

# Explainable AI and the brain

Characterizing heterogeneity in diverse clinical cohorts

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# Outline

1. Theoretical background
  - a. Artificial neural networks
  - b. Explainable AI
2. Explainable AI and dementia
3. Explainable AI and brain age



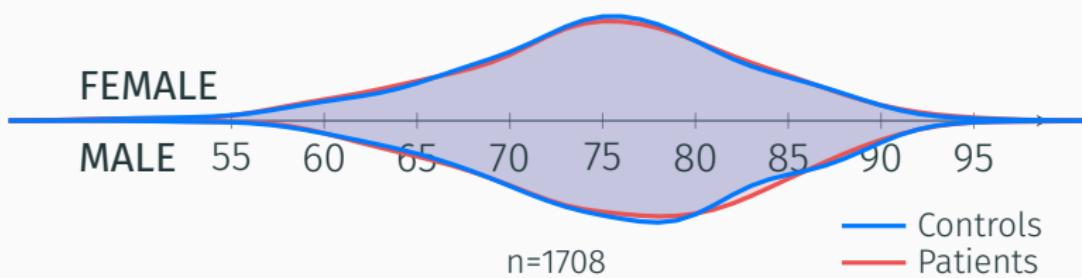
# Explainable AI and dementia predictions

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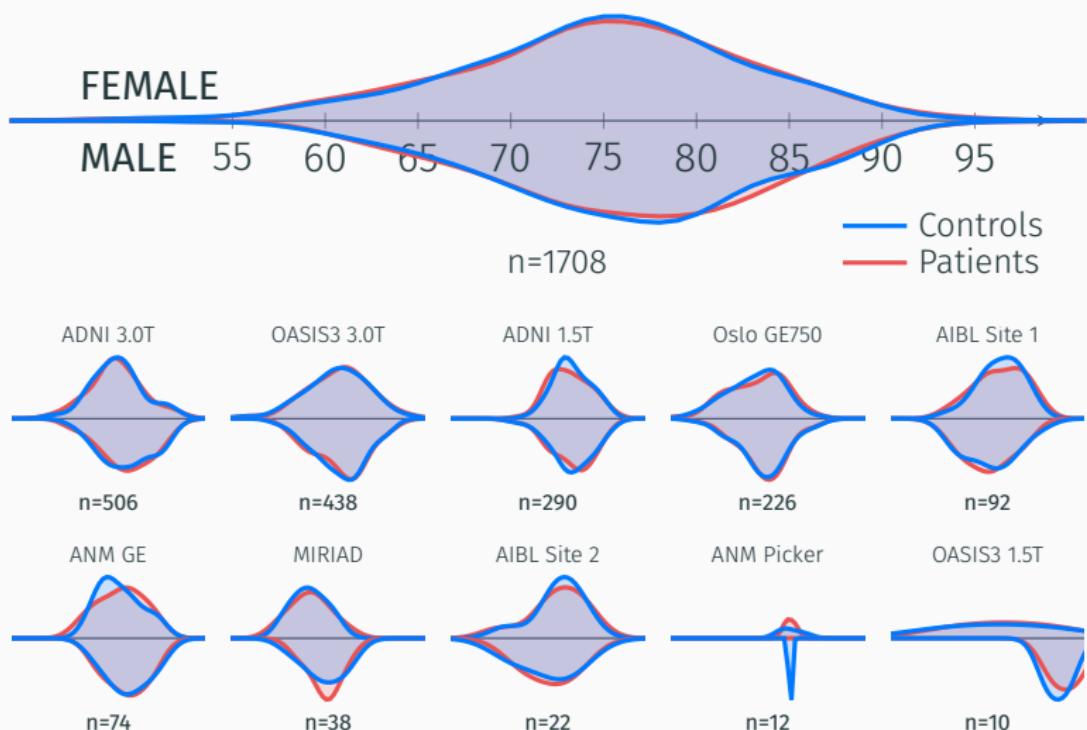


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# Explainable dementia classification: Dataset



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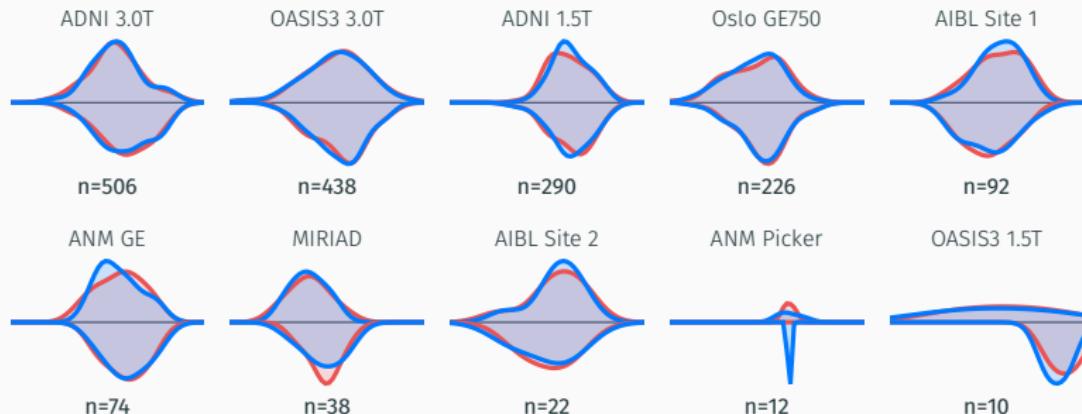


# Explainable dementia classification: Dataset

ADNI:  
Probable  
Alzheimer's disease

OASIS3:  
Dementia

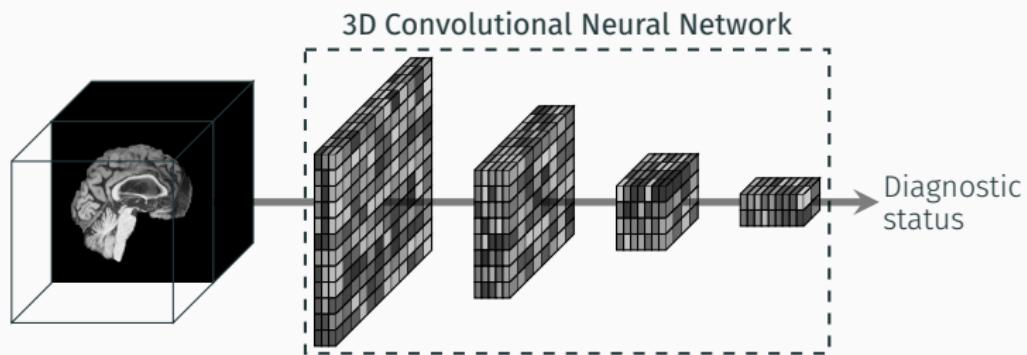
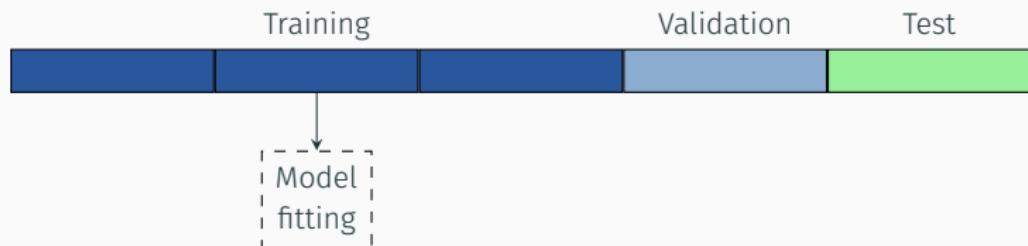
Oslo:  
Alzheimer's disease,  
Vascular dementia,  
Unspecified dementia



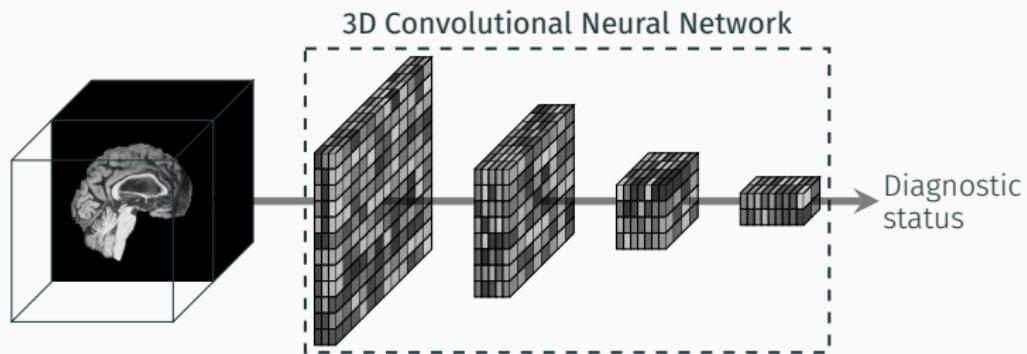
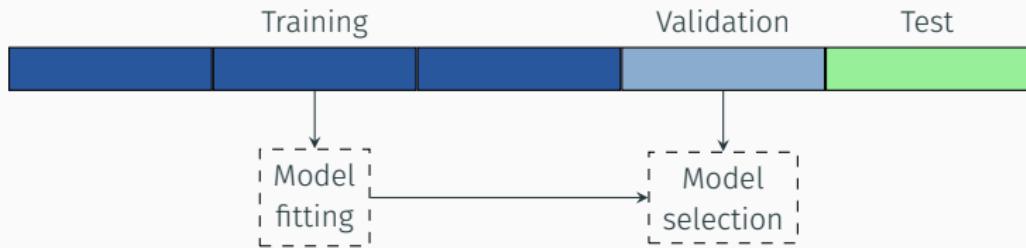
# Explainable dementia classification: Modelling



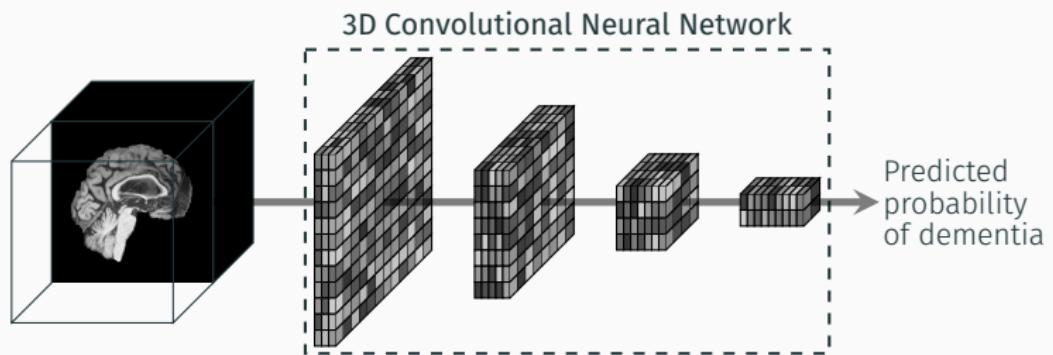
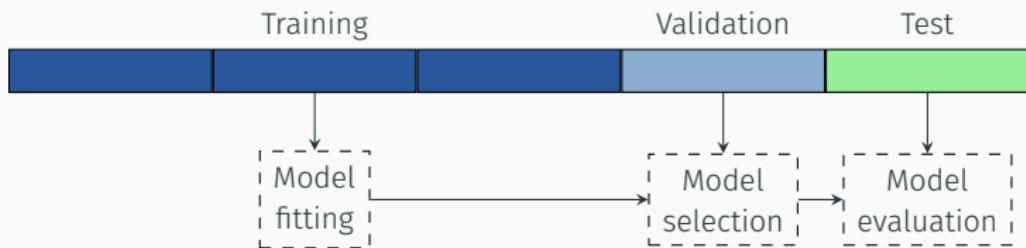
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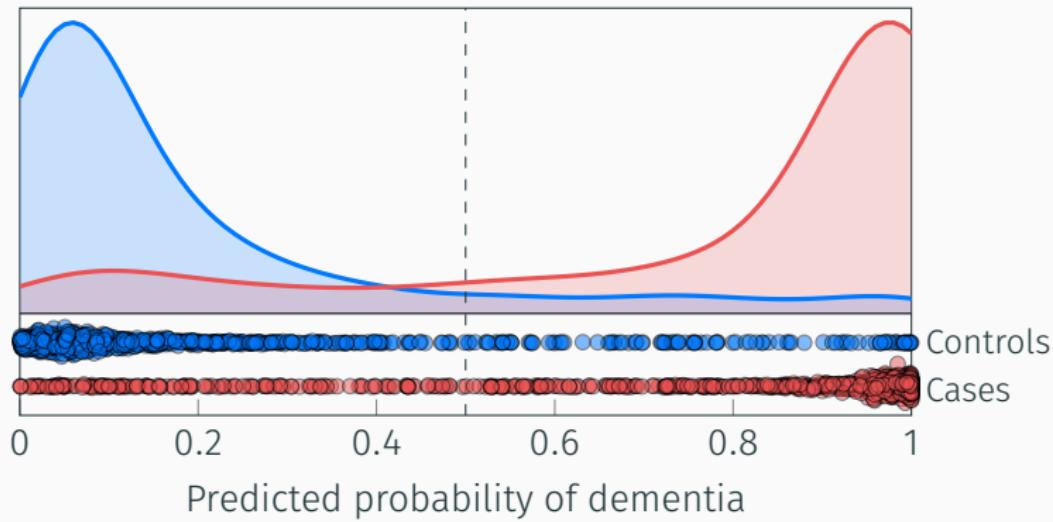
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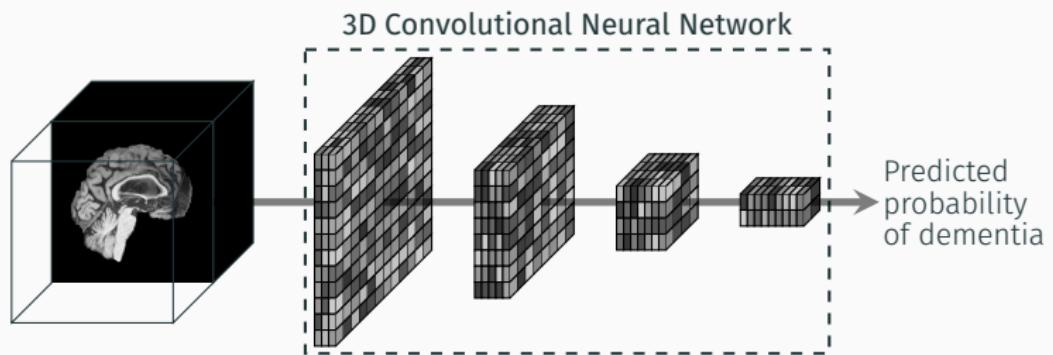
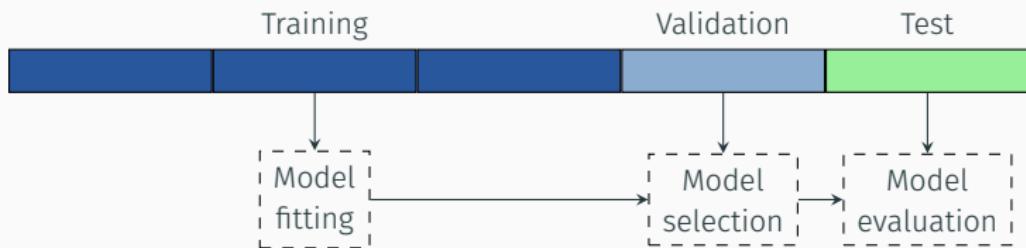
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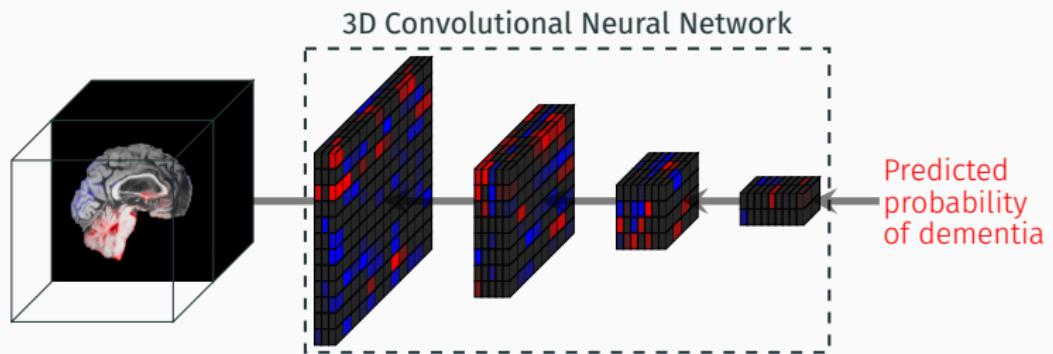
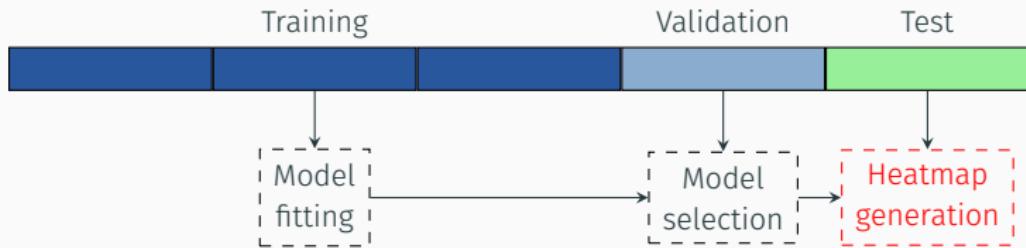
AUC=0.91, balanced accuracy=85%



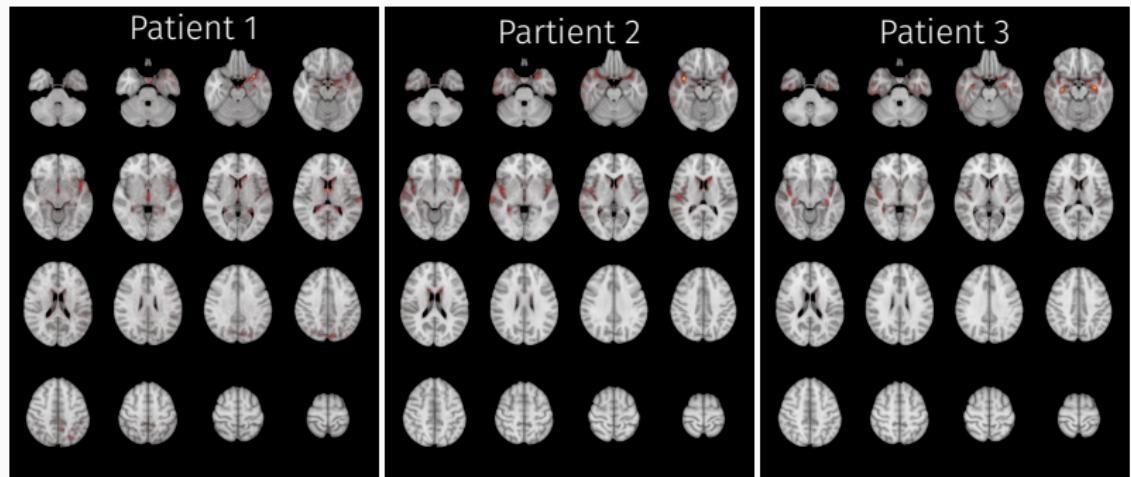
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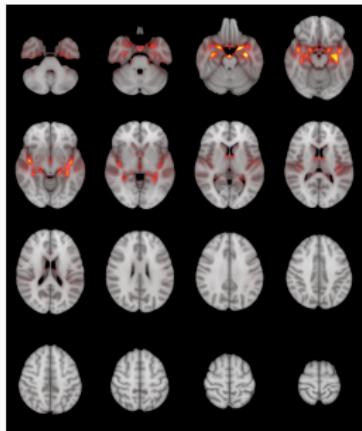


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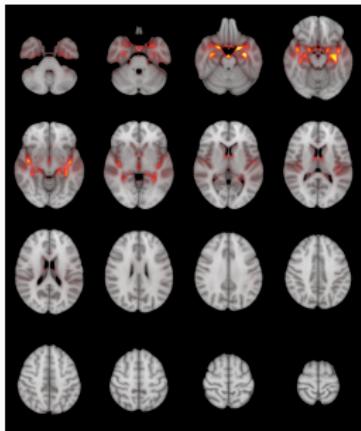
# Explainable dementia classification: Validation

## Explainable AI

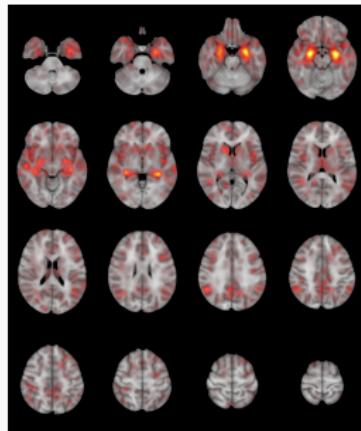


# Explainable dementia classification: Validation

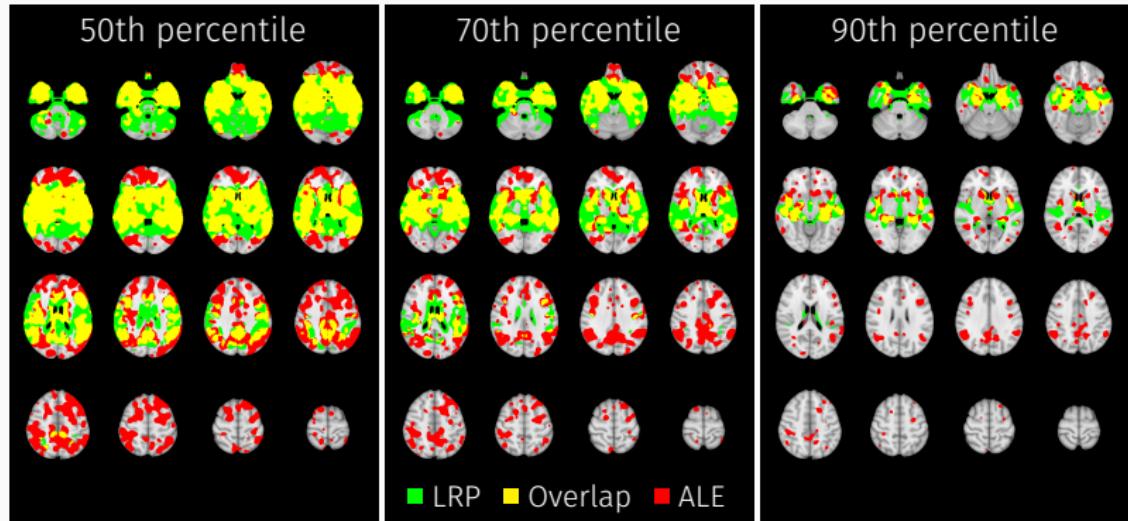
Explainable AI



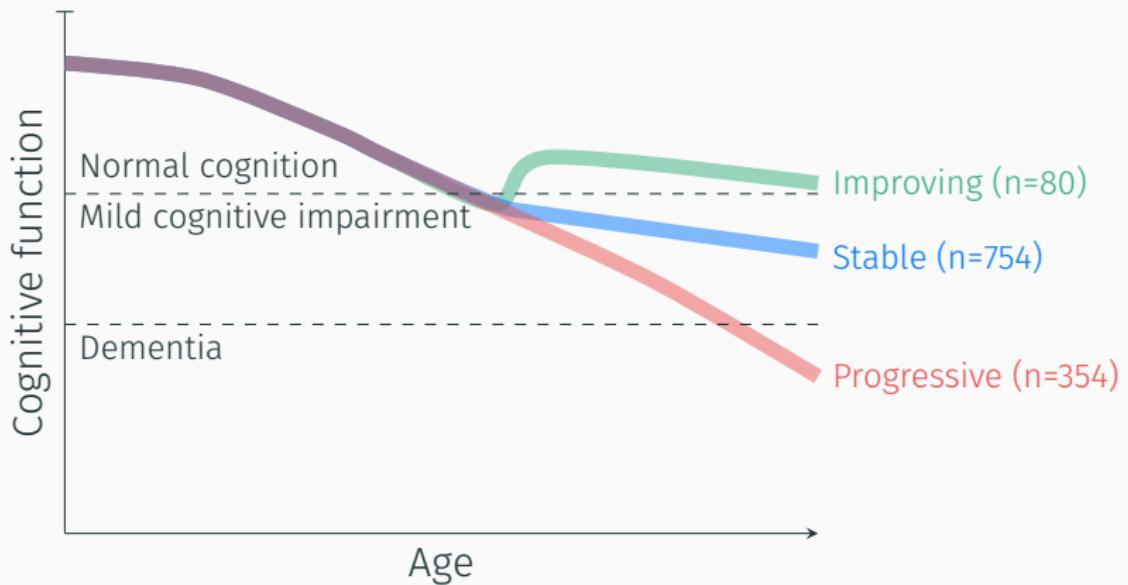
Human researchers



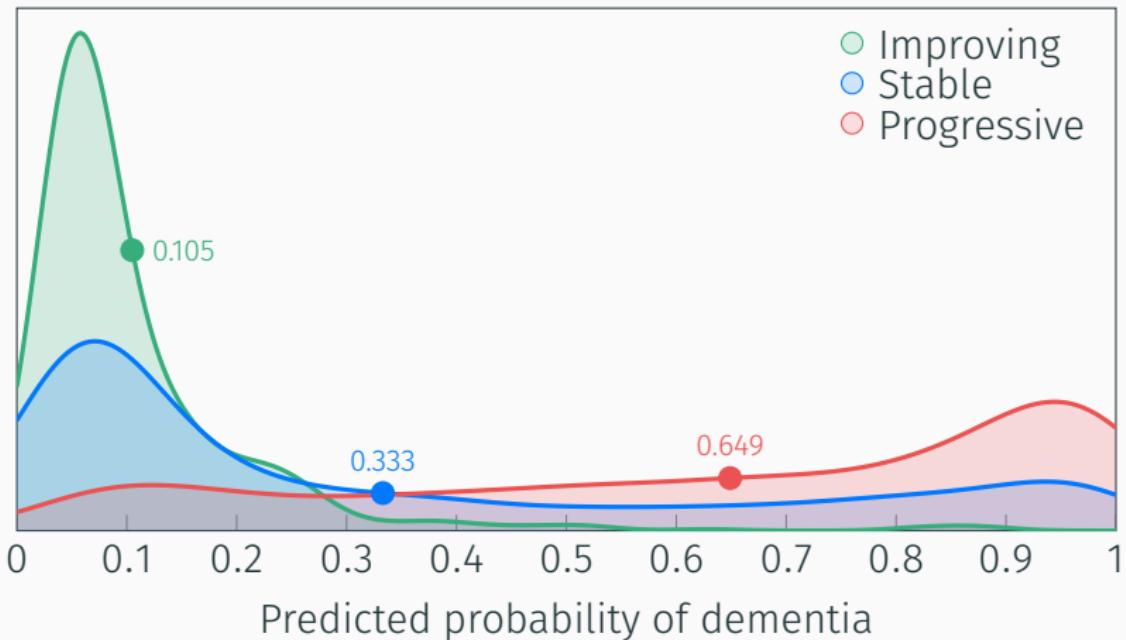
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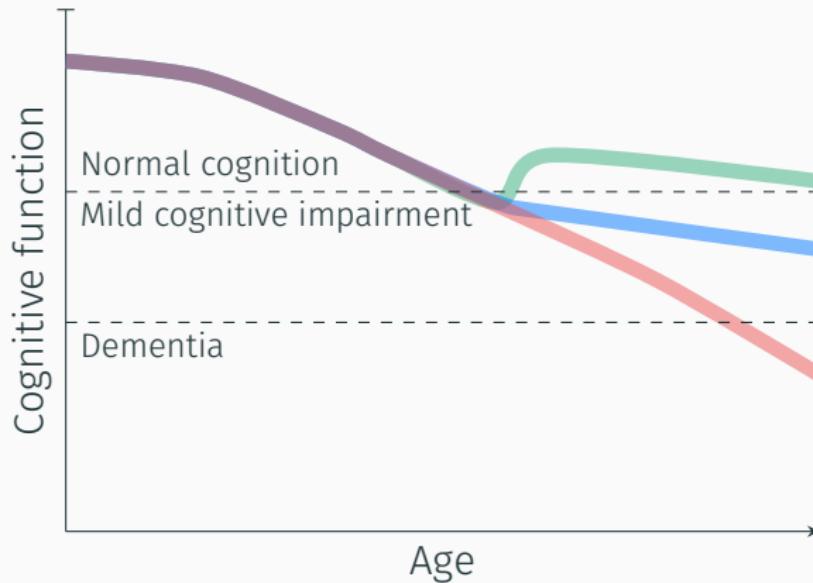
# Explainable dementia classification: Application



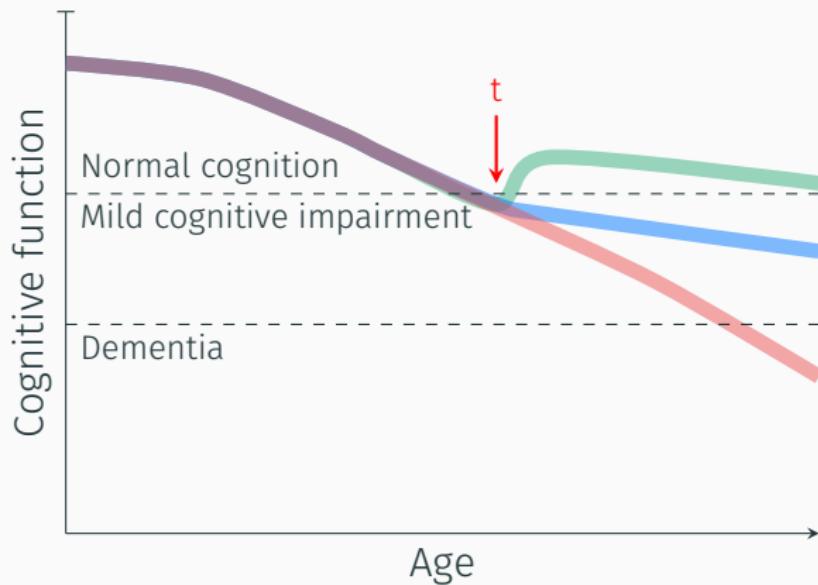
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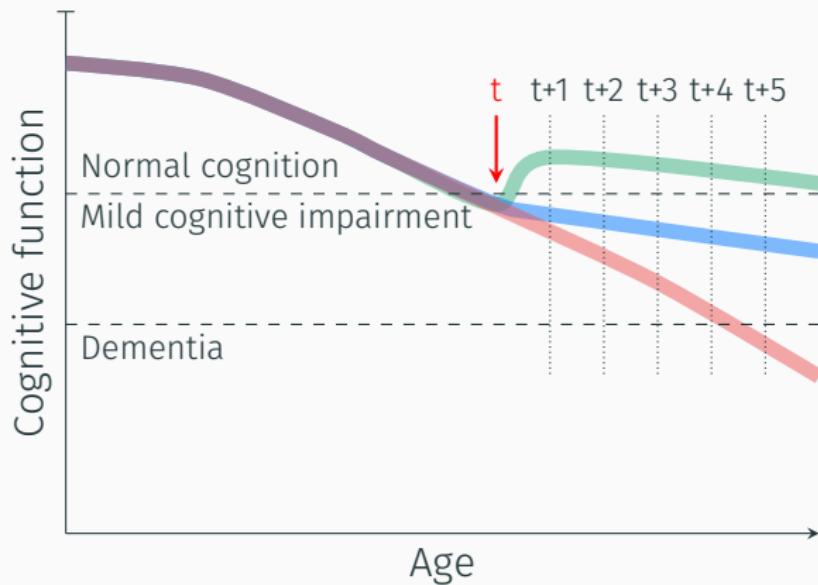
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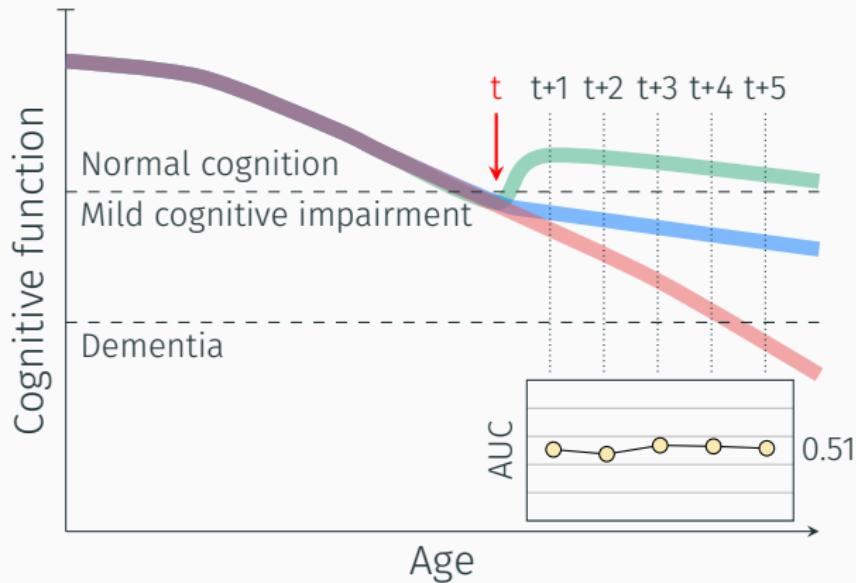
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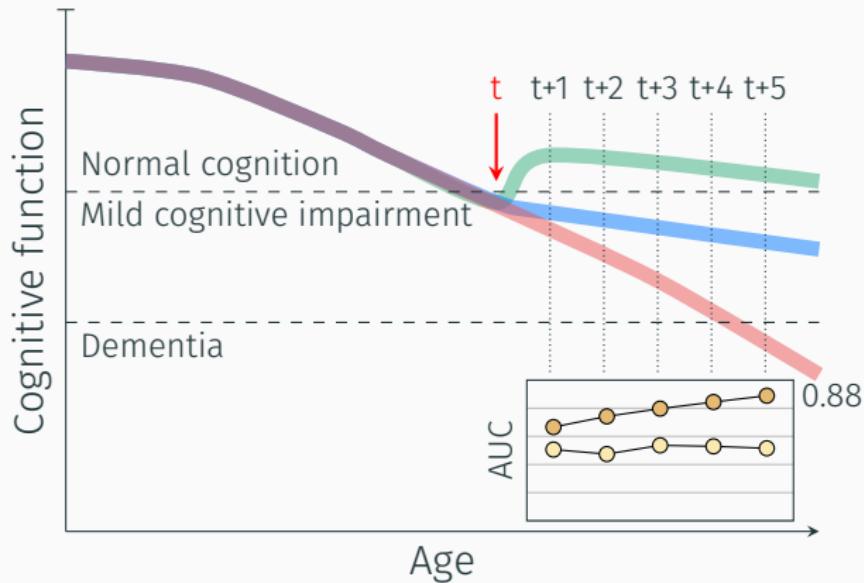
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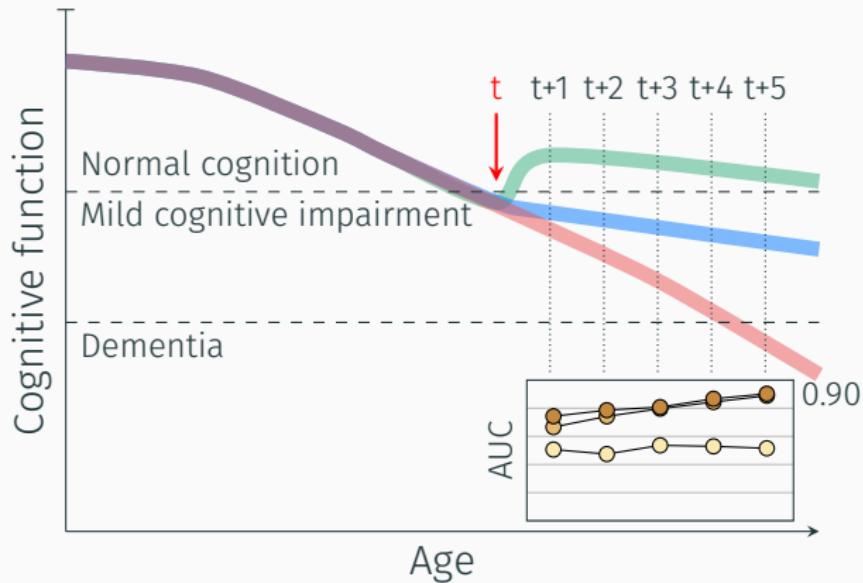
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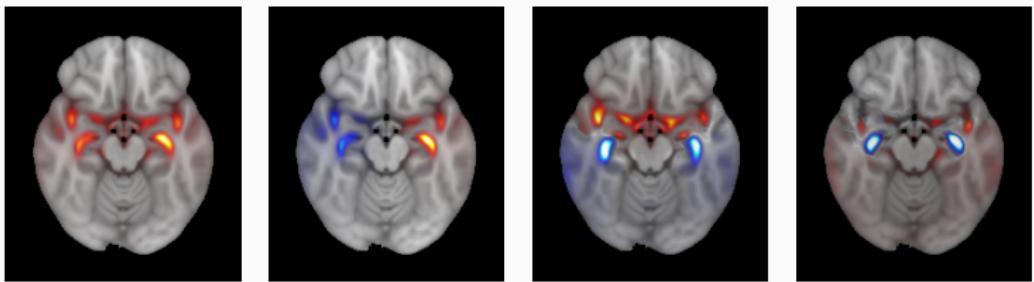
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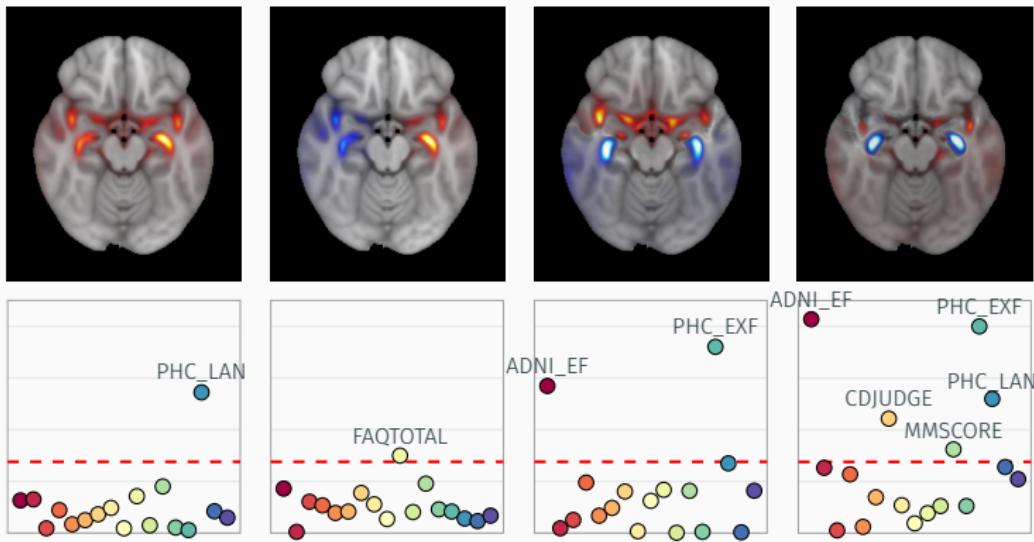
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We used explainable AI to generate heatmaps characterizing the manifestation of dementia-related aberrations in individual brains

- Information in the heatmaps allowed us to predict progression from mild cognitive impairment to dementia with an AUC of 0.9 after 5 years
- Distinct patterns in the heatmaps were associated with decline in various cognitive domains

