

# Exploring the brain with explainable artificial intelligence

Characterizing diversity in patients with  
dementia

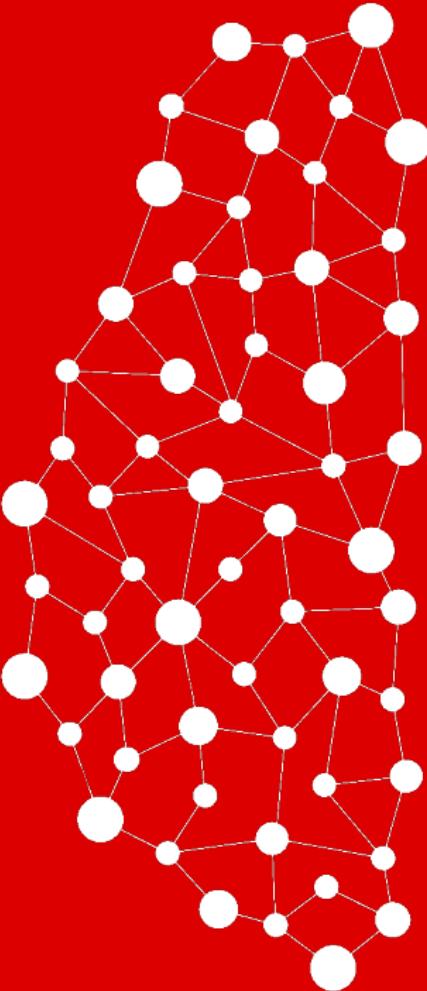


Esten H. Leonardsen

Postdoctoral research fellow, Department of  
Psychology, University of Oslo  
Chief Scientific Officer, baba.vision



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# Dementia

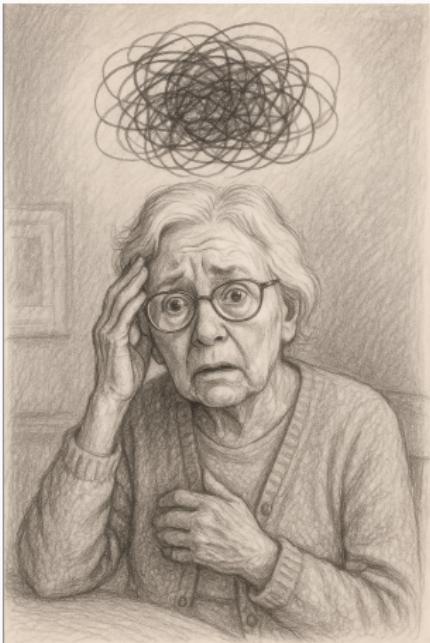
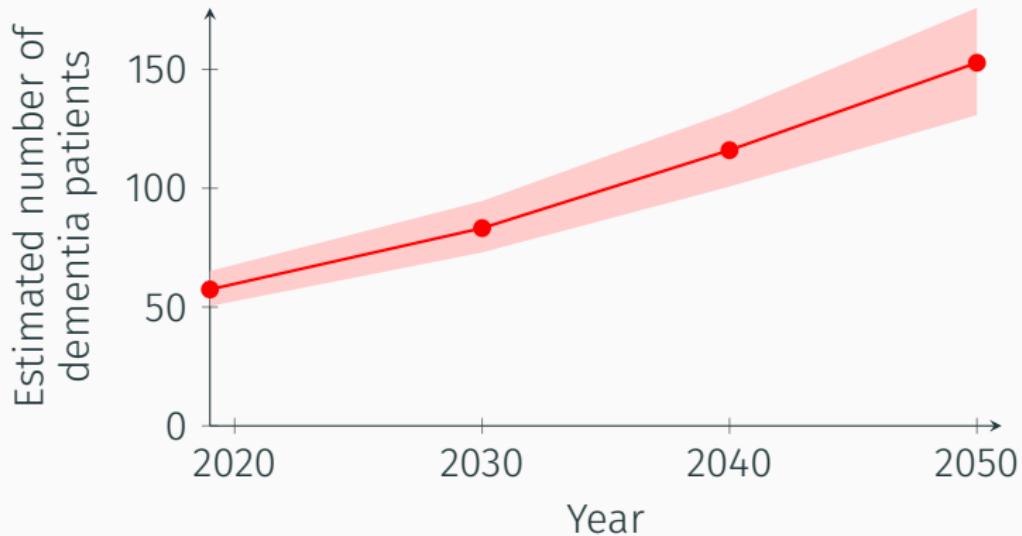


Image generated by GPT-4o

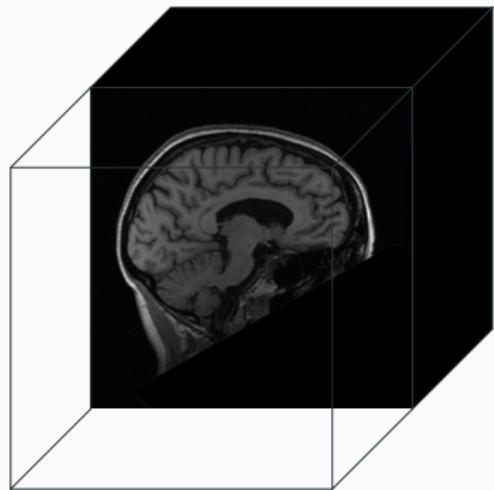
# Dementia



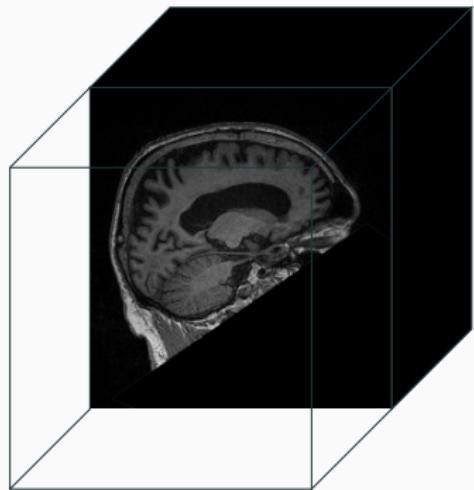
Adapted from Nichols, E., et al. (2022). Estimation of the global prevalence of dementia in 2019 and forecasted prevalence in 2050: an analysis for the Global Burden of Disease Study 2019. *The Lancet Public Health*, 7(2), e105-e125.



# Dementia



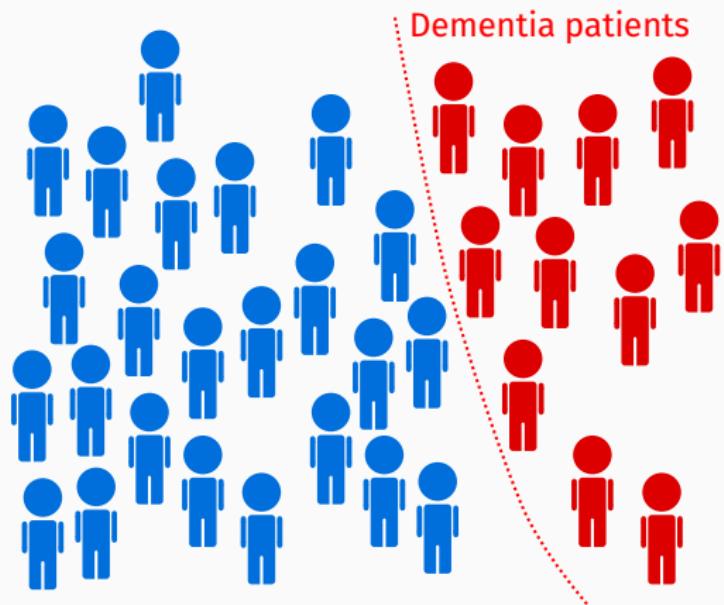
Healthy control



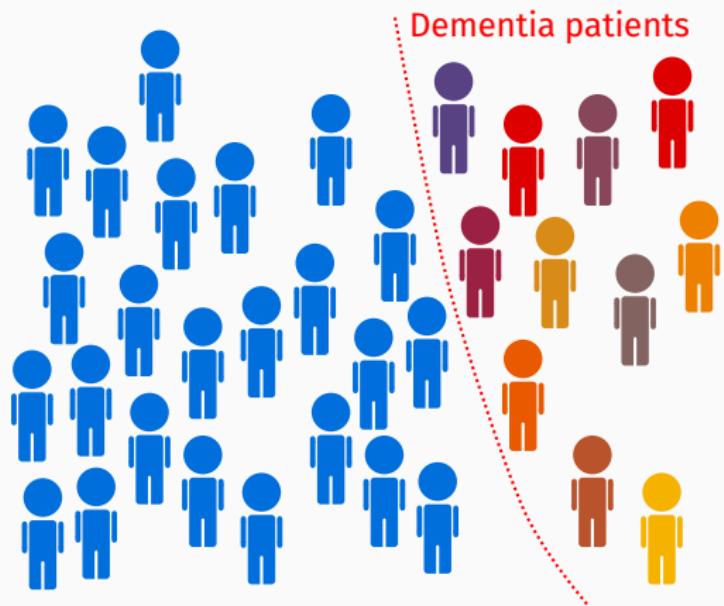
Dementia patient

Data from the Alzheimers Disease Neuroimaging Initiative (ADNI)

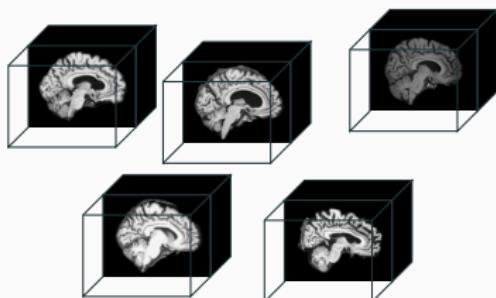
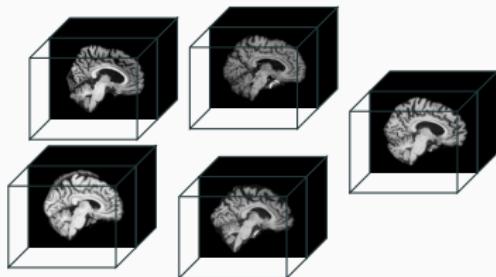
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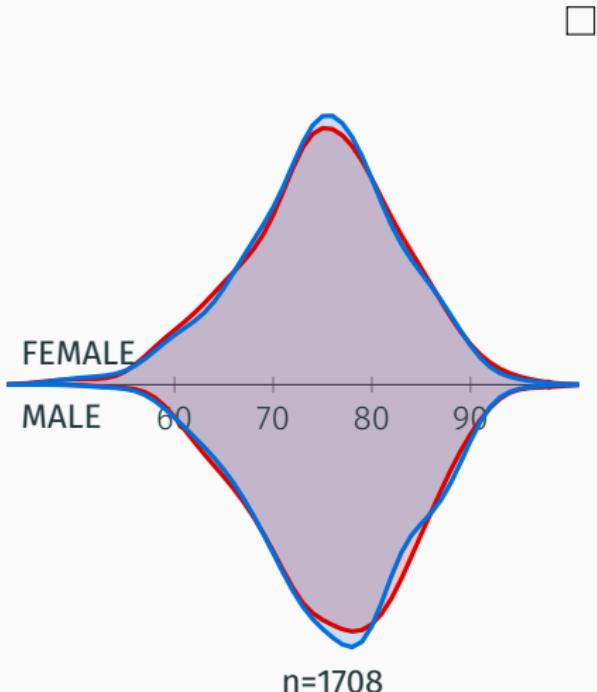
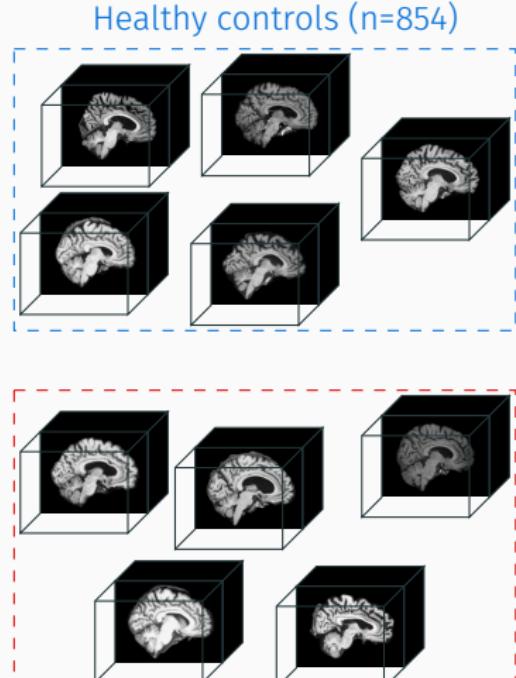
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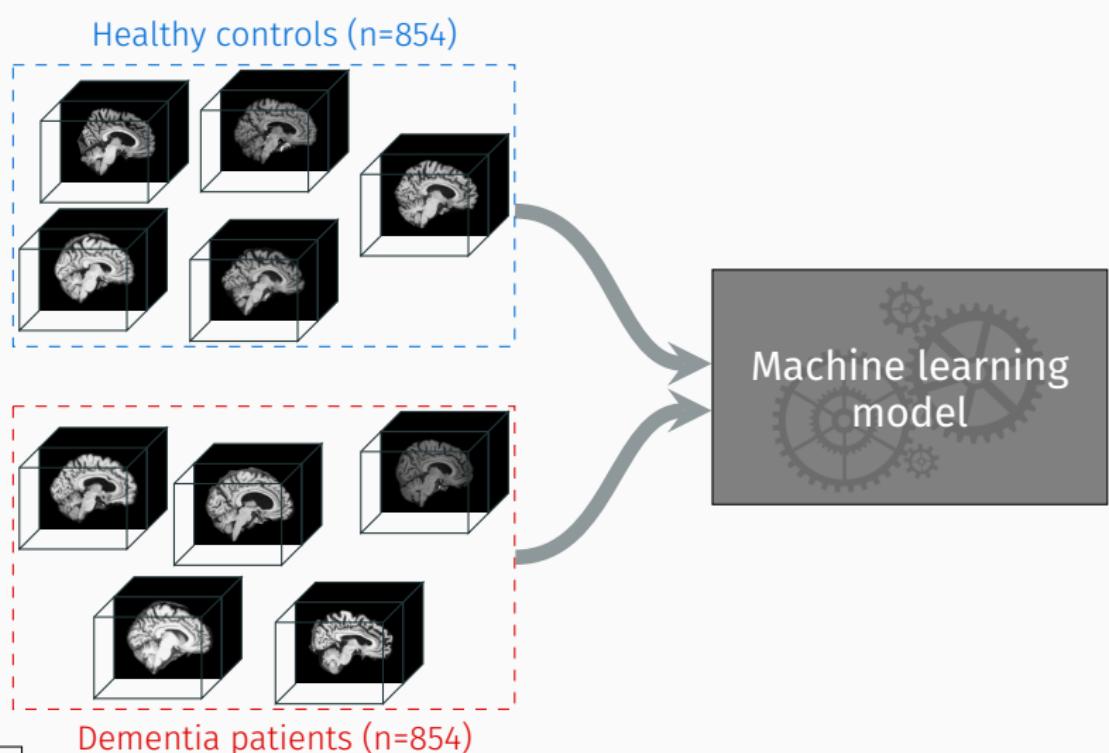
# Methodology



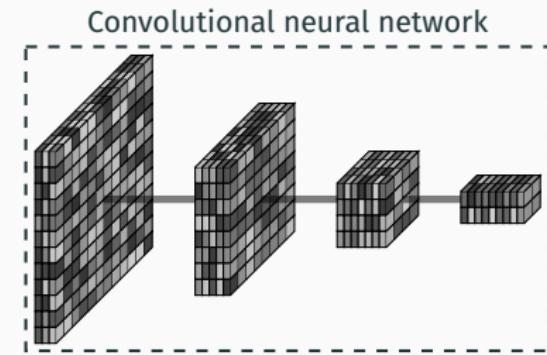
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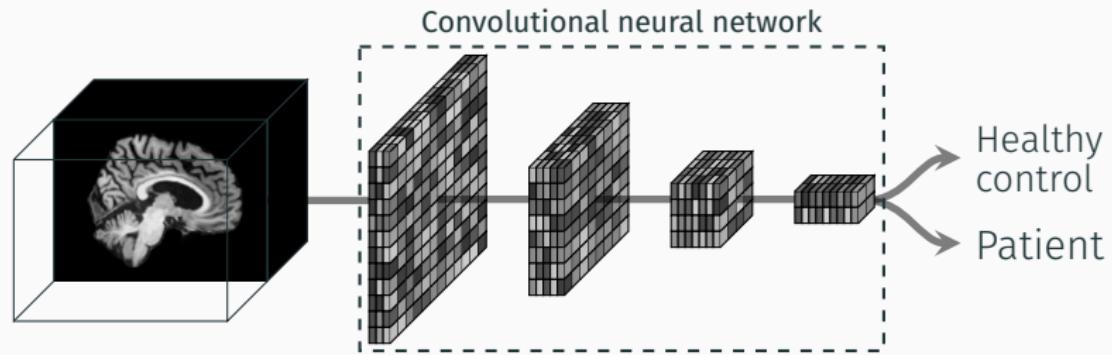
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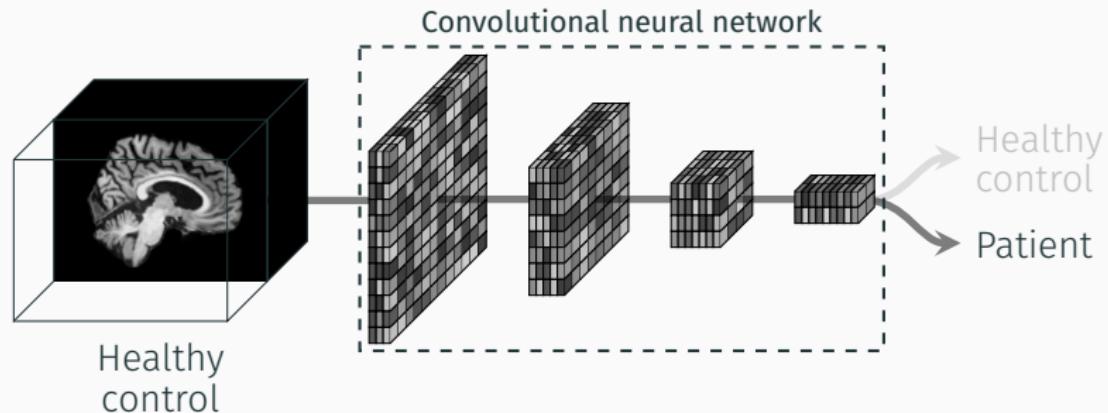
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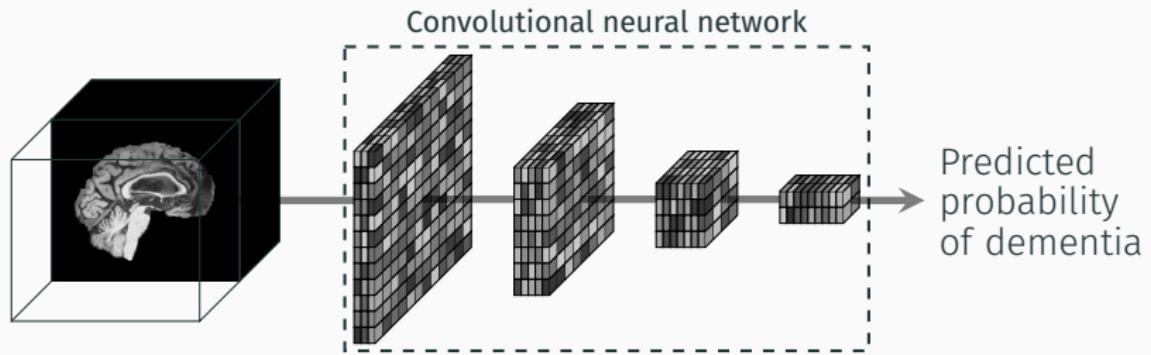
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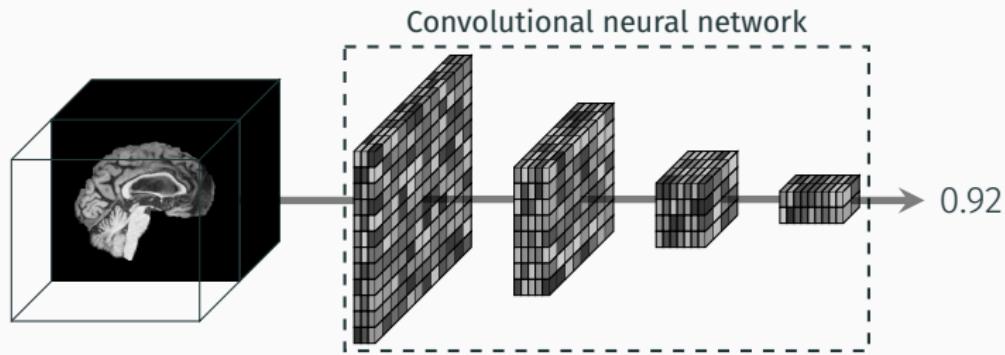
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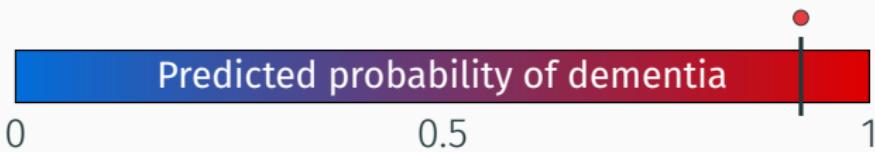
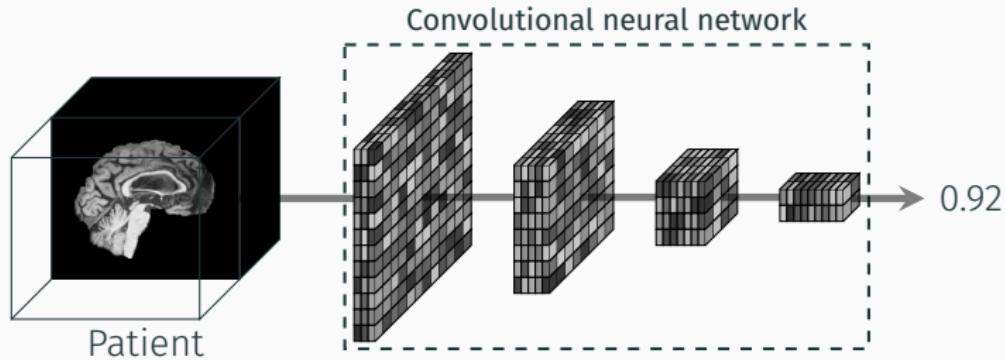
Predicted  
probability  
of dementia



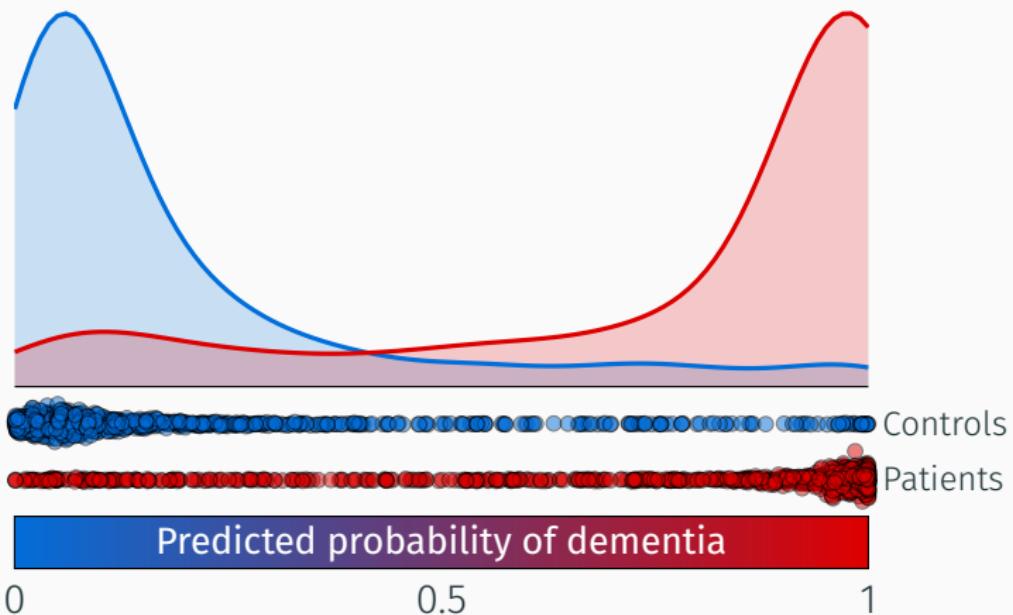
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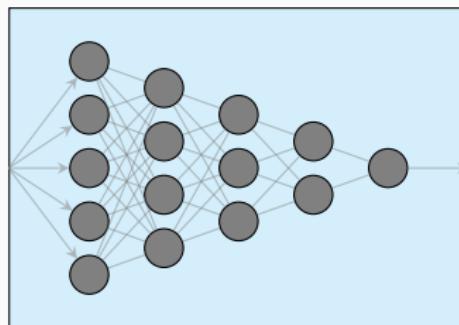


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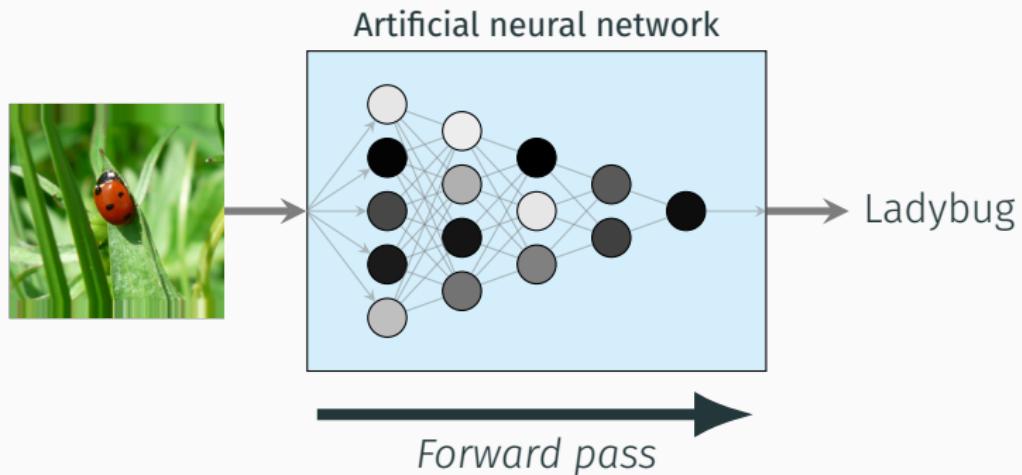


# Explainable artificial intelligence

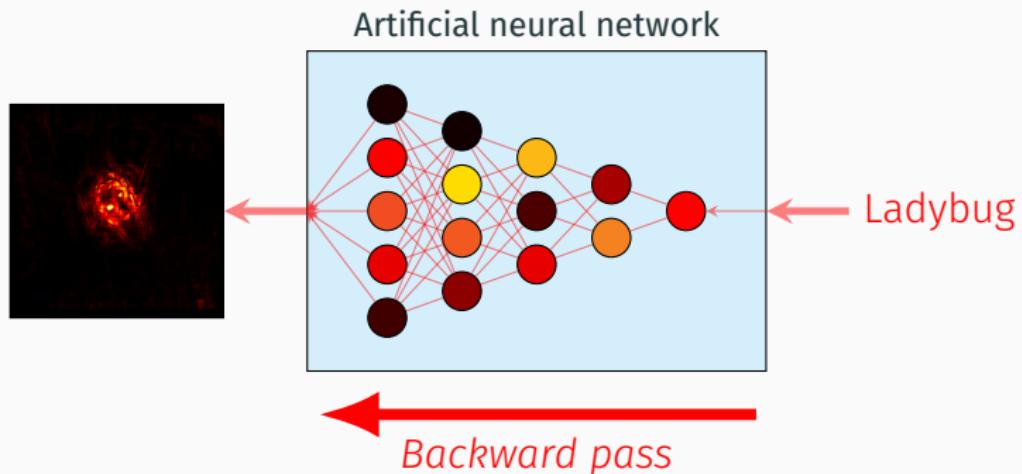
Artificial neural network



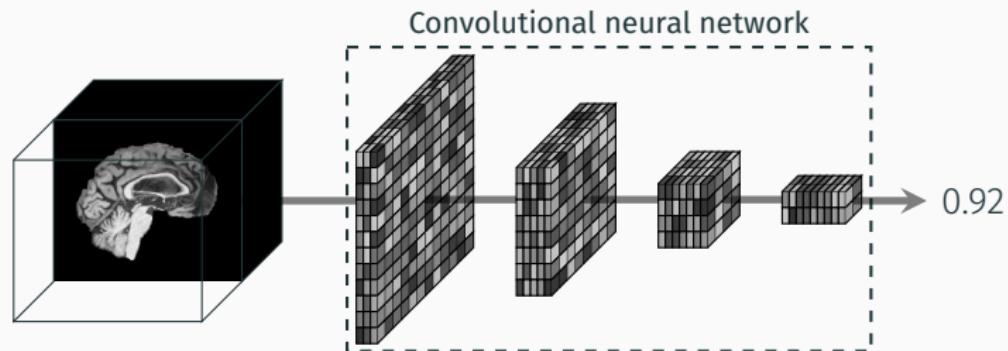
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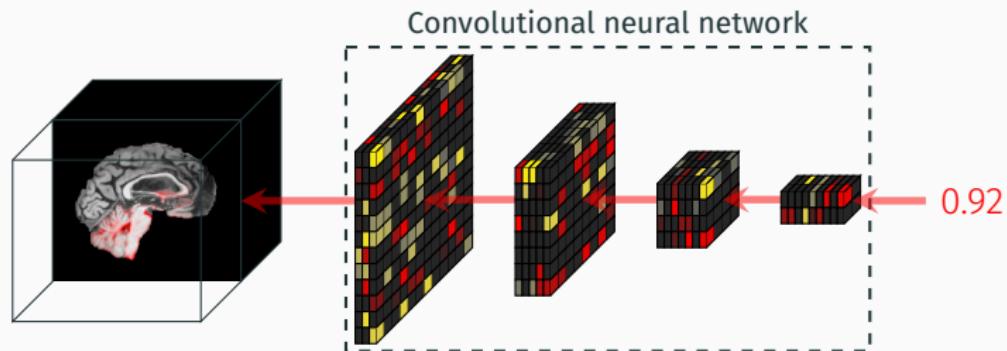
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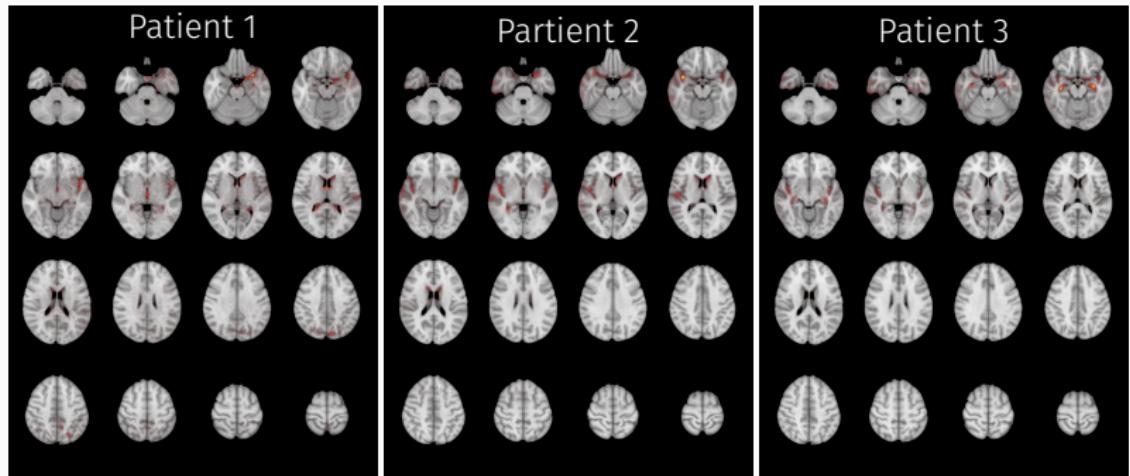
# Explainable AI and dementia



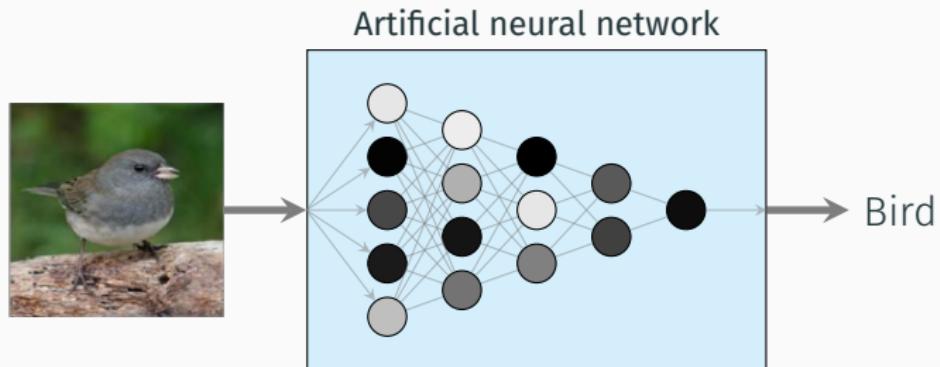
# Explainable AI and dementia



# Explainable AI and dementia

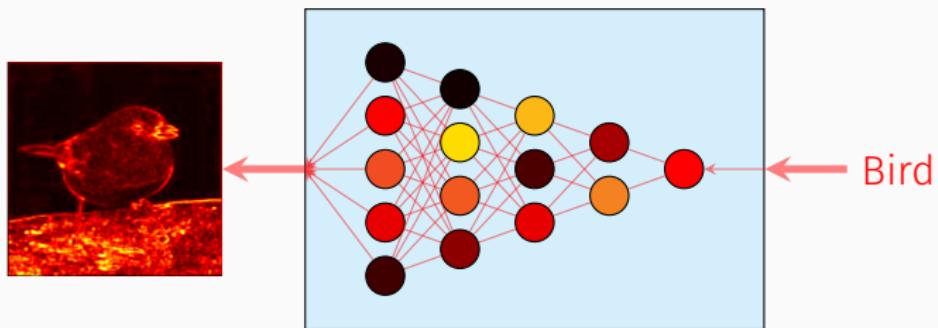


# Explainable AI: Caveats



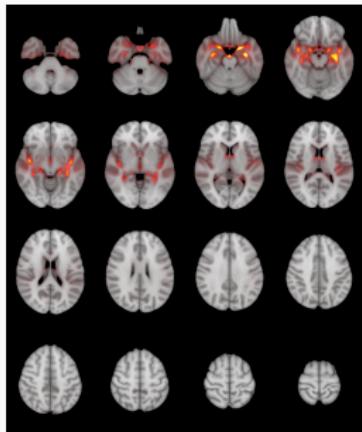
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Artificial neural network



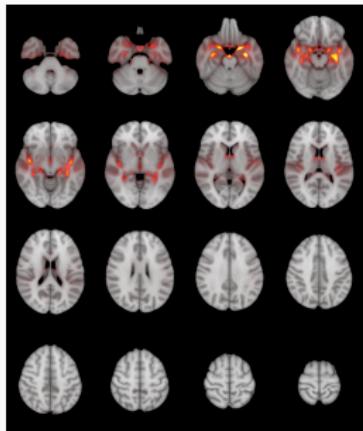
# Explainable AI and dementia

## Explainable AI

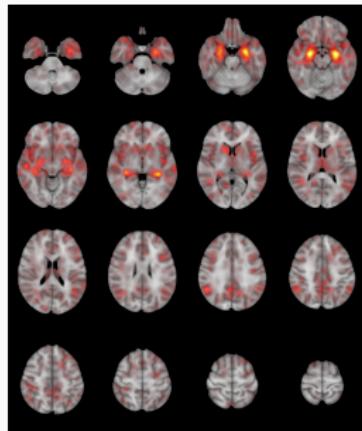


# Explainable AI and dementia

Explainable AI



Human researchers



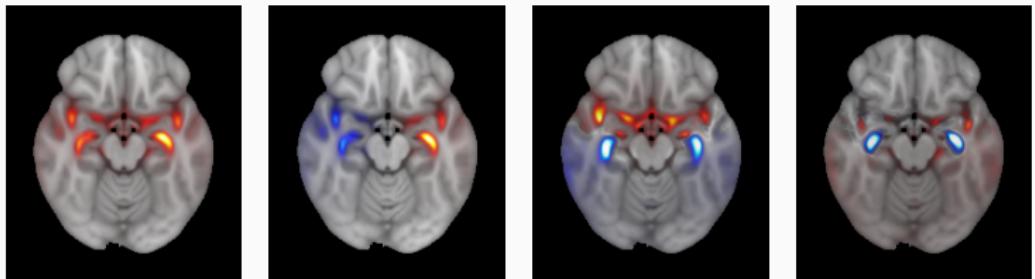
# Explainable AI and dementia

Test battery	Domain	Name	Description
Functional Activities Questionnaire		FAQTOTAL	Measures instrumental activities from everyday life
ADSP Phenotype Harmonization Consortium	Language	PHC_LAN	Composite language score
UW - Neuropsych Summary Scores	Executive functioning	ADNI_EF	Composite score for executive functioning
UW - Neuropsych Summary Scores	Memory	ADNI_MEM	Composite score for memory

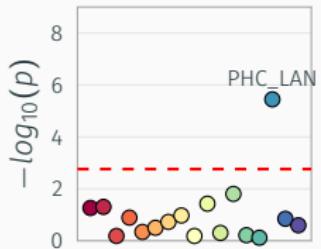
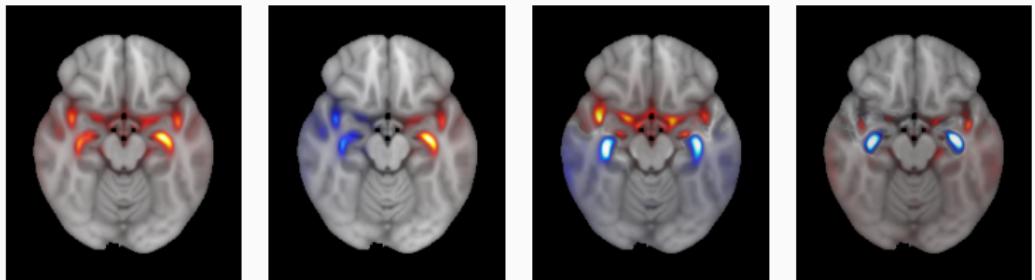
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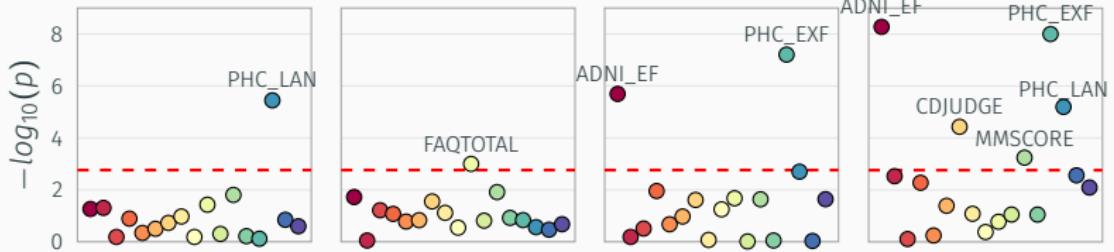
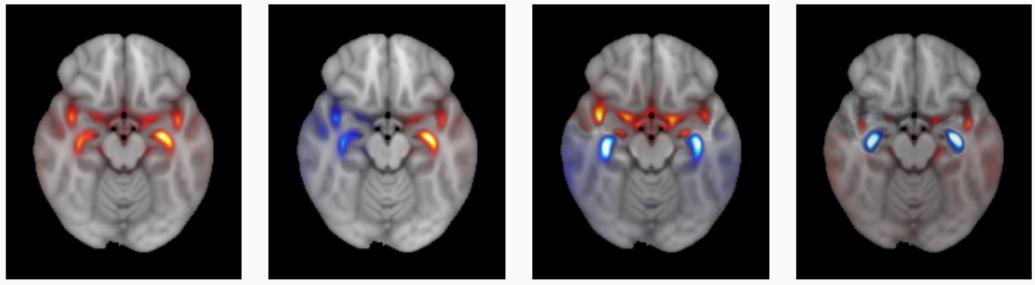
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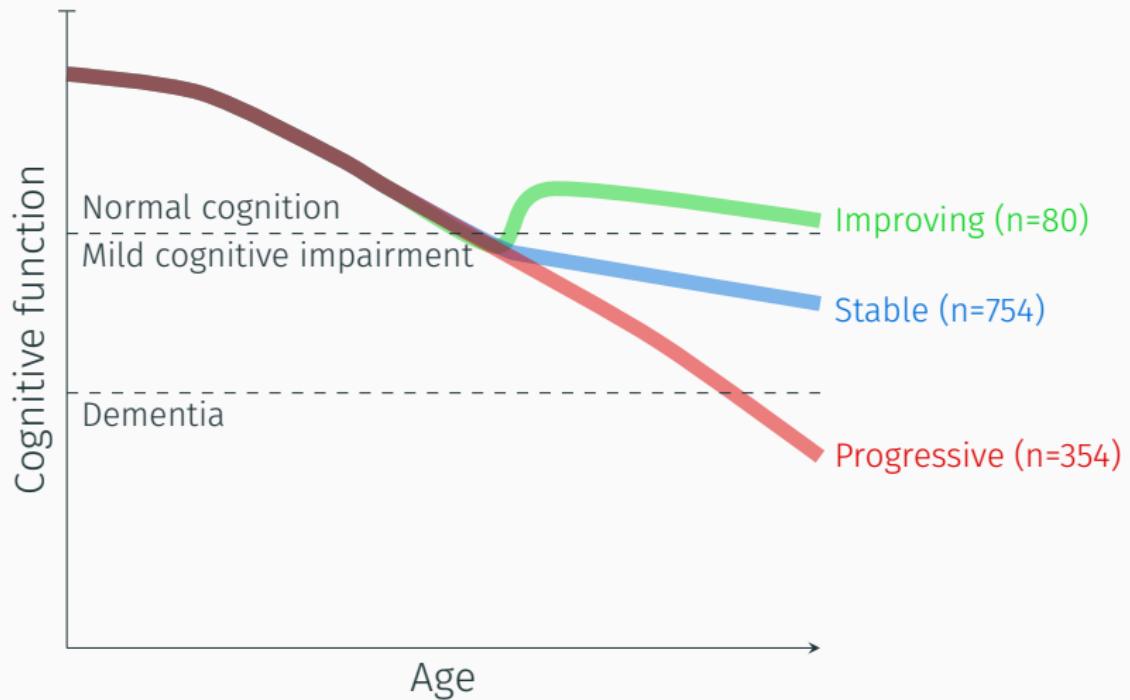
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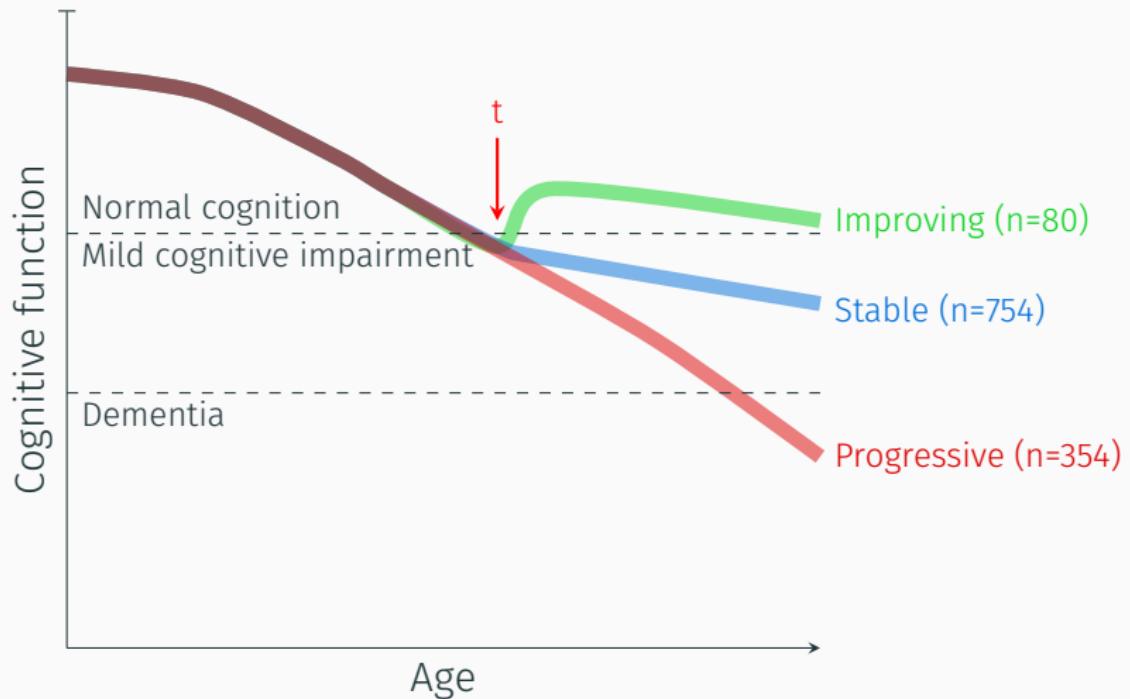
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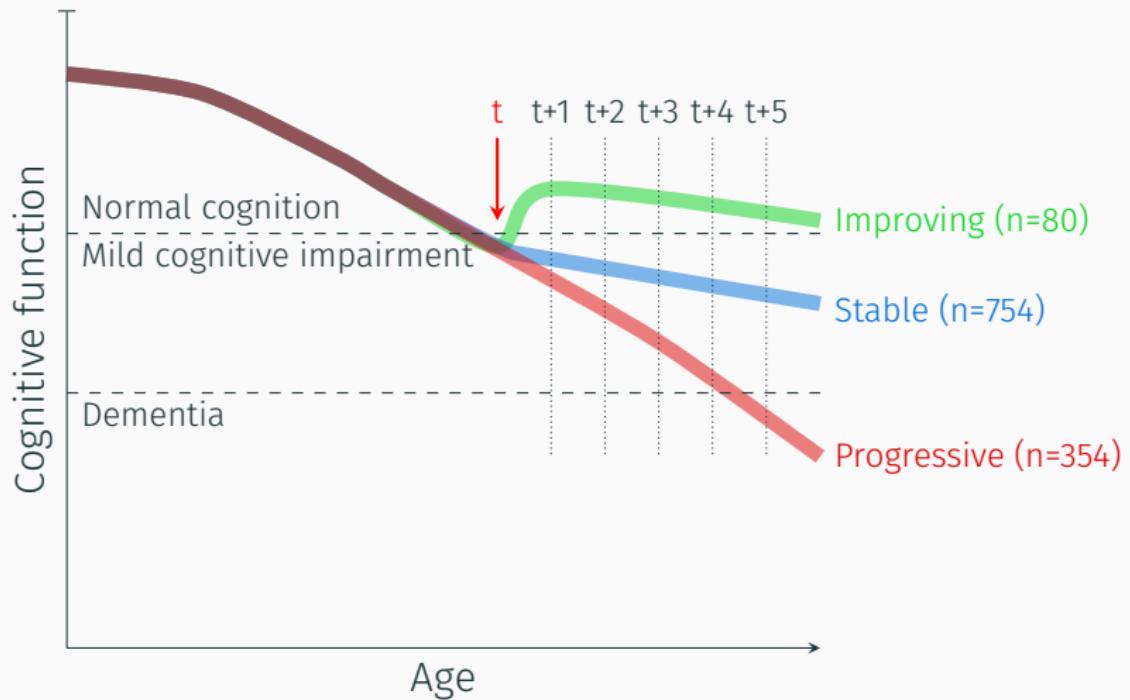
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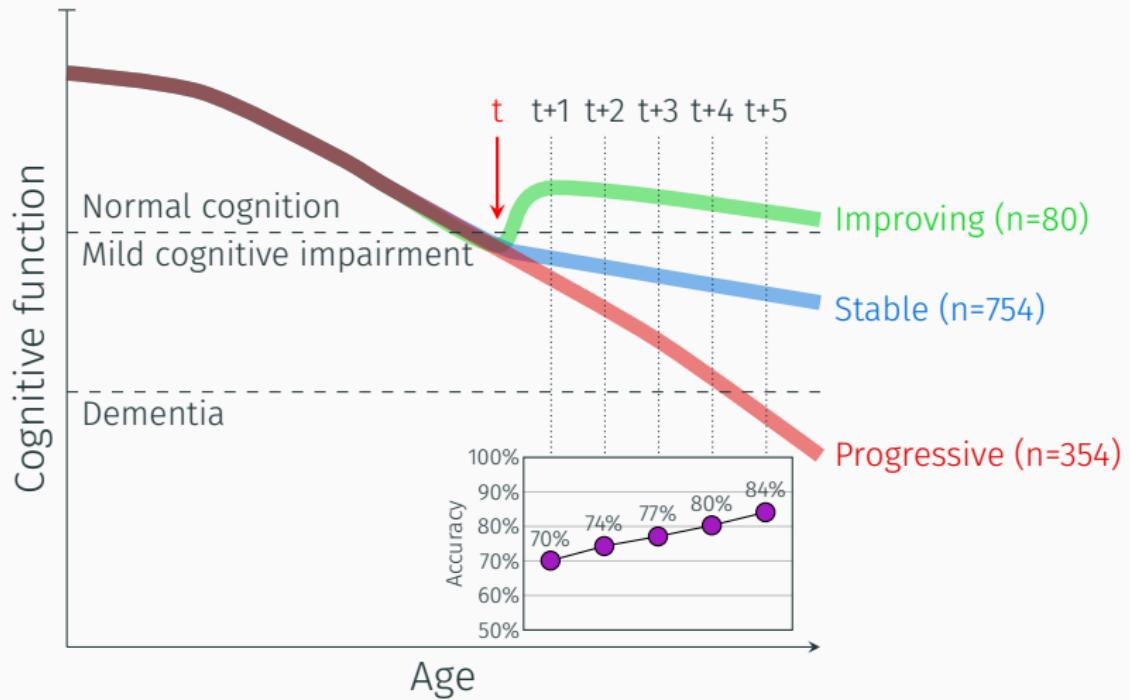
# Explainable AI and dementia



# Explainable AI and dementia



# Explainable AI and dementia



# Summary

We used explainable artificial intelligence to generate heatmaps that characterized the manifestation of dementia in the brains of individual patients.

- The heatmaps focused on brain regions known to be afflicted in dementia
- Variability in the heatmaps was associated with neuropsychological variation
- The localization of dementia-related aberrations enabled by the heatmaps allowed us to accurately predict progression from mild cognitive impairment to dementia



Thank you for your attention!  
[estenhl@ui.no](mailto:estenhl@ui.no)



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