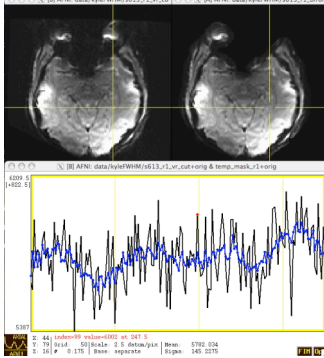


What's New in AFNI-Space and SUMA-Land

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Controlled Blurring TO desired FWHM

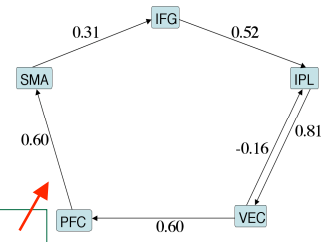
3dBlurToFWHM, 3dFWHMx, SurfSmooth, SurfFWHM

- Blurs data inside a mask until reaching a global Full Width at Half Maximum goal.
- Program can also use spatially variable blurring to make local FWHM measures uniform throughout dataset (3d only at the moment)
- Facilitates cluster-based multiple comparison corrections
- Facilitates comparison of data acquired from different sites

Structural Equation Modeling

1dSEM

- Fast path analysis module building upon an optimization scheme in [1] to determine both paths and their weights between brain areas (see poster #258)
- 1dSEM can run in confirmatory or exploratory modes
- Solutions are at least as optimal as ones obtained with LISREL



Automated Processing Script Generation **afni_proc.py**

- A Python program that automatically creates a tcsh script for processing a single subject's data.
- Starting from anatomical and EPI data as obtained from the scanner, the script will do linear regression analysis (GLM) and Talairach transformation
- The program allows for variants on the processing stream, and different HRF kernels for regression.
- A minimal command can produce the entire processing script using default options :
`afni_proc.py -tlrc_anat anat+orig -dsets epi*.HEAD -regress_stim_files stims.1D`
- The resultant script contains a clearly laid out and modifiable sequence of processing steps such as: catenation, outlier detection, slice timing correction, volume registration, linear regression / deconvolution.

```
# run 3dOutcount and 3dShift for each run
foreach run ( $runs )
  3dOutcount -automask pb00.$subj.r$run.tcsh+orig > outcount_r$run.1D
  ...
end

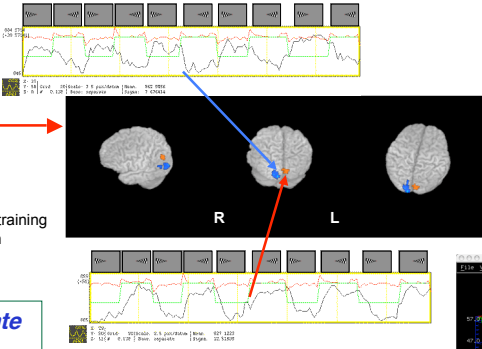
# align each dset to the base volume
foreach run ( $runs )
  3dvolreg -verbose -zpad 1 -base pb01.$subj.r01.tshifts+orig[0] \
  -Dfile dfile_r$run.1D -prefix pb02.$subj.r$run.volreg \
  pb01.$subj.r$run.tshifts+orig
end

# make a single file of registration params
...
# blur each volume
...
# create 'full_mask' dataset (union mask)
...
# get mean and compare it to 0 for taking 'union'
...
# scale each voxel time series to have a mean of 100
...

# run the regression analysis
3dDeconvolve -input pb04.$subj.r??scale+orig.HEAD
  -stim_times 1 stimuli/stim_times.01.1D -TENT(0,14,8) \
  -stim_label 1 ToolMovie
  ...
  -iresp 1 iresp_ToolMovie.$subj
  ...
  -gltsym SYM: -ToolMovie +HumanMovie -ToolPoint +HumanPoint \
  -glt_label 1 HvsT
  ...
  -fout -tout -full_first -x1D Xmat.1D
  -fits fits.$subj -bucket stats.$subj
```

Brain State Classification of FMRI **3dSVM**

- Brain state classification using Support Vector Machines (SVM) [4]
- Plugin is wrapper for SVM-Light[2]
- provides options for brain masking, discarding training samples, and visualizing model parameters



Individual time series from training data and model visualization

Cross-Modality 3D Registration **3dAllineate**

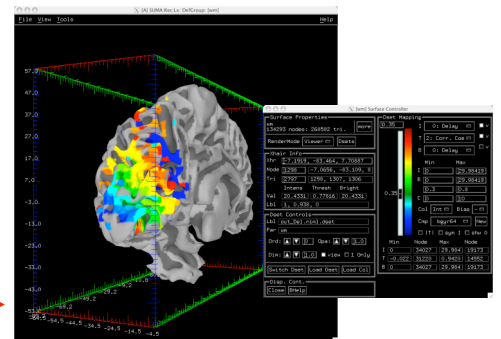
- Cross-modality affine volume registration allowing for multiple cost functions and parameter range controls.

Neighborhood-Based Computations **3dLocalstat, SurfLocalstat, 3dLocalBistat**

- Calculates various statistics such as variance, median or FWHM in a voxel's (or a node's) neighborhood. Inter-dataset statistics such as mutual information or Pearson correlation coefficient can be calculated with 3dLocalBistat.

Automating SUMA **DriveSuma**

- Controls SUMA's GUI operations from the Unix command line. Also, SUMA can be controlled, as with AFNI, from an external program via C function calls or from Matlab™



Series of commands to automatically setup this example:

```
suma -nimgl &
DriveSuma -com show_surf -label wm -l_fs lh.smoothwm.asc
DriveSuma -com surf_cont -load_dset_out_Del.nimgl.dset \
-surf_label wm -view_surf_cont y
DriveSuma -com surf_cont -l_sb 0 -t_sb 2 -t_val 0.35
DriveSuma -com viewwver_cont -key ctrl+shift+up -key r5 left \
-key F1 -key r4 F2 -key r2 z
```

Miscellaneous Stuff

- Support for *oblique* DICOM images. Tested with different versions of GE and SIEMENS data.
- Additions to **AFNI** interface for:
 - Interactive spatial clustering
 - Auto-rescanning
 - Shortcuts for display control without leaving view windows (see keys 'o', 'u' for example).
- **3dDeconvolve** additions:
 - Interface for including stimulus (parametric) modulation regressors
 - Condition numbers are output for regressors of interest without baseline components
 - Warnings are logged and made more prominent to ensure that the user acknowledges them
- **3dSynthesize** allows for reconstructing timeseries using model coefficients from 3dDeconvolve
- **3dNLfim** has non-linear models for Michaelis-Menten drug kinetics and Dynamic contrast-Enhanced Magnetic Resonance Imaging
- Support for porting diffusion tensor data from AFNI to **DTIquery** [3] interactive tractography
- Iso-surface extraction from volumetric datasets with **IsoSurface**

See also

- **Monday-PM poster #258** by Chen *et alii*
- **Wednesday-PM poster #300** by Cox *et alii*
- Download AFNI from <http://afni.nimh.nih.gov/afni>
- Download PDF copies of our posters from <http://afni.nimh.nih.gov/sscc/posters>

References

[1] Bullmore E. T. et al. *Neuroimage* 11, (2000).
 [2] T. Joachims, *Advances in Kernel Methods - Support Vector Learning*, (1999)
 [3] Sherbondy A. et al. *IEEE TVCG*, (2005)
 [4] LaConte S.M. et al. *Neuroimage* 26, (2005)