Early detection of Alzheimer’s disease (AD) is essential for developing effective treatments. Neuroimaging techniques like Magnetic Resonance Imaging (MRI) have the potential to detect brain changes before symptoms emerge [1]. Structural MRI can detect atrophy related to AD, but functional changes related to loss of synapses and synaptic plasticity occur even earlier. Our work tests the potential of Magnetoencephalography (MEG) to detect progressive differences in brain activity in people with early stages of dementia, such as Mild Cognitive Impairment (MCI), or even healthy people at-risk of AD owing to lifestyle or genetic factors. We use machine learning to extract features from the rich spatiotemporal dynamics of resting-state MEG, and the fitting of neurophysiological models (such as Dynamic Causal Modelling) to task-evoked responses [2]. A PhD within this area would involve developing and validating advanced MEG analyses on a number of large, pre-existing datasets, such as BioFIND, NTAD and CamCAN.

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