



# Evaluating regularized modeling methods for calculating functional connectivity



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## Background

- Functional MRI (fMRI) is used to non-invasively study the human brain.
- Functional connectome:** the statistical relationship between every pair of distinct brain regions.[1]
- cute little diagram
- jkfd;a
- this is space for a diagram
- The majority of the fMRI literature uses the Pearson Correlation between two brain regions to calculate the functional connectome.
  - Pearson Correlation connectomes are theoretically, psychometrically, and empirically flawed.
- We investigate using regularized models as alternatives to Pearson Correlations.

Do functional connectomes calculated with regularized methods overcome the drawbacks of Pearson connectomes?

## Methods

- Data:** Human Connectome Project - Openly available, high quality MRI dataset of 1,000+ “healthy” young adults.
- Current analyses use 100 randomly selected participants as discovery dataset.
- Statistics:** calculated connectomes using three methods: Pearson Correlation, LASSO regularization, and Union of Intersections (UoI) regularization framework.
- UoI:** UoI uses a two step ensemble process to perform model estimation and selection to fit sparse, stable, and accurate models [2]

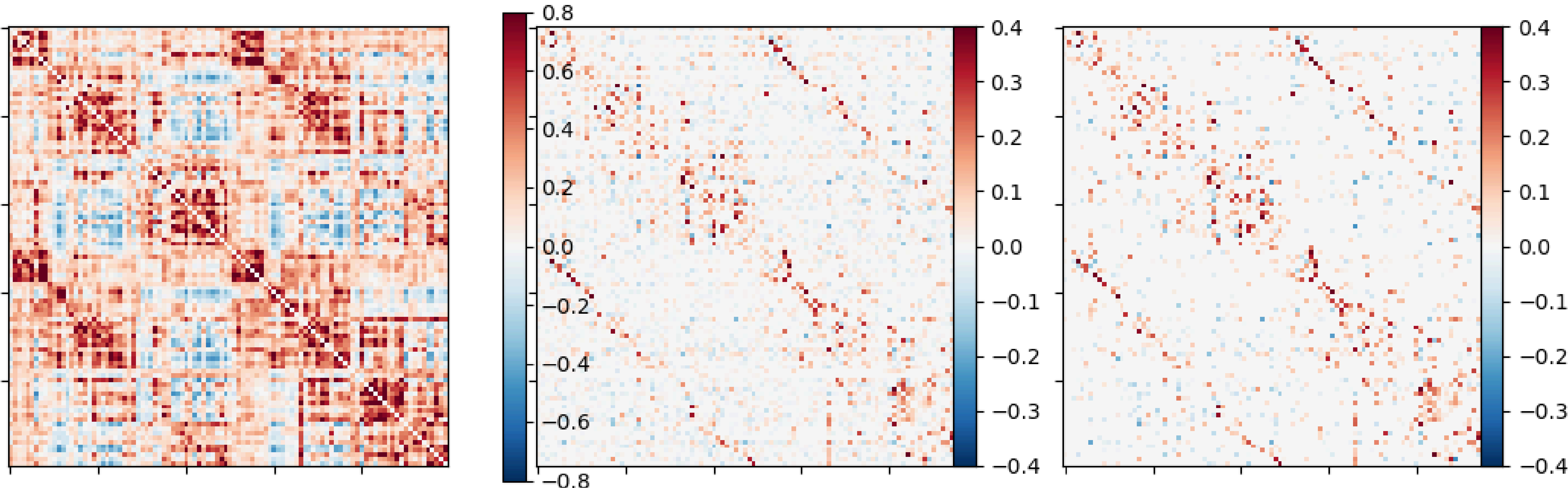
Connectomes evaluated using characteristics desirable for empirical analyses using functional connectomes: sparsity, reliability, correlation with motion (“qcfc”), and identifiability (“fingerprinting”).

## Data Management

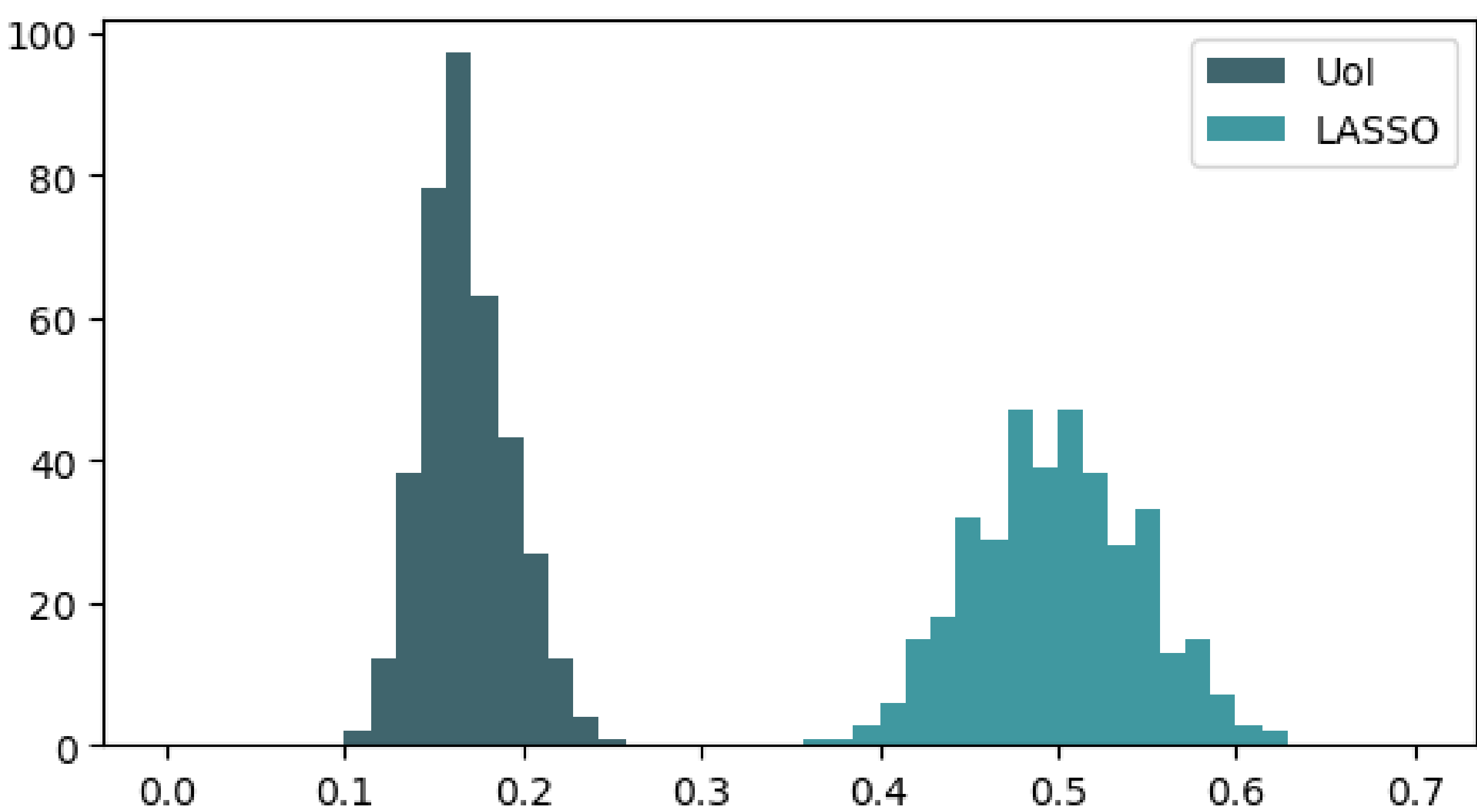
Inconsistent file naming and directory organization can impede data sharing. Enter: the Brain Imaging Data Structure specification.

Neuroimaging data is large, which can cause issues even with high performance computing. - Datalad enables

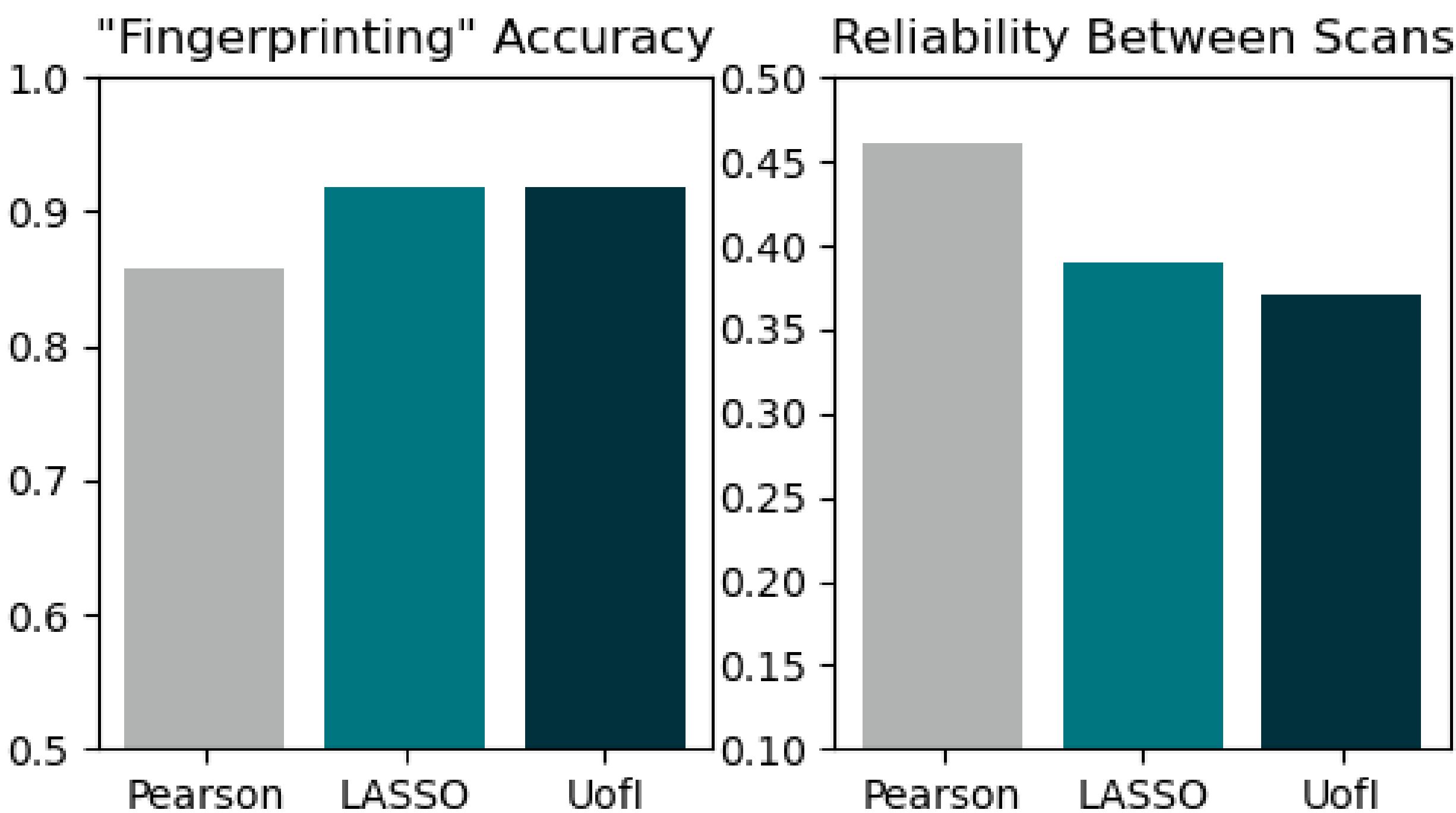
## Preliminary Results



**Example connectomes.** LASSO and UoI matrices are (necessarily due to regularization) *more sparse* than Pearson Correlations, and UoI eliminates spurious low magnitude connections.



**Selection ratio.** Here is an interesting caption.



**Captionssss title Caption.**

- this is another caption

## Acknowledgements



Data were provided by the Human Connectome Project, WU-Minn Consortium.

## References

- H. E. Wang *et al.*, *Front. Neurosci.* (2014).
- P. S. Sachdeva *et al.*, *J. Neurosci. Methods* (2021).