Getting Started with FSL

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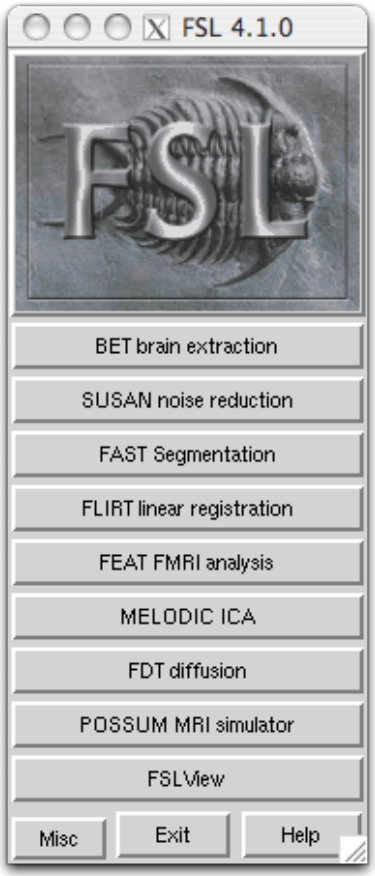
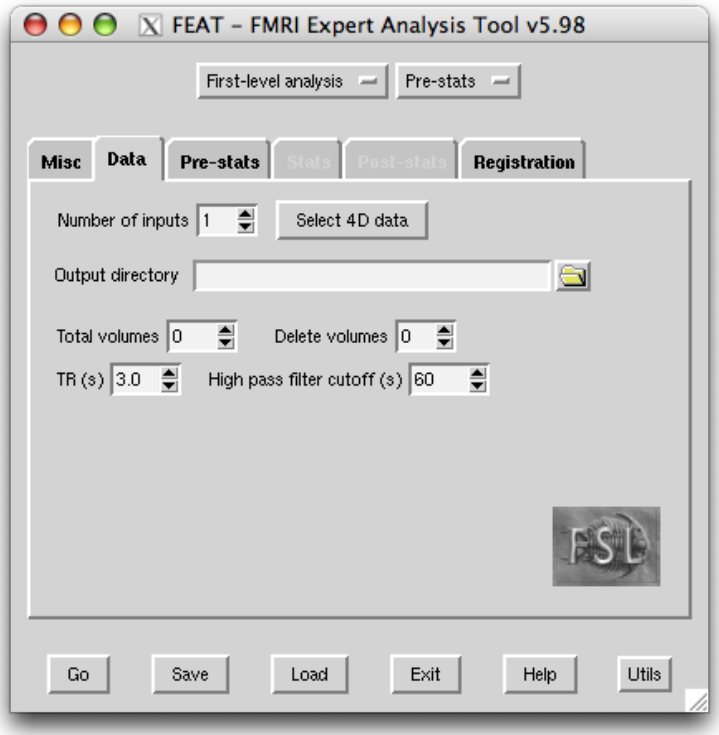
FMRIB Software Library (FSL)



- FSL
  - http://www.fmrib.ox.ac.uk/fsl/
  - http://www.fmrib.ox.ac.uk/fsl/feat5/
- BIAC Wiki
  - http://fourier.biac.duke.edu/wiki/doku.php/biac:fsl:guide

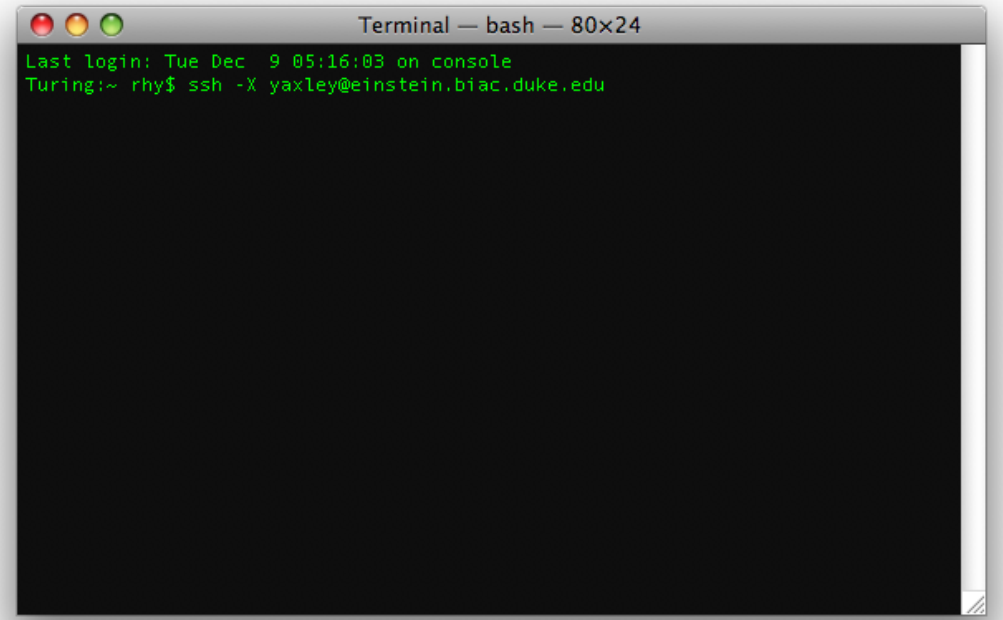
FMRI Expert Analysis Tool (FEAT)



"a software tool for high quality model-based FMRI data analysis, with an easy-to-use graphical user interface (GUI)."

Connect to Cluster

- Secure Shell (SSH) via Terminal in OS X, F-Secure in XP



Access Data

- Login to Einstein:
  `$ ssh -X Username@einstein.biac.duke.edu`
- Login to Node4:
  `$ qinteract`
- Mount experiment directories:
  `$ lnexp Exp.01`
- Navigate to experiment:
  `$ cd ~/experiments/Exp.01`

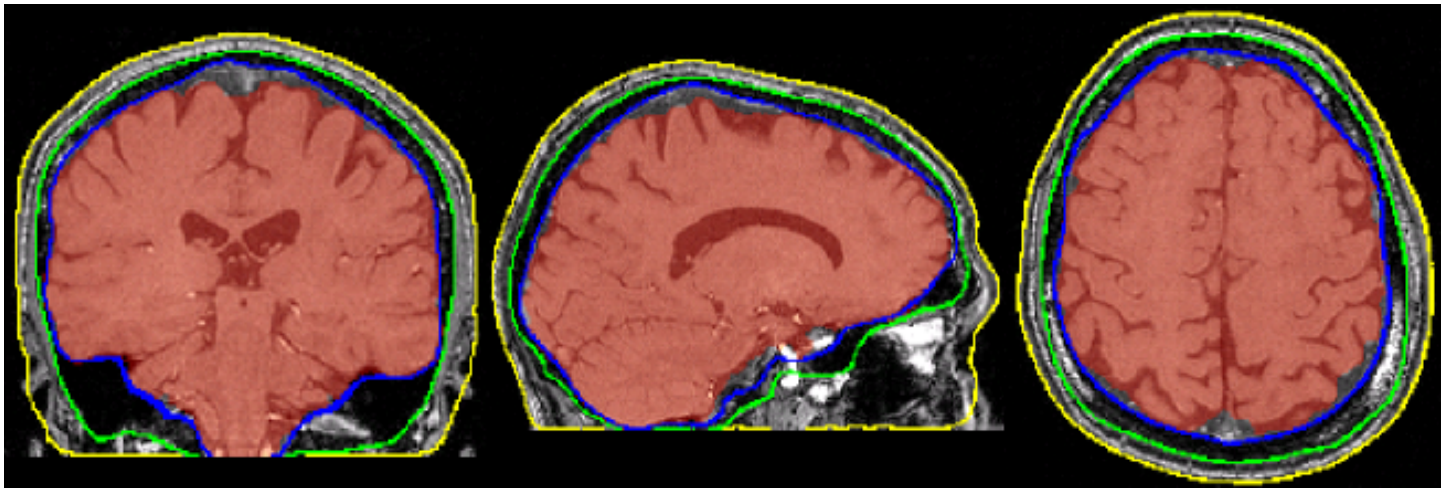
Reorient Raw Data

- BIAC images must be reoriented from LPS (Left,Posterior,Superior) to LAS (Left,Anterior,Superior)
- Functional:
  `$ bxhreorient --orientation LAS run004.bxh reoriented_run01.bxh`
- Anatomical:
  `$ bxhreorient --orientation LAS series002.bxh reoriented_anat.bxh`
- Repeat for every functional image

Generate NIFTI-formatted Images

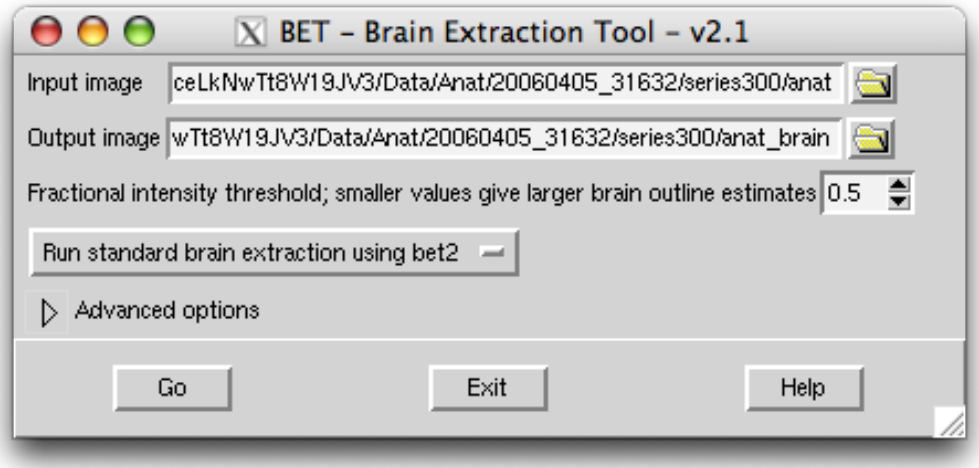
- Functional:
  `$ bxh2analyze --nifti -s -v run001_01.bxh run01`
- This will create one large file (run01.img) that contains the functional data in 4D format and a NIFTI-formatted header (run01.hdr)
- Anatomical:
  `$ bxh2analyze --niftihdr -s -v series003.bxh anat`

Brain Extraction Tool



- BET deletes non-brain tissue from an image of the whole head
- `http://www.fmrib.ox.ac.uk/analysis/research/bet/`

Generate Anatomical Brain Mask



- Use GUI or CLI to generate 'anat_brain.nii.gz'
- Anatomical:
  `$ bet anat anat_brain -f 0.5 -g 0`
- Functional: Perform later in 'Prestats'

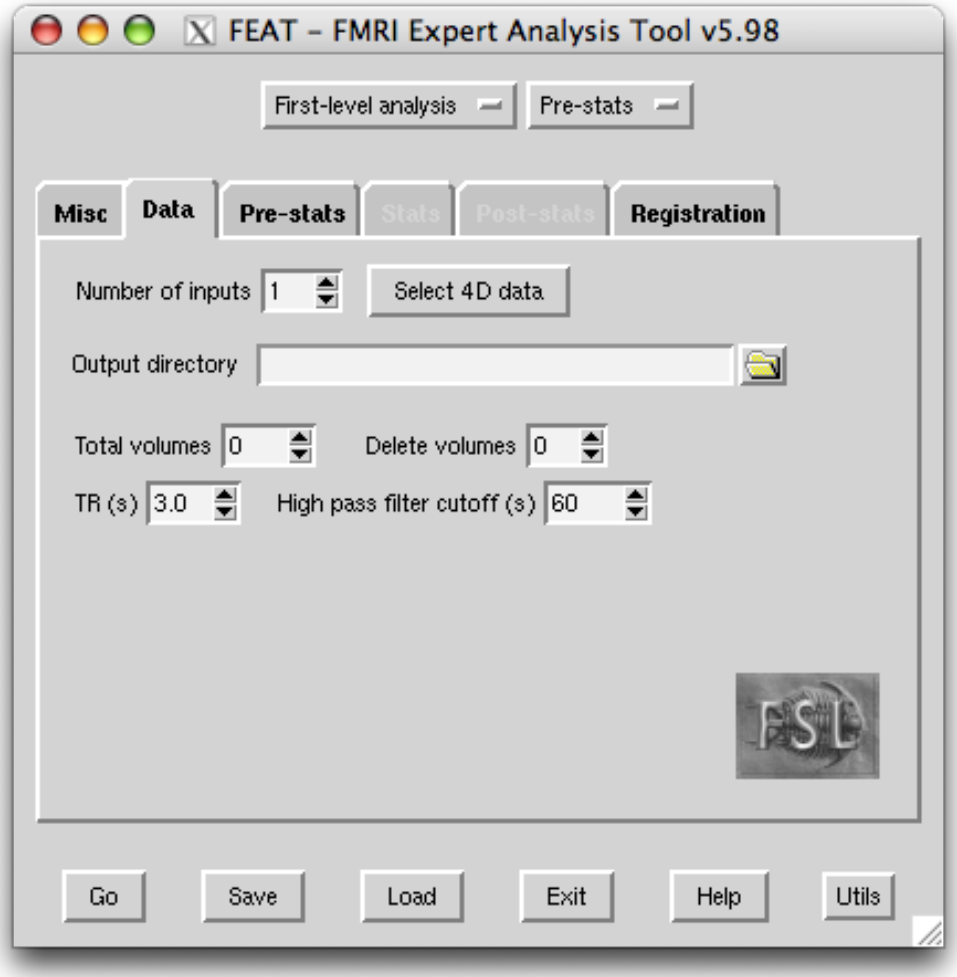
Time-series of Events

- 3-column tab-delimited text files

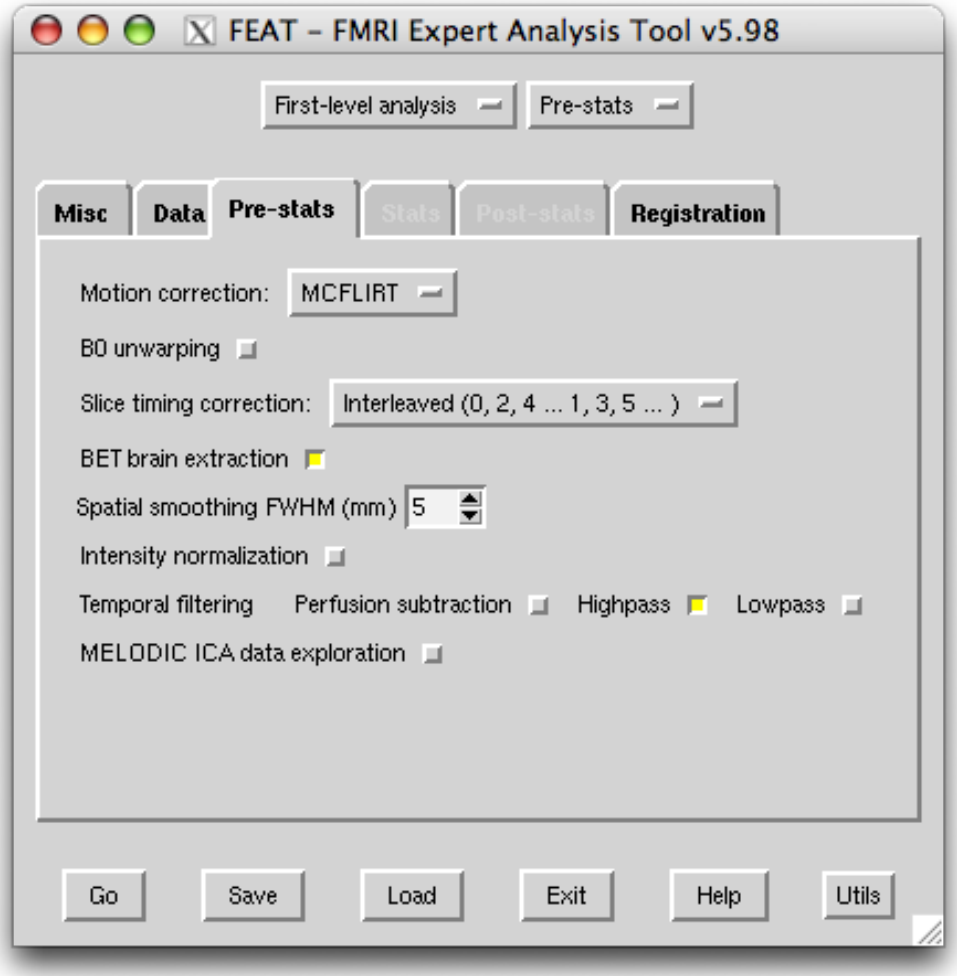
Onset	Duration	Weight
30	1	1
60	1	1
90	1	1
120	1	1

- One file for each condition of each run for each subject
- Example: 3 conditions X 6 runs X 20 subjects = 360 text files

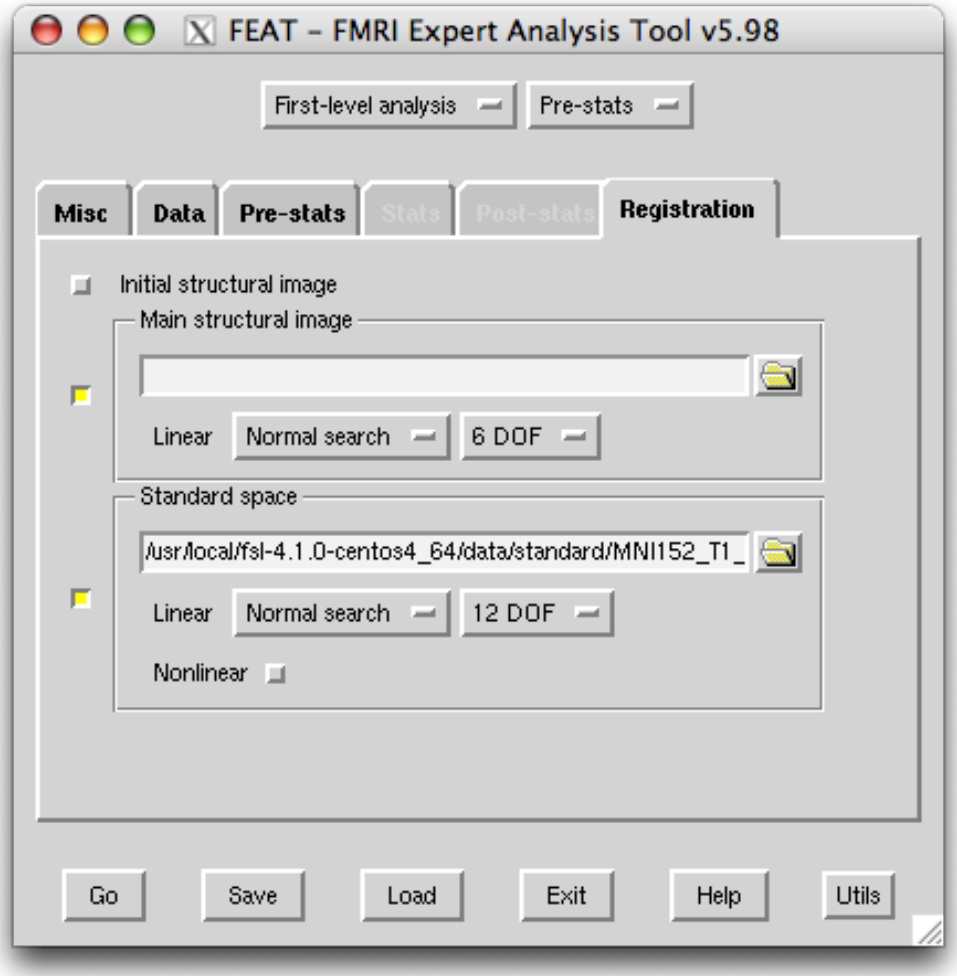
Data


FEAT - FMRI Expert Analysis Tool v5.98
First-level analysis
Pre-stats
Misc
Data
Pre-stats
Stats
Post-stats
Registration
Number of inputs
1
Select 4D data
Output directory
Total volumes
0
Delete volumes
0
TR (s)
3.0
High pass filter cutoff (s)
60
FSL
Go
Save
Load
Exit
Help
Utils

Prestats

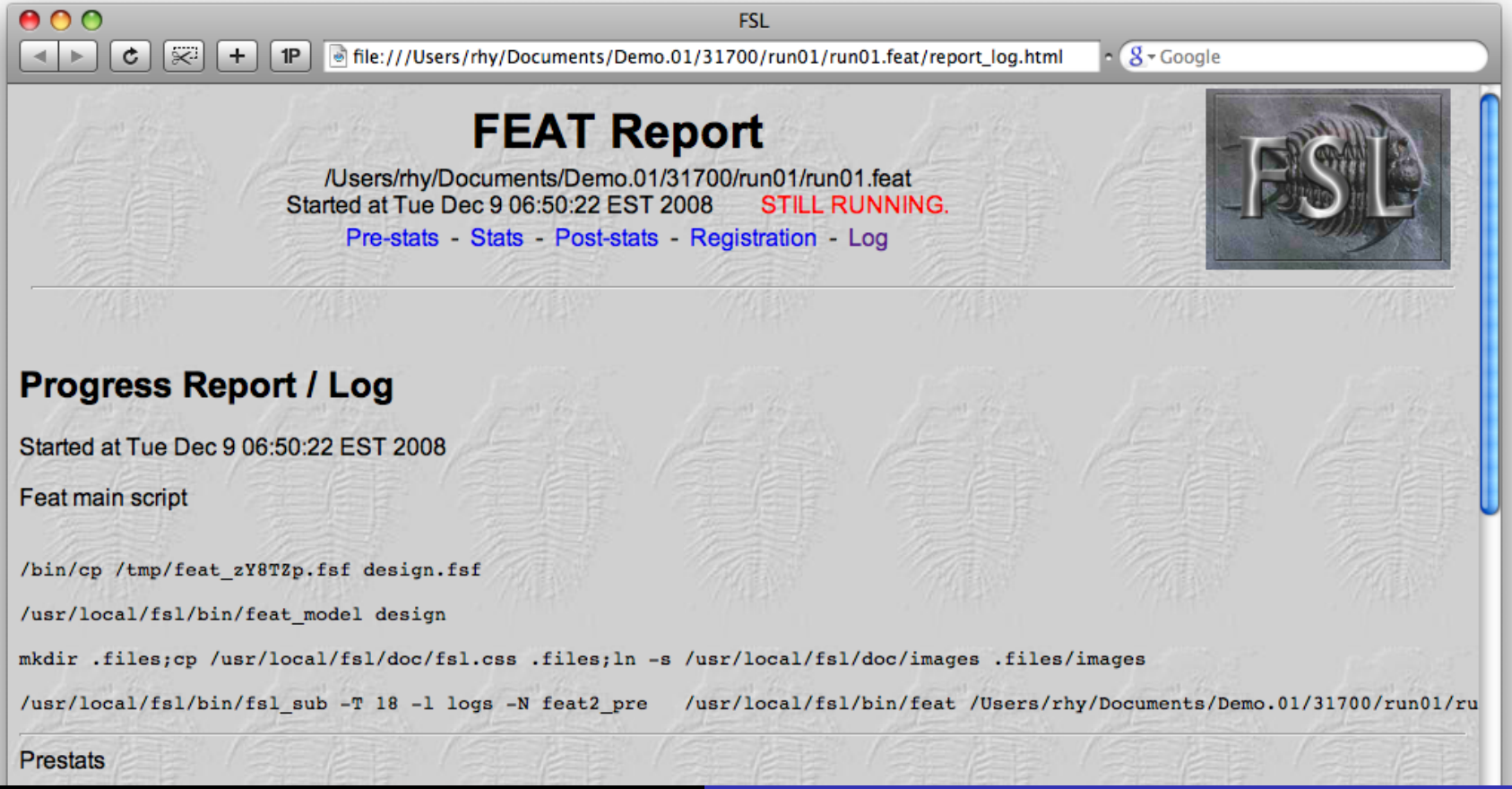

FEAT - FMRI Expert Analysis Tool v5.98
First-level analysis
Pre-stats
Misc
Data
Pre-stats
Stats
Post-stats
Registration
Motion correction:
MCFLIRT
B0 unwarping
Slice timing correction:
Interleaved (0, 2, 4 ... 1, 3, 5 ...)
BET brain extraction
Spatial smoothing FWHM (mm)
5
Intensity normalization
Temporal filtering
Perfusion subtraction
Highpass
Lowpass
MELODIC ICA data exploration
Go
Save
Load
Exit
Help
Utils

Registration



Output

- Output placed in `run01.feat/`



Conclusion

- Prepared the functional and anatomical images (reoriented, converted to NIFTI, and created brain mask from hi-res image)
- Specified event time-series for conditions
- Preprocessed and checked
- Now ready to setup model...