Monday, November 01, 2021, 15:00 hrs
Zoom Meeting

Institute Colloquium

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U-fibre mapping using advanced diffusion MRI

Short cortico-cortical association fibres (U-fibres) are the shortest and most abundant cortico-cortical white matter connections in the human brain. U-fibres are underrepresented in current maps of the human brain connectome owing primarily to the methodological challenges for U-fibre detection in vivo. The small size of U-fibre bundles coupled with current lack of knowledge about their geometries and distributions across the brain make their detection and validation a challenge.

We propose the multi-modal approach combining high resolution in vivo and postmortem diffusion weighted imaging, functional MRI retinotopy and advanced histology to advance our knowledge about the U-fibres in the human brain.

We developed a dedicated pipeline for in vivo U-fibre connectivity mapping by combining sub-millimetre resolution diffusion tractography and functional retinotopic mapping in the human early visual processing stream. Our findings successfully reproduced the retinotopic connectivity principle up to the third order visual cortices mediated by short U-fibre connections in vivo. We then validated the geometries of the in vivo mapped fibre bundles against ultra-high resolution postmortem diffusion tractography demonstrating convergence in a corresponding anatomical area.

We believe that our multi-modal approach is an important step towards the construction of a comprehensive human brain connectome via accurate and robust identification and characterisation of the U-fibres.