# FNGS Pipeline Sprint 1

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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
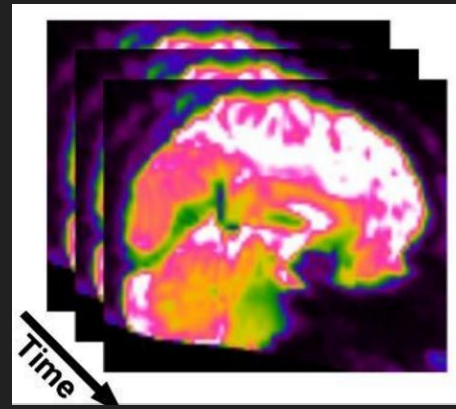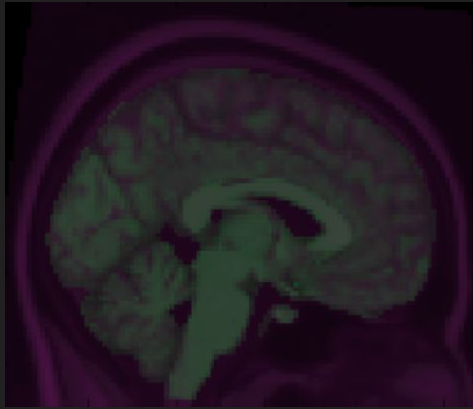
Macroscale Connectomics Requires Large Sample Size

- 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
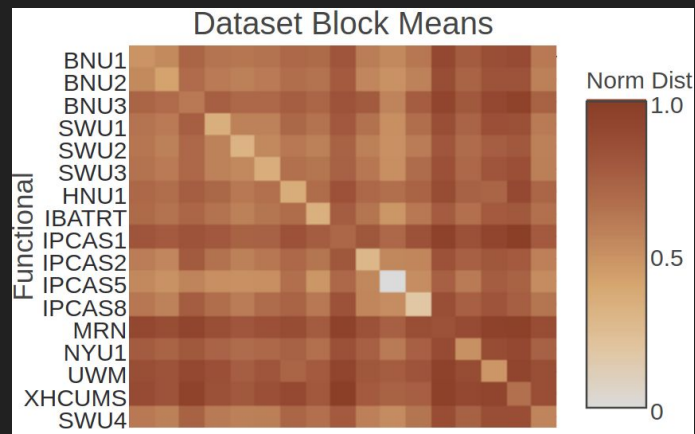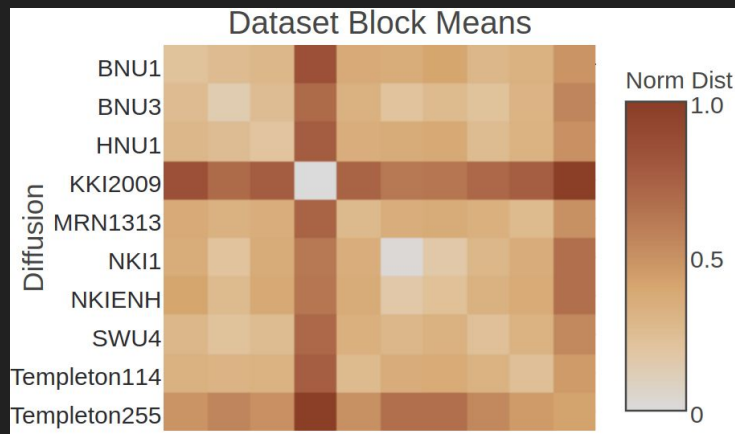
# Existing Pipelines Fail to Meet Pipeline Desiderata

| pipeline | accurate | reliable | | robust | expedient | scalable | | | | portable | | | | open | |
		TRT	ICC			b	e	m	c	dc	sc	vdi	turn-key	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)	✓	✓	✓	✓	✓	✓	–	–	✓	✓
fmriprep	✓	–	–	?	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
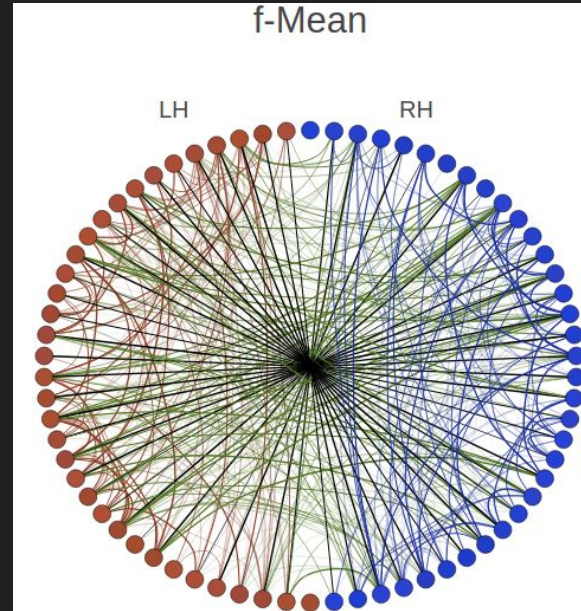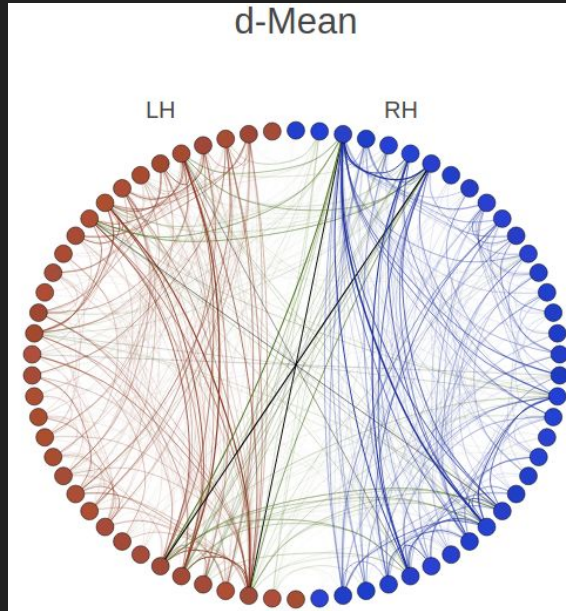
The NDMG Pipeline Enables the Acquisition of fMRI connectomes
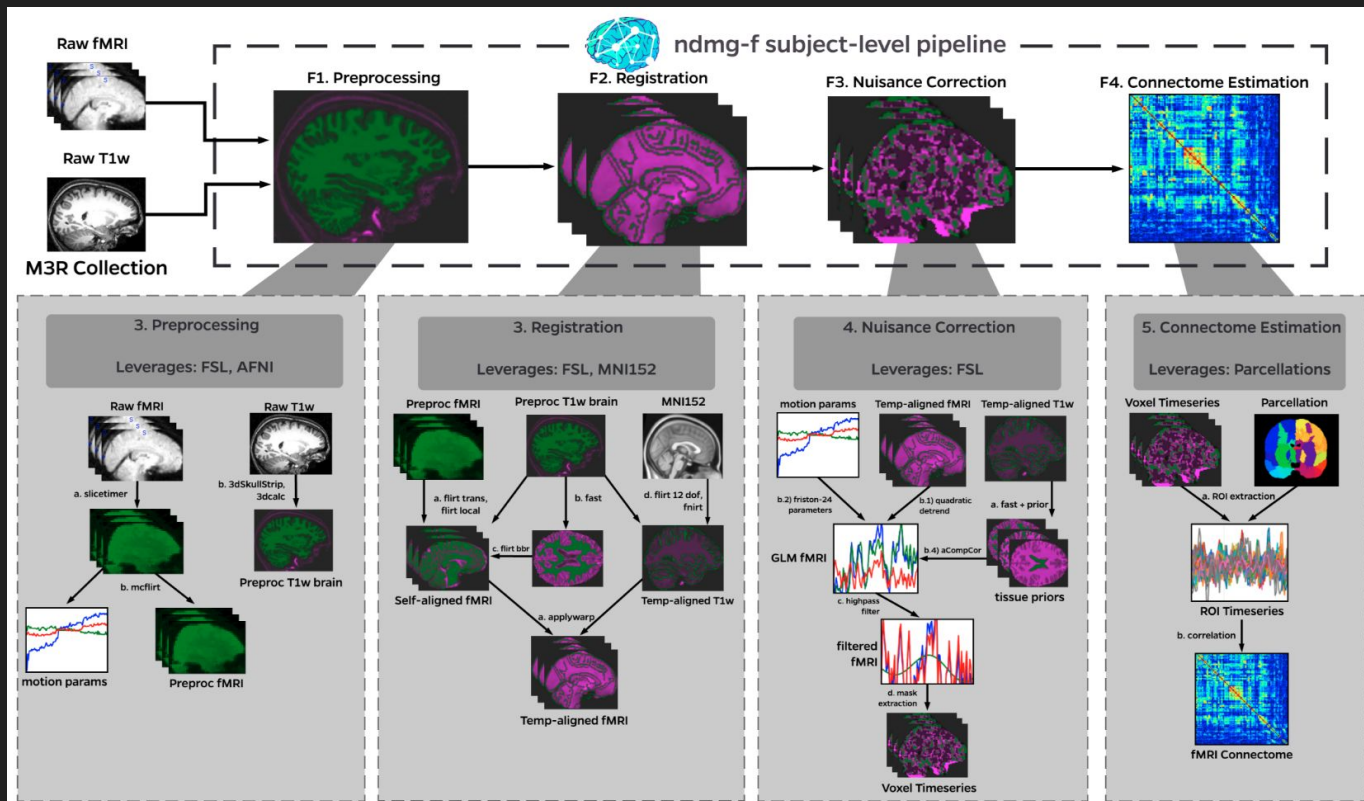
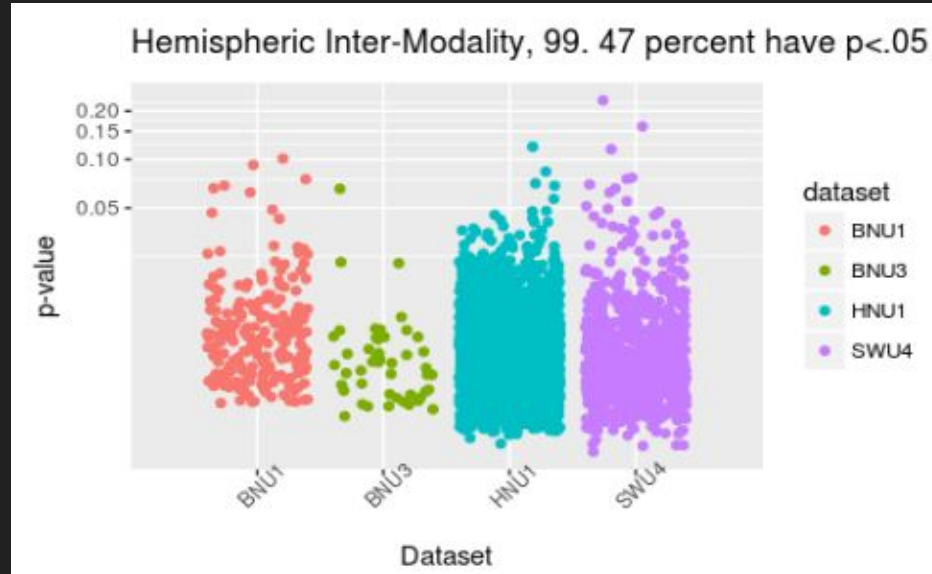# The NDMG Pipeline Enables the Acquisition of DWI connectomes
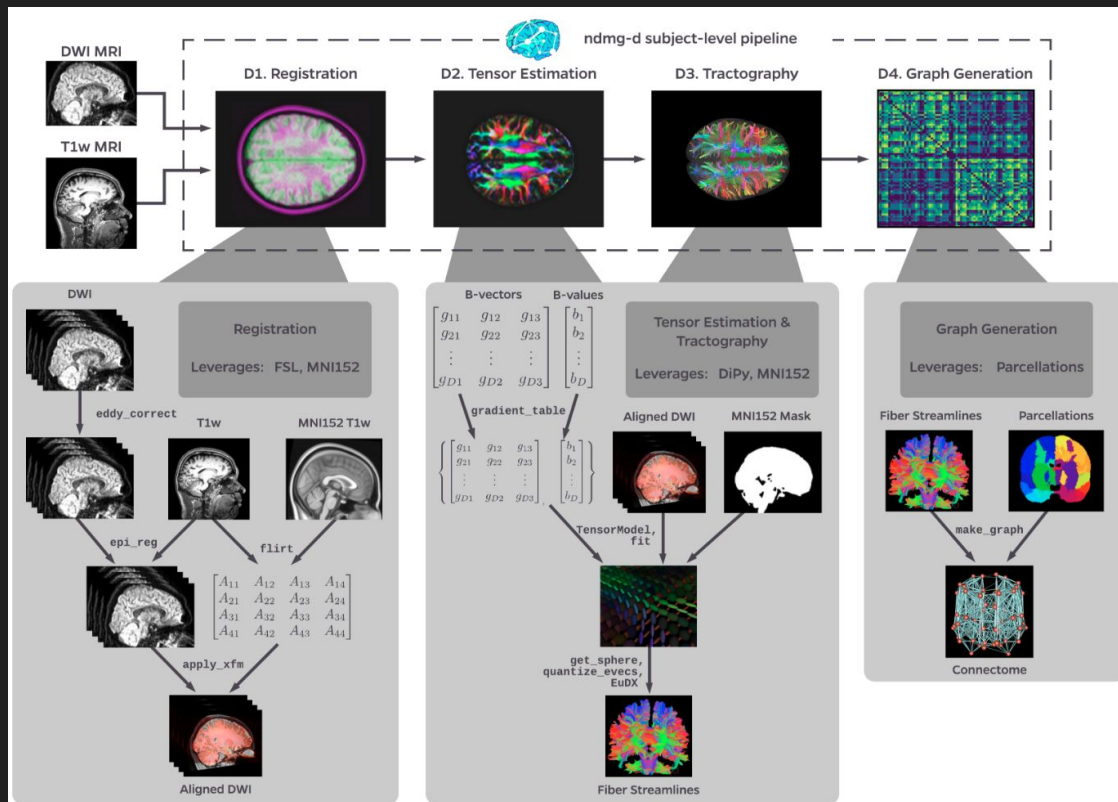
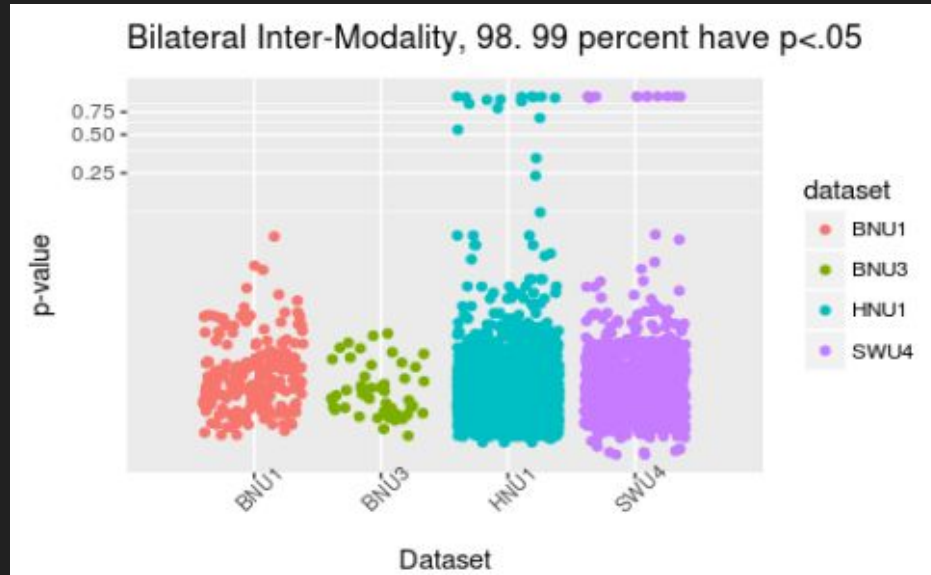# Meganalysis enables users to make inferences at the population level

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

Hemispheric Inter-Modality, 99. 47 percent have p<.05

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

Bilateral Inter-Modality, 98. 99 percent have p<.05

We are progressing as planned

Sprint	Date Due	Requirements
Sprint 1: NDMG Preliminary Meganalysis	11/6	• 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	• 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