

What's New In AFNI-Space And SUMA-Land

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Introduction:

AFNI and SUMA are open-source software systems for volume- and surface-based analysis and display of MRI data, respectively. AFNI and SUMA run on Unix, Linux, and Mac OSX. The packages, updated frequently, have automated version checking and a popup notice informing users of critical updates.

Volume-Based:

⇒*afni_proc.py*: Python program that automatically creates a tesh script for processing single subject's data. Starting from scanned anatomical and EPI data, *afni_proc.py* produces linear regression results in both original and Talairach spaces. Variants on the processing stream, and different kernels for regression are optional. A minimal command such as:

```
afni_proc.py -tlrc_anat anat+orig -dsets epi*.HEAD -regress_stim_files stims.1D
```

produces an entire processing script

⇒*3dAllineate*: Cross-modality affine volume registration program. Allows for multiple cost functions and for control of parameter range

⇒*3dBlurToFWHM*: Blurs a dataset inside a mask until a global Full Width at Half Maximum goal is reached. The program can also use spatially variable blurring to make local FWHM measures uniform

⇒*1dSEM*: A fast path analysis module building upon an optimization scheme in [1] to determine both paths and their weights between brain areas (see presentation by Chen G. et al.)

⇒*3dSVM*: Plugin for brain state classification of fMRI data using support vector machines. *3dsvm* is a wrapper for SVM-Light [2] and provides options for masking, discarding training samples, and visualizing model parameters

⇒*3dLocalstat*: Calculates various statistics such as variance, median, or FWHM, in each voxel's neighborhood

⇒*3dLocalBistat*: Calculates various bivariate statistics such as mutual information or Pearson correlation coefficient in each voxel's neighborhood

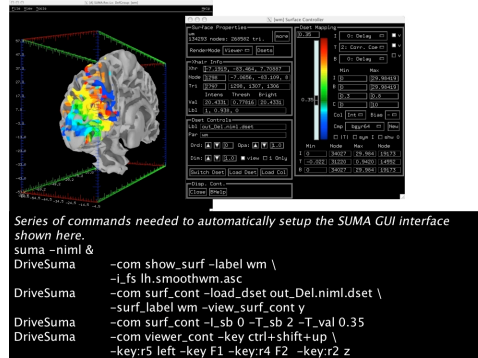
⇒*3dNLfim*: Addition of non linear models for Michaelis-Menten drug kinetics and Dynamic contrast-Enhanced Magnetic Resonance Imaging

⇒Support for direct porting of diffusion tensor data from AFNI to DTIquery for tractography analysis [3]

Surface-Based:

⇒*LandWarp*: Warps a brain surface to align a set of landmarks using a global diffeomorphism optimization approach based on [4]

⇒*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™



⇒Surface-based data are now stored in a format common to both AFNI and SUMA. This new format allows for more efficient storage of data and preservation of auxiliary header information such as statistical parameters and labels. All existing voxel-based analysis programs can be used for surface-based data. On-the-fly subset selection and masking operations (-cmask) are also supported

⇒*SurfSpharm*: Spherical harmonics decomposition for data and geometry based on [5]

⇒*SurfSmoothToFWHM*, *SurfFWHM*, and *SurfLocalstat*: Equivalents of 3dBlurToFWHM, 3dFWHM, and 3dLocalstat on the surface.

⇒*IsoSurface*: Iso-surface extraction from volumetric datasets.

Help and Documentation:

In addition to command line help, AFNI's afni.nimh.nih.gov website provides extensive educational material, demo commands and data, and the message board for questions.

References:

- [1]-Bullmore E.T. et al. NeuroImage 11, (2000)
- [2]-T. Joachims, Advances in Kernel Methods - Support Vector Learning, MIT-Press, (1999)
- [3]-Sherbondy A. et al. IEEE Transactions on Visualization and Computer Graphics, (2005)
- [4]-Glaunes, J.M.,et al. Journal of Mathematical Imaging and Vision 20, (2004)
- [5] Chung M.K. et al. Technical Report 1122. University of Wisconsin-Madison (2006)

Category: Modeling and Analysis

Sub-Category: Motion correction/Spatial normalization, atlas construction