A

List of abbreviations

The following table describes the significance of various abbreviations and acronyms used throughout the thesis. The page on which each one is defined or first used is also given. Nonstandard acronyms that are used in some places to abbreviate the names of certain white matter structures are not in this list.

Abbreviation	Meaning	Page
AVF	anisotropic volume fraction	51
BEDPOST	Bayesian Estimation of Diffusion Parameters Obtained using Sampling Techniques	51
c.d.f.	cumulative density function	11
CSF	cerebrospinal fluid	4
CV	coefficient of variation	71
dMRI	diffusion magnetic resonance imaging	3
DSI	diffusion spectrum imaging	56
DTI	diffusion tensor imaging	40
EM	Expectation–Maximisation	16
EPI	echo planar imaging	34
FA	fractional anisotropy	41
FACT	Fibre Assignment by Continuous Tracking	47
FLIRT	FMRIB's Linear Image Registration Tool	69
fMRI	functional magnetic resonance imaging	45
FMRIB	Centre for Functional Magnetic Resonance Imaging of the Brain (Oxford, UK)	53
FMT	fast marching tractography	53
FSL	FMRIB software library	53
FID	free induction decay	31
FWHM	full width at half maximum	62
HARDI	high angular resolution diffusion imaging	54
i.i.d.	independent and identically distributed	14
MAP	maximum *a posteriori*	16
MC	Monte Carlo	19
MCMC	Markov chain Monte Carlo	22
MD	mean diffusivity	41
ML	maximum likelihood	14
MNI	Montréal Neurological Institute	69
MRI	magnetic resonance imaging	3
NMR	nuclear magnetic resonance	4

Abbreviation	Meaning	Page
NT	neighbourhood tractography	64
ODF	orientation distribution function	56
PAS	persistent angular structure	56
p.d.f.	probability density function	11
p.m.f.	probability mass function	10
RF	radiofrequency	29
ROI	region of interest	63
TBSS	tract-based spatial statistics	62
TE	echo time	32
TI	inversion time	32
TR	repetition time	32
VBM	voxel-based morphometry	61
VCI	vascular cognitive impairment	103

B

Summary of publications

The following is a list of works published by the author during the course of the doctorate. Many of these works are cited in the text and therefore also appear in the full bibliography which follows.

Journal papers

- M.E. Bastin, **J.D. Clayden**, A. Pattie, I.F. Gerrish, J.M. Wardlaw & I.J. Deary (in press). Diffusion tensor and magnetization transfer MRI measurements of periventricular white matter hyperintensities in old age. To appear in *Neurobiology of Aging*.

- **J.D. Clayden**, A.J. Storkey & M.E. Bastin (2007). A probabilistic model-based approach to consistent white matter tract segmentation. *IEEE Transactions on Medical Imaging* **26**(11):1555–1561.

- **J.D. Clayden**, M.E. Bastin & A.J. Storkey (2006). Improved segmentation reproducibility in group tractography using a quantitative tract similarity measure. *NeuroImage* **33**(2):482–492.

- I.J. Deary, M.E. Bastin, A. Pattie, **J.D. Clayden**, L.J. Whalley, J.M. Starr & J.M. Wardlaw (2006). White matter integrity and cognition in childhood and old age. *Neurology* **66**(4):505–512.

Peer-reviewed conference abstracts

- **J.D. Clayden**, A.J. Storkey & M.E. Bastin (2007). A probabilistic model-based approach to consistent white matter tract segmentation. In *Proceedings of the ISMRM-ESMRMB Joint Annual Meeting*, p. 78.

- **J.D. Clayden**, S. Zhang, S. Correia & D.H. Laidlaw (2007). Fine-grained comparison of anisotropy differences between groups of white matter tracts. In *Proceedings of the ISMRM-ESMRMB Joint Annual Meeting*, p. 82.

- M.E. Bastin, **J.D. Clayden**, A. Pattie, I.F. Gerrish, J.M. Wardlaw & I.J. Deary (2007). DTI and MTI parameters correlate in periventricular white matter hyperintensities in old age. In *Proceedings of the ISMRM-ESMRMB Joint Annual Meeting*, p. 2160.

- **J.D. Clayden**, M.E. Bastin & A.J. Storkey (2006). Neighbourhood tractography: a new approach to seed point placement for group fibre tracking. In *Proceedings of the British Chapter of the ISMRM*, p. P34.

- **J.D. Clayden**, M.E. Bastin & A.J. Storkey (2006). Automated assessment of tract similarity in group diffusion MRI data. In *Proceedings of the ISMRM 14th Scientific Meeting & Exhibition*, p. 2742.

- **J.D. Clayden**, D.K.S. Marjoram, M.E. Bastin, E.C. Johnstone & S.M. Lawrie (2005). Towards an automated method for white matter integrity comparison between populations. In *Proceedings of the ESMRMB 22nd Annual Meeting*, p. 508.

- I.J. Deary, M.E. Bastin, A. Pattie, **J.D. Clayden** & J.M. Wardlaw (2005). Cognitive ageing and white matter integrity: a diffusion tensor and magnetisation transfer MRI study. In *Proceedings of the ISMRM 13th Scientific Meeting & Exhibition*.

- I.J. Deary, M.E. Bastin, A. Pattie, **J.D. Clayden**, J.M. Starr & J.M. Wardlaw (2005). White matter integrity and cognition in childhood and old age: a diffusion tensor MRI study. *Methods for Quantitative MRI of Human Brain*. ISMRM Workshop, Lake Louise, Canada.

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