Vertical white matter tracts cluster with ventral stream tracts in development

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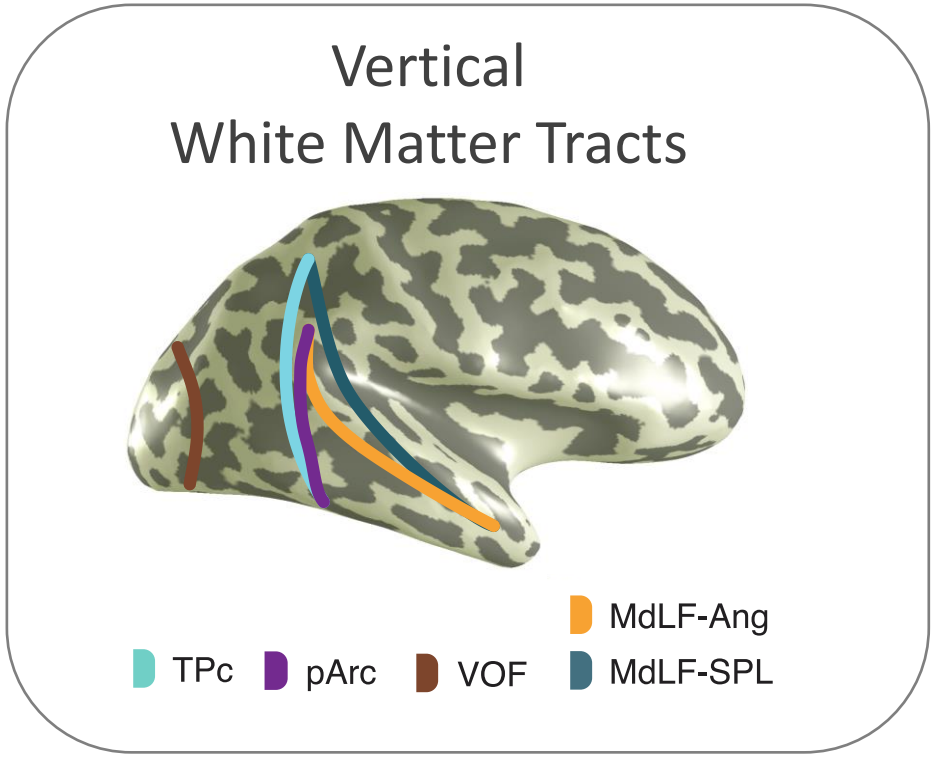
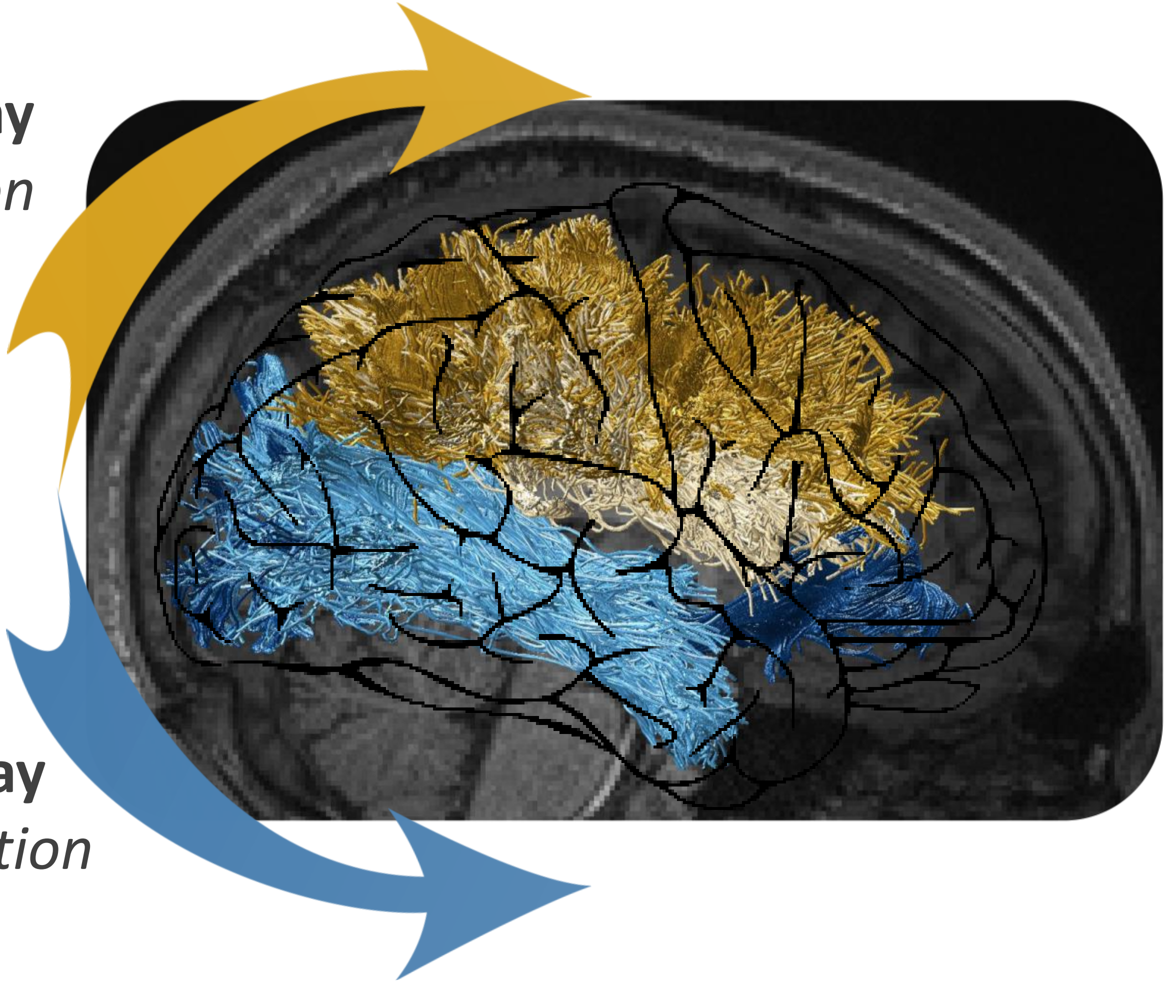


Two visual streams

Dorsal Pathway
vision for action



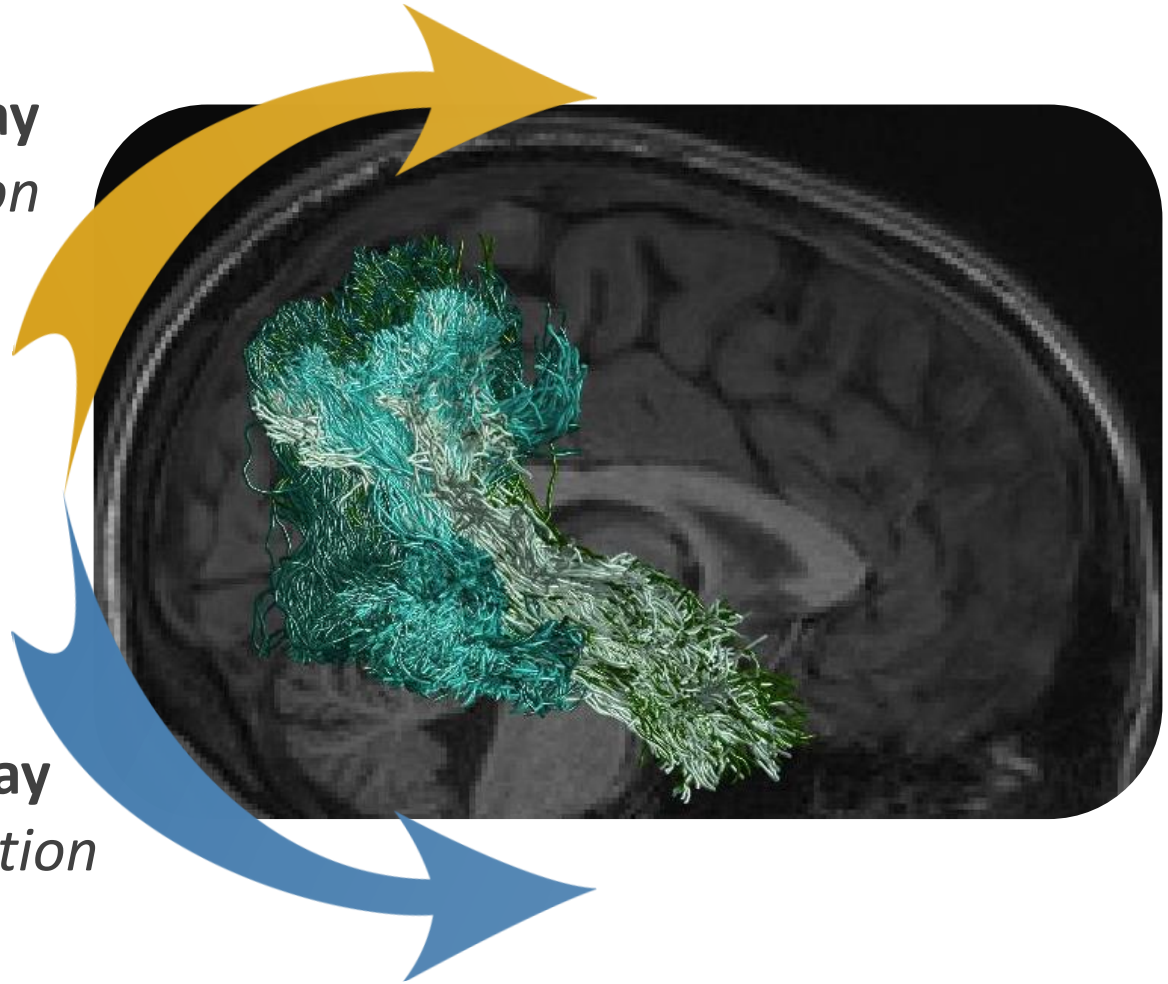
Ventral Pathway
vision for perception

Ungerleider & Mishkin, *Behav Brain Res*, 1982
Milner & Goodale, *Trends Neurosci*, 1995
Rizzolatti & Matelli, *Exp Brain Res*, 2003

Lebel, Walker, Leemans, Phillips, & Beaulieu, *NeuroImage*, 2008
Loenneker, …, & Martin, *NeuroImage*, 2011
Stiles, Akshoomoff, & Haist, *Neural Circuit Dev*, 2013

Hypothesis: Microstructure of the vertical pathway develops early with the ventral pathway.

Dorsal Pathway
vision for action



Ventral Pathway
vision for perception

Children
(4.5 – 8.5 years, n = 24)

Adults
(18 – 22 years, n = 12)

Bullock, … & Pestilli, *Brain Struct Funct*, 2019
Weiner, Yeatman, & Wandell, *Cortex*, 2017
Catani, Jones, & Ffytche, *Ann Neurol,* 2005

Application	Github repository	Open Service DOI
HCP AC-PC Alignment	https://github.com/brain-life/app-hcp-acpc-alignment	https://doi.org/10.25663/bl.app.99
Freesurfer Segmentation	https://github.com/brainlife/app-freesurfer	https://doi.org/10.25663/bl.app.0
Distortion and motion Correction	https://brainlife.io/app/5e6e72838a20890d8a8e96af	https://doi.org/10.25663/brainlife.app.287
dMRI Preprocessing	https://github.com/brain-life/app-mrtrix3-preproc	https://doi.org/10.25663/bl.app.68
Tractography	https://github.com/brain-life/app-mrtrix3-act	https://doi.org/10.25663/bl.app.101
Tract Segmentation	https://github.com/brainlife/app-wmaSeg	https://doi.org/10.25663/brainlife.app.188
Tract Cleaning	https://github.com/brainlife/app-removeTractOutliers	https://doi.org/10.25663/brainlife.app.195
Tract Analysis Profiles	https://github.com/brain-life/app-tractanalysisprofiles	https://doi.org/10.25663/brainlife.app.185
Tract Statistics	https://github.com/brainlife/app-tractographyQualityCheck	https://doi.org/10.25663/brainlife.app.189

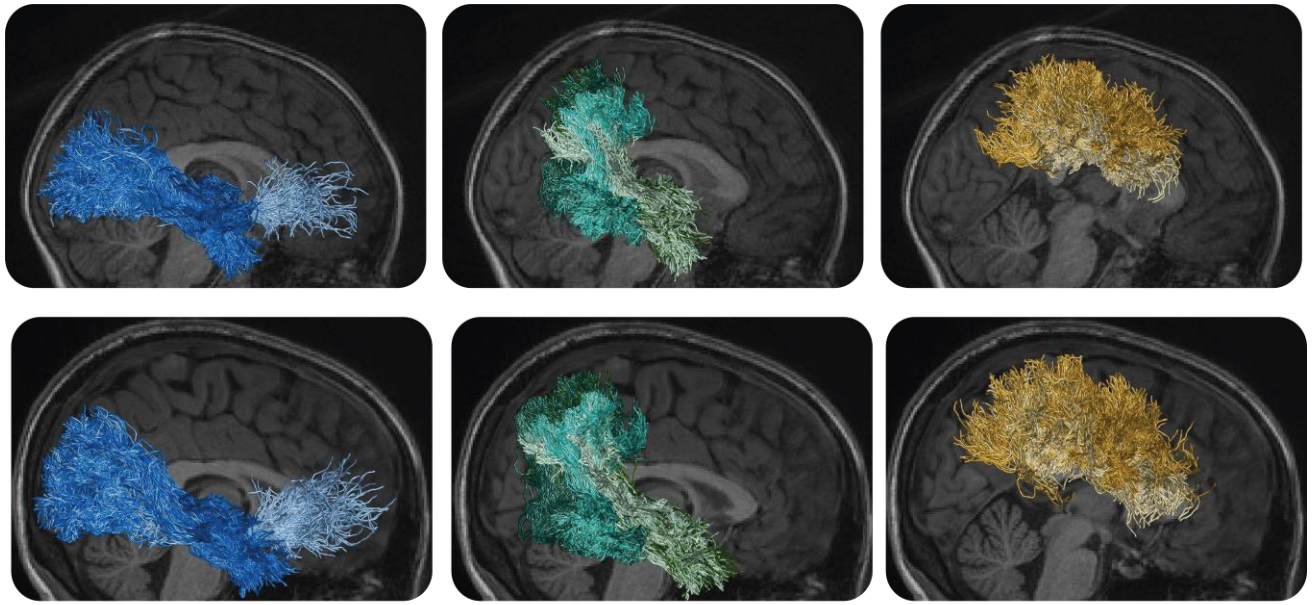
Brain Life

Life is a verb.

View on GitHub

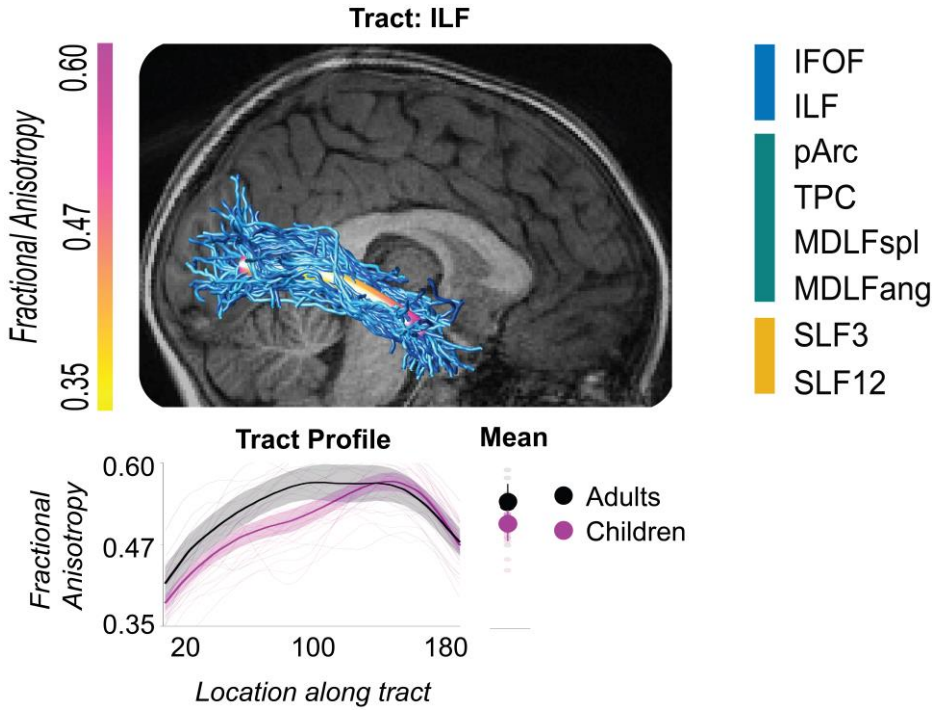
Diffusion Tractography

Ventral *Vertical* *Dorsal*



ILF
IFOF
TPC
pArc
MDLFang
MDLFspl
SLF1and2
SLF3

Tract Profiles Analysis

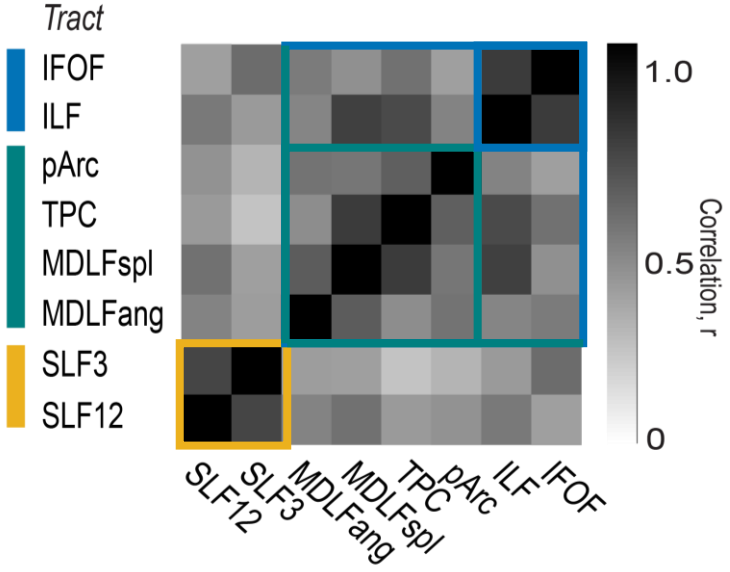


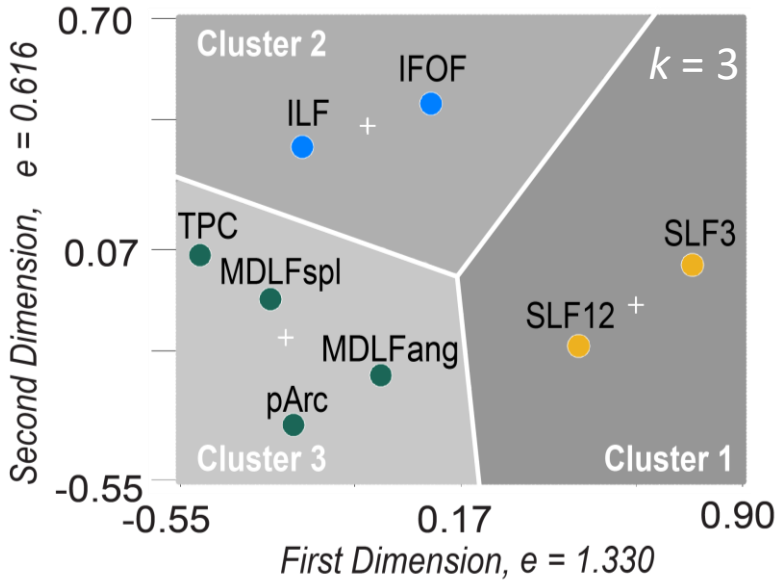
Pairwise correlations among tracts.

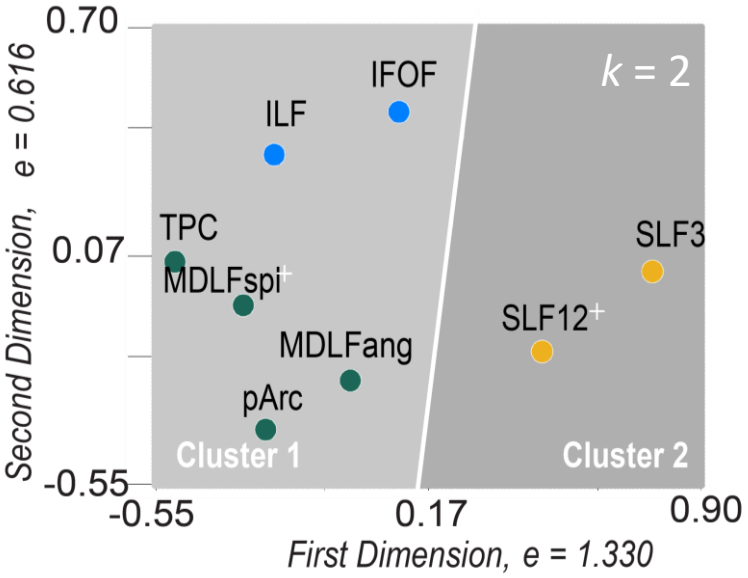
Tracts clustered into pathways.

Vertical tracts clustered with ventral tracts.

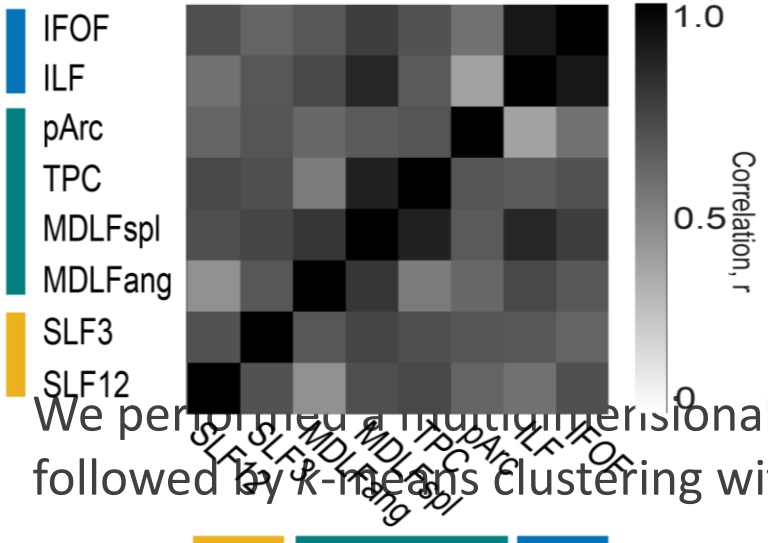
Children

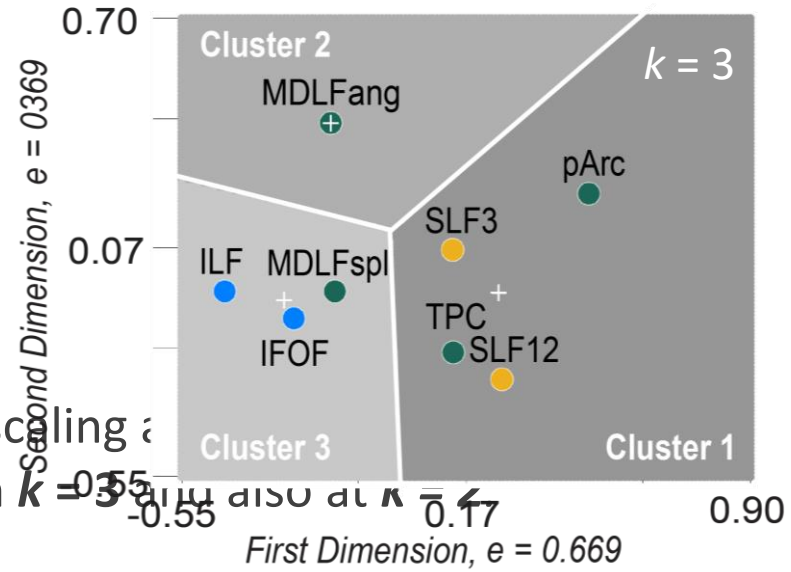


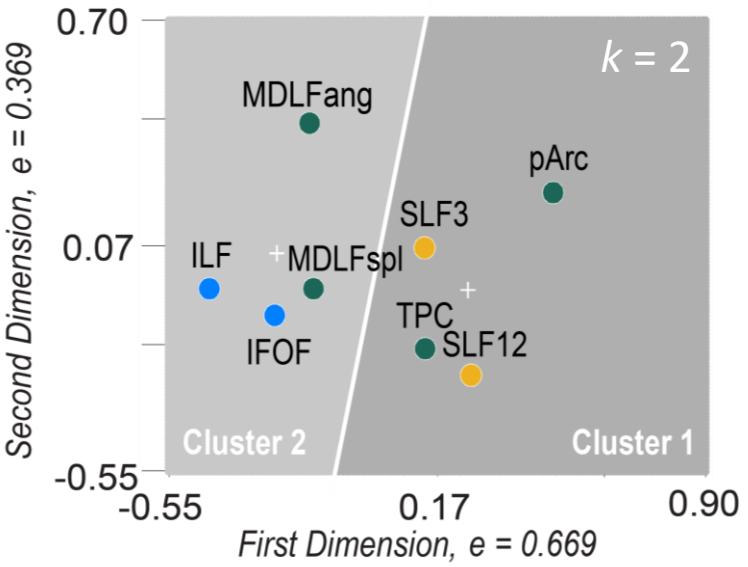




Adults







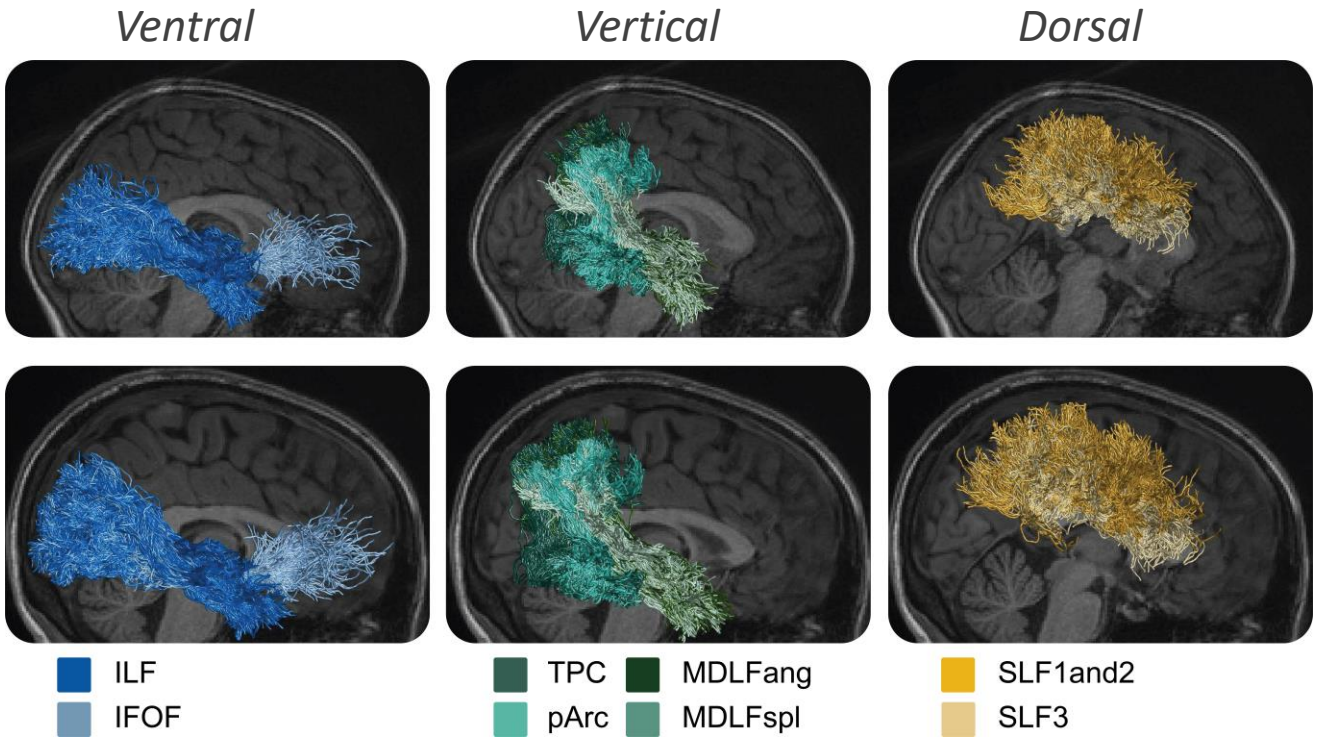
We performed a multidimensional scaling a
followed by k-means clustering with $k = 3$ and also at $k = 4$

Summary & Discussion

Tracts clustered into ventral, vertical, and dorsal pathways.

Vertical tracts clustered with ventral tracts.

… in childhood, but not in adulthood.



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