

Ninon Burgos

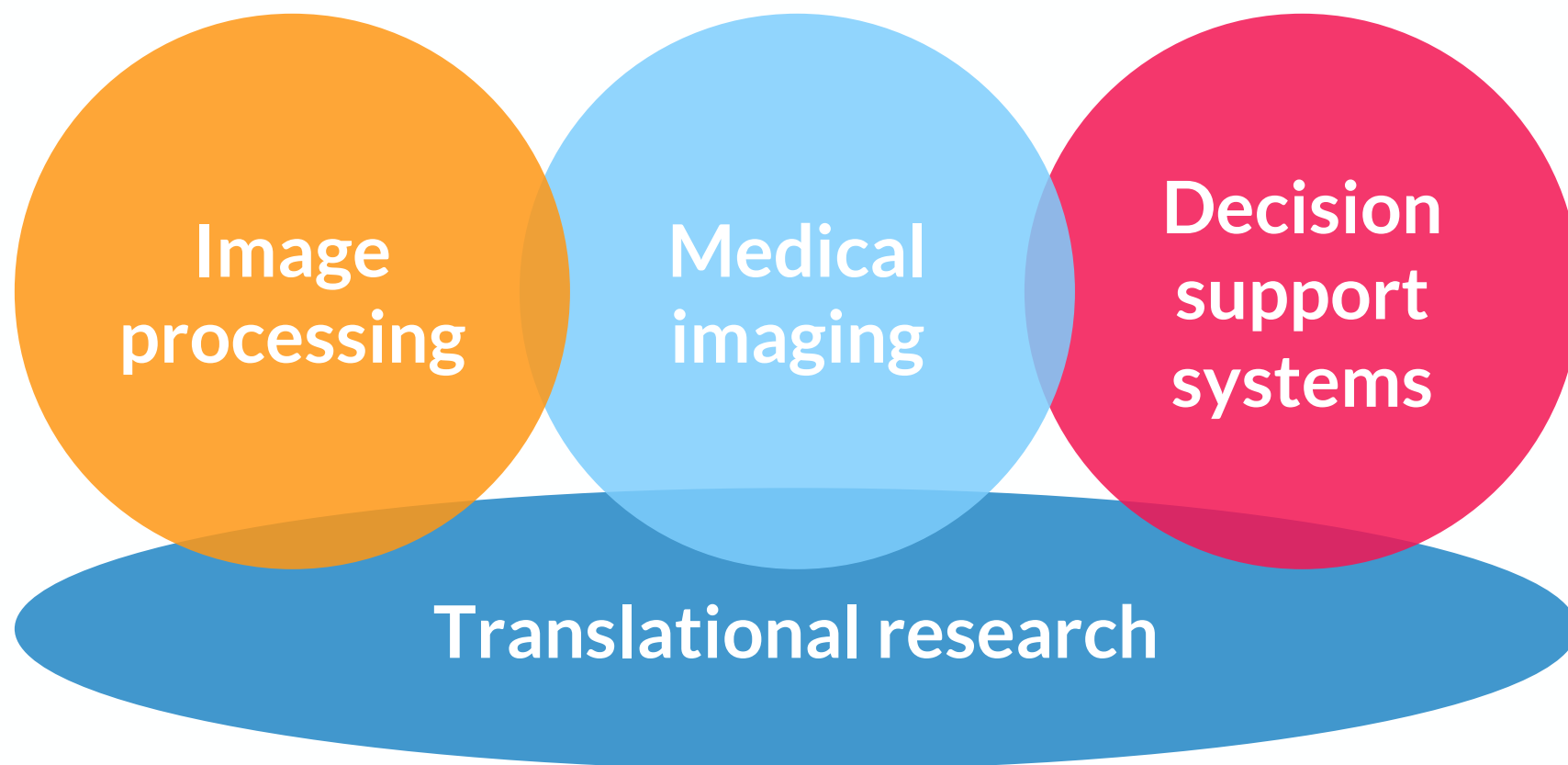


CNRS Researcher

Brain and Spine Institute – Aramis Lab

Paris, France

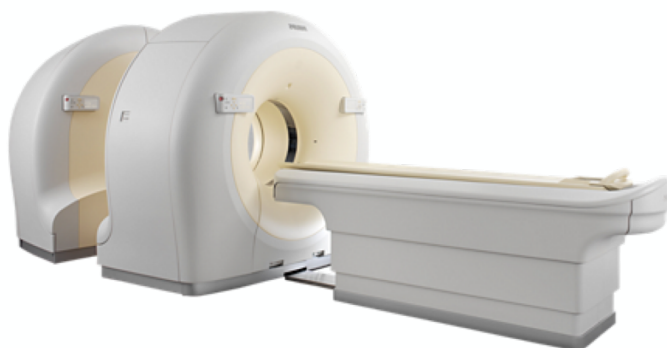
Research area



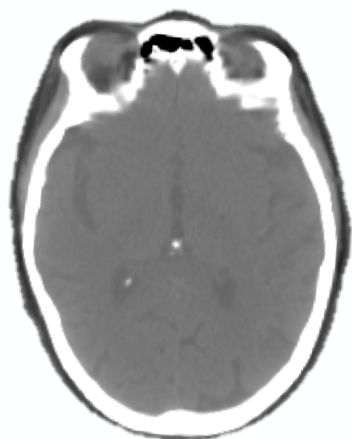
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Combination of structural and functional imaging modalities

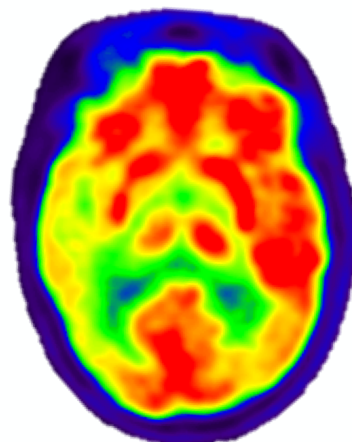
PET/CT



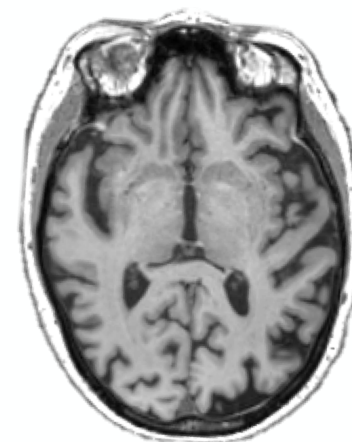
PET/MRI



CT



PET



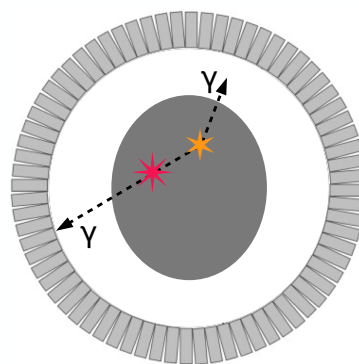
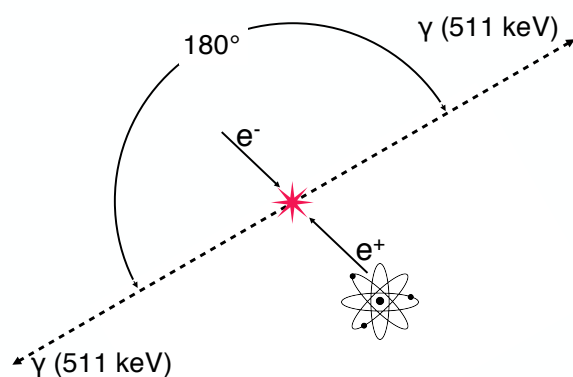
MRI

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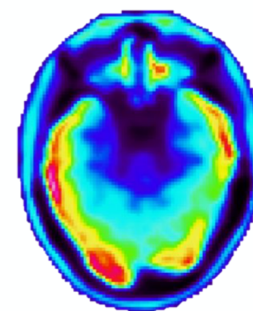
Image synthesis for the attenuation correction of PET/MR data

Clinical motivation

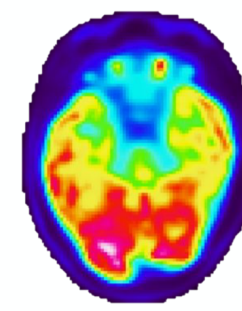
- ▷ Imperfect attenuation correction on PET/MR scanners



Attenuation



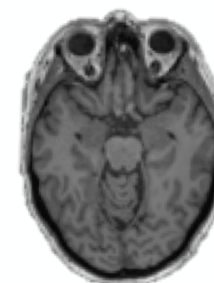
PET without
attenuation correction



PET with
attenuation correction

Objective

- ▷ Synthesise CT from MR images to correct for attenuation PET/MR data



MRI



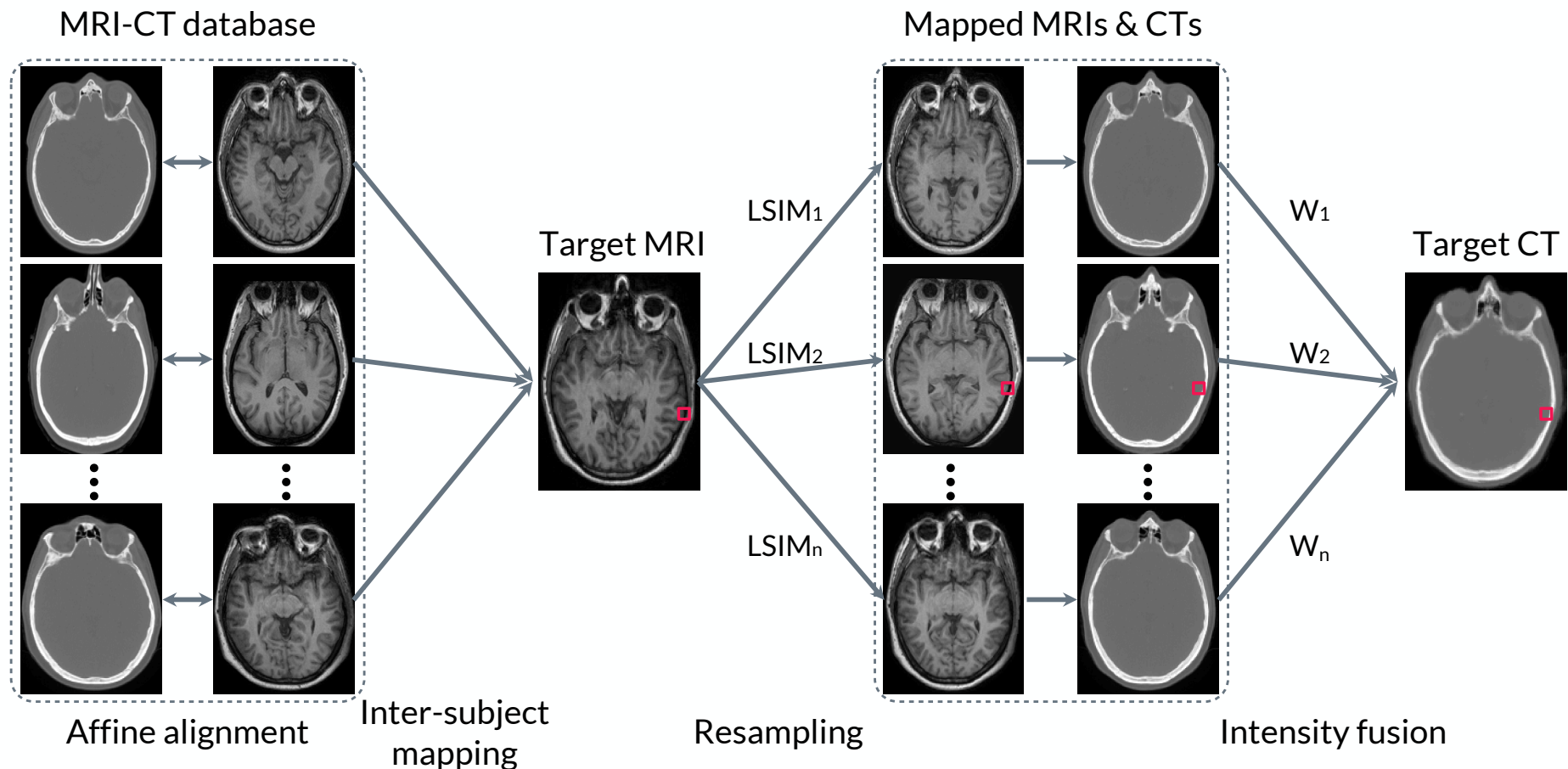
CT

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Image synthesis for the attenuation correction of PET/MR data

Method [Burgos et al., MICCAI, 2013], [Burgos et al., IEEE TMI, 2014], [Burgos et al., EJNMMI, 2015]

▷ Multi-atlas registration, propagation and fusion

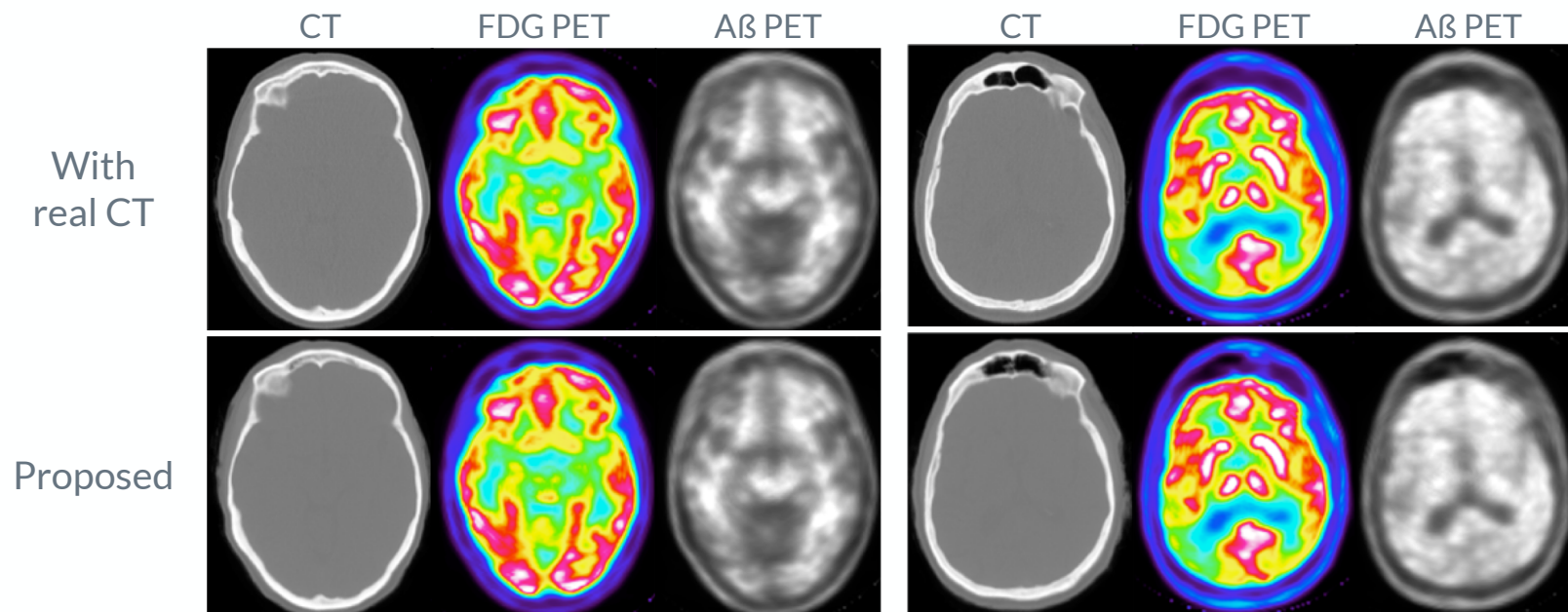


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Image synthesis for the attenuation correction of PET/MR data

Evaluation

- ▷ Validation on FDG and Florbetapir (A β) PET images: **less than 2% difference** [Burgos et al., EJNMMI, 2015]
- ▷ Independent multi-centre evaluation study: joint **best performance** [Ladefoged et al., NeuroImage, 2017]
- ▷ Evaluation using low resolution MR images **in collaboration with University Hospital Zurich and GE Healthcare** [Sekine, Burgos et al., JNM, 2016]



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Image synthesis for the attenuation correction of PET/MR data

Technology development

- ▷ **NiftySeg** Method part of a software package for image segmentation and synthesis
- ▷ **NiftyWeb** Method available online as a web service tool for testing, already used 1900+ times

<https://github.com/KCL-BMEIS/NiftySeg>

<http://niftyweb.cs.ucl.ac.uk/program.php?p=PCT>

Transfer to clinical research

- ▷ Method routinely used on several research studies at the Dementia Research Centre (UCL)

[Weston et al., Alzheimer's & Dementia: Diagnosis and Disease Monitoring, 2016]
[Lane et al., BMC Neurology, 2017]

Transfer of technology

- ▷ Licensing agreement recently signed between Oncovision and UCL



Current & future work

Clinical motivation

- ▷ Neuroimaging plays a crucial role in the understanding, diagnosis, and treatment of neurological disorders
- ▷ **Challenge:** joint analysis of multiple imaging modalities at several time points

Improve the analysis of multimodal neuroimaging data, and thus improve the understanding and diagnosis of neurodegenerative diseases

Current work

Automatic identification of abnormality patterns

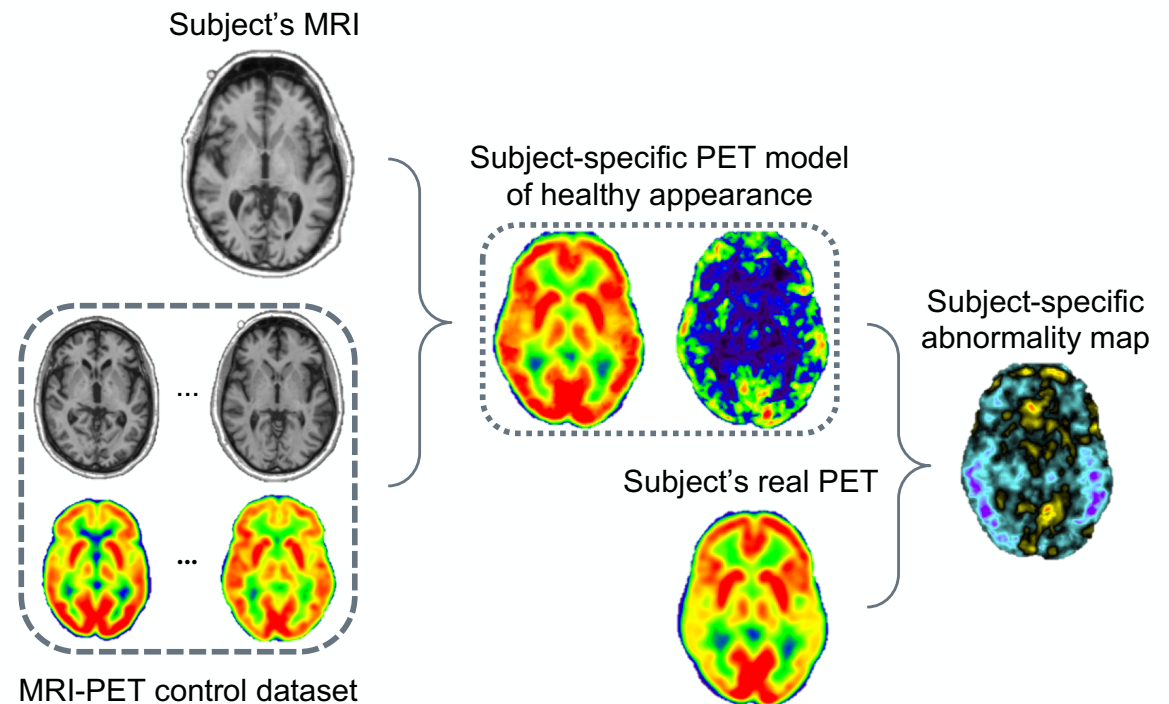
Objective

- ▷ Locate and characterise patterns of abnormality from multimodal imaging data

Method

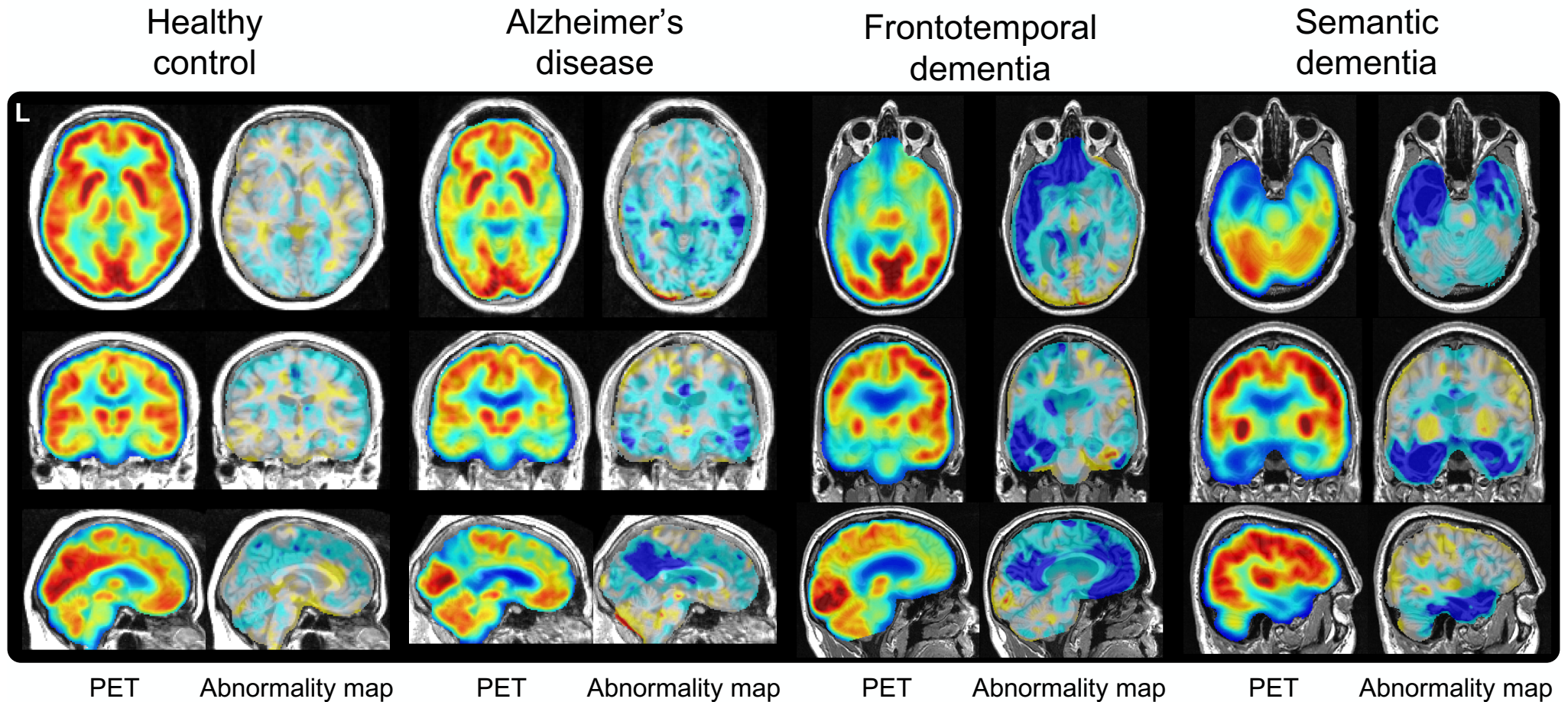
[Burgos et al., MICCAI, 2015],
 [Burgos et al., CMMI, 2017],
 [Burgos et al., Submitted]

- ▷ Subject-specific model of healthy appearance
- ▷ Subject-specific map of abnormality



Current work

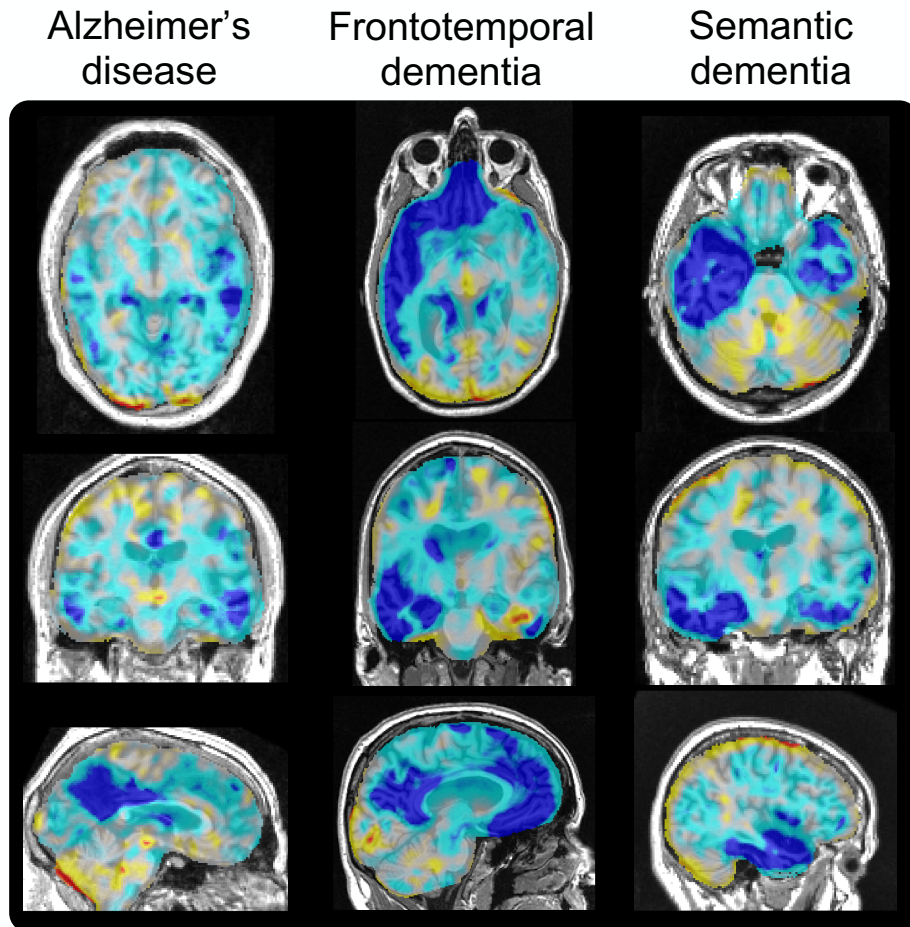
Automatic identification of abnormality patterns



Current work

Automatic identification of abnormality patterns

Visualisation tool



Improved interpretability of subsequent analyses

