

FNGS Pipeline Sprint 1

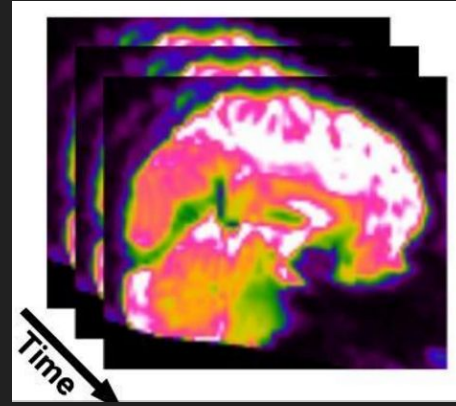
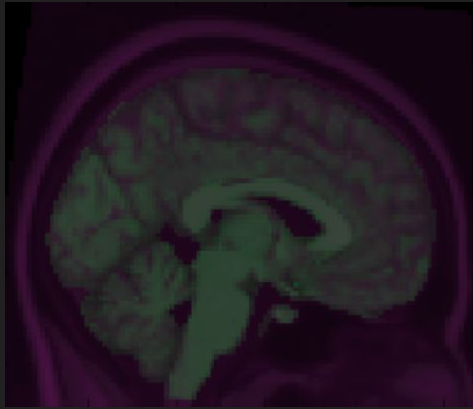
Eric Bridgeford

Mission

To accelerate macroscale connectomics research by providing a cloud-deployable pipeline tool designed for the mega-acquisition of human connectomes

Macroscale connectomics provide favorable resolution for large-scale brain analysis

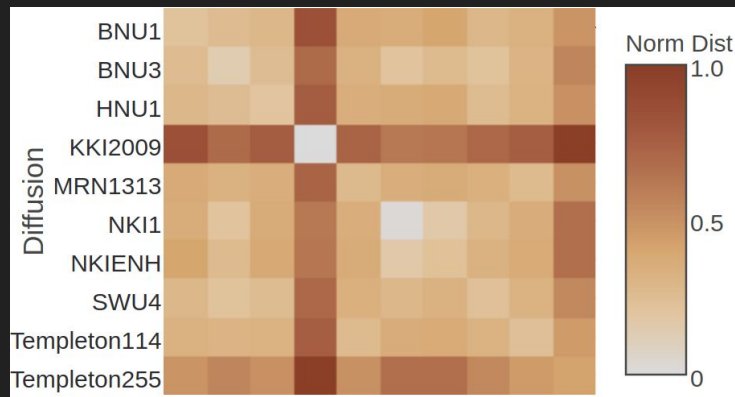
- M3r imaging enables user spatial + temporal (functional MRI, fMRI) or spatial + structural (diffusion weighted imaging, DWI) brain insights
- Connectome provides favorable mathematical representation (graph) of the relevant properties for a given modality for downstream inference tasks



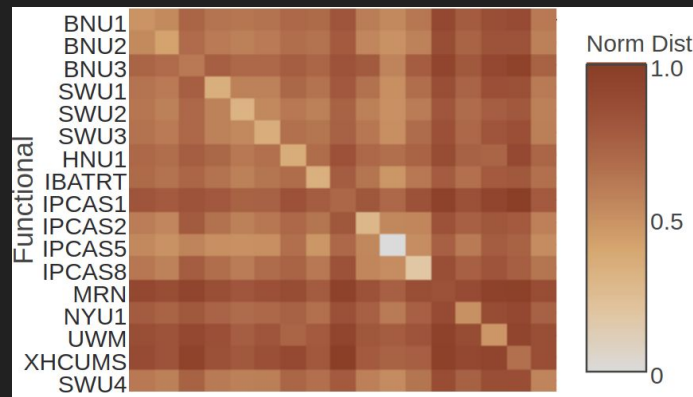
Macroscale Connectomics Requires Large Sample Size

- It has been shown that macroscale connectomics require sufficiently large and diverse samples to make accurate inferences from m3r data
- The degree of compute intensive preprocessing required to acquire sufficiently rich connectome data proves a barrier to entry for large-scale meganalysis

DWI Batch Effect



fMRI Batch Effect

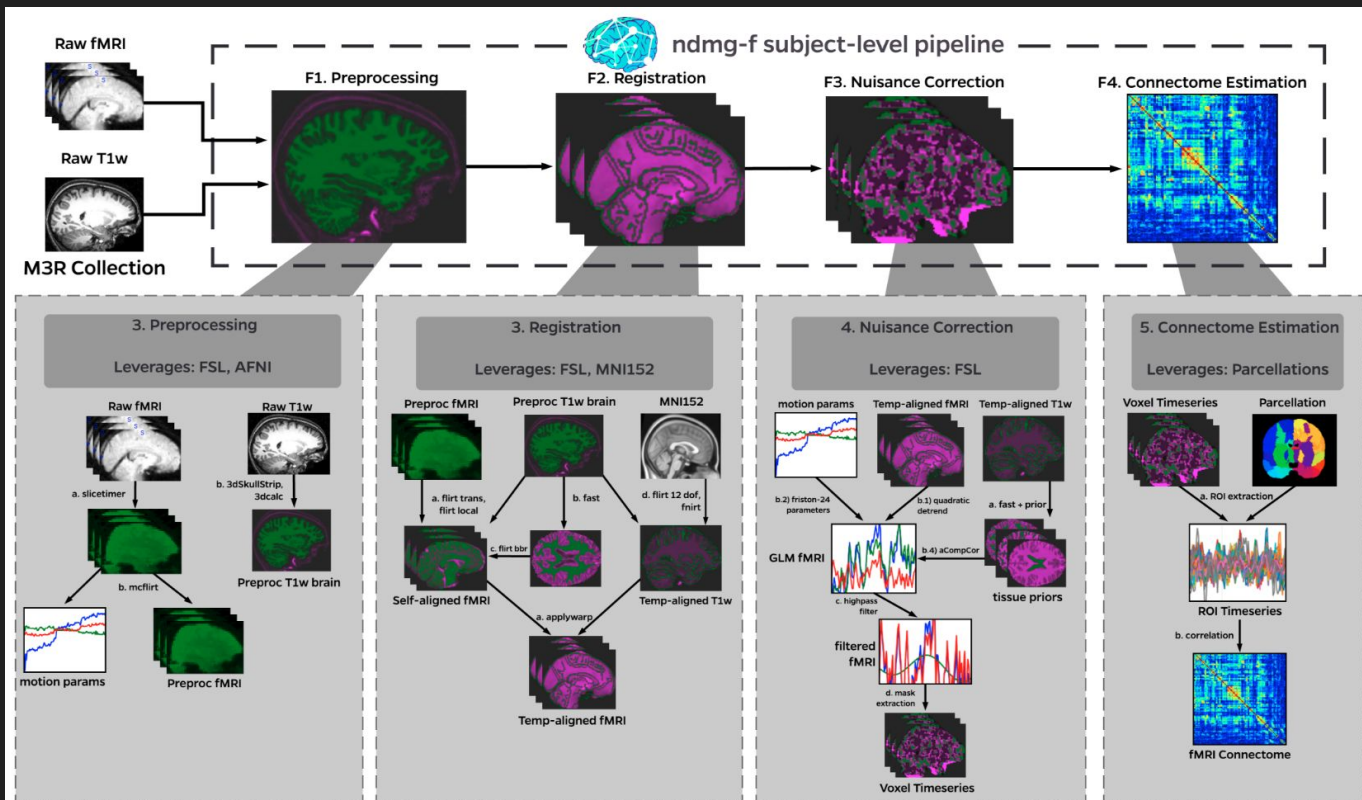


Existing Pipelines Fail to Meet Pipeline Desiderata

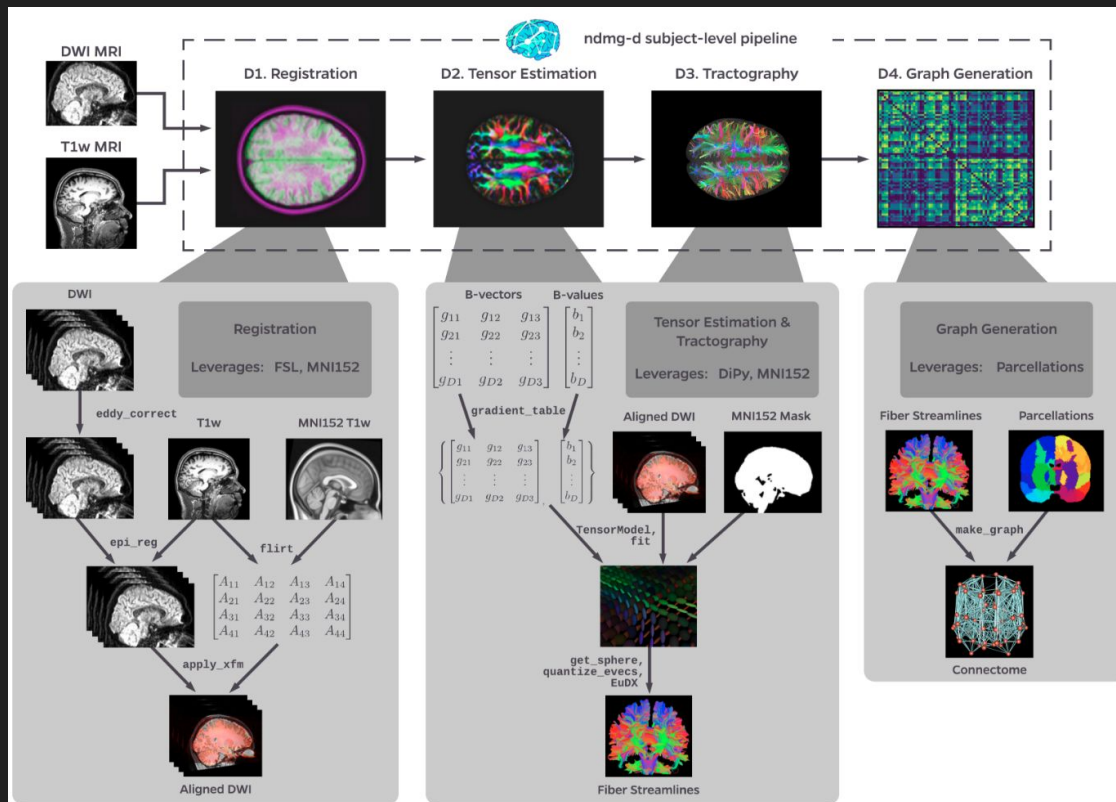
pipeline	accurate	reliable		robust	expedient	scalable				portable			turn-key	open	
		TRT	ICC			b	e	m	c	dc	sc	vdi		os	d
NDMG-D	✓	0.98	–	10	O(1 hr)	✓	–	✓	–	✓	✓	–	✓	✓	✓
NDMG-F	✓	0.88	–	18	O(1 hr)	✓	–	✓	–	✓	–	–	✓	✓	✓
CPAC	✓	0.88*	–	18	O(1 hr)	✓	✓	✓	✓	✓	✓	–	–	✓	✓
fmriprip	✓	–	–	?	O(1 day)	✓	✓	–	✓	✓	✓	–	✓	✓	✓
PANDA	✓	–	–	–	O(1 day)	–	–	✓	✓	–	–	✓	?	?	?
mindboggle	✓	–	–	1	?	–	–	–	–	✓	–	–	✓	✓	✓
HCP	✓	–	–	✓	–	–	–	–	–	–	–	–	–	✓	✓
Pipeline															
NIAK	✓	–	0.46	1	?	–	–	–	–	✓	–	–	–	–	✓

- Existing pipelines fail in 1 or more desiderata categories: accurate, reliable, robust, expedient, scalable, portable, turn-key, or openness

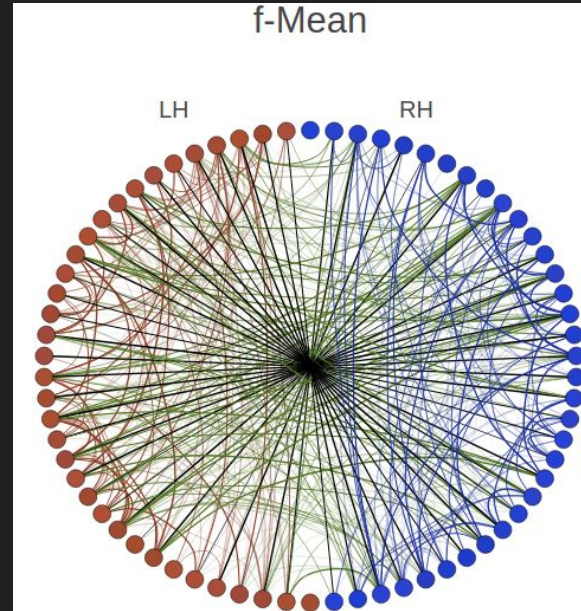
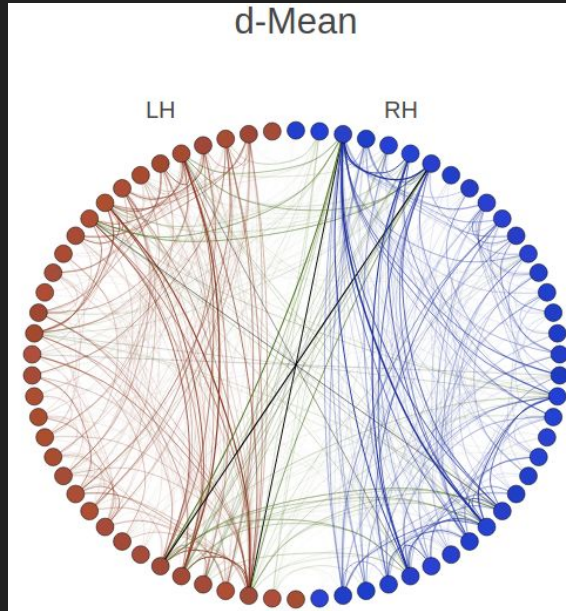
The NDMG Pipeline Enables the Acquisition of fMRI connectomes



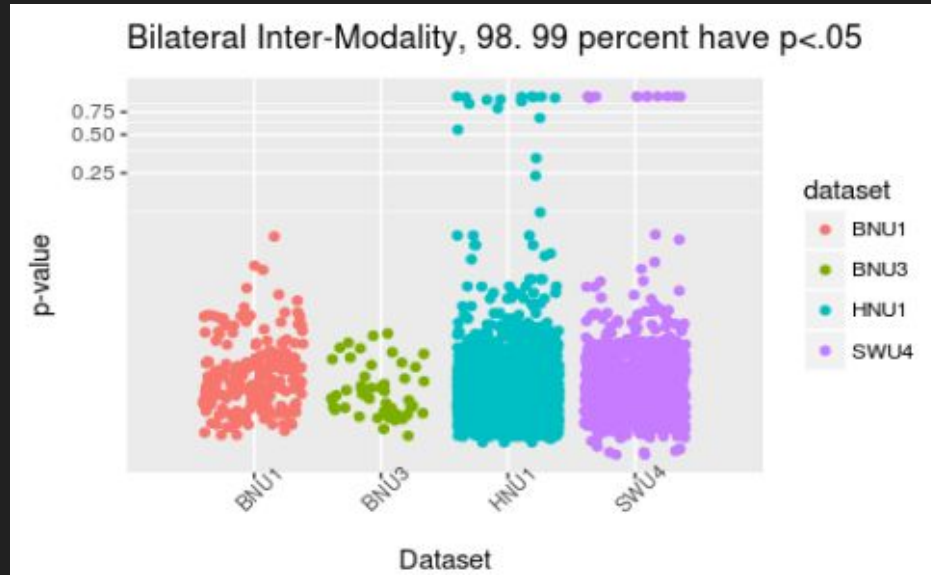
The NDMG Pipeline Enables the Acquisition of DWI connectomes



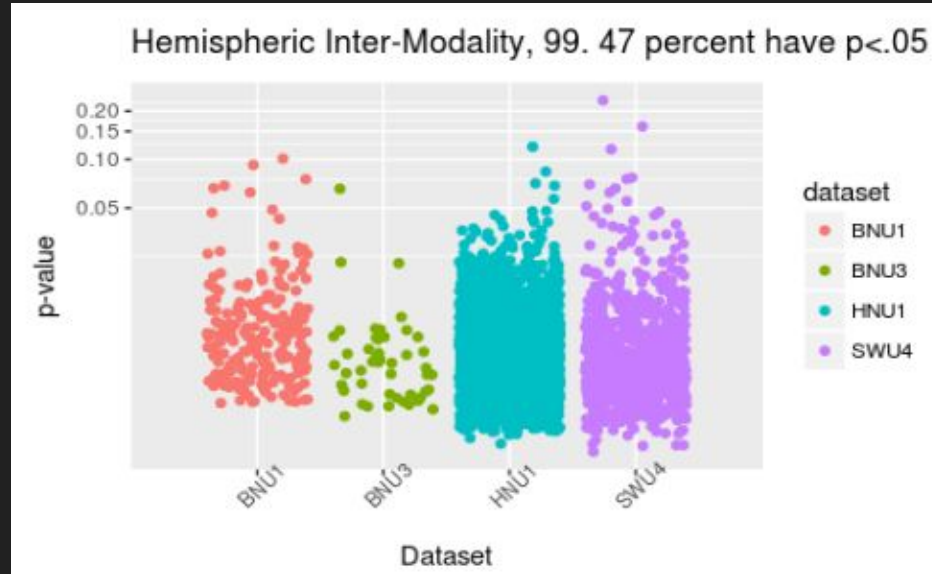
Meganalysis enables users to make inferences at the population level



fMRI Connectomes show a greater difference in connectivity bilaterally vs non-bilaterally than DWI connectomes



DWI Connectomes show a greater difference in connectivity ipsi-laterally vs contra-laterally than fMRI connectomes



We are progressing as planned

Sprint	Date Due	Requirements
Sprint 1: NDMG Preliminary Meganalysis	11/6	<ul style="list-style-type: none">• Tie NDMG-f and NDMG-d together into m3r-release: deliverable is a github branch/docker container with both modalities, and a demo for each modality• Identify differences in connectivity ipsi-laterally vs. contra-laterally in fMRI and DWI: deliverable is a RMarkdown containing algorithms.md for the investigation• Identify differences in connectivity bulaterally vs. non-bilaterally in fMRI and DWI: deliverable is a RMarkdown containing algorithms.md for the investigation
Sprint 2: Parametric Investigations of Batch Effects	12/15	<ul style="list-style-type: none">• Use GTheory to investigate Batch Effects of connectome Data: Deliverable is an RMarkdown containing algorithms.md for GTheory on connectome data• Use Mixed-Effects Modelling to investigate Batch Effects of connectome Data: Deliverable is an RMarkdown containing algorithms.md for mixed-effects modelling on connectome data• MGC package updated: nature checklist, vignettes for each function, and travis-ci tests for MGC package