

Diffusion MRI: Measuring water to quantify brain microstructure and visualise connectivity

Claude J Bajada

Since the discovery of Magnetic Resonance Imaging (MRI) techniques in the 1970s MRI has found its way into the clinic as a safe, non-invasive approach to probing the brain and for diagnosing pathology. While the MR images are deceptively photographic, MRI is a very flexible technique that allows for various tissue features to be probed.

One of the features that can be probed is the diffusion of water in tissue. In the early 1990s the diffusion signal was modelled using tensors giving rise to the technique known as diffusion tensor imaging.

My talk briefly introduces the physics behind diffusion MRI. We will then see how to use the diffusion signal to explore previously unmeasurable microstructural features of the brain and how to exploit diffusion to model structural connections in the brain's white matter.