Focused Ultrasound Stimulation (FUS) is a non-invasive neurostimulation technique that has the potential to reversibly and safely modulate neural activity in regions of the human brain that are difficult to target precisely with more traditional techniques like Transcranial Magnetic Stimulation (TMS). These include regions such as the hippocampus that are deep in the brain and so beyond the limited reach of TMS, and regions such as the anterior temporal lobes that are difficult to target with TMS without causing peripheral nerve stimulation. FUS has the potential to transform basic science by enabling causal inference about the functional properties of specific brain regions, as well as offer potential new treatments for dementia, stroke and mental health. This PhD project will combine FUS with behavioural and fMRI measurements, and could be taken in several scientific directions:

1. Testing whether FUS can modulate activity in hippocampus during episodic memory tasks and help dementia (primarily supervised by Rik Henson, in collaboration with Drs Nord and Halai);
(2) Testing whether FUS could modulate anterior temporal lobe activity during semantic memory tasks and potential use in conjunction with stroke rehabilitation targeting perilesional tissue or the contralateral hemisphere (primarily supervised by Ajay Halai, in collaboration with Prof Henson and Dr Nord);

(3) Testing whether FUS modulates activity in subregions of the insula, measuring subsequent or concurrent effects on interoception in healthy patients and those with mental health conditions (primarily supervised by Camilla Nord, in collaboration with Prof Henson and Dr Halai).