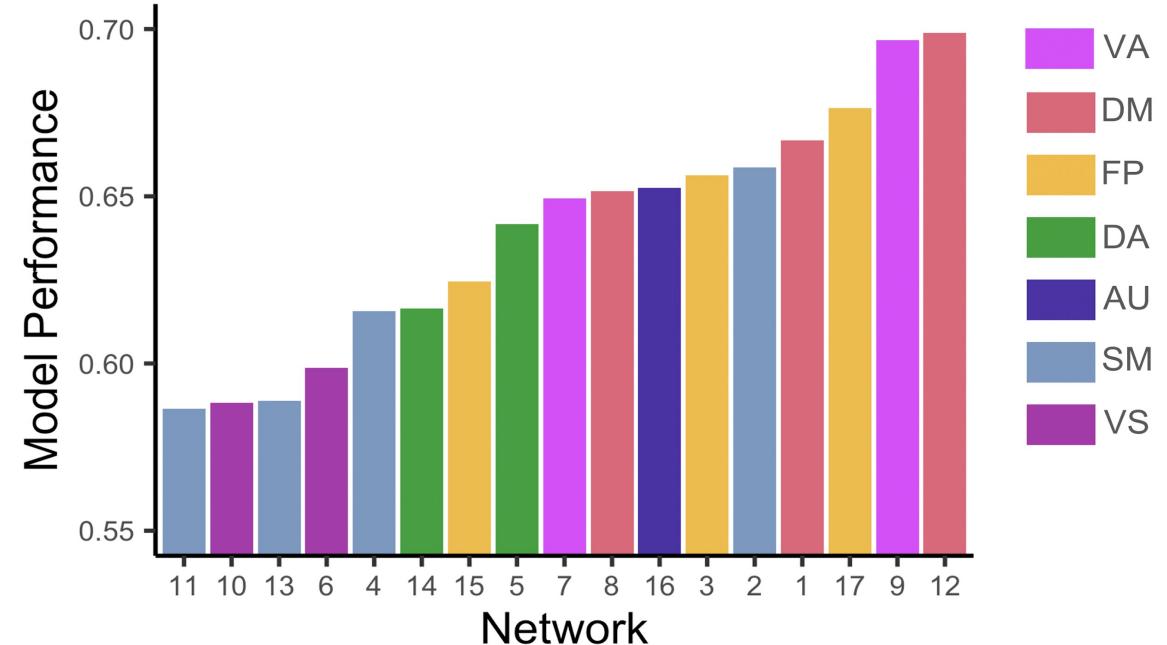


Quarterly Update

12.6.2021

Sex Differences in Functional Topography

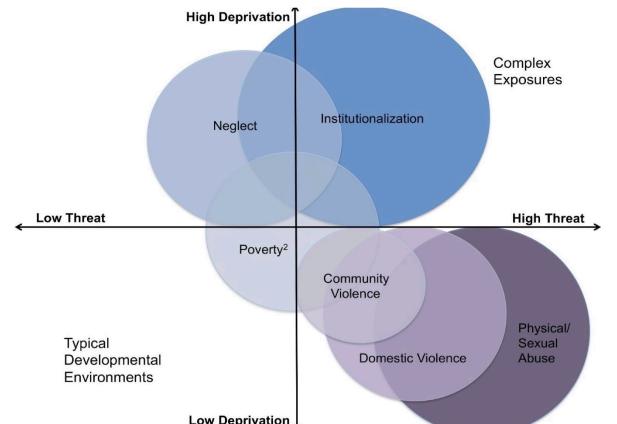
- LRP Renewal
- Study stage- In revision
- Hypothesis: Sex differences in functional topography will be greatest in association networks
- Dataset- PNC
- Modality- fMRI
- Data type- topography



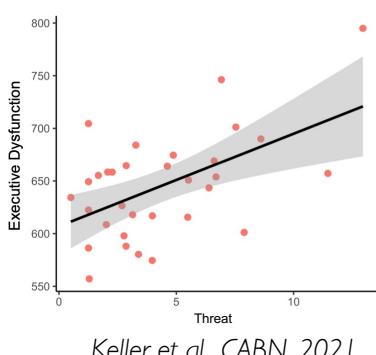
Investigating the effects of adverse childhood experiences on personalized functional brain network topography and trans-diagnostic executive dysfunction in youth

Hypothesis: experiences of Threat during childhood impact the normative development of functional brain networks, leading to trans-diagnostic executive dysfunction in youth.

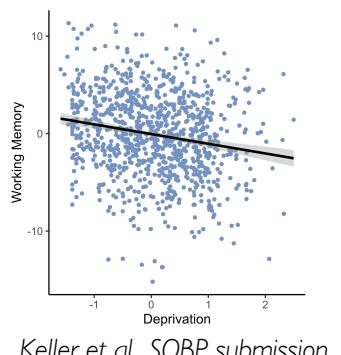
Aim 1: To determine the types of adverse experiences associated with executive dysfunction.



Machlin et al., Front. Behav. Neurosci., 2019

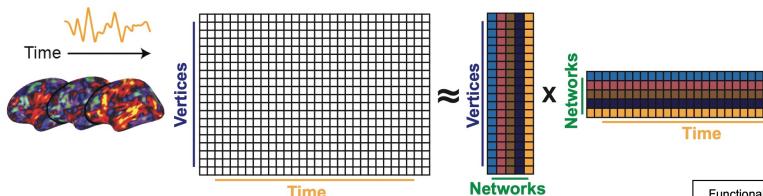


Keller et al., CABN, 2021

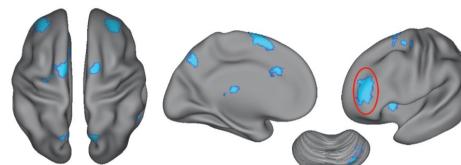


Keller et al., SOBP submission

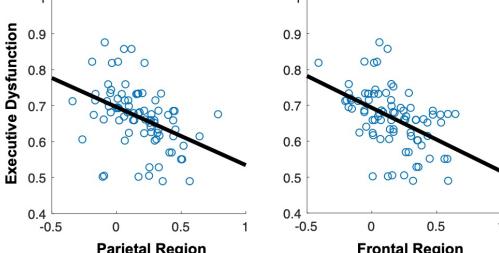
Aim 2: To delineate how abnormalities of the functional topography of fronto-parietal PFNs mediate the association between experiences of Threat in childhood and executive dysfunction.



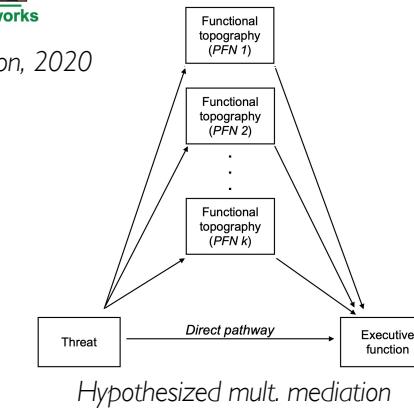
Cui et al., Neuron, 2020



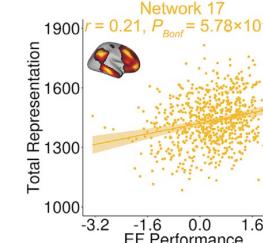
Shanmugan et al., AJP, 2016



Keller et al., Dissertation



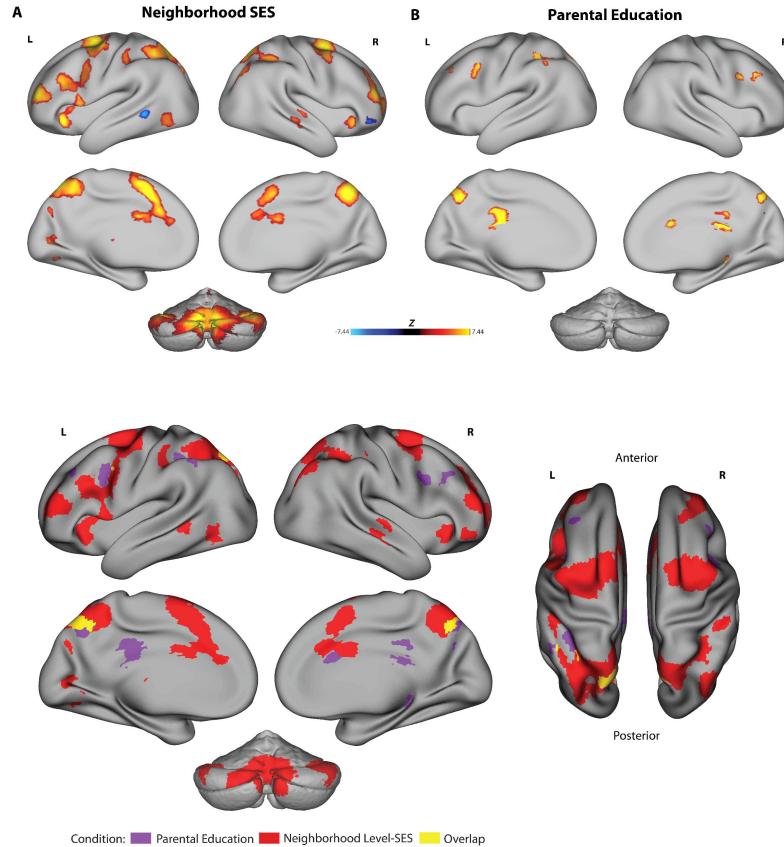
Hypothesized mult. mediation



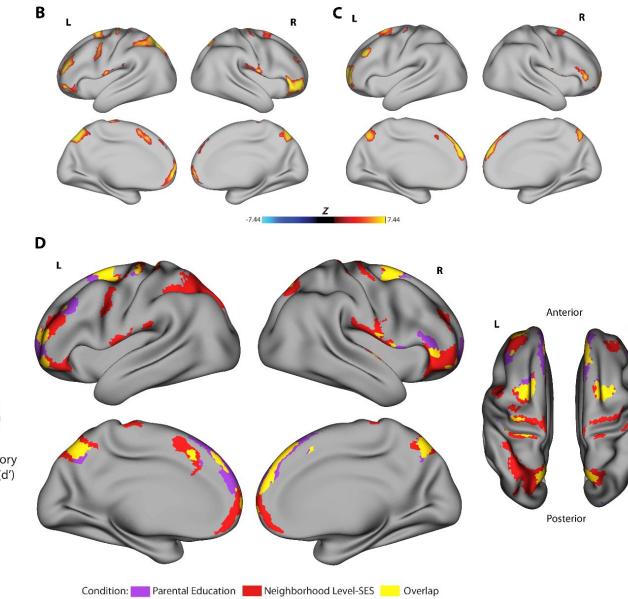
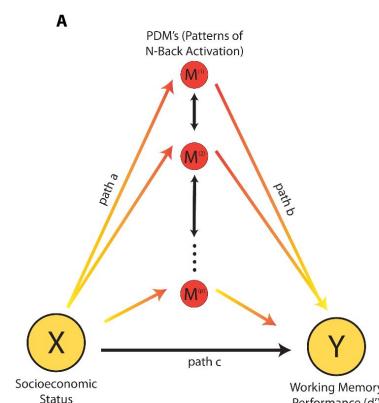
Cui et al., Neuron, 2020

Association between Neighborhood and Family Level Socioeconomic Status and Executive System Activation in Youth

Cerebral CORTEX

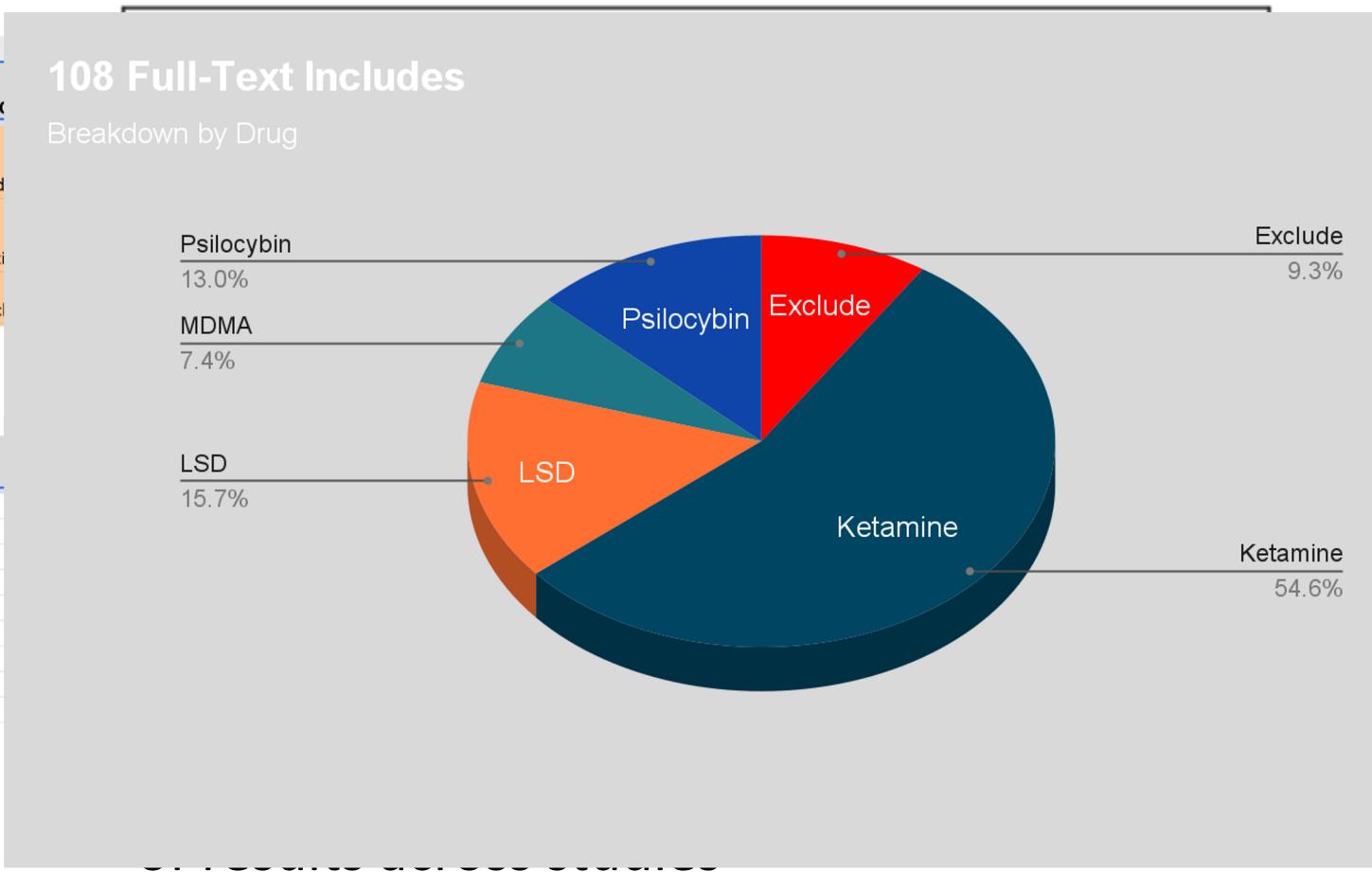
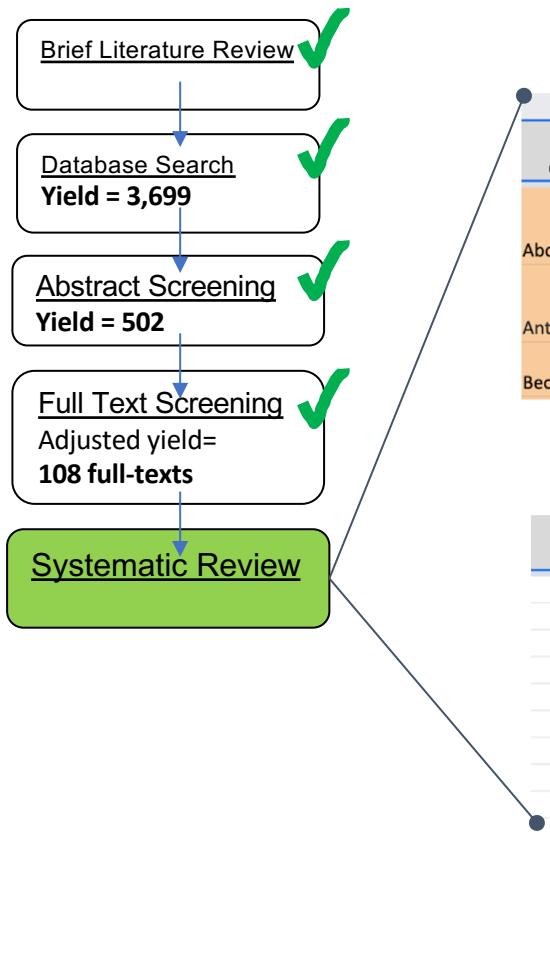
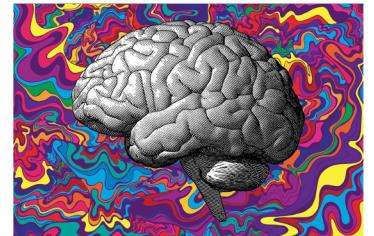


- Revise and resubmit for Cerebral Cortex
- Apply to 17 PhD programs
- Submit new abstract to SOBP 2022



PSYCHEDELICS

Study Objective: To determine the brain regions that respond to experimentally administered psychedelics, via systematic review of fMRI studies



Category	Motion quality	DV
1	Vox/v	
1	ROI	
2	Vox/v	
2	Vox/v	
3	Mask	
2	Vox/v	
2	ROI	
2	Vox/v	
0	Vox/v	

Many thanks to Metta team – Ted, Jake, Bart, Adam, Val &

Mobile Phenomics

```
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              "esm_instructions": "Rate your outfit",  
              "esm_submit": "Now!"  
            }  
          }  
        }  
      }  
    }  
  ]
```

2. Key Inclusion Criteria:

All Subjects

- Age: 13-25. This age range allows us to focus on the critical period of adolescence and young adulthood.
- Sex: Males and Females
- For MRI studies, women of child bearing potential must verbally attest that they are not pregnant at each visit
- Proficiency in English, as study assessments and tasks are designed for English speakers
- Able to understand study procedures and agreeing to participate by giving written informed consent

The poster features a woman with a brain-like head holding a smartphone. It lists inclusion criteria: internet capable mobile phone, ages 13-25. The study is a VIRTUAL research on BRAIN DEVELOPMENT AND MOBILE PHENOMICS. Participants will download a mood tracking app, complete daily questionnaires, and computerized tasks. Some may come to Penn for an in-person MRI scan. The study lasts up to 3 months with \$90.00 compensation. A QR code and Penn University logo are included.

Do you have an internet capable mobile phone?

Are you between the ages of 13 and 25?

The University of Pennsylvania Psychiatry Department is conducting a **VIRTUAL** research study on....

BRAIN DEVELOPMENT AND MOBILE PHENOMICS

Eligible participants will be asked to download a mood tracking app, complete daily questionnaires and computerized tasks. Select participants may be asked to come to the University of Pennsylvania for an in-person MRI scan!

The study will last for up to 3 months and you will be paid up to \$90.00 for the virtual research procedures

For more information about the study please visit _____ or scan the QR code!

Investigator: Theodore Satterthwaite, M.D., M.A., (267) 441-9026



Penn
UNIVERSITY OF PENNSYLVANIA

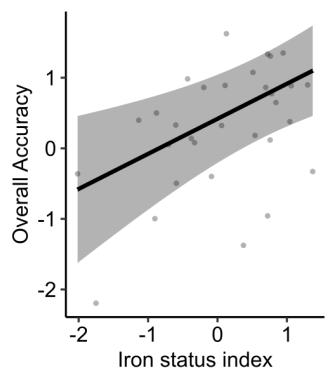
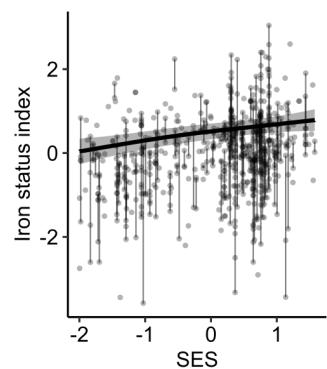
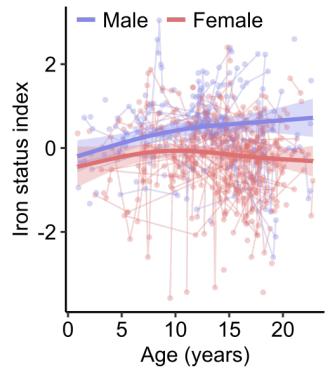
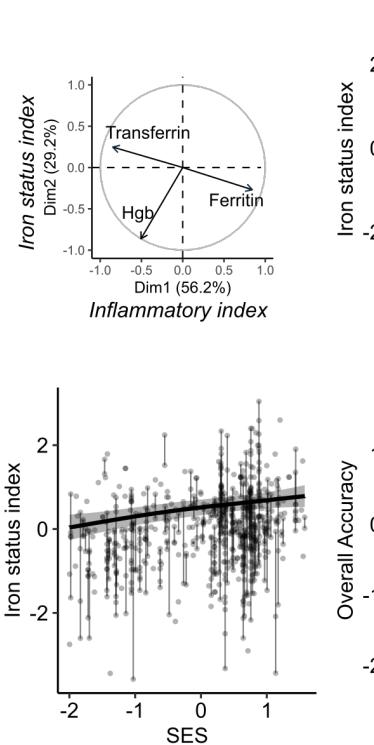
Mood liability + relation to mobile metrics, mediated by network abnormalities

**Study stage:
Setting up infrastructure**

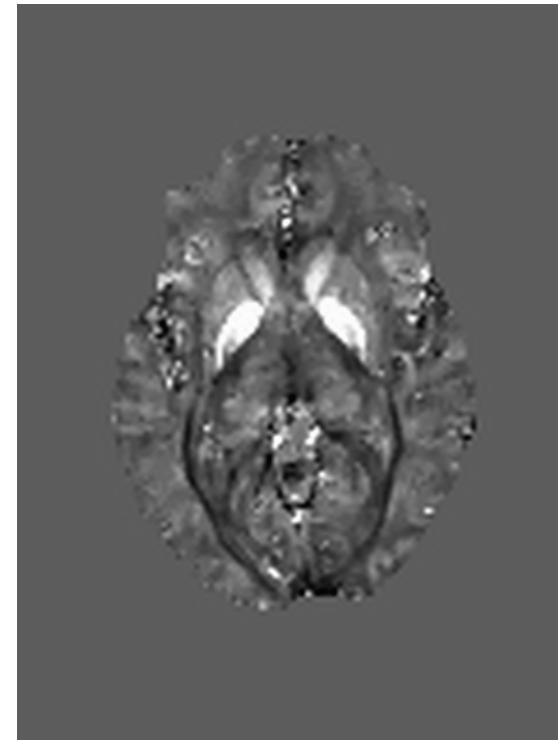
1. ESM configuration
2. Recruitment materials
3. Protocol modifications

Bart

Writing paper for development of iron status.



Working on processing pipeline for QSM

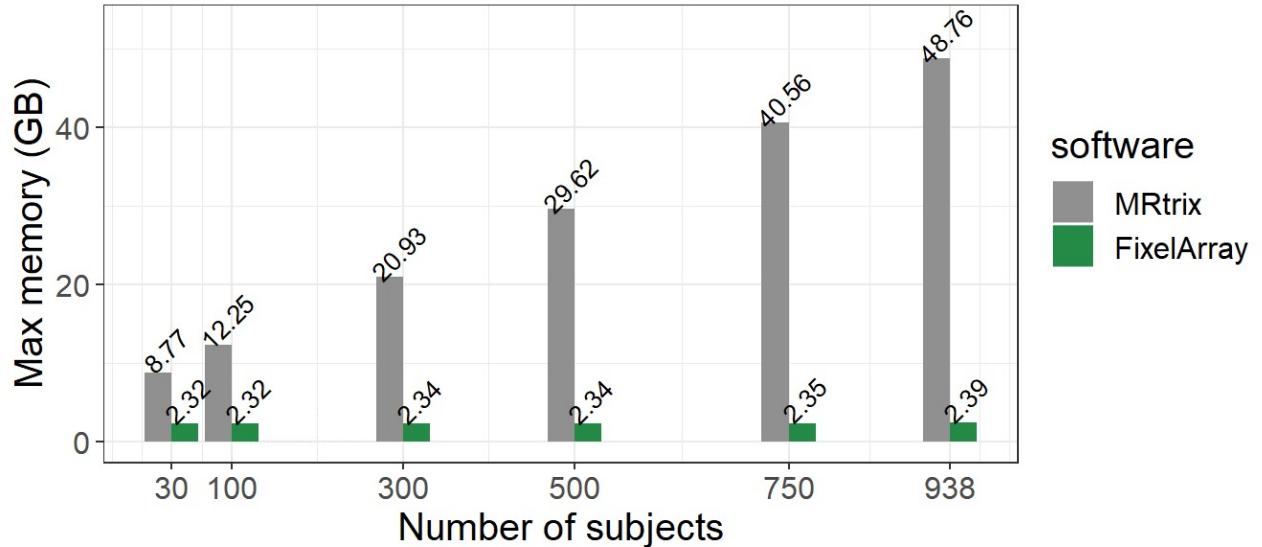


```

formula <- FDC ~ s(age, k = 4, fx = TRUE) + sex
mygam <-
  FixelArray.gam(formula, fixelarray, phenotypes, scalar,
    fixel.subset, eff.size.term.index = c(1),
    n_cores=2, pbar = TRUE)

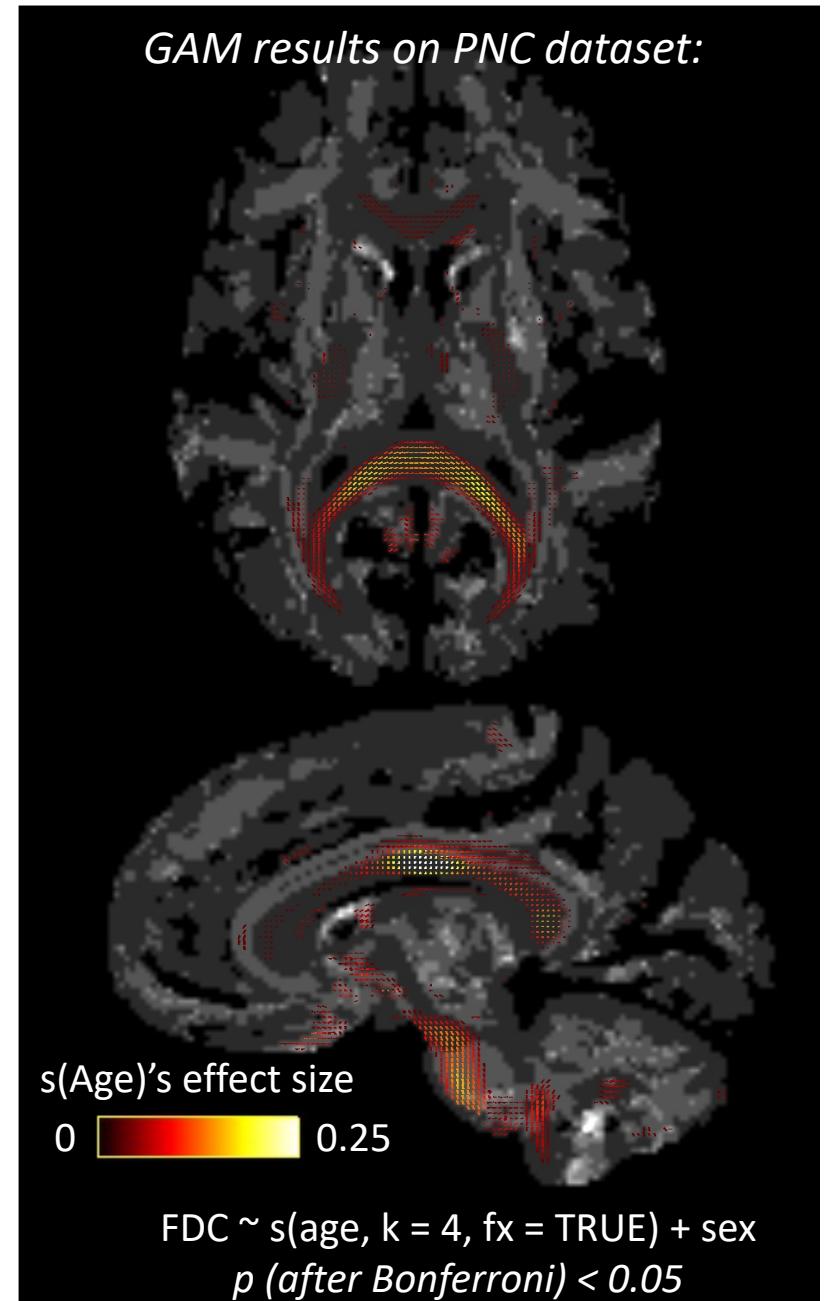
```

*FixelArray.lm() – linear regression:
Comparison: nthreads (ncores) = 4*



On the way:

- Generalization: “**ModelArray**” for any type of data (voxel-wise, surface vertex-wise, etc)
 - **ModelArray.lm()**, **ModelArray.gam()**





ROS/MAP fMRI dataset processed!!!



	Individuals	Scans
N	1201	2174
Age BL (SD)	76.5 (7.3)	75.9 (7.2)
Age LV (SD)	83.3 (7.9)	83.7 (7.7)
% Female	78.1%	77.9%
Education (SD)	15.8 (3.1)	15.8 (3.3)
%MCI LV	17.5%	18.1%
%AD LV	11.0%	9.4%
DX Progressors	18.4%	19.0%
% w/ autopsy	13.2%	10.7%

* Doesn't include 63 scans just processed

	Old	New	Sig
% Edges rel. Motion	45%	41%	Yes
Median partial r w/ motion (SD)	0.002 (0.8)	0.04 (0.9)	Yes
Fingerprint	12.8%	24.9%	Yes
Age prediction MAE	7.1	7.0	Yes

Thank you!!

Sydney Covitz

Matt Cieslack

Azeez Adibempe

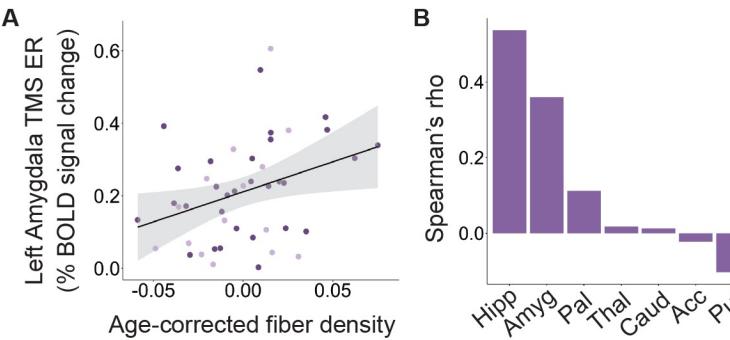
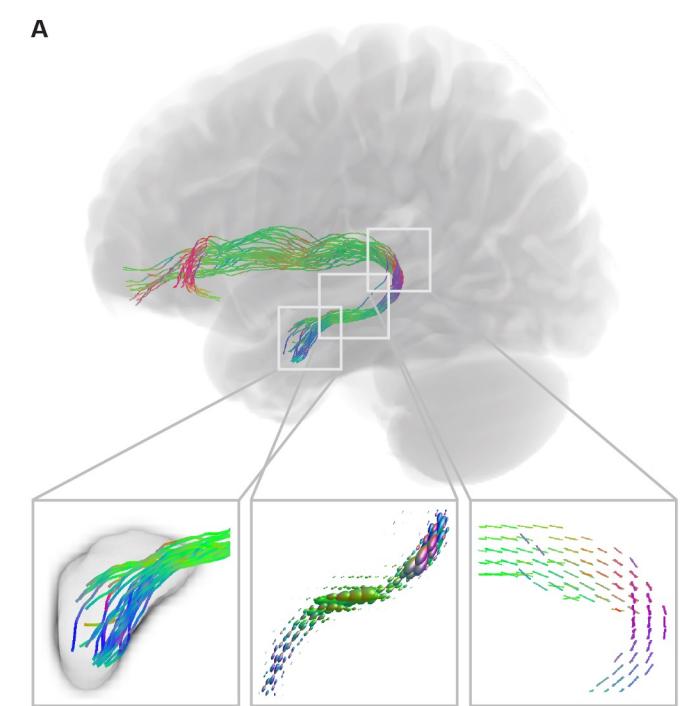
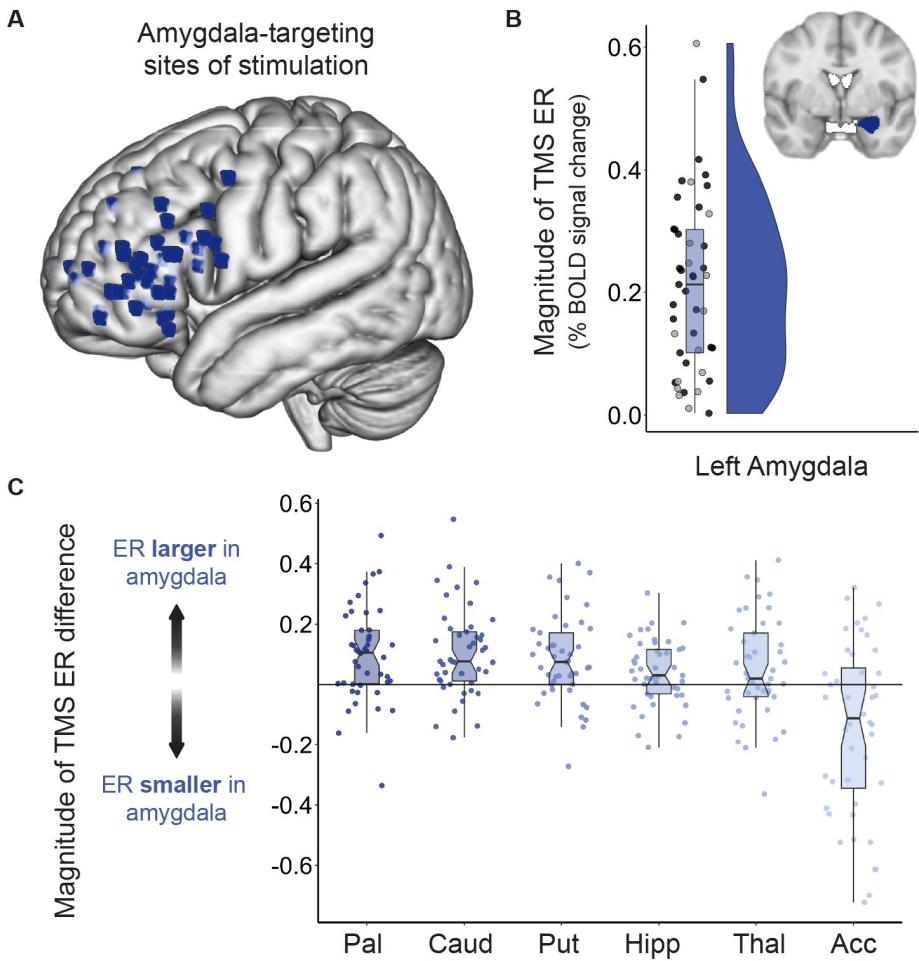
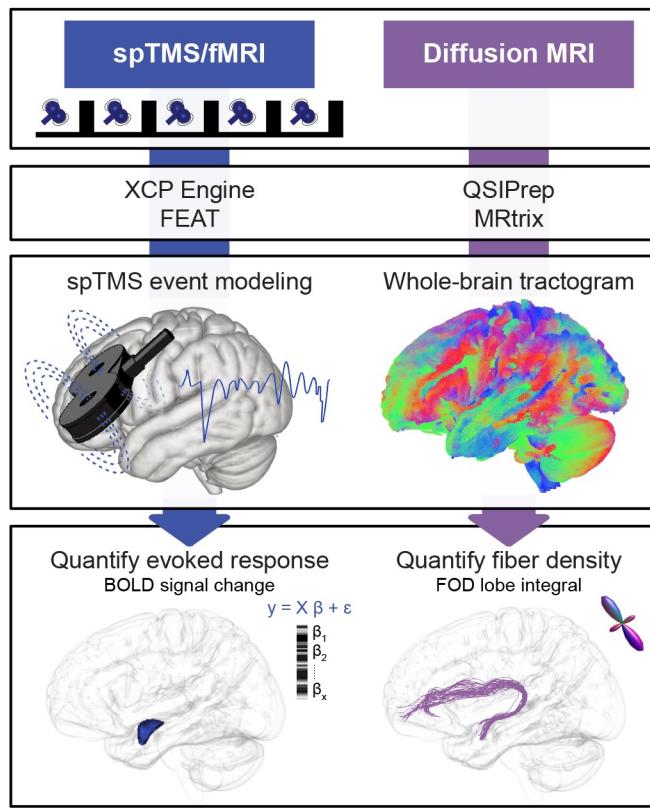
Max Bertolero

Tinashe Tapera

Ted Satterthwaite

Other news

- Resubmitting K99 (just in case)
- Currently drafting Spatial Gradients paper
- Well poised for Y2 projects

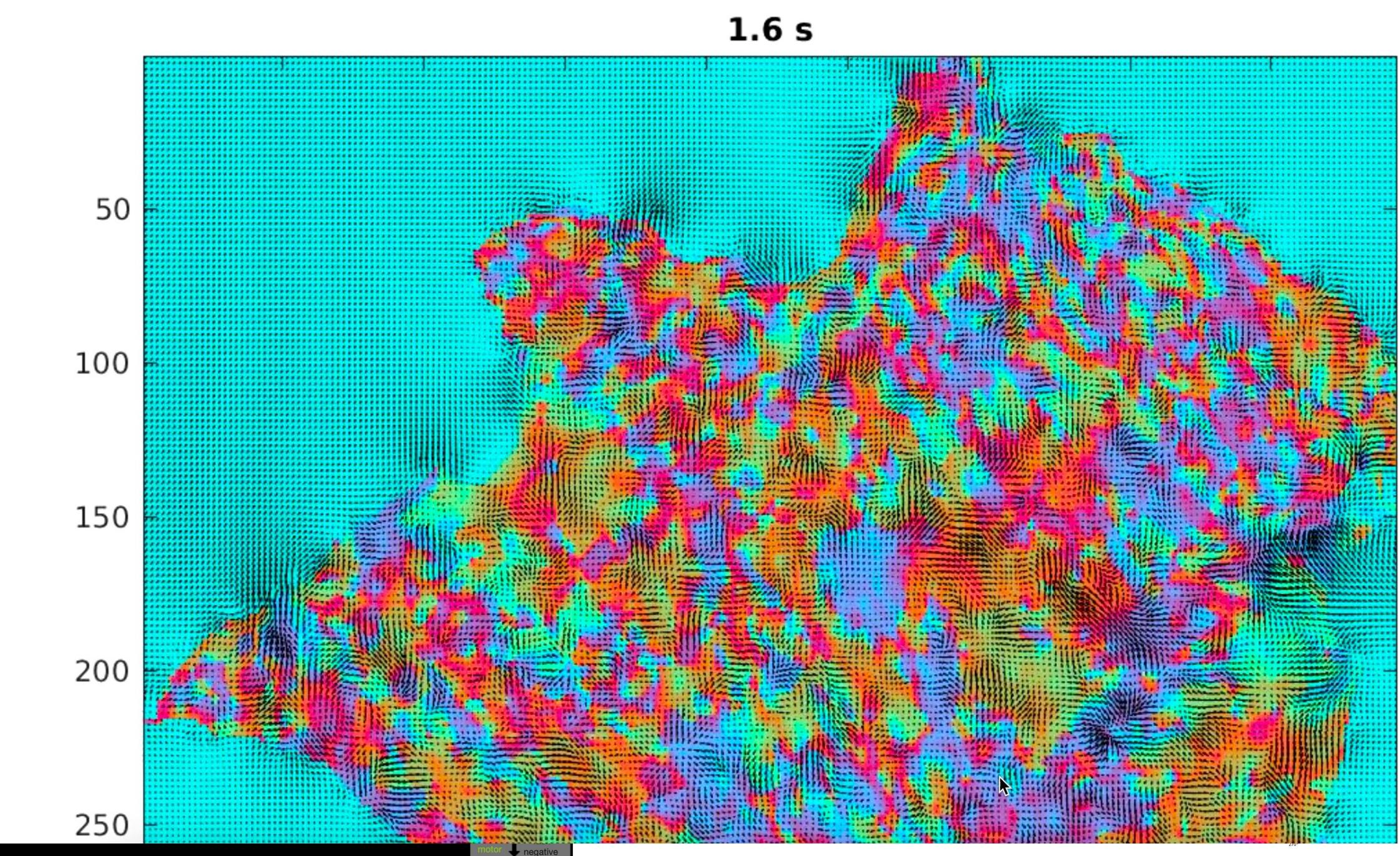


Valerie

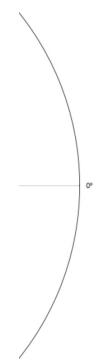
H1:
hie

H2:
wit

H3:
top
Bol



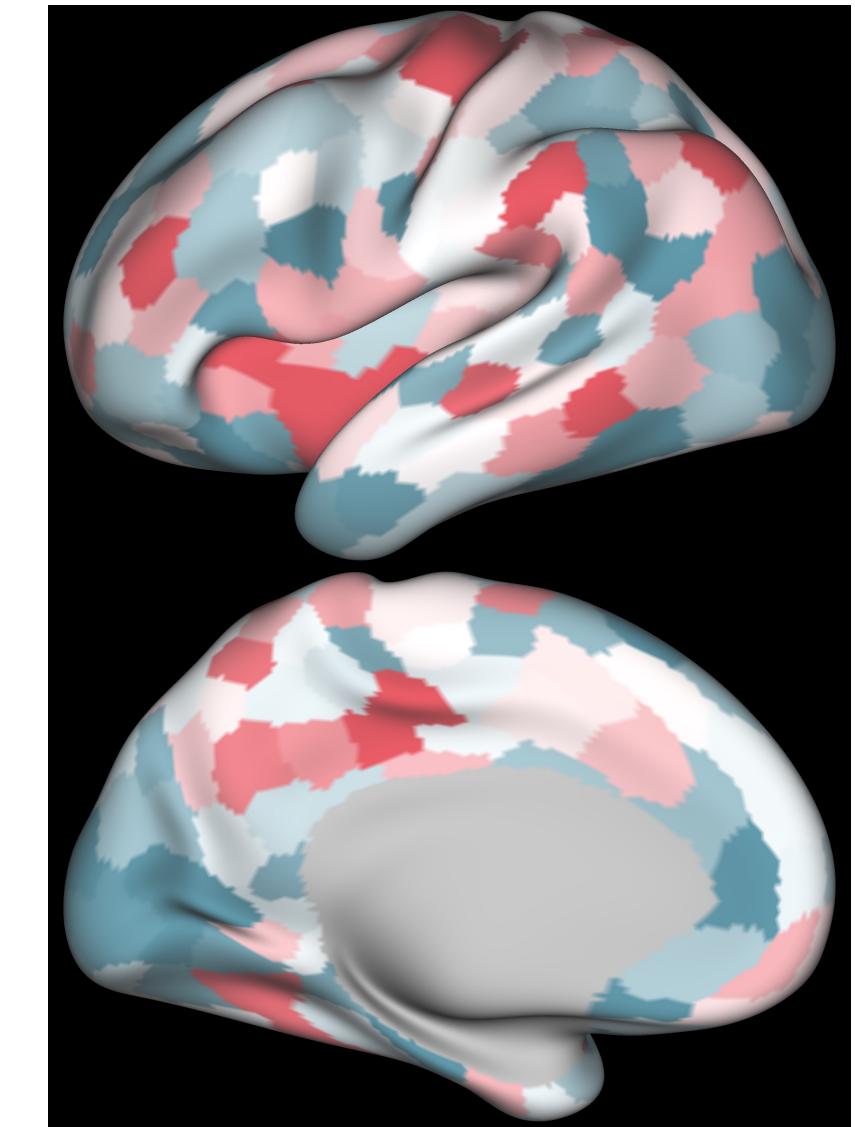
dt)



```

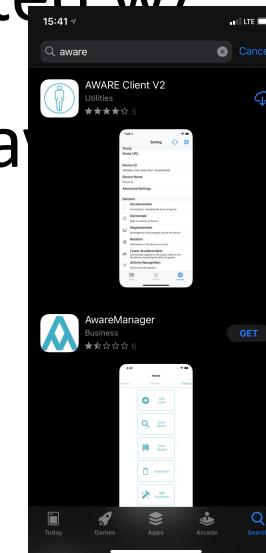
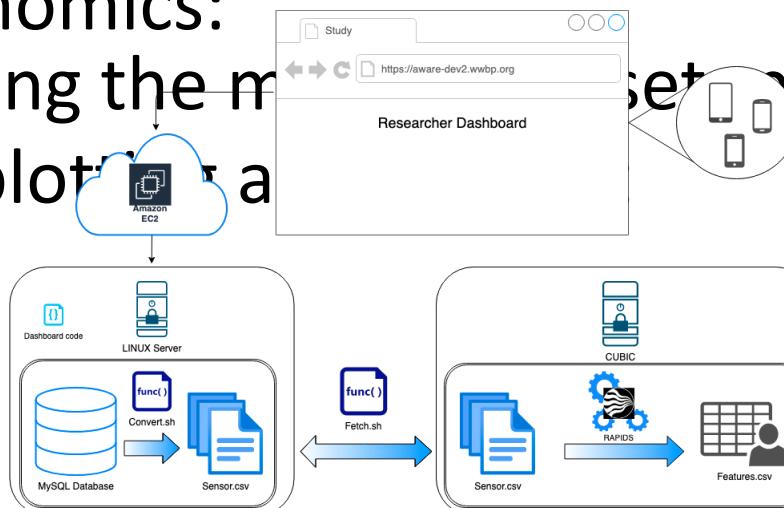
1 import pennlinckit.data
2 import pennlinckit.network
3 import pennlinckit.utils
4 import pennlinckit.brain
5 import numpy as np
6 from scipy.stats import pearsonr
7 global homedir
8 homedir = '/cbica/home/bertolem/bpd/'
9
10 > def score_bdp(data):...
12
13 def make_data(source,cores=10):
14     """
15     Make the datasets and run network metrics
16     """
17     data = pennlinckit.data.dataset(source,task='**', parcels='Schaefer417',fd_scrub=.2)
18     data.load_matrices()
19     data.filter(way='>',value=100,column='n_frames')
20     data.network = pennlinckit.network.make_networks(data,yeo_partition=7,cores=cores)
21     pennlinckit.utils.save_dataset(data,'/{0}/data/{1}.data'.format(homedir,source))
22
23 source = 'hcpya'
24 make_data(source)
25 data = pennlinckit.utils.load_dataset('/{0}/data/{1}.data'.format(homedir,source))
26 score_bdp(data)
27 data.filter(way='has_subject_measure',value='bpdscore')
28 regressors = ['meanFD','interview_age','sex']
29
30 data.targets = data.subject_measures['bpdscore'].values
31 accuracy = np.zeros(data.matrix.shape[1])
32 bootstrap = np.zeros(data.matrix.shape[1])
33 for node in range(data.matrix.shape[1]):
34     data.features = data.matrix[:,node]
35     pennlinckit.utils.predict(data,**{'model':'ridge','cv':'KFold','folds':10,'remove_linear_vars':regressors})
36     r,low,high,p = pennlinckit.utils.bootstrap_corr(data.targets,data.prediction,pearsonr,1000)
37     accuracy[node] = r
38     bootstrap[node] = p
39
40 colors = np.array(pennlinckit.utils.make_heatmap(pennlinckit.utils.cut_data(accuracy,1.5),\
41 sns.diverging_palette(220, 10,n=1001)))
42 out_path='/{0}/brains/{1}_{2}_prediction_acc'.format(homedir,source,'_'.join(regressors))
43 pennlinckit.brain.write_cifti(colors,out_path,parcels='Schaefer400')
44

```

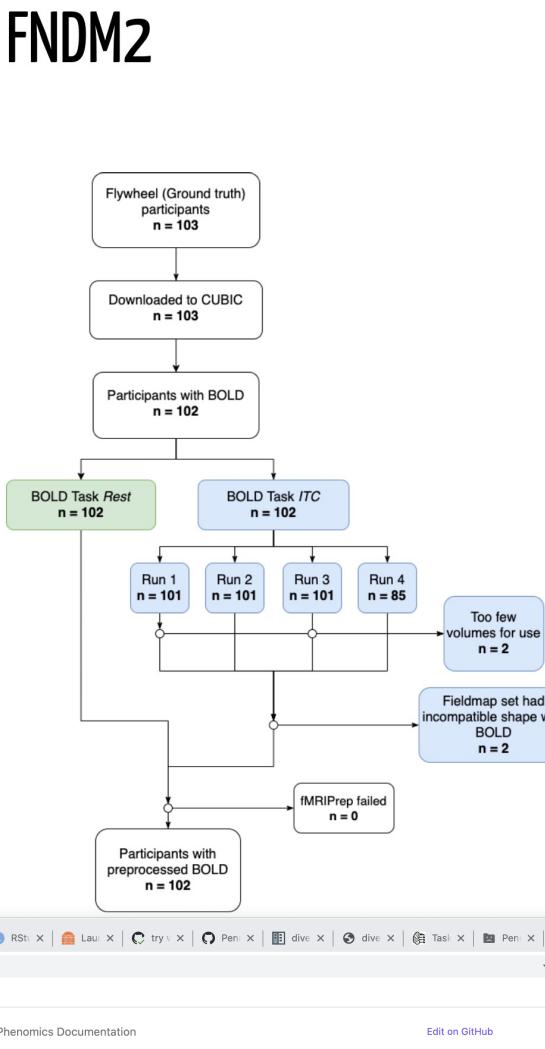


Tinashe

- Reward Data Processing:
 - Projects: fndm1, fndm2, Nodra, CogTrain. Neff1 & Neff2 enqueue, day2 being handled by MG
 - Status: XCP most recently completed w/ TheWay™
 - Also wrangling Events and behavioral data
- MobilePhenomics:
 - Configuring the mobile phenomics set up
 - Shoreline: plotting raw data

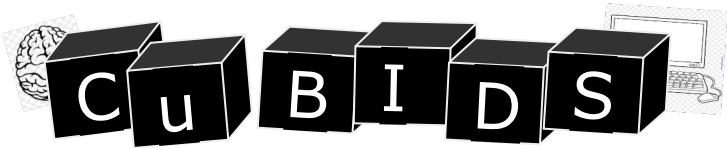


session	count
day2	125
fndm1	56
fndm2	103
neff	46
neff2	71
nodra	104
total	505



The screenshot shows the 'Mobile Phenomics Documentation' website. The left sidebar includes links for Home, Study, Recruitment, Procedure, Compensation, Sensor Data (which is currently selected), Methods, and Analytics. The main content area is titled 'What Data Do We Collect?' and describes the sensors monitored by AWARE. A table below lists the sensor details:

Sensor Label	Description	iOS Available	Android Available	Do We Collect?
Accelerometer	Measures the acceleration applied to the sensor built-in into the device including gravity	TRUE	TRUE	No
Captures				High sample rate space



- Paper in progress
- New users/use cases both within and outside BBL
- Updates & bug fixes, often found by new users/use cases
- Readthedocs update in progress
- Presenting at BrainHack Global 2021

RBC

- Saturday) We have derivatives!
- All of our datasets have been run through fMRIPrep, XCP, and QSPIPrep
- CUBIC has been flying through the last few batches of preprocessing jobs

THE WAY

- Helping new users both within and outside BBL navigate our system
- Working with rest of informatics team to update/maintain the system, and helping collaborators adapt it to new clusters
- Workflow seems to be functioning, largely **Up Next**
- Figuring out distribution step
- (Finishing BIDS paper)
- Steinhardt Order Parmaeter templates with Matt (yay Spherical Harmonics!)
- Continue to help out with ms-depreression project
- Maintain CuBIDS/push updates as

QSIPrep: 96k runs!

Adding FreeSurfer segmentation support for recon

Adding tractometry recon workflow

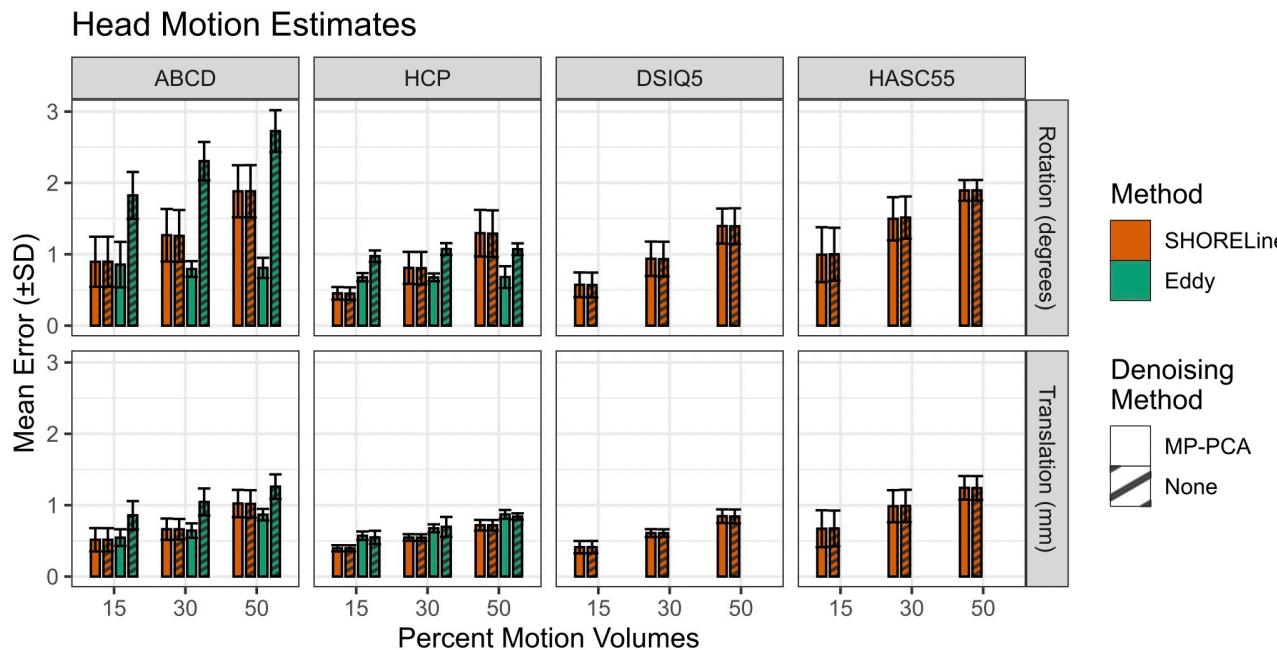
TheWay: Working

Most of RBC finished, bold and dwi

Helped set up TheWay at

- UMN
- Stanford
- MIT

SHORELine: works as well as eddy



Bidsify HCP Development using The Way

A Fully reproducible process enabled by Datalad

Shoutout to Audrey Houghton, Matt Cieslak, Sydney Covitz! Thank you!

- **Goal:** convert raw HCP-D data into *BIDS* compatible datasets in a way that is computationally reproducible
- **More specifically:** *One individual at a time*, 1. Retrieve associated file contents from the URLs on Amazon S3; 2. Perform changes (rename as well as add the IntendedFor field required for field map jsons) 3. Capture provenance for all of this /the entire process tracked
- **Solution:** Using the The Way workflow to produce machine-readable and rerun-able provenance records
- **Different from other bootstraps:** 1. we use datalad addurlls to retrieve raw input data from S3
- 2. Two csv files need to be prepared as the input to the bootstrap
- 3. No software container is necessary
- **Usage and inputs:** bash bootstrap_hcpd_bids.sh SUBJECT_LIST.csv S3_LINKS.csv
- **Results:** all 652 subjects downloaded and converted with tracking
- **Reproducible:** the execution does not depend on compute infrastructure
- Next steps: CuBIDS validation

```
merge_ds
├── CHANGELOG.md
├── code
├── README.md
├── sub-0001305
├── sub-0008117
├── sub-0021614
├── sub-0022919
├── sub-0026119
├── sub-0029630
├── sub-0031617
├── sub-0040113
└── sub-0041822
```

```
[base] [rbc@cubic-login5 merge_ds]$ git log --oneline
5638df60 (HEAD -> master, origin/master, origin/HEAD) merge results batch 1/1
5dbfea408 (origin/job-145097-HCD1458153) Records the deletion of raw non-BIDS director
5ec30386d [DATALAD RUNCMD] rename for HCD1458153
5dce561c6 [DATALAD] add 211 files to 1 (sub)datasets from URLs
5da1e8212 (origin/job-145134-HCD1992375) Records the deletion of raw non-BIDS director
5f156ba34 [DATALAD RUNCMD] rename for HCD1992375
5b300f703 (origin/job-145122-HCD1610436) Records the deletion of raw non-BIDS director
551b385ea (origin/job-145124-HCD1785572) Records the deletion of raw non-BIDS director
5662f67f8 (origin/job-145140-HCD1057337) Records the deletion of raw non-BIDS director
5e81318f6 (origin/job-145142-HCD2612142) Records the deletion of raw non-BIDS director
5f05faf68 [DATALAD RUNCMD] rename for HCD1610436
5eed7411a [DATALAD RUNCMD] rename for HCD1057337
5a2c38668 [DATALAD RUNCMD] rename for HCD1785572
```