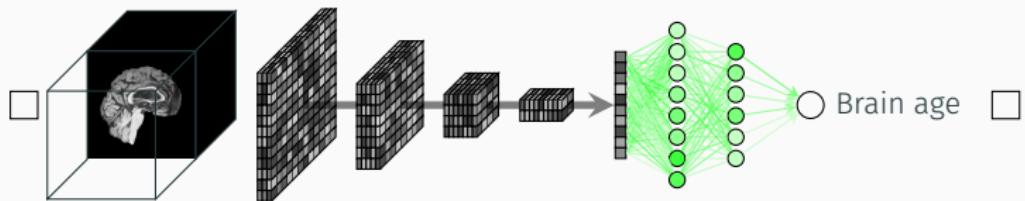
Explainable brain age: Methods



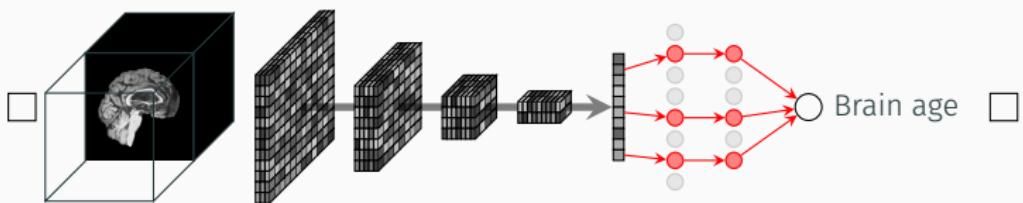
Explainable brain age: Methods



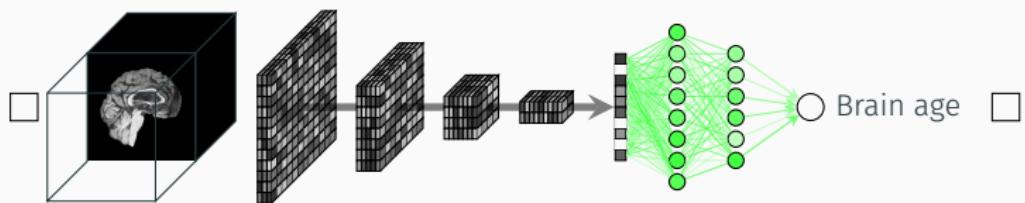
Explainable brain age: Methods



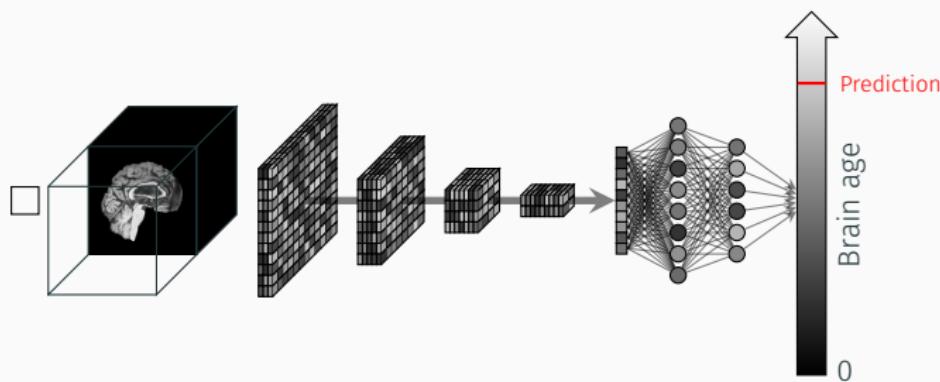
Explainable brain age: Methods



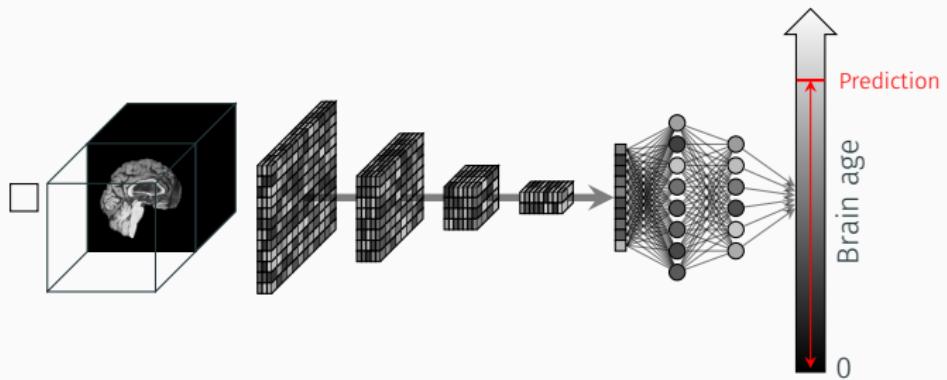
Explainable brain age: Methods



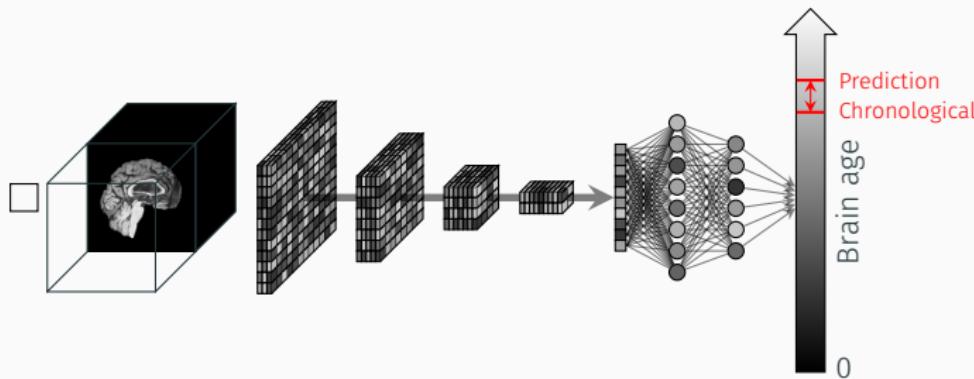
Explainable brain age: Methods



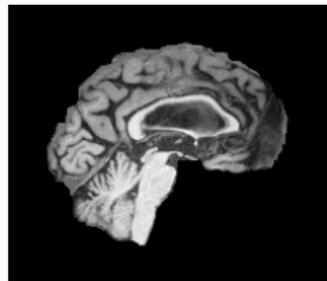
Explainable brain age: Methods



Explainable brain age: Methods



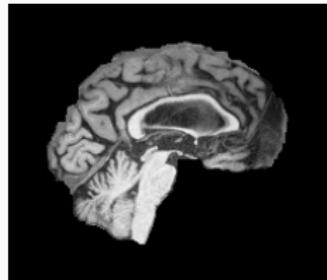
Explainable brain age: Methods



Age
62



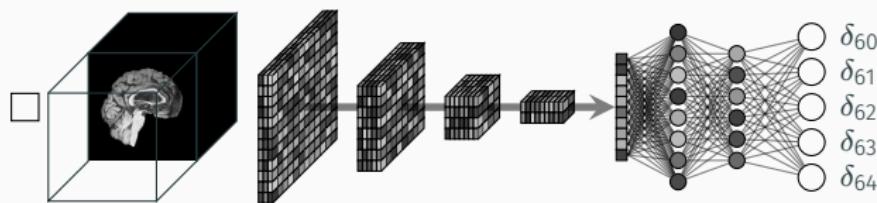
Explainable brain age: Methods



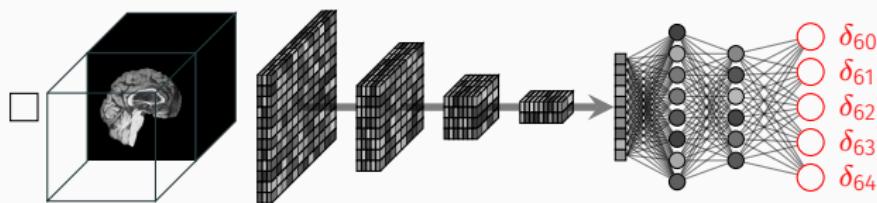
δ_{60}	δ_{61}	δ_{62}	δ_{63}	δ_{64}
2	1	0	-1	-2



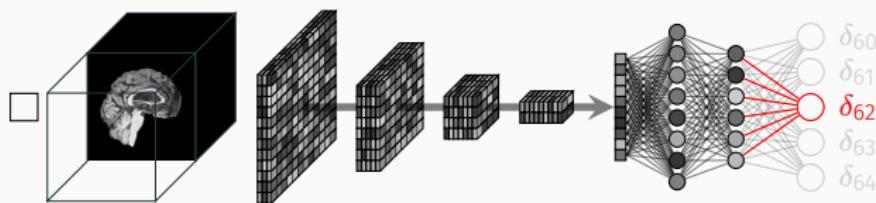
Explainable brain age: Methods



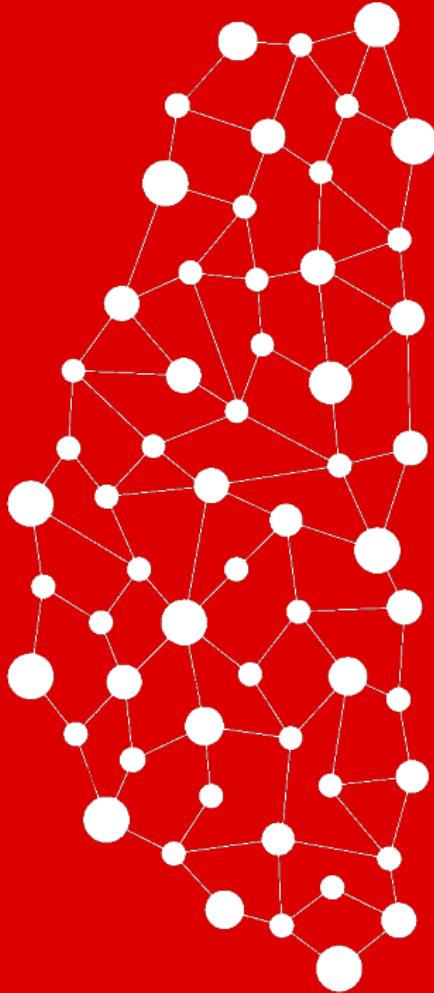
Explainable brain age: Methods



Explainable brain age: Methods



Thank you for your attention!
estenhl@ui.no



UNIVERSITY
OF OSLO