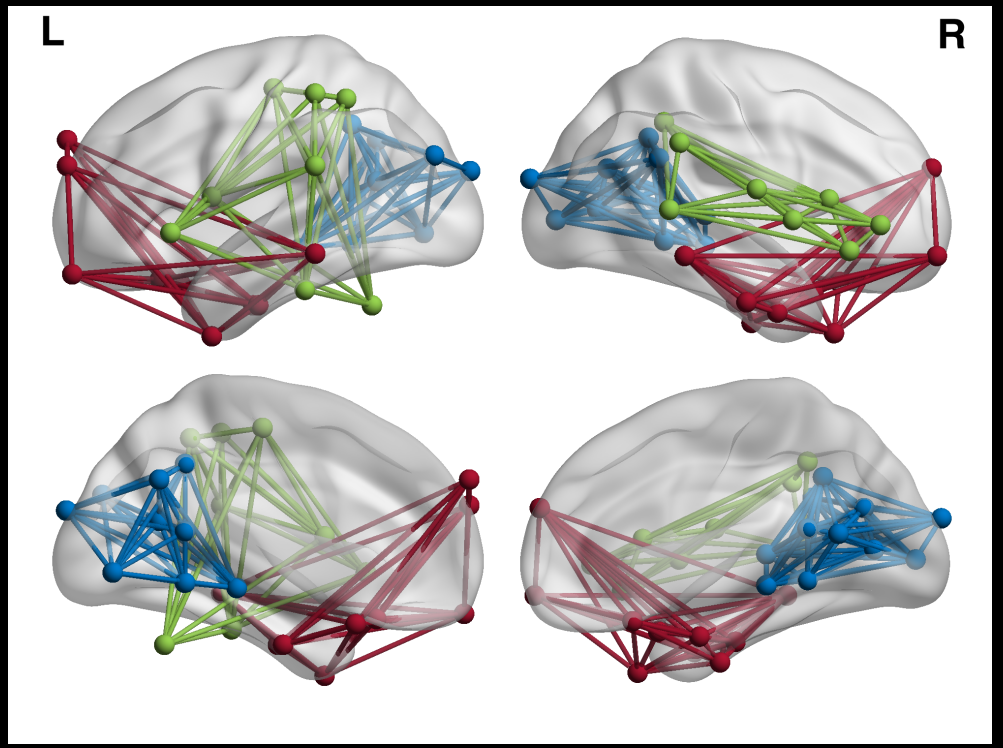
Full stream functional connectivity analyses with xcpEngine (eXtensible Connectivity Pipeline)

Example: a functional system we're interested in …
posterior-medial anterior-temporal (PMAT)

Posterior-medial (PM)
- Contextual detail
- Recollection
- Relational binding

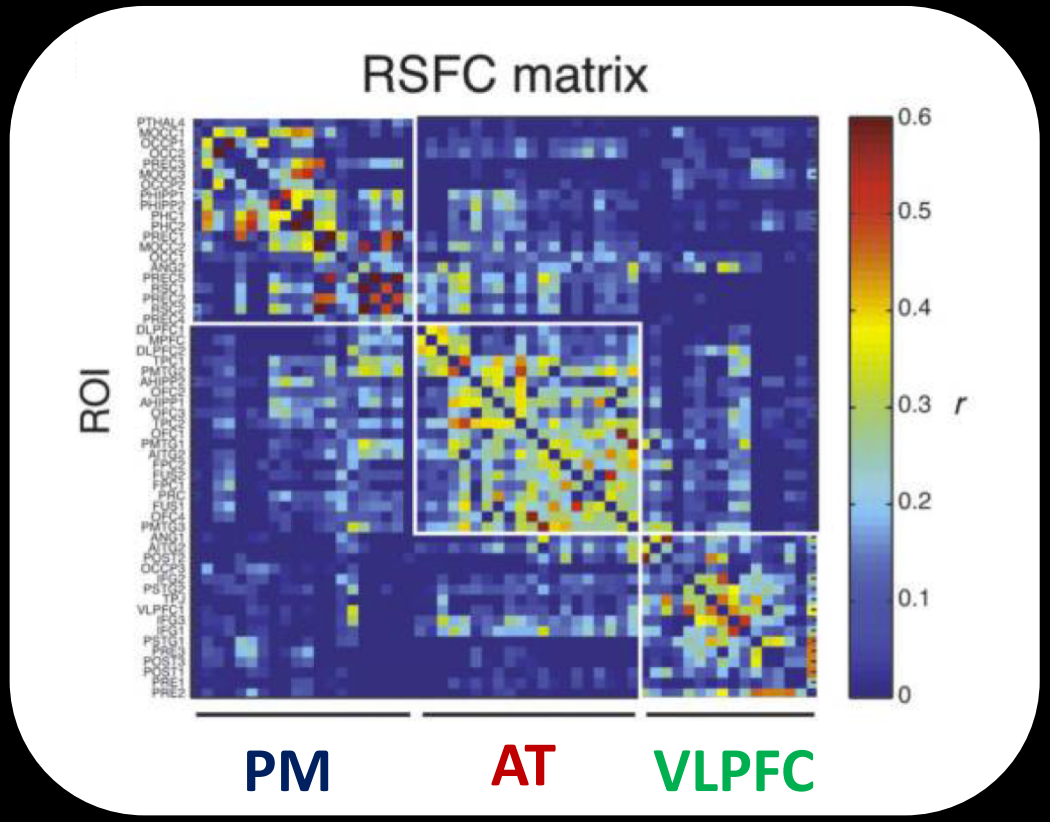


Ventrolateral PFC
- Reorienting, updating
- Working memory (non-verbal)

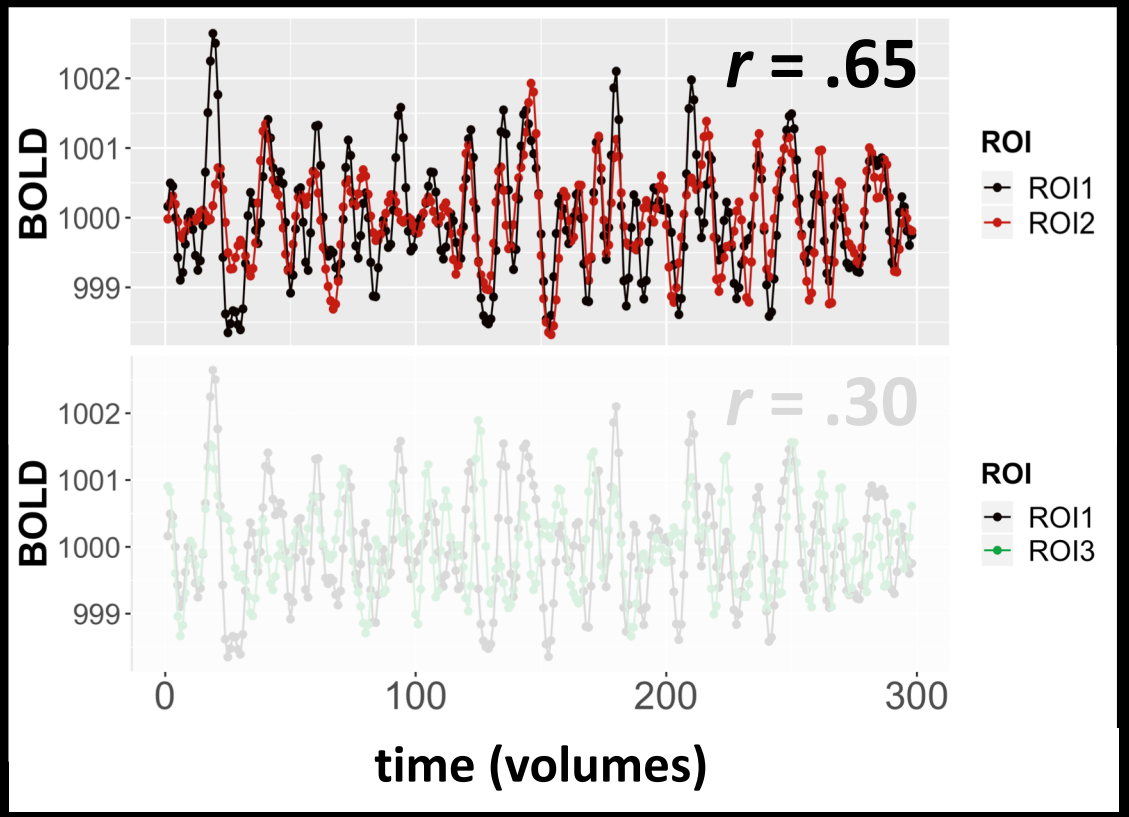
Anterior-temporal (AT)
- Item discrimination
- Semantic concepts

Ranganath & Ritchey, 2012; Libby et al., 2012; Ritchey et al., 2014

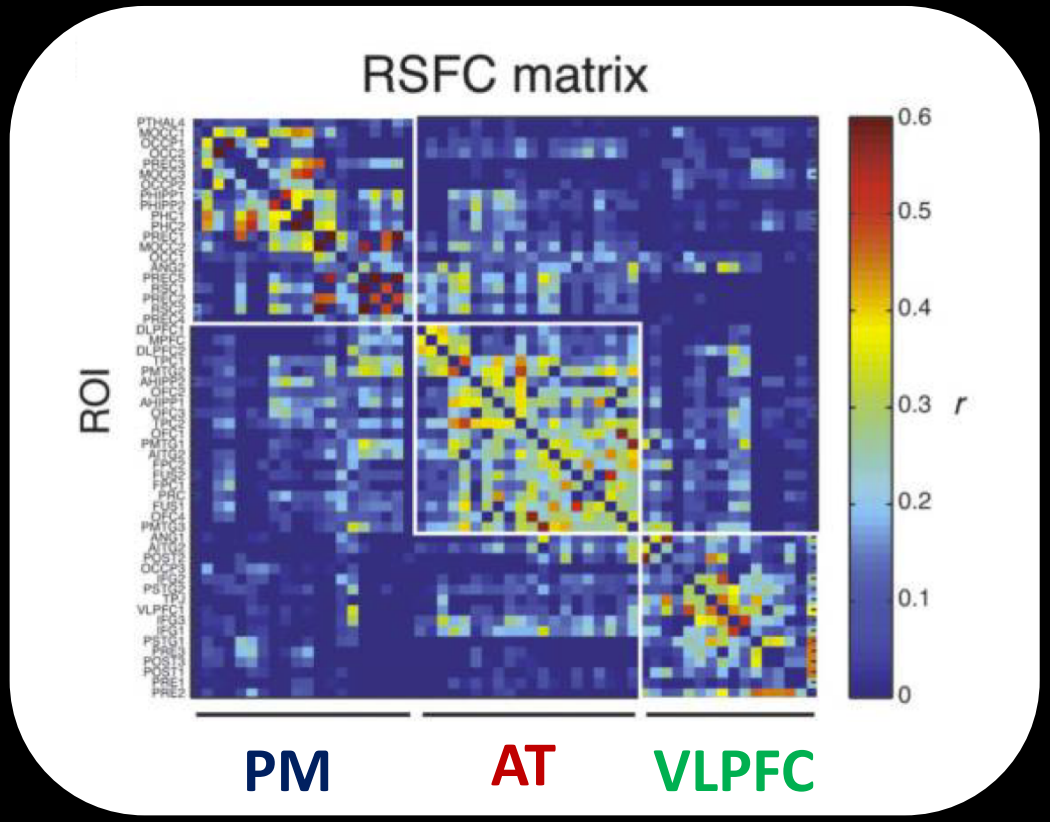
Resting state fMRI
detectable during the resting state



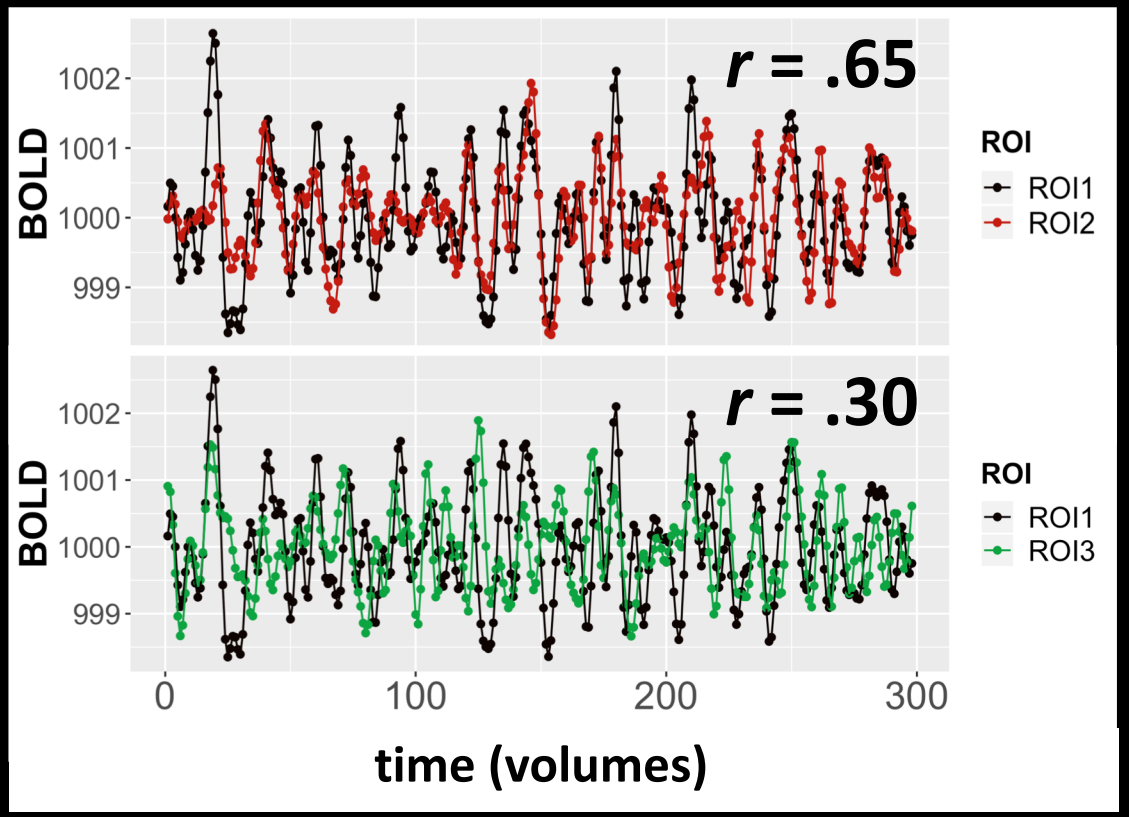
Ritchey et al., 2014



Resting state fMRI
detectable during the resting state

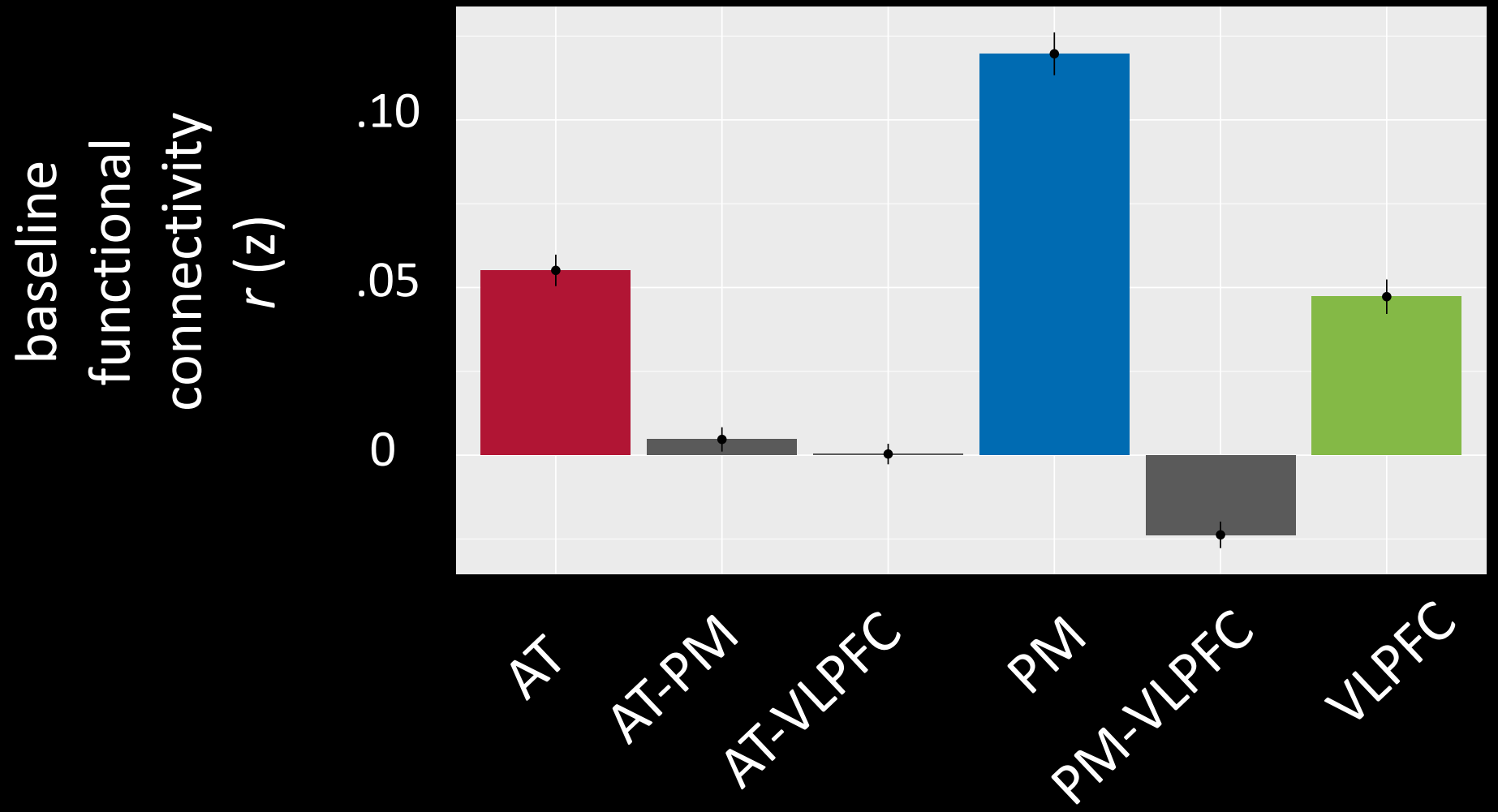


Ritchey et al., 2014



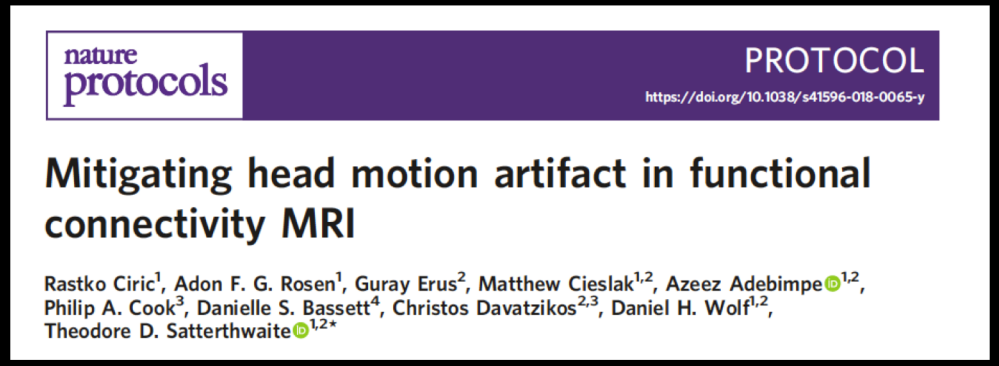
Resting state fMRI

PMAT structure in cognitively normal older adults



Voss et al., accepted

(eXtensible Connectivity Pipeline)



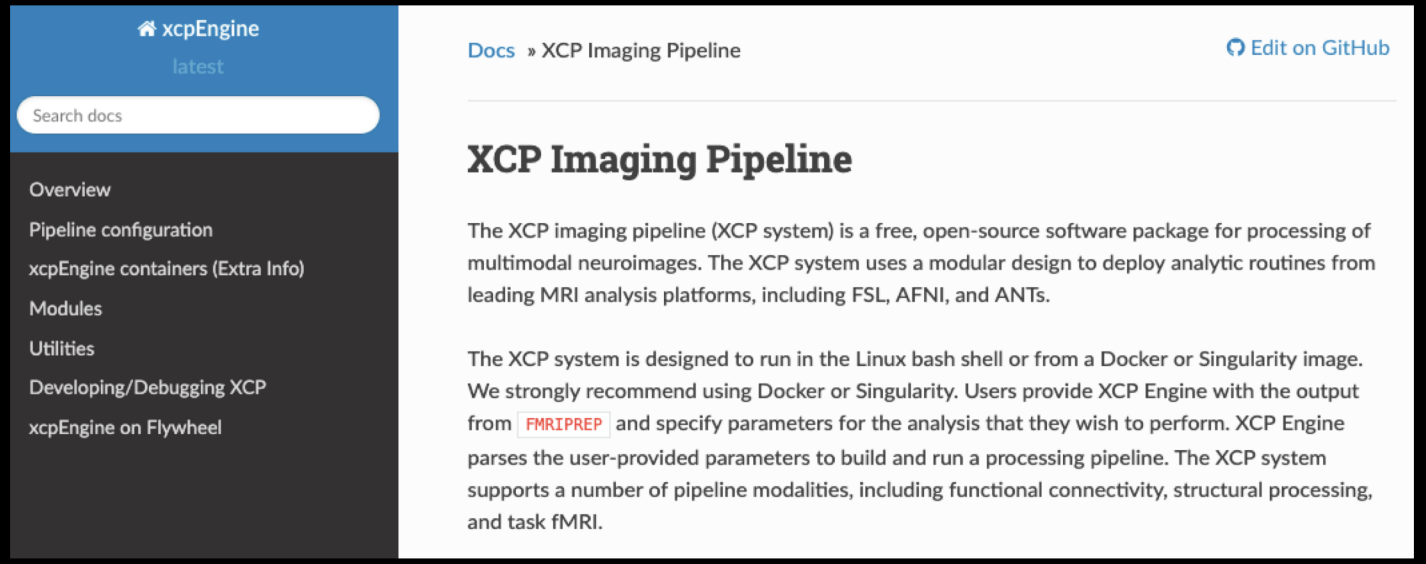
nature protocols

PROTOCOL

https://doi.org/10.1038/s41596-018-0065-y

Mitigating head motion artifact in functional connectivity MRI

Rastko Ciric[1], Adon F. G. Rosen[1], Guray Erus[2], Matthew Cieslak[1,2], Azeez Adebimpe[1,2], Philip A. Cook[3], Danielle S. Bassett[4], Christos Davatzikos[2,3], Daniel H. Wolf[1,2], Theodore D. Satterthwaite[1,2*]



xcpEngine

latest

Search docs

Overview

Pipeline configuration

xcpEngine containers (Extra Info)

Modules

Utilities

Developing/Debugging XCP

xcpEngine on Flywheel

Docs » XCP Imaging Pipeline

Edit on GitHub

XCP Imaging Pipeline

The XCP imaging pipeline (XCP system) is a free, open-source software package for processing of multimodal neuroimages. The XCP system uses a modular design to deploy analytic routines from leading MRI analysis platforms, including FSL, AFNI, and ANTs.

The XCP system is designed to run in the Linux bash shell or from a Docker or Singularity image. We strongly recommend using Docker or Singularity. Users provide XCP Engine with the output from `FMRIPREP` and specify parameters for the analysis that they wish to perform. XCP Engine parses the user-provided parameters to build and run a processing pipeline. The XCP system supports a number of pipeline modalities, including functional connectivity, structural processing, and task fMRI.

https://xcpengine.readthedocs.io/index.html

https://github.com/PennBBL/xcpEngine

Goals

- Learn how to run xcpEngine using Docker and/or Singularity
- Get familiar with output and critical QC checks
- Functional connectivity (*fc*)
  - Get to know output
  - Develop post-processing code in R to summarize *fc* output
    - Per individual
    - Compare denoising approaches
    - Compare parcellations
    - Run igraph to compute graph theory metrics and visualize modules
  - If time…
      - Learn how to add your own atlas of regions
      - Seed-based *fc* map