

Diffusion Tensor Imaging: In & Around the **AFNI** Package

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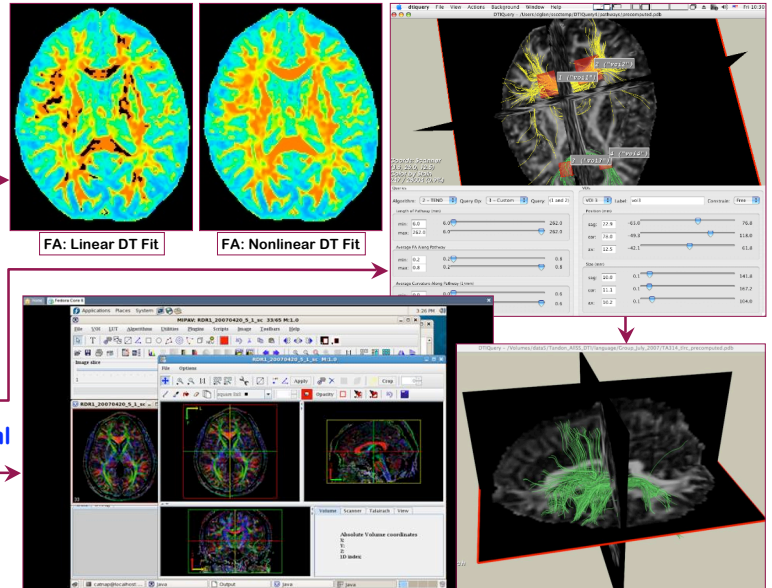
SSCC/NIMH/NIH/DHHS/USA/Earth

<http://afni.nimh.nih.gov>



Basic Processing Stream

- Conversion of images to **AFNI** or NIFTI-1 format
- Image alignment with program **3dAllineate**
 - e.g., Mutual Information; affine or weakly nonlinear warping
- **Option:** nonlinear anisotropic smoothing with **3danissmooth**
 - All DW images in same collection smoothed the same way
 - 2D or 3D smoothing based on “local structure” of images
- Computation of DT, FA, etc, with program **3dDWItoDT**
 - Robust, fast, nonlinear fit of DT model to DWI data
 - D tensor guaranteed to be positive definite
 - Two nonlinear optimization methods used to find best fit
 - **Option:** Outlier down-weighting followed by re-fit
 - Output results in NIFTI-1 format for input to other software
- e.g., Stanford program **DTI-Query** for fiber tracing:
 - <http://graphics.stanford.edu/projects/dti/software/index.html>
- Parts of AFNI's software are used in **CATNAP** DTI pipeline:
 - <http://iaci.ece.jhu.edu/~bennett/catnap/catnap.shtml>

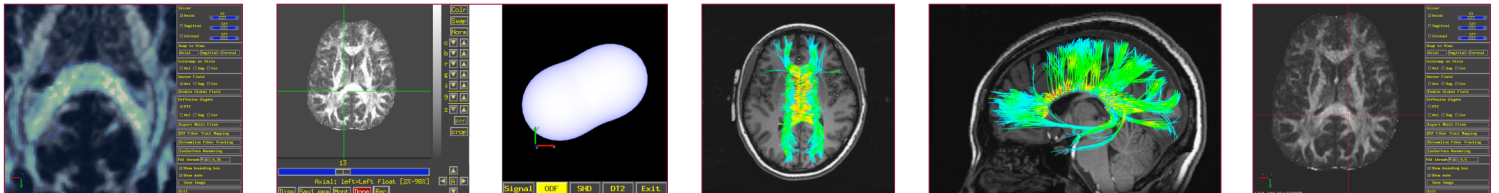


Needed: DWI & DTI data interchange format!

UCSD Plugin for AFNI (Larry Frank et al)

- Detailed examination of DTI datasets for quality
- Fiber tracking via anisotropic diffusion simulation
- Can use HARDI (High Angular Resolution Diffusion Imaging) data

▪ <http://csci.ucsd.edu/projects/fiber-tractography.html>



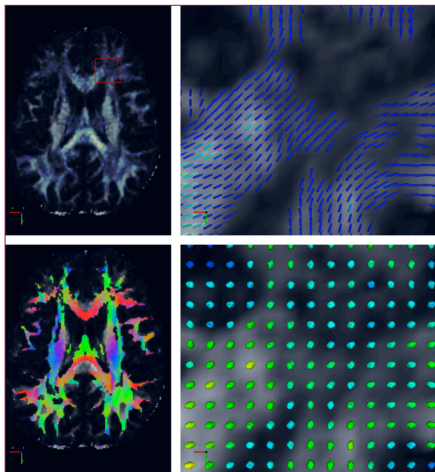
Directions in the CC

Directionality in one voxel

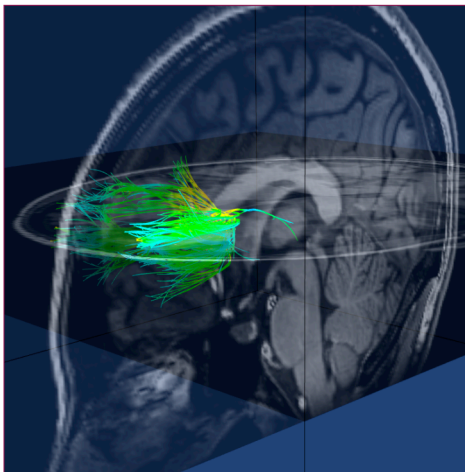
Fibers

Fibers

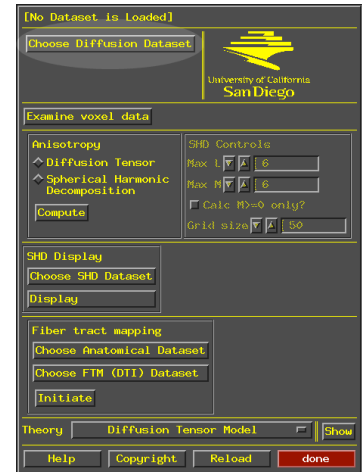
Advanced image viewer



Tensor colormap



More fibers



Plugin control panel