

Surfing the Connectome: InstaCorr in AFNI & SUMA

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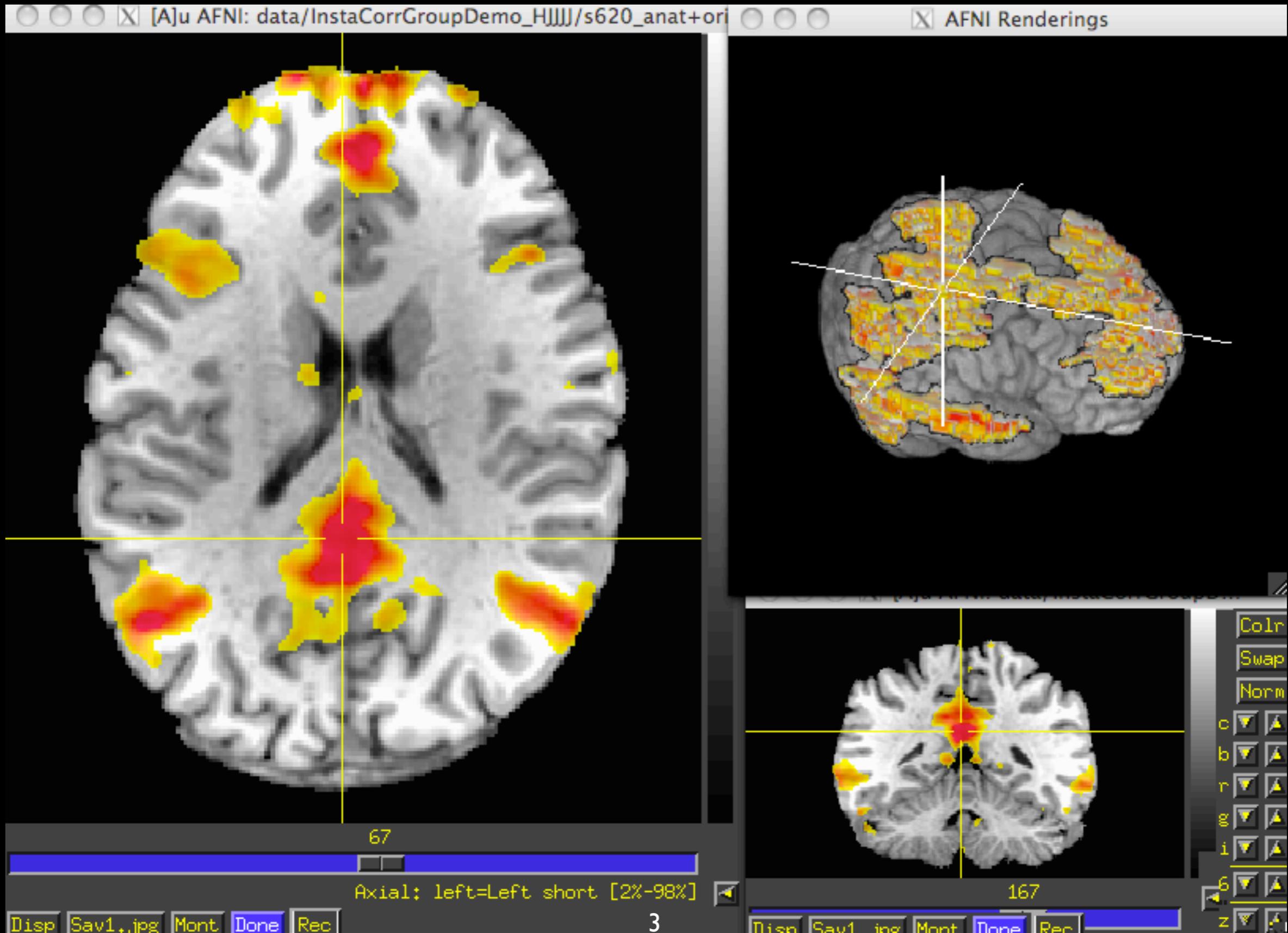
SSCC / NIMH & NINDS / NIH / DHHS / USA

- Some demo data from Alex Martin [NIMH]
- Some demo data from FCON1000 [a cast of zillions]
- Our versions of this are freely available – just ask

Seed-Based RS Maps

- Pre-process image time series to remove artifacts and minimize noise [*cf* posters #025 & #035 & ZS Saad's ineffably numbered poster for **ANATICOR**]
- Pick a seed voxel (or seed region)
 - Extract time series of data from seed
- Correlate seed data with time series from all other brain voxels in the same dataset
 - Groups of datasets: then t -test $\tanh^{-1}(r)$
 - 1- or 2-sample tests, optionally with covariates
- Display a pretty picture **AND/OR** Do some thinking

Pretty Pictures



Software

- Individual Subject **InstaCorr** is built into **AFNI & SUMA GUIs** [including basic pre-processing]
- **Group InstaCorr** is a separate server program that “talks” to **AFNI** and **SUMA GUIs** [via **TCP/IP** or **shared memory**]
 - Takes advantage of multiple CPUs [via **OpenMP**]
 - Nearly perfect speedup [embarrassingly parallel]
 - Pre-processing is done in a script, then desired collection of time series datasets is gathered into one **BIG** file

Group InstaCorr Numbers

- We have processed 890 of the FCONI000 3 Tesla datasets into MNI space
 - And run about 600 anatomicals thru **FreeSurfer**
 - Results will be re-upped to NITRC **real-soon-now**
- **Group InstaCorr** file size [all 890] = **9.9 GB**
 - 69,291 voxels in the collective brain mask
 - On my desktop, computations \approx 3000 msec per click [to see 890 corr maps | 1-sample *t*-test]
 - 8 core Mac Pro, 32 GB of RAM

AFNI

Interlude: Single Subject and Group InstaCorr

AFNI Pre-Processing Tools

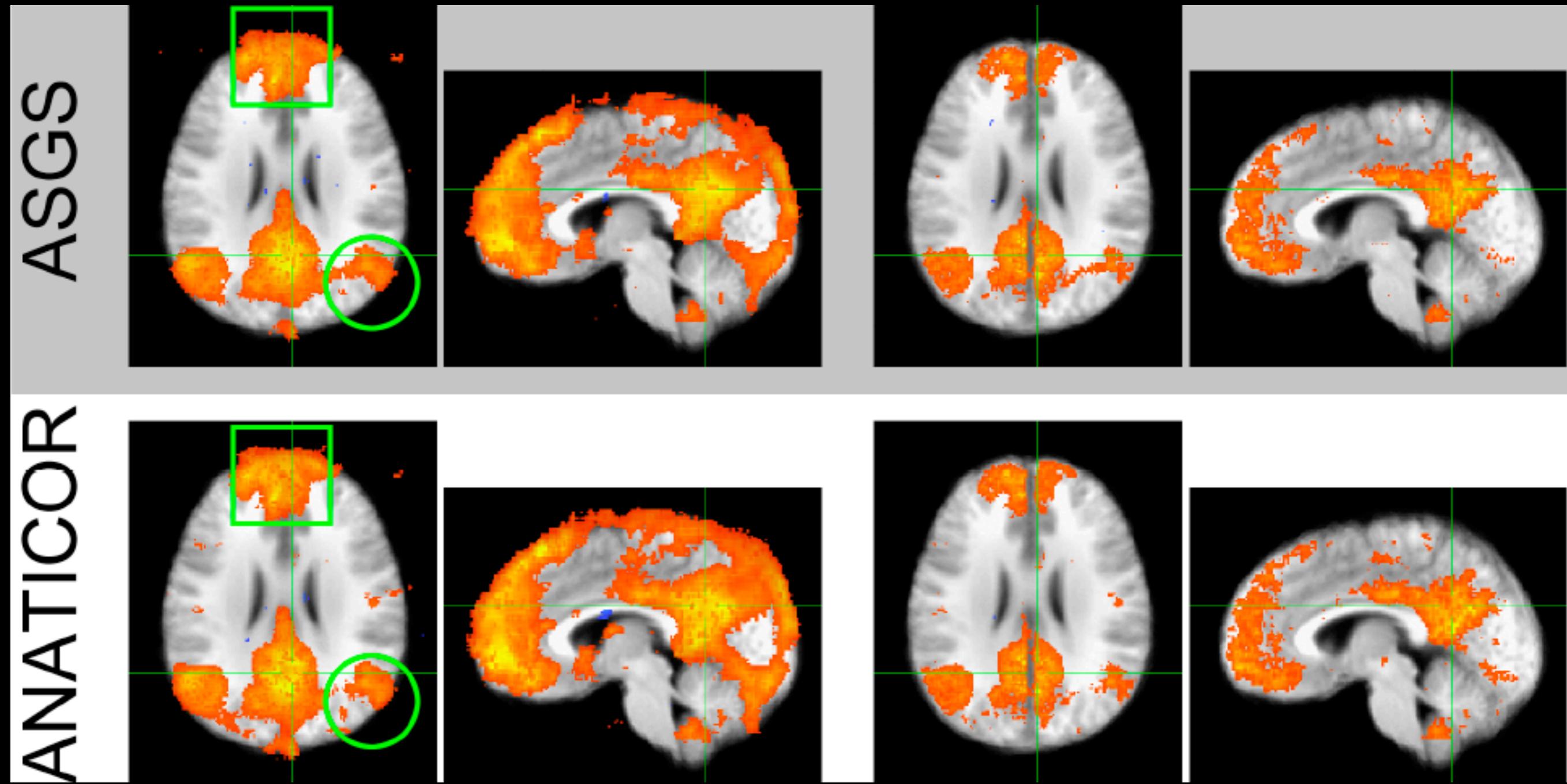
- Mostly there, but some parts still underway
- Tissue masks: at present we use **FreeSurfer**
 - In progress: new method for segmentation
 - **FreeSurfer** of course does much more
- Time series image registration via **3dvolreg**
- MPRAGE↔EPI alignment via **align_epi_anat.py**
 - Also does alignment to MNI space
- Temporal filtering and smoothing in **3dBandpass**
 - WM_{LOCAL} time series via **3dLocalstat**
- Overall pre-processing script for resting state data a là **ANATICOR**

2 Ways to Smooth

Global Smoothing

Smoothing within tissue type masks

Group Maps



SUMA Finale:

Group

InstaCorr, &c.