

Supplementary Note 1 : Glossary of MRI terms

dMRI (diffusion MRI): An imaging modality that captures how water molecules diffuse within tissue. This modality can be analyzed for tracing white matter pathways (tractography), as well as for microstructural features (tensor and NODDI models).

FA (fractional anisotropy): A tensor-based metric of microstructure reflecting the variation of water diffusion as a function of orientation. In white matter, high FA typically reflects strong diffusion along the tract, and is often interpreted as a proxy for tract integrity.

fMRI (functional MRI): An imaging method that detects brain activity indirectly based on changes in local blood oxygenation. Brain activity can either be induced by a stimulus or cognitive task, or be measured as spontaneous co-fluctuations between regions.

ICA (independent component analysis): A data-driven decomposition used (for example) in fMRI for parcellating the brain, usually into a set of spatially-independent maps, each with a single common timecourse. More generally, ICA reduces data to a number of independent features that often are more biophysically meaningful than one finds from simpler methods such as principal component analysis.

ICVF (intracellular volume fraction): See NODDI.

Mode of anisotropy: A tensor-based metric of microstructure that differentiates between voxels containing single fibres (with cigar-like diffusion, $MO > 0$) from multiple fibres (with disc-like diffusion, $MO < 0$), both of which result in high FA.

NODDI: A biophysical model of the diffusion MRI signal that aims to separate ‘free’ water (isotropic volume fraction, ISOVF) from restricted water (intracellular volume fraction, ICVF). NODDI also estimates the dispersion of ‘neurite’ fibres in the ICVF compartment.

swMRI (susceptibility-weighted MRI): An imaging modality driven by differences in tissue magnetic susceptibility due to (e.g.) tissue iron or lipids. Here, swMRI data is analysed to calculate the speed of MRI signal decay, characterized by the time constant $T2^*$.

$T2^*$: See swMRI.

T2 FLAIR (T2 fluid-attenuated inversion recovery): An imaging modality where free water signal is suppressed and some pathological tissues have high signal (“hyperintensities”).

Tensor (or, diffusion tensor): A signal model approximating the diffusion of water in tissue as a three-dimensional ellipse, from which metrics that are relevant to tissue microstructure can be derived (e.g. fractional anisotropy).

Tract skeleton: A spatial map corresponding to the center of major white matter pathways. dMRI data is often analysed on a skeleton to reduce misalignment confounds.

Tractography: Identification of white matter pathways from dMRI data, in which the direction of fastest water diffusion is tracked voxel-by-voxel from a seed region of interest.

Voxel: A three-dimensional pixel. “Voxel-wise” maps involve every voxel in the image, in comparison to region-of-interest analyses that pool many voxels.