Artificial Intelligence in Healthcare

Identifying neuroimaging phenotypes with AI

Esten H. Leonardsen

07.02.25

UNIVERSITY
OF OSLO

Outline

Plan for the day

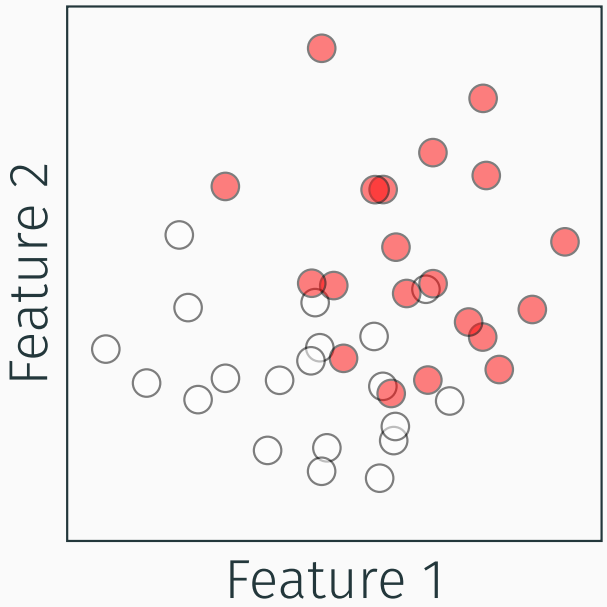
1. Do we need new imaging phenotypes?
2. How can we identify new phenotypes with neural networks?
3. Use case: Explainable AI for dementia
4. Use case: Multitask pretraining
5. Use case: Explainable brain age predictions

How can we understand these learned features?

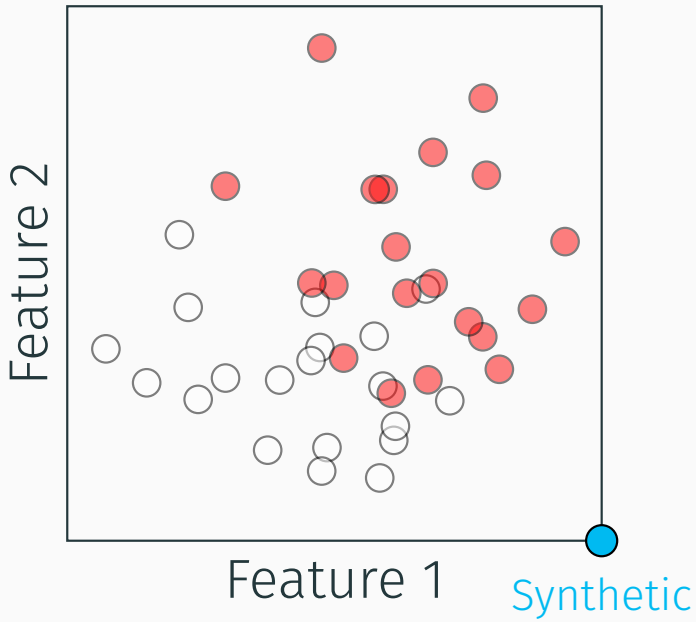
How can we understand these learned features?

Explainable AI!

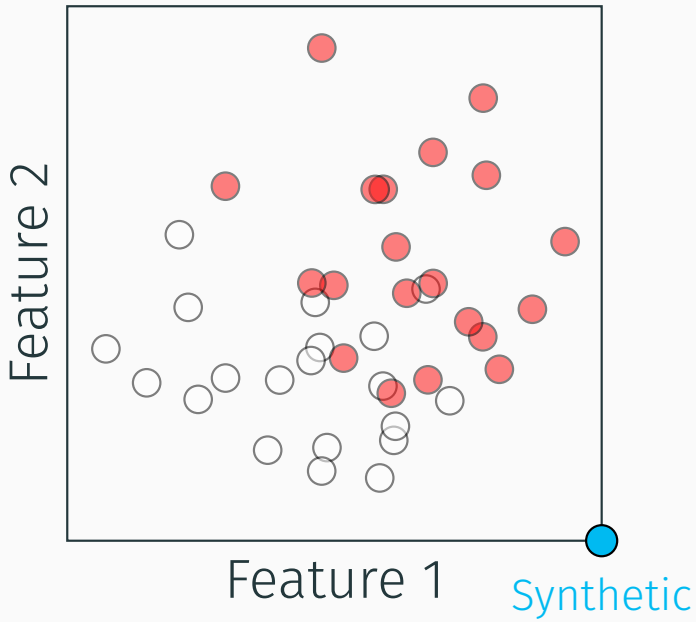
How can we understand these learned features?



How can we understand these learned features?



How can we understand these learned features?



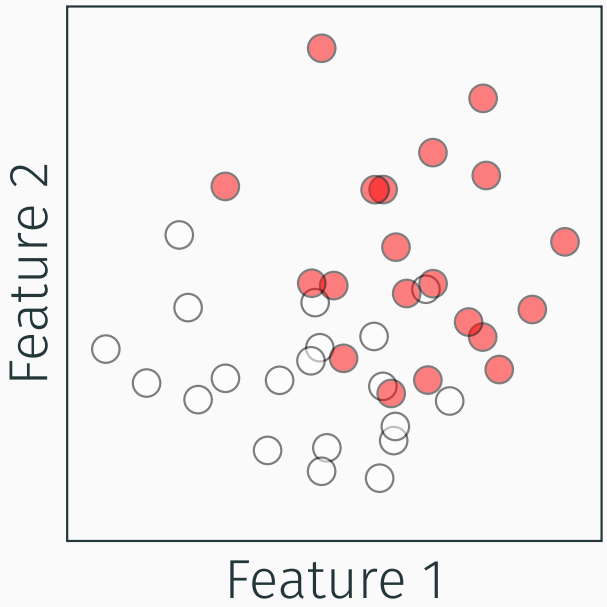
Activation maximization

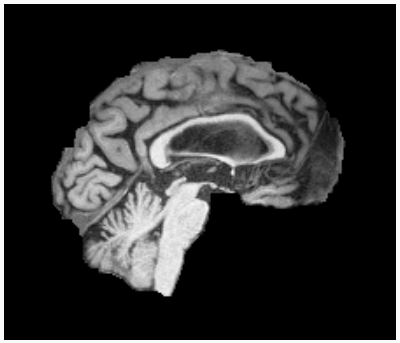
How can we understand these learned features?

How can we understand these learned features?

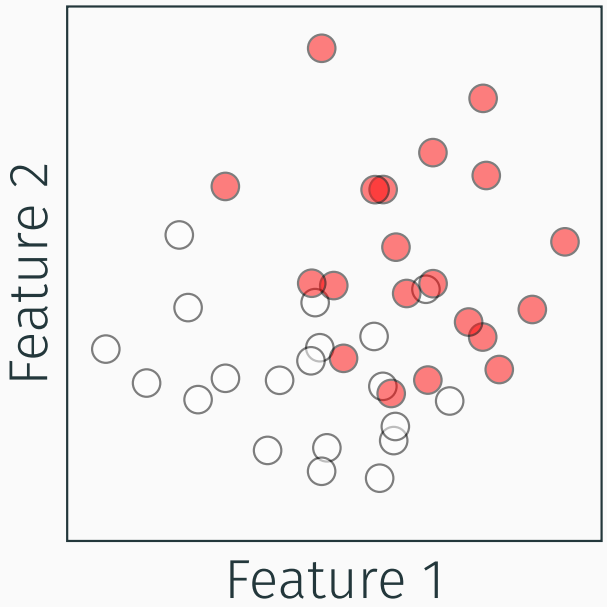
Saliency mapping

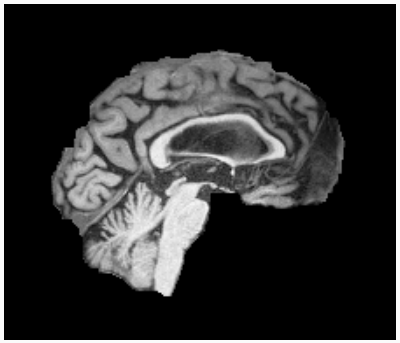
How can we understand these learned features?





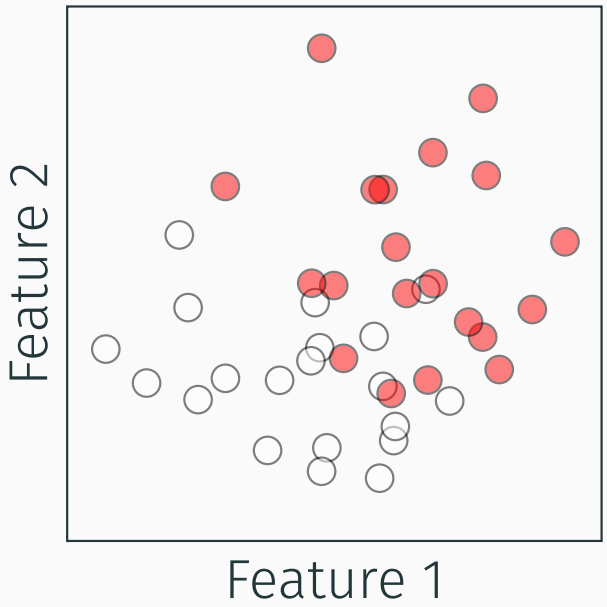
How can we understand these learned features?

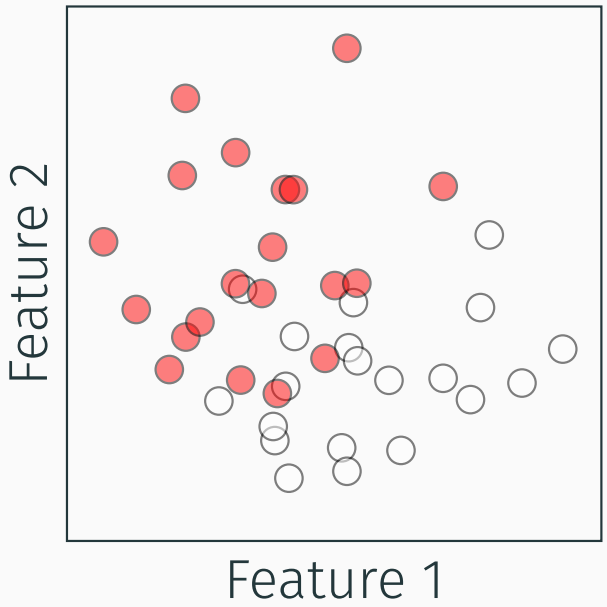


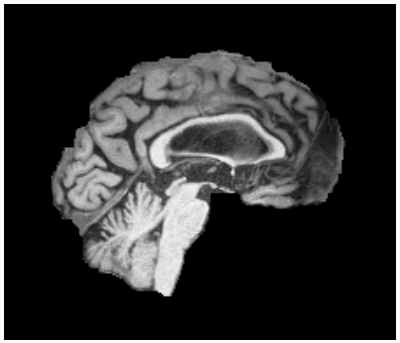


The patient shows cortical atrophy, reduced hippocampal volumes and enlarged ventricles

How can we understand these learned features?

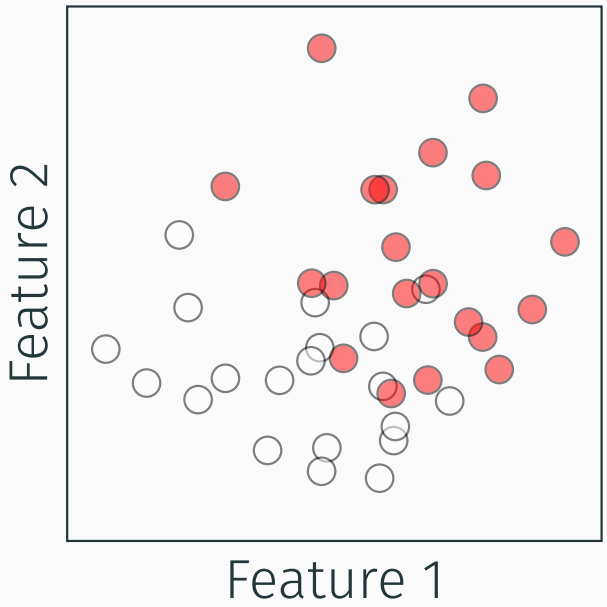


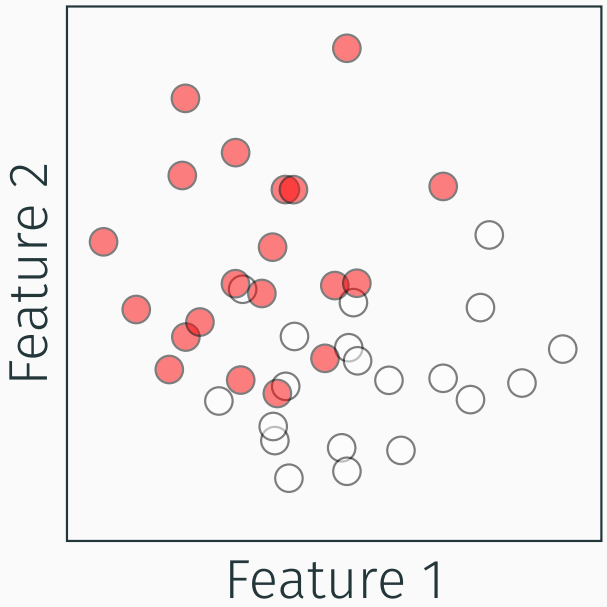


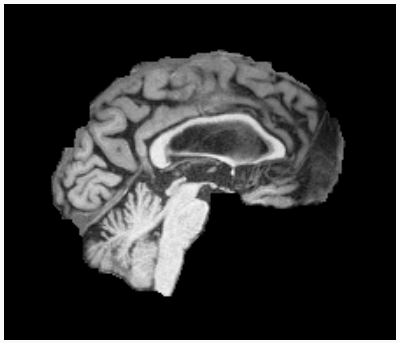


The patient shows cortical atrophy, reduced hippocampal volumes and enlarged ventricles

How can we understand these learned features?

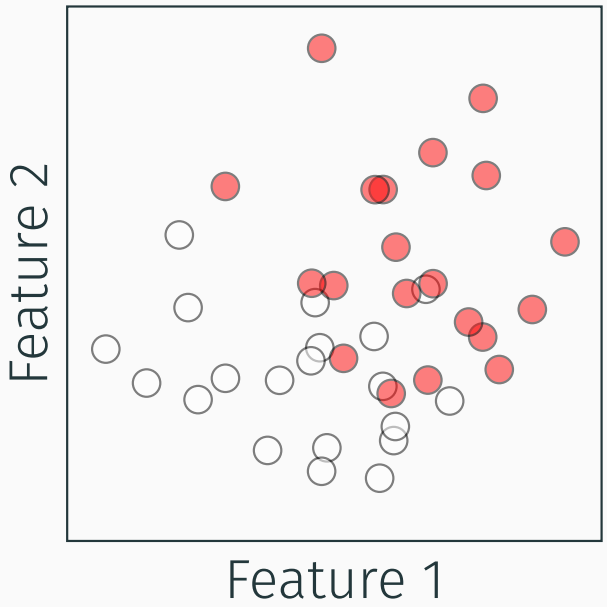


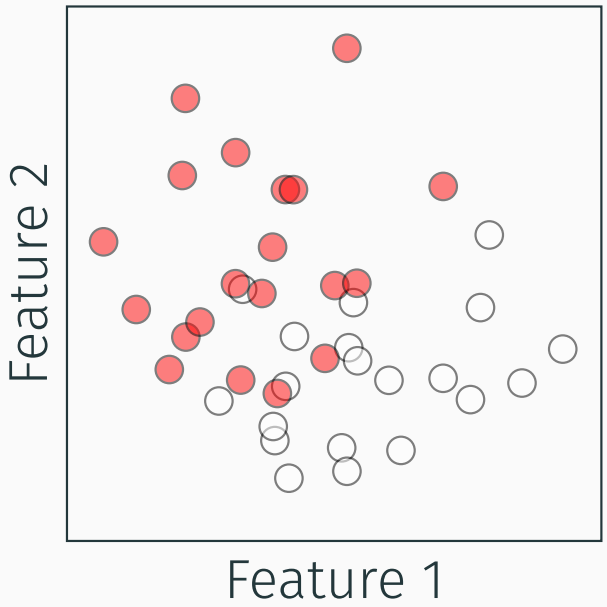


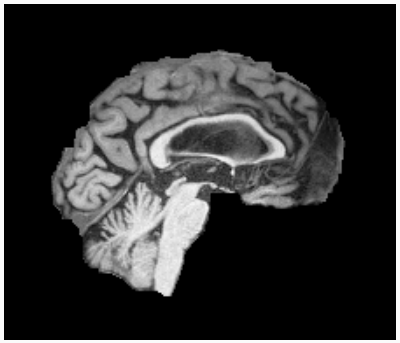


The patient shows cortical atrophy, reduced hippocampal volumes and enlarged ventricles

How can we understand these learned features?

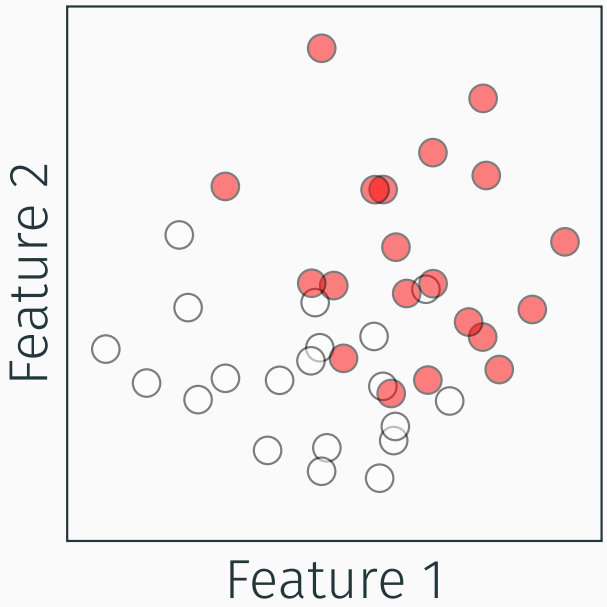


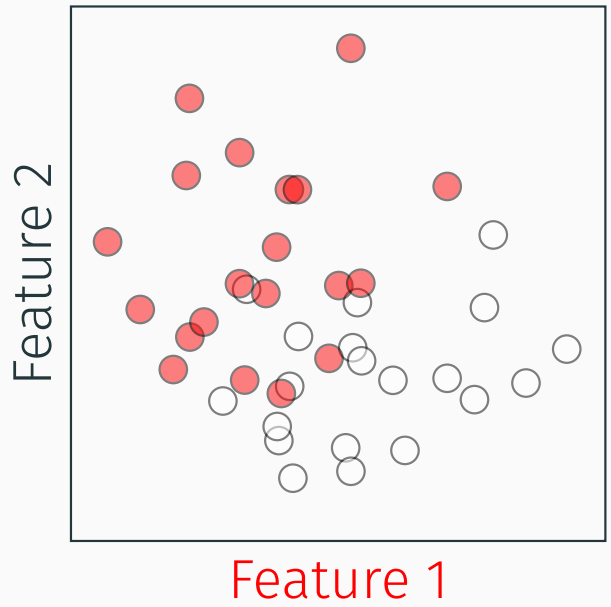


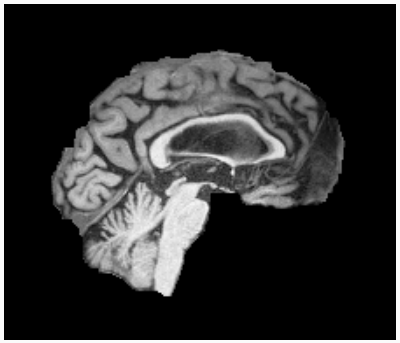


The patient shows cortical atrophy, reduced hippocampal volumes and enlarged ventricles

How can we understand these learned features?

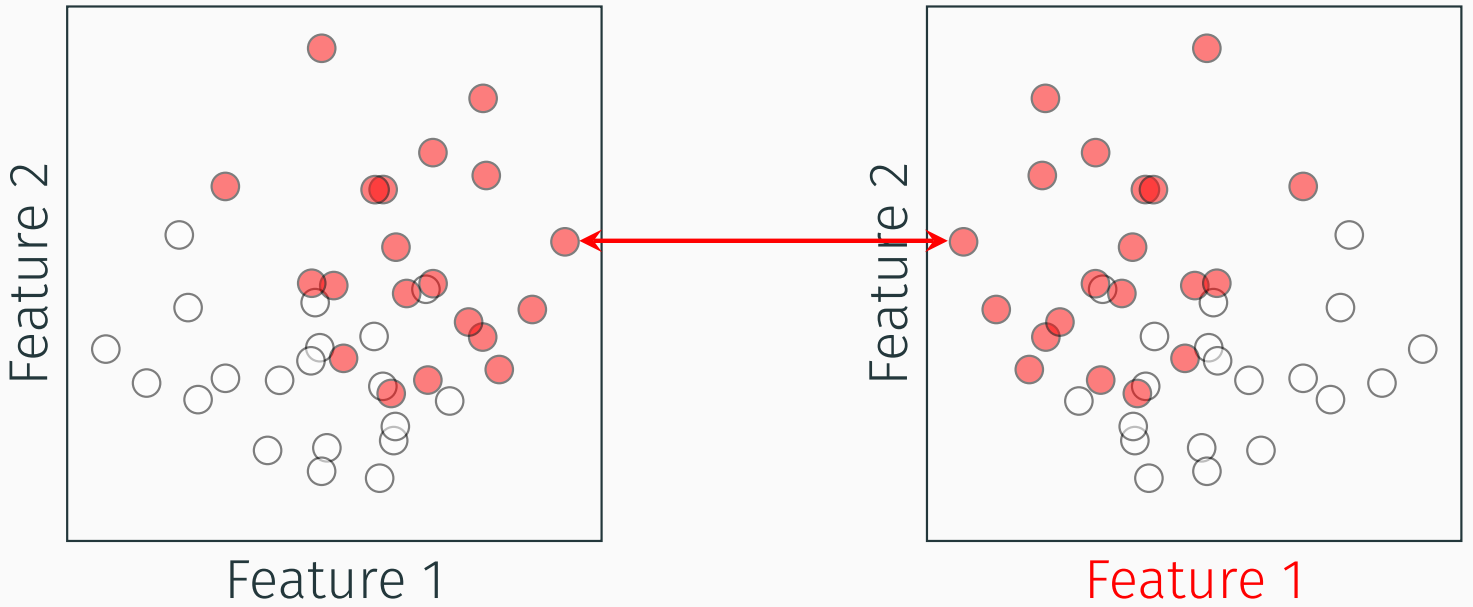


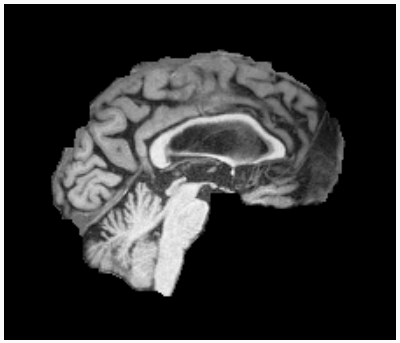




The patient shows cortical atrophy, reduced hippocampal volumes and enlarged ventricles

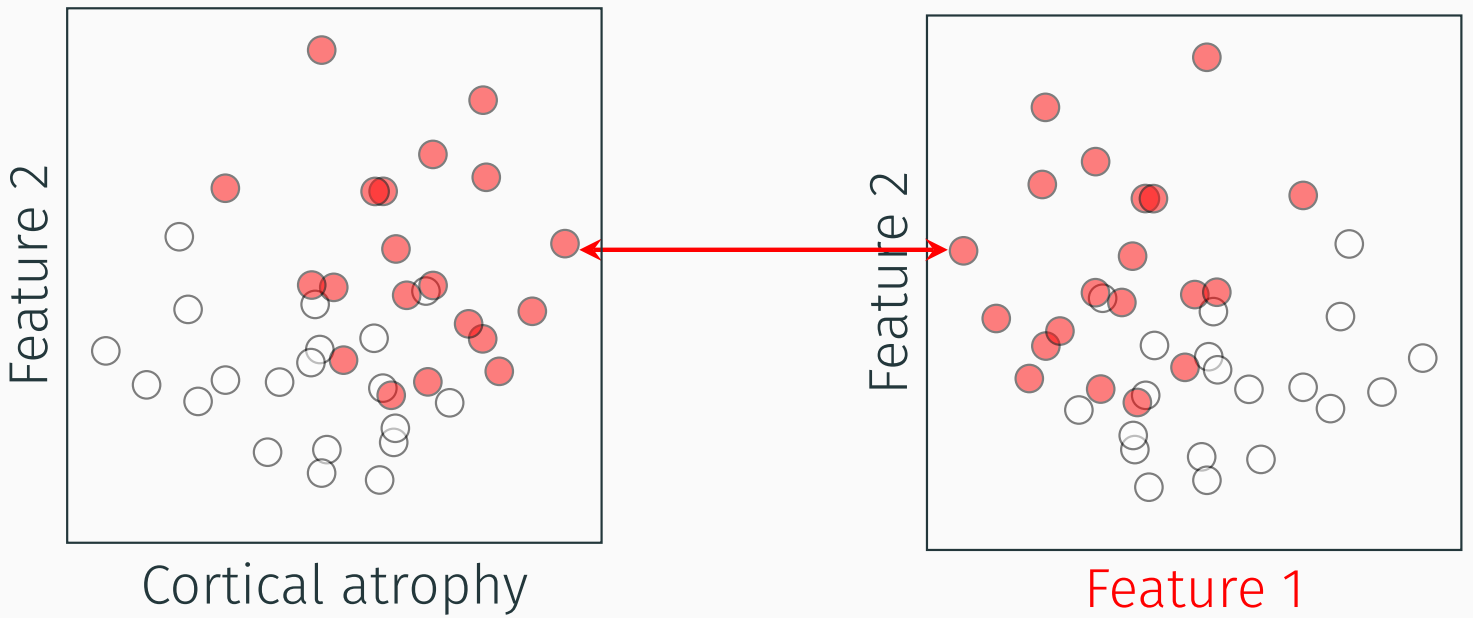
How can we understand these learned features?

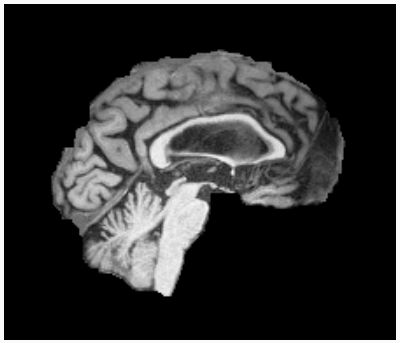




The patient shows cortical atrophy, reduced hippocampal volumes and enlarged ventricles

How can we understand these learned features?



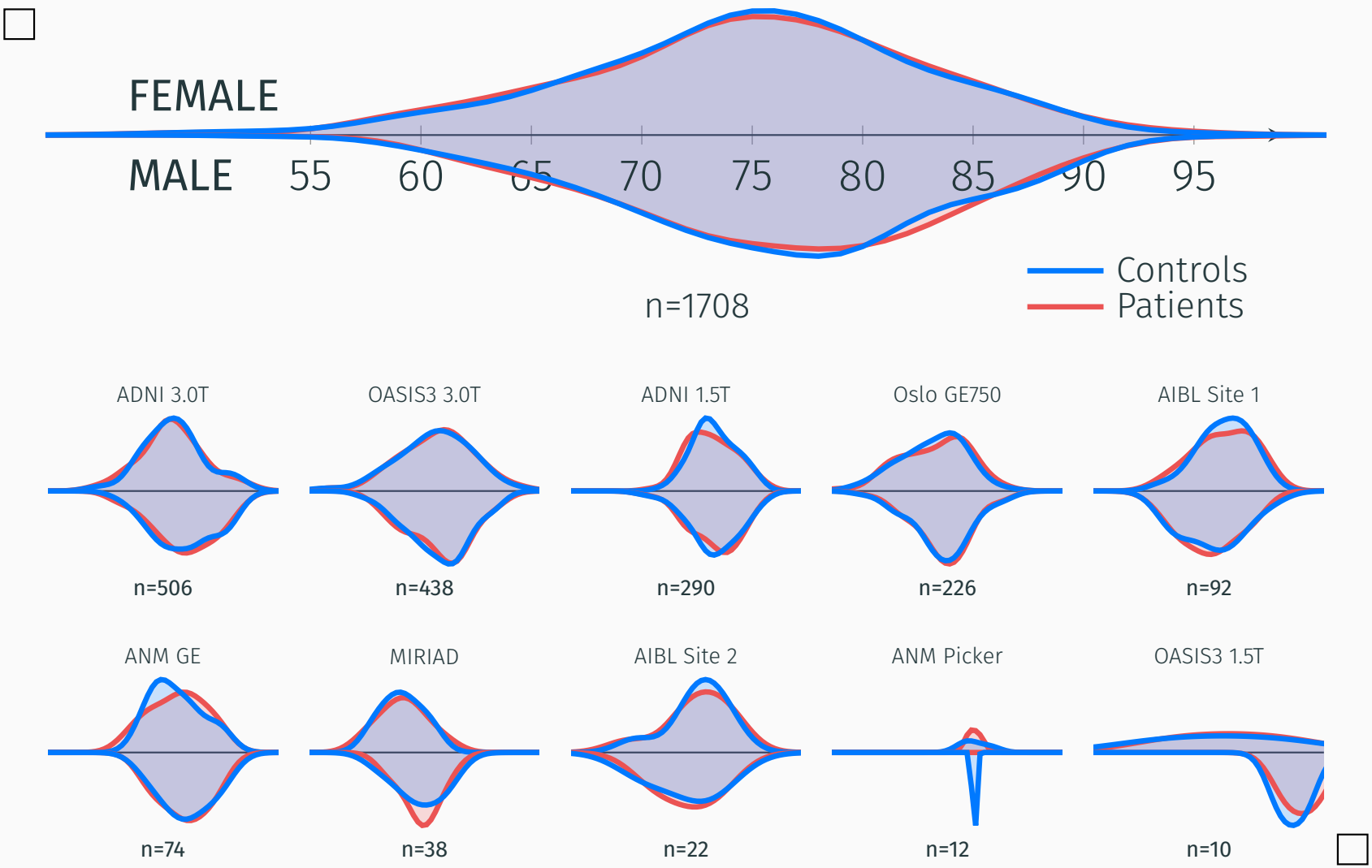


The patient shows cortical atrophy, reduced hippocampal volumes and enlarged ventricles

Use cases

UNIVERSITY
OF OSLO

Dementia and explainable AI



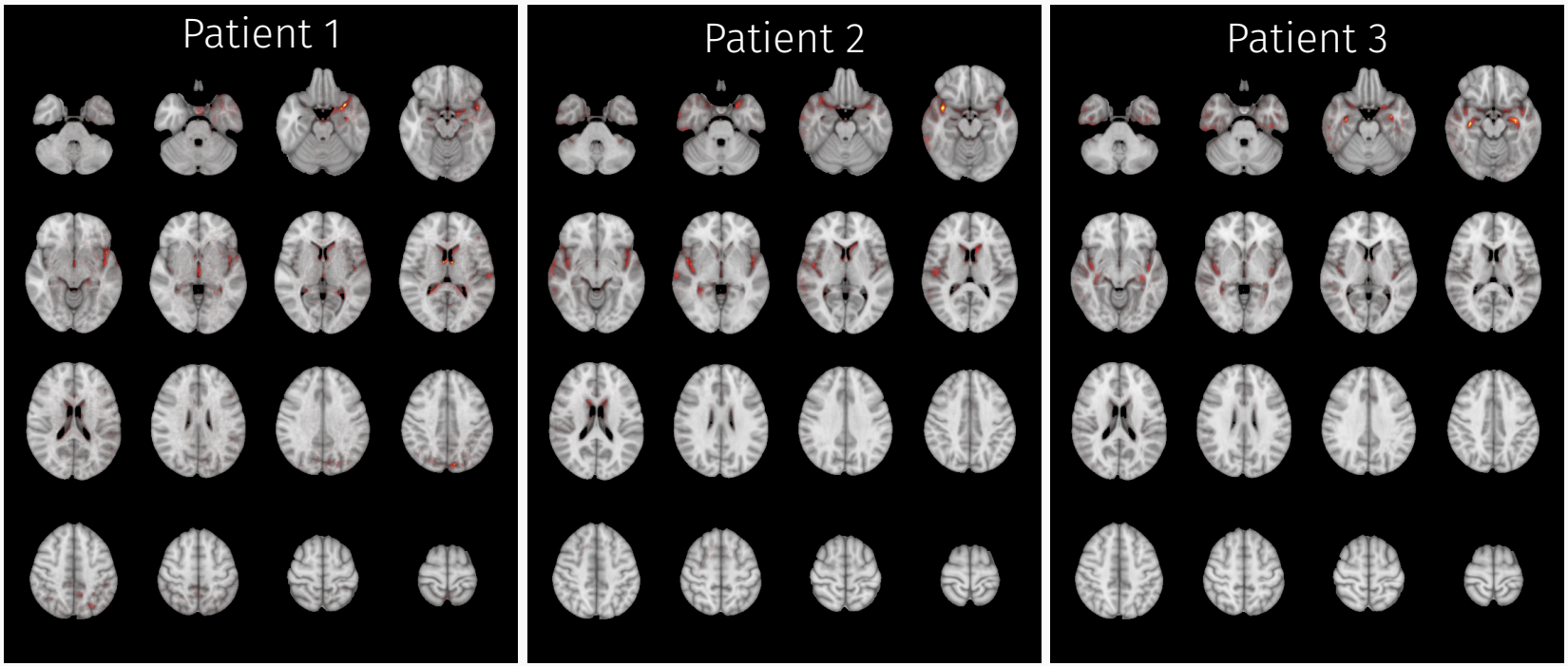
Dementia and explainable AI

CNN

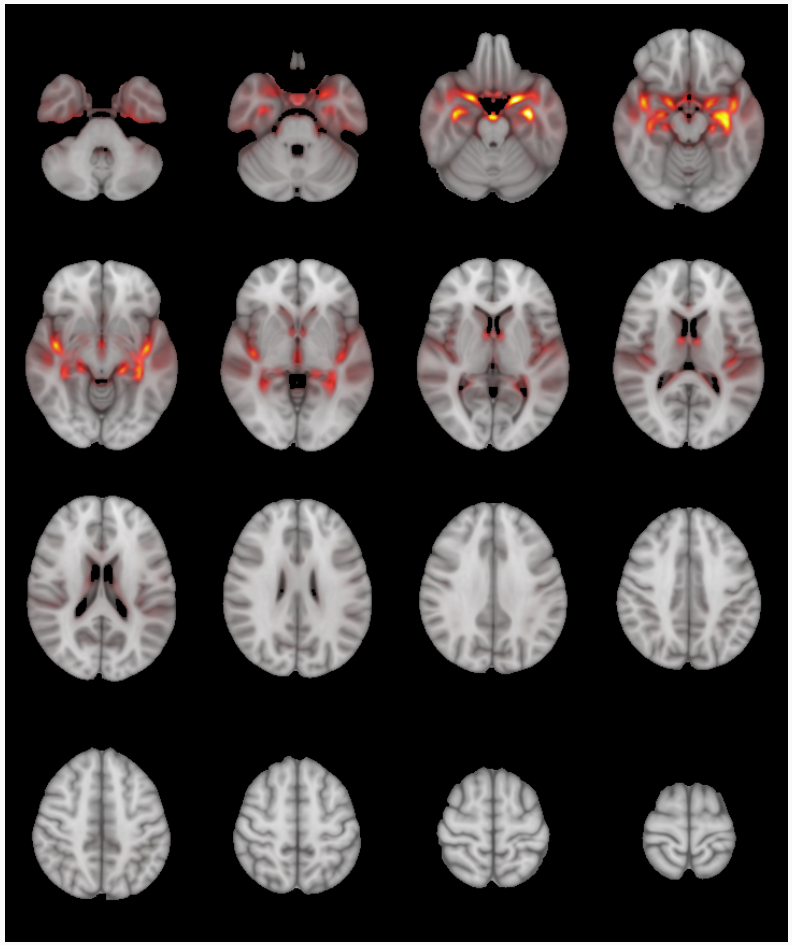
Dementia and explainable AI

LRP

Dementia and explainable AI

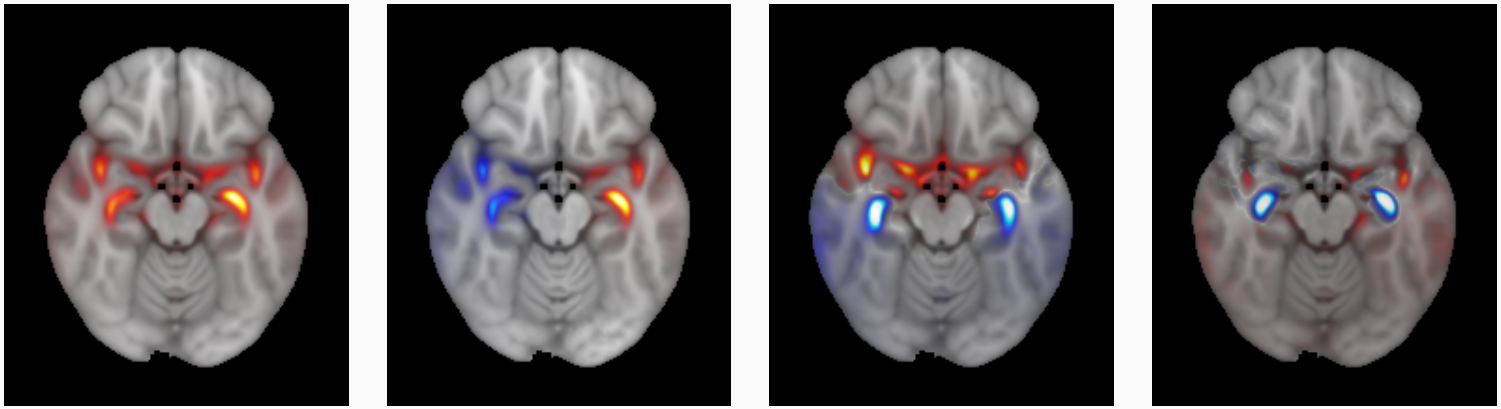


Dementia and explainable AI



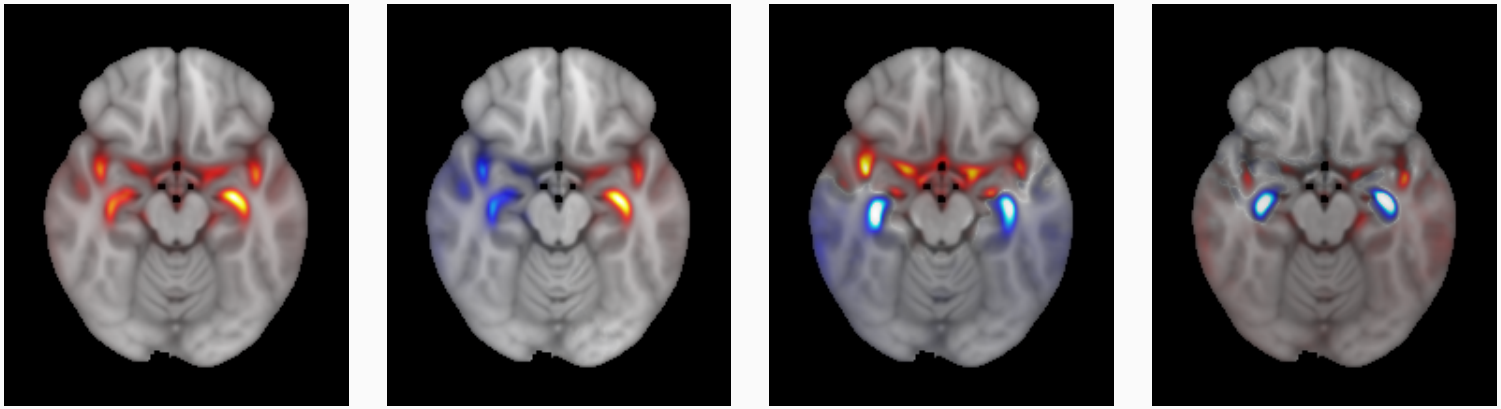
Dementia and explainable AI

Component 0 Component 1 Component 2 Component 3



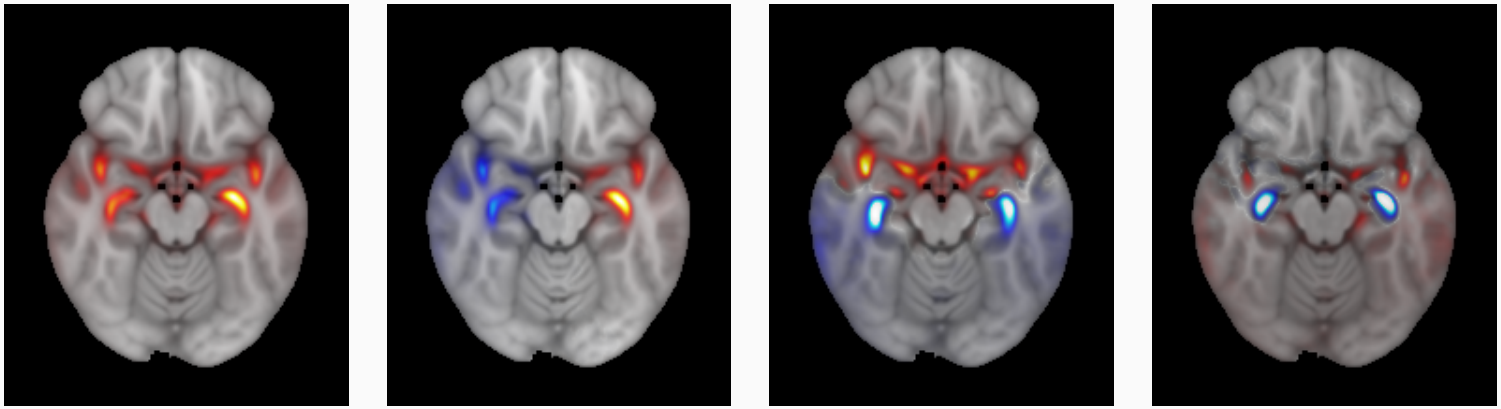
Dementia and explainable AI

Component 0 Component 1 Component 2 Component 3



Dementia and explainable AI

Component 0 Component 1 Component 2 Component 3



Multitask pretraining

Explainable brain age predictions