



aa 4.3: new features

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Automatic analysis (aa) 4.3

- **Robustness**

- Running
- Summaries

- **Convenience**

- Setting up
- Running
- Results

<https://github.com/rhodricusack/automaticanalysis/blob/v4-devel/CHANGELOG.md>

- **New features**

- General
- fMRI
- MEG



Robustness

- **Running**

- Compatibility with MATLAB pre-r2012b (*localsingle* only)¹
- Iterative file retrieval to overcome network issues (*aap.options.maximumretry = 5*)
- aaworker folders
 - prevent creation of the useless aaworker0 folder
 - created in <HOME>/.**aa** (hidden) folder
 - cleaned up regularly after certain days (*aap.options.aaworkercleanup = 7*)

- **Summaries**

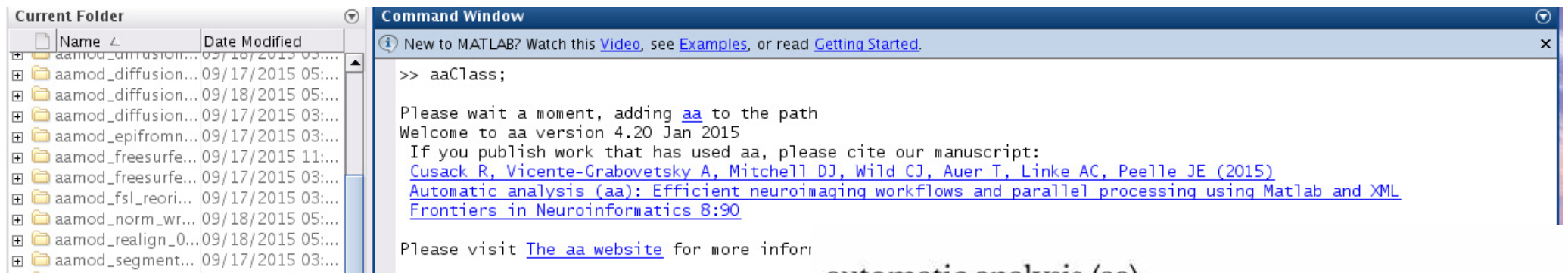
- Default message for "Motion correction summary" in case of a single subject
- Renaming "First level contrasts" to "First level thresholded maps"

Convenience

- **Setting up**
 - Allow specification of subjects in the whole UMS in the same way
 - *aas_addsubject*
 - *aas_addevent*
 - *aas_addcovariate*
 - *aas_addcontrast*
 - *aap.options.checktasksettingconsistency* (experimental):
 - Check whether settings have changed since the last execution
 - Trigger re-execution of the task accordingly regardless of the doneflag

Convenience

- Running
 - aa Intro



TECHNOLOGY REPORT ARTICLE

Front. Neuroinform., 15 January 2015 | <http://dx.doi.org/10.3389/fninf.2014.00090>

Automatic analysis (aa): efficient neuroimaging workflows and parallel processing using Matlab and XML

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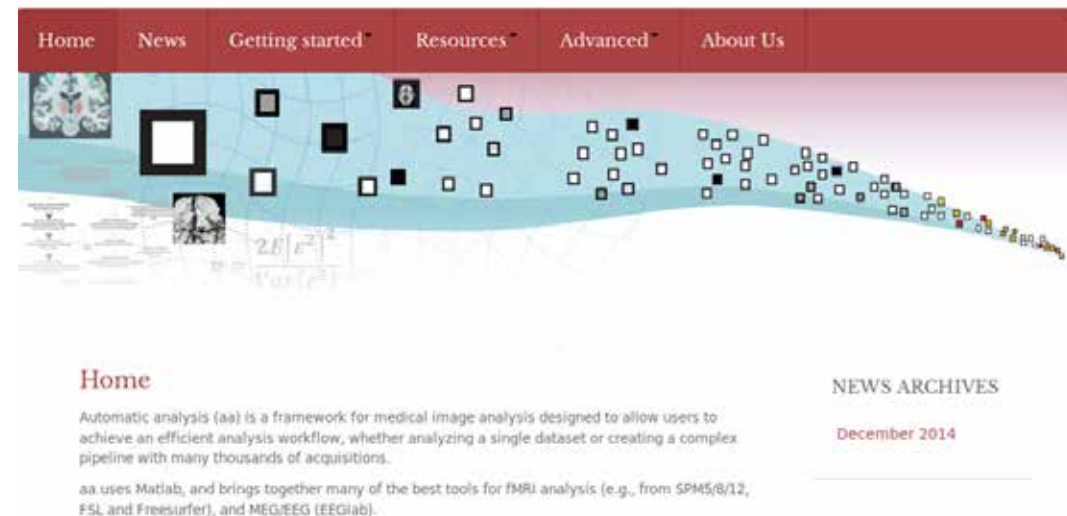
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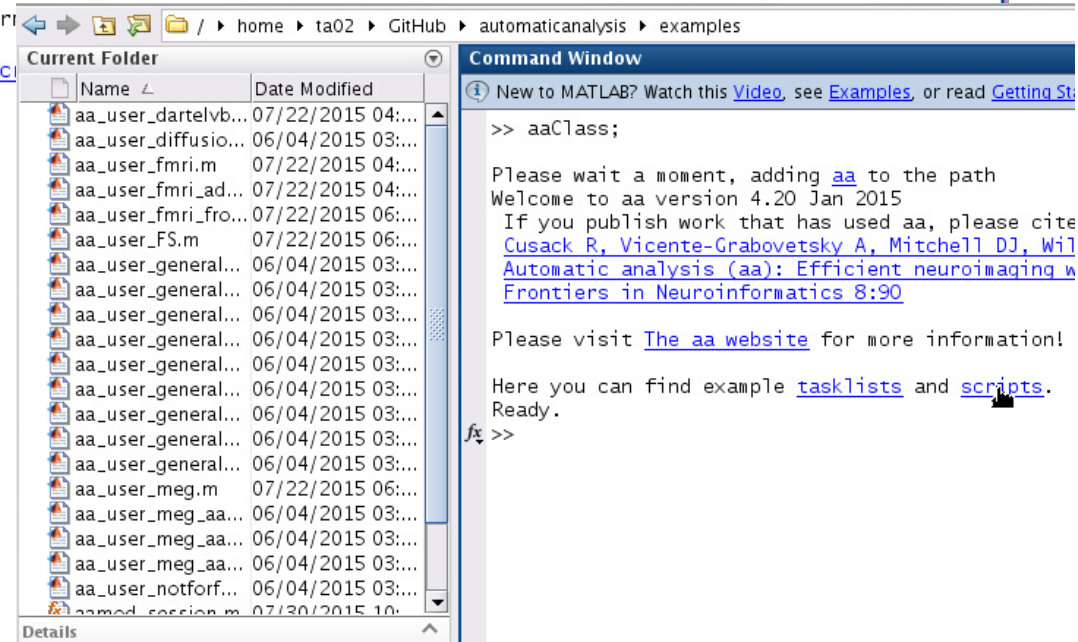
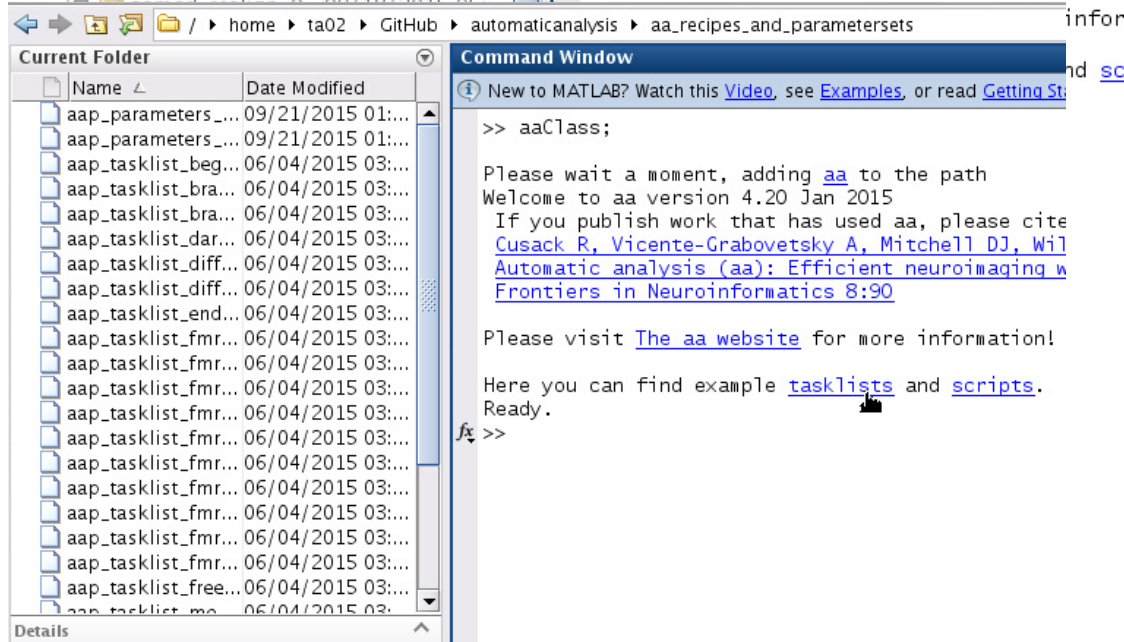
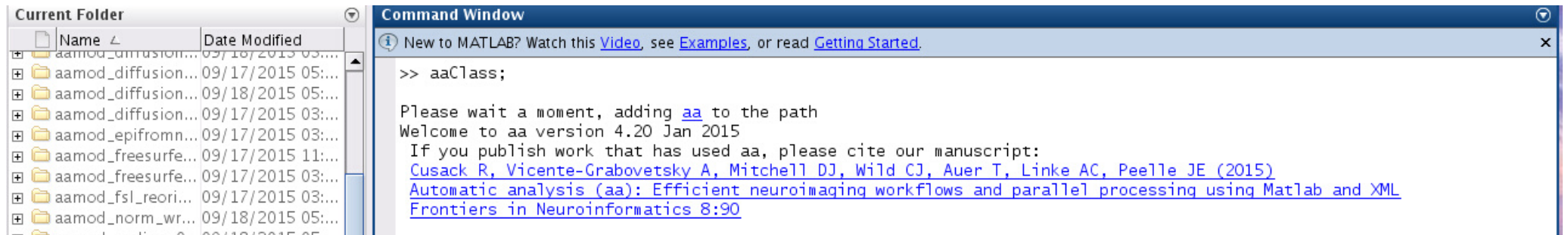
1d [SCI](#) automatic analysis (aa)

Efficient workflows for medical imaging



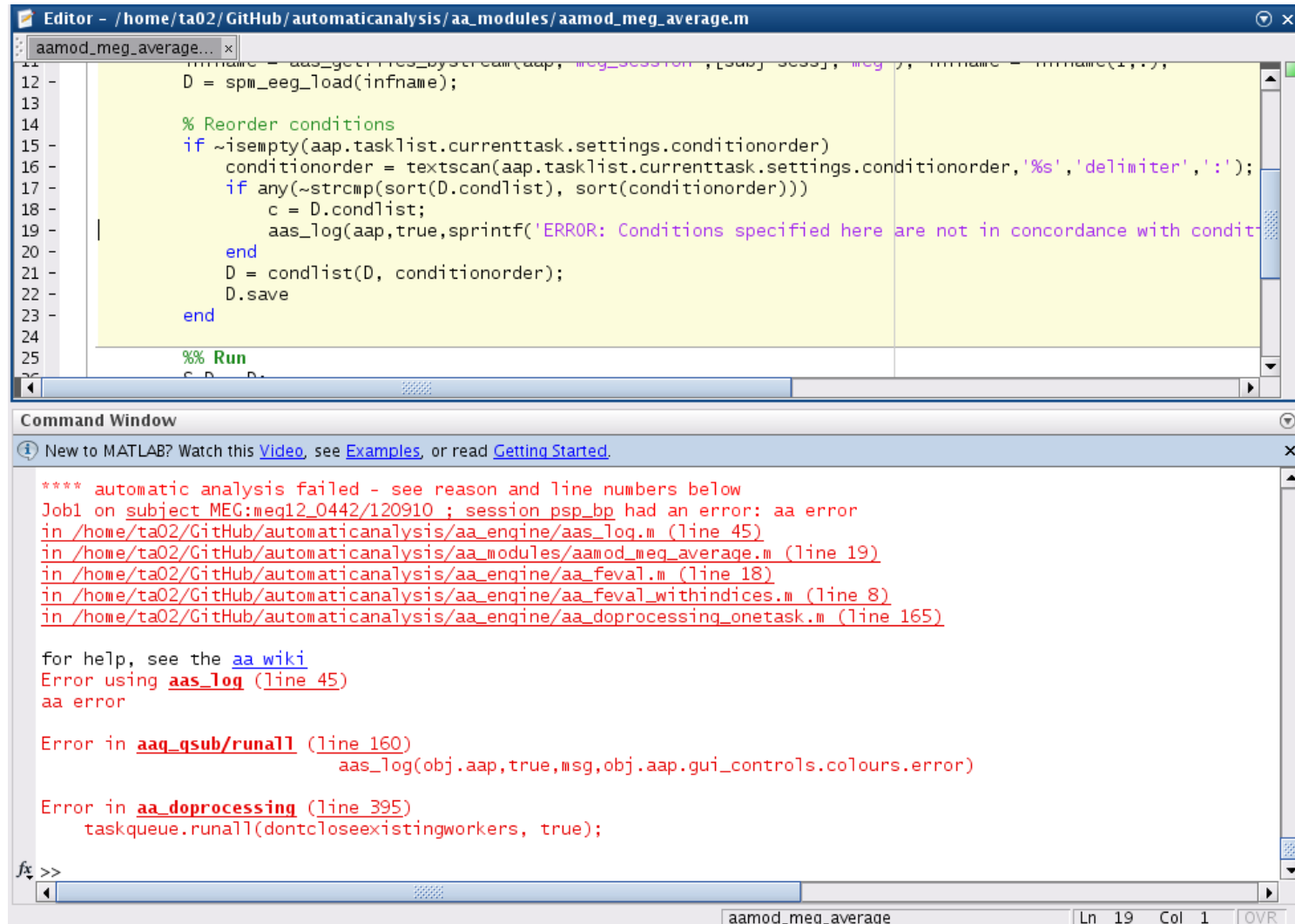
Convenience

- Running
 - aa Intro



Convenience

- Running
 - qsub provides links to code in case of error



The screenshot shows a MATLAB Editor window with a script named `aamod_meg_average.m`. The script contains the following code:

```
12 - D = spm_eeg_load(infile);
13
14 % Reorder conditions
15 - if ~isempty(aap.tasklist.currenttask.settings.conditionorder)
16     conditionorder = textscan(aap.tasklist.currenttask.settings.conditionorder, '%s', 'delimiter', ':');
17     if any(~strcmp(sort(D.condlist), sort(conditionorder)))
18         c = D.condlist;
19         aas_log(aap, true, sprintf('ERROR: Conditions specified here are not in concordance with condit
20     end
21     D = condlist(D, conditionorder);
22     D.save
23 - end
24
25 %% Run
```

The Command Window displays the following error message:

```
**** automatic analysis failed - see reason and line numbers below
Job1 on subject MEG:meg12_0442/120910 ; session psp_bp had an error: aa error
in /home/ta02/GitHub/automaticanalysis/aa_engine/aas_log.m (line 45)
in /home/ta02/GitHub/automaticanalysis/aa_modules/aamod_meg_average.m (line 19)
in /home/ta02/GitHub/automaticanalysis/aa_engine/aa_feval.m (line 18)
in /home/ta02/GitHub/automaticanalysis/aa_engine/aa_feval_withindices.m (line 8)
in /home/ta02/GitHub/automaticanalysis/aa_engine/aa_doprocessing_onetask.m (line 165)

for help, see the aa wiki
Error using aas_log (line 45)
aa error

Error in aaq_qsub/runall (line 160)
    aas_log(obj.aap, true, msg, obj.aap.gui_controls.colours.error)

Error in aa_doprocessing (line 395)
    taskqueue.runall(dontcloseexistingworkers, true);

fx >>
```

The status bar at the bottom of the Command Window shows the current file is `aamod_meg_average`, line 19, column 1.

Convenience

- Running
 - GUI for qsub
 - Main window¹

The screenshot displays the MATLAB R2012b environment. A 'Queue' dialog box is open, showing a list of active jobs. The jobs are numbered 1 through 8, all with the name 'aamod_firstlevel_model'. The dialog box includes an 'Autoupdate' checkbox (unchecked), an 'Update' button, and buttons for 'Info...', 'Kill all!', and 'Close'. Below the dialog box, the MATLAB editor shows a script with the following code:

```
11 % Modify standard recipe module selection here if you'd like
12 aap.options.wheretoprocess = 'qsub'; % queuing system           % typical value qsub | localsingle
13 aap.options.autoidentifyfieldmaps=0;                          % typical value 1
14 aap.options.NIFTI4D = 1;                                       % typical value 0
15 aap.options.email='tibor.auer@mrc-cbu.cam.ac.uk';
16
17 aap.tasksettings.aamod_dartel_norm_write.vox = 1;
18 aap.tasksettings.aamod_smooth.FWHM = 5;
19 aap.tasksettings.aamod_diffusion_bet.bet_f_parameter = 0.4;
20 aap.tasksettings.aamod_slicetiming.autodetectS0 = 1;
21 aap.tasksettings.aamod_slicetiming.refslice = 16;
22 aap.tasksettings.aamod_norm_write_dartel.vox = [3 3 3];
23 aap.tasksettings.aamod_firstlevel_model(1).includemovementpars = 1; % Include/exclude Moco params in/from DM,
24 aap.tasksettings.aamod_firstlevel_model(2).includemovementpars = 1; % Include/exclude Moco params in/from DM,
25 aap.tasksettings.aamod_firstlevel_threshold(1).overlay.nth_slice = 9;
```

The Command Window at the bottom shows the following output:

```
MODULE aamod_firstlevel_model RUNNING: Job2.
MODULE aamod_firstlevel_model RUNNING: Job3.
MODULE aamod_firstlevel_model RUNNING: Job4.
MODULE aamod_firstlevel_model RUNNING: Job5.
MODULE aamod_firstlevel_model RUNNING: Job6.
MODULE aamod_firstlevel_model RUNNING: Job7.
MODULE aamod_firstlevel_model RUNNING: Job8.
MODULE aamod_firstlevel_model on subject MRI:01_retest FINISHED: Job1 used 53s.
```


Convenience

- Running
 - GUI for qsub
 - Info...

The screenshot displays the MATLAB R2012b environment with several windows open:

- Queue Window:** Shows active jobs at 21-Sep-2015 16:34:36. The list includes jobs 57 through 64, all running. Below the list are buttons for 'Autoupdate', 'Update', 'Info...', 'Kill all!', and 'Close'.
- Scheduler: parallel.cluster.Torque Window:** Provides job status: 'Queuing 0 jobs', 'Running 8 jobs', and 'Finished 56 jobs'. It also lists submission details: 'Submitted from master01.mrc-cbsu.local', 'To 1 core(s)/Jobs', 'In compute queue', 'With 4gb RAM', 'For maximum 1d', and 'Job Storage in /home/ta02/aaworker/20150921T162205_tp682a7211_1437_4685_97c3_e4c52e4c4488'. An 'OK' button is at the bottom.
- Command Window:** Shows the output of a qsub command, including module loading and job completion status for Job59 and Job57.

```
running job 57: aamod_firstlevel_threshold_register2FS
running job 58: aamod_firstlevel_threshold_register2FS
running job 59: aamod_firstlevel_threshold_register2FS
running job 60: aamod_firstlevel_threshold_register2FS
running job 61: aamod_firstlevel_threshold_register2FS
running job 62: aamod_firstlevel_threshold_register2FS
running job 63: aamod_firstlevel_threshold_register2FS
running job 64: aamod_firstlevel_threshold_register2FS

Autoupdate:  Update

Info... Kill all! Close

- Queuing 0 jobs
- Running 8 jobs
- Finished 56 jobs

- Submitted from master01.mrc-cbsu.local
- To 1 core(s)/Jobs
- In compute queue
- With 4gb RAM
- For maximum 1d

- Job Storage in
/home/ta02/aaworker/20150921T162205_tp682a7211_1437_4685_97c3_e4c52e4c4488

OK

MODULE aamod_firstlevel_threshold_register2FS RUNNING: Job59.
MODULE aamod_firstlevel_threshold_register2FS RUNNING: Job60.
MODULE aamod_firstlevel_threshold_register2FS RUNNING: Job61.
MODULE aamod_firstlevel_threshold_register2FS RUNNING: Job62.
MODULE aamod_firstlevel_threshold_register2FS RUNNING: Job63.
MODULE aamod_firstlevel_threshold_register2FS RUNNING: Job64.
MODULE aamod_firstlevel_threshold_register2FS on subject MRI:01_retest FINISHED: Job57 used 3m 0s.
MODULE aamod_firstlevel_threshold_register2FS on subject MRI:02_retest FINISHED: Job59 used 2m 59s.
```

Convenience

- Running
 - GUI for qsub
 - Job

The screenshot displays the MATLAB R2012b environment. A 'Queue' window is open, showing a list of active jobs. A 'Job34Task1' dialog box is overlaid on top, providing details for a specific job. The Command Window at the bottom shows the output of the jobs, including their status and completion times.

Queue Window:

```
Active jobs at 21-Sep-2015 16:28:13
running job 25: aamod_firstlevel_threshold_register2FS
running job 26: aamod_firstlevel_threshold_register2FS
running job 38: aamod_firstlevel_model
running job 39: aamod_firstlevel_model
running job 40: aamod_firstlevel_model
```

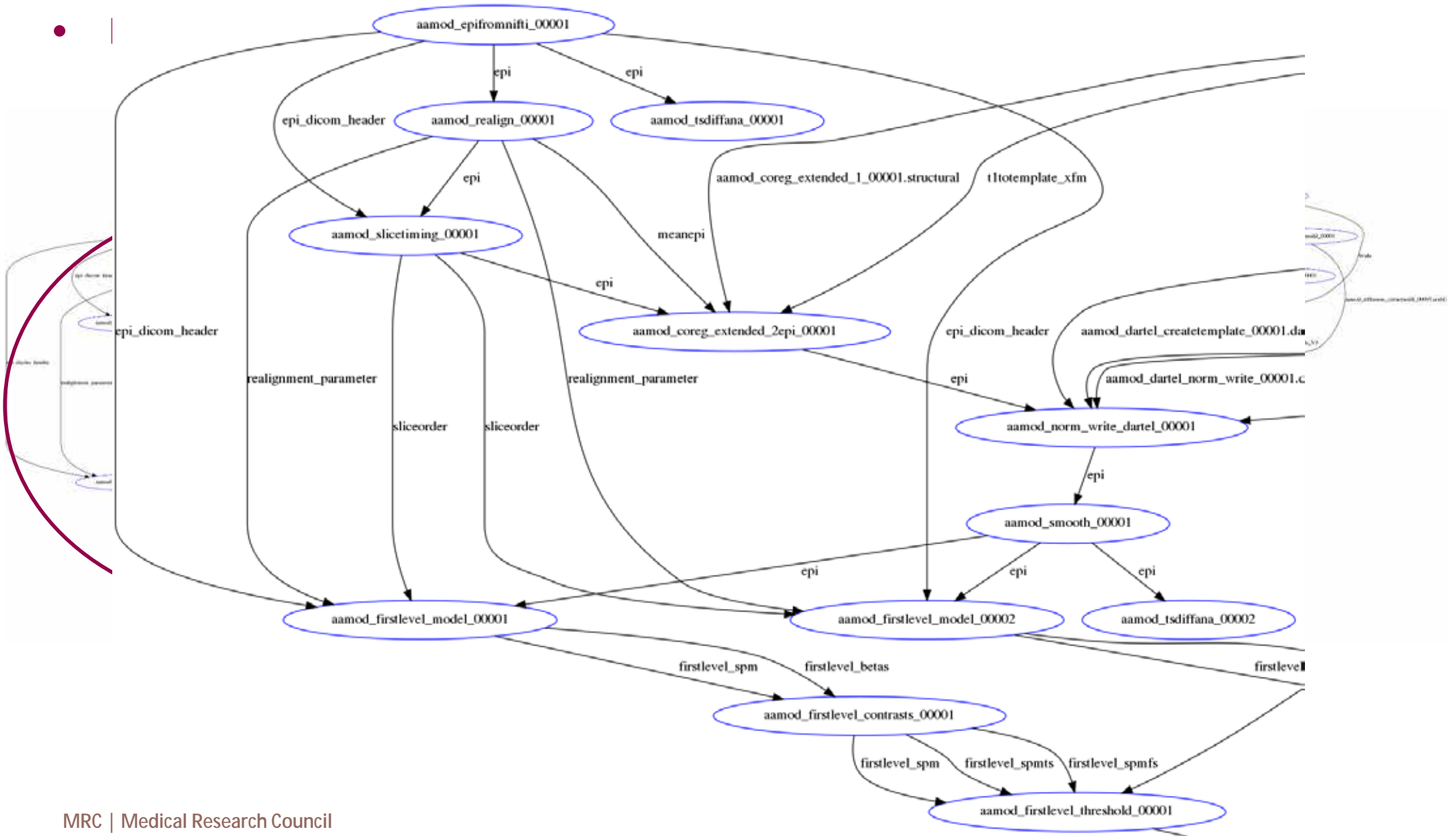
Job34Task1 Dialog Box:

```
- Module: aamod_firstlevel_model
- Indices:
  - Subject 01_test
- Has been running on node-cc06.mrc-cbu.cam.ac.uk
- For 0 days 0h 1m 38s
```

Command Window:

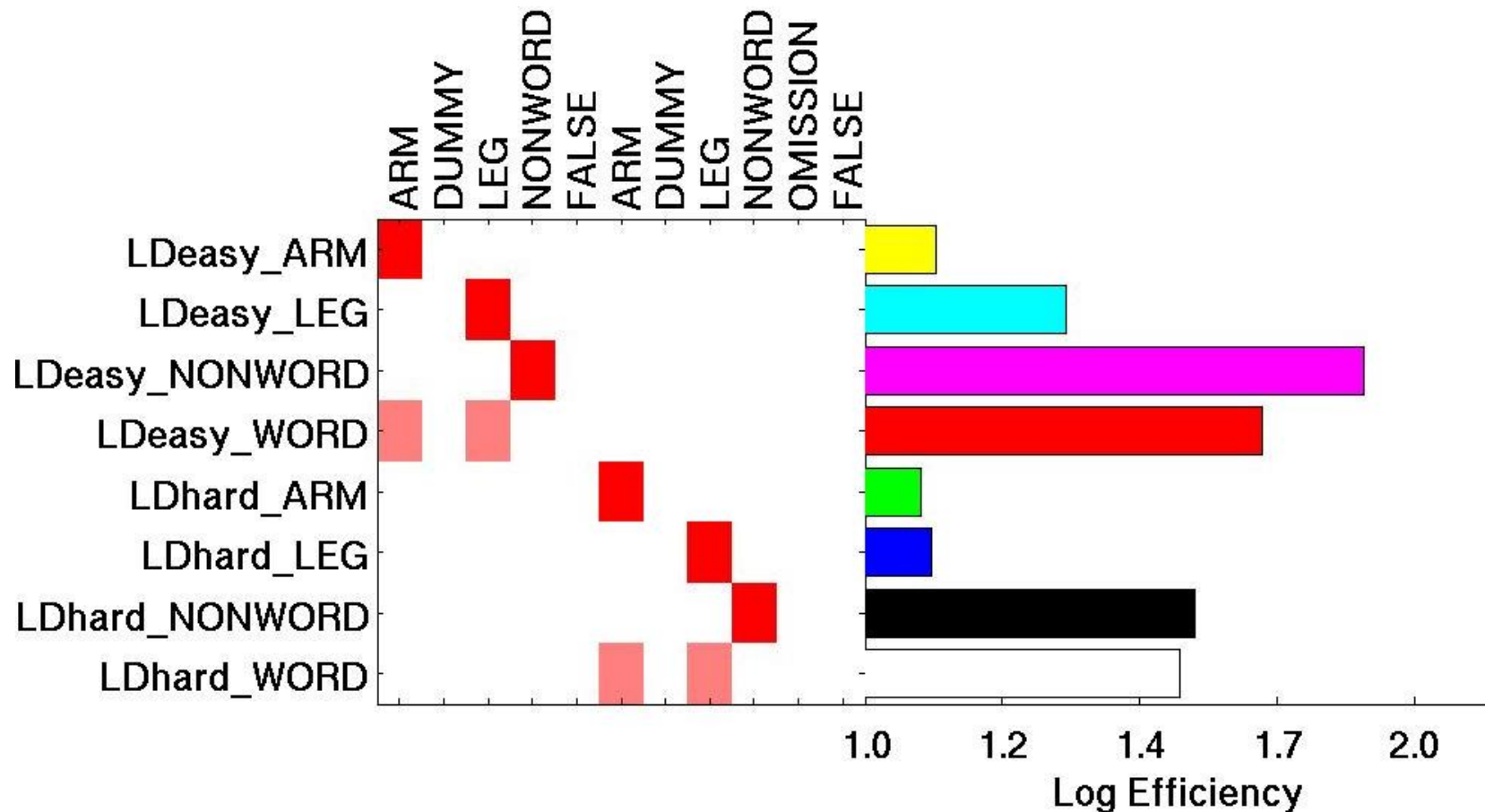
```
MODULE aamod_firstlevel_contrasts PENDING: First level contrasts for /imaging/ta02/aa/BIDS114_Fast/aamod_firstlevel_c
MODULE aamod_firstlevel_contrasts PENDING: First level contrasts for /imaging/ta02/aa/BIDS114_Fast/aamod_firstlevel_c
MODULE aamod_firstlevel_contrasts PENDING: First level contrasts for /imaging/ta02/aa/BIDS114_Fast/aamod_firstlevel_c
MODULE aamod_firstlevel_contrasts PENDING: First level contrasts for /imaging/ta02/aa/BIDS114_Fast/aamod_firstlevel_c
MODULE aamod_firstlevel_model on subject MRI:01_retest FINISHED: Job33 used 1m 45s.
MODULE aamod_firstlevel_model on subject MRI:01_test FINISHED: Job34 used 1m 58s.
```

Convenience



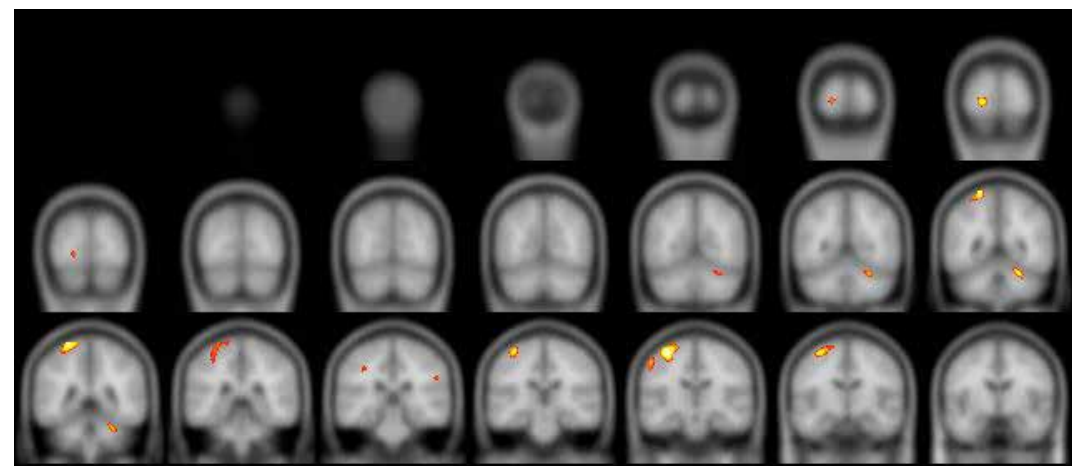
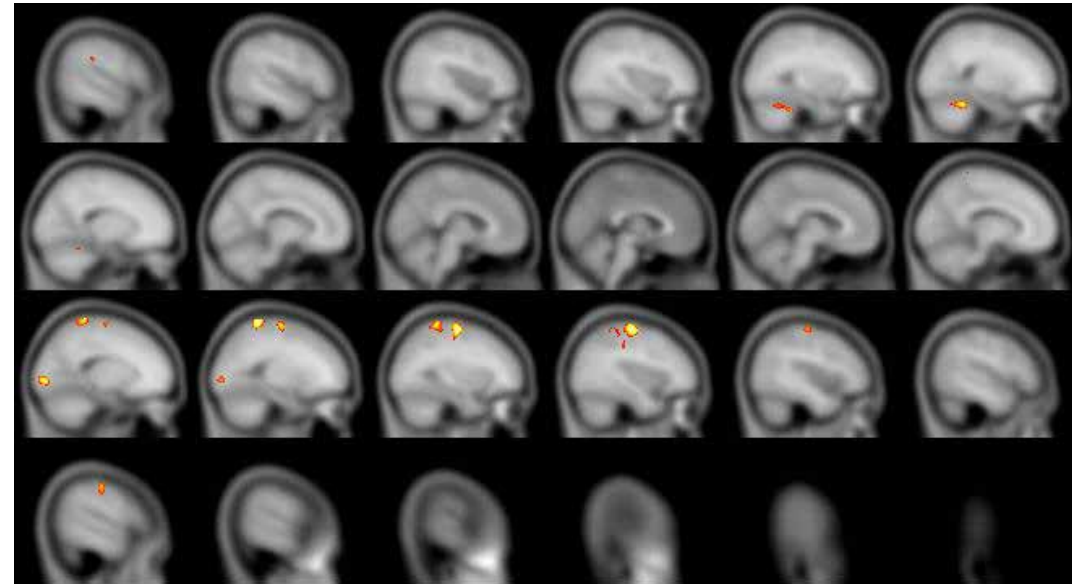
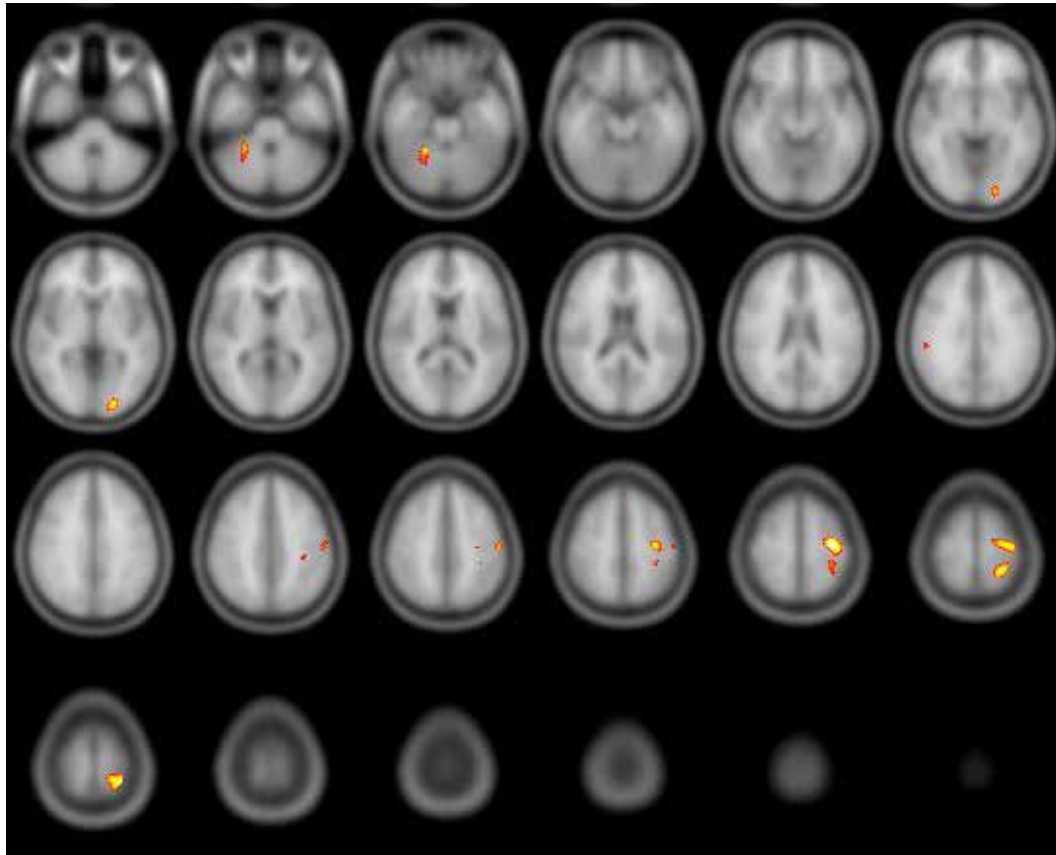
Convenience

- Results
 - Consistent (and nice) graph of contrasts



Convenience

- Results
 - *aamod_firstlevel_threshold* creates overlays across all three axes



New features

- **General**

- dynamic modification of streams (*aas_renamestream*)
- E.g.: *aamod_maths* to calculate resting-state fluctuation amplitude (RSFA)



aamod_maths.xml

% Specify equation

aap.tasksettings.aamod_maths.operation = 'std(X,[],4)';

% Use 'epi' as input

aap = aas_renamestream(aap, 'aamod_maths_00001', 'input', 'epi');

% Output 'RSFA'

aap = aas_renamestream(aap, 'aamod_maths_00001', 'output', 'RSFA', 'output');

New features

- **fMRI:**
 - Automatic slicetiming with exact timing from DICOM header
aap.tasksettings.aamod_slicetiming.autodetectSO = 1;
 - Automatic temporal modulation
parametric.name = 'time'
parametric.P = [];
parametric.h = <polynomial expansion>;
aap = aas_addevent(...,parametric);
 - Second-level GIFT



- Volumes
 - rthrT_0002
 - nu
- Surfaces
 - lh.orig



File name: sub-02/ses-test/surf/lh.orig

Opacity: 1.00

Color:

Render: Surface

Show vertices

Curvature: Binary

Mid point: 0

Overlay: rthrT_00022FS_lh.mgh

Configure Overlay

Annotation: Off

Label: Load Label

Edge color:

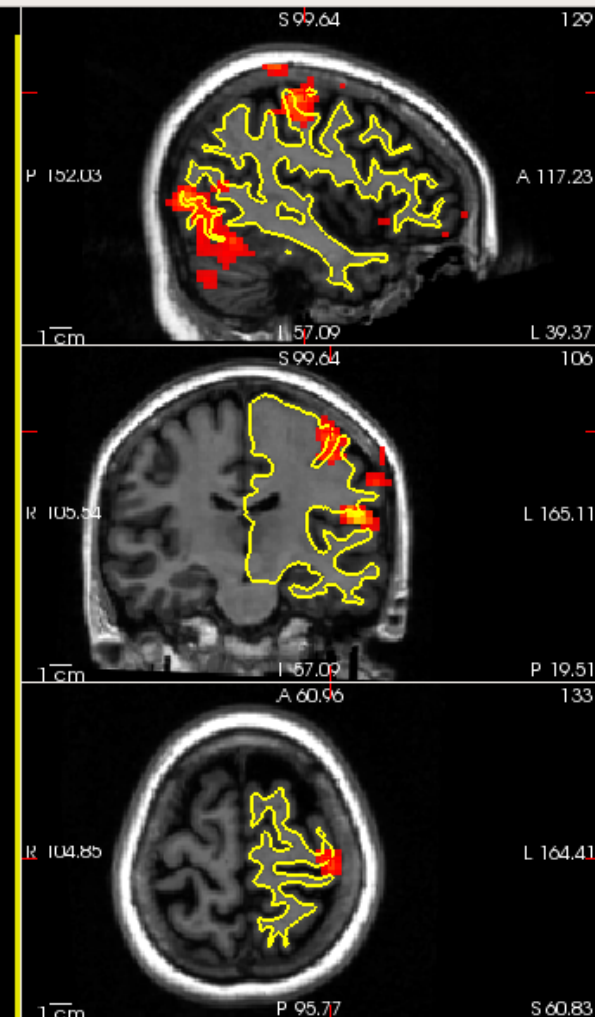
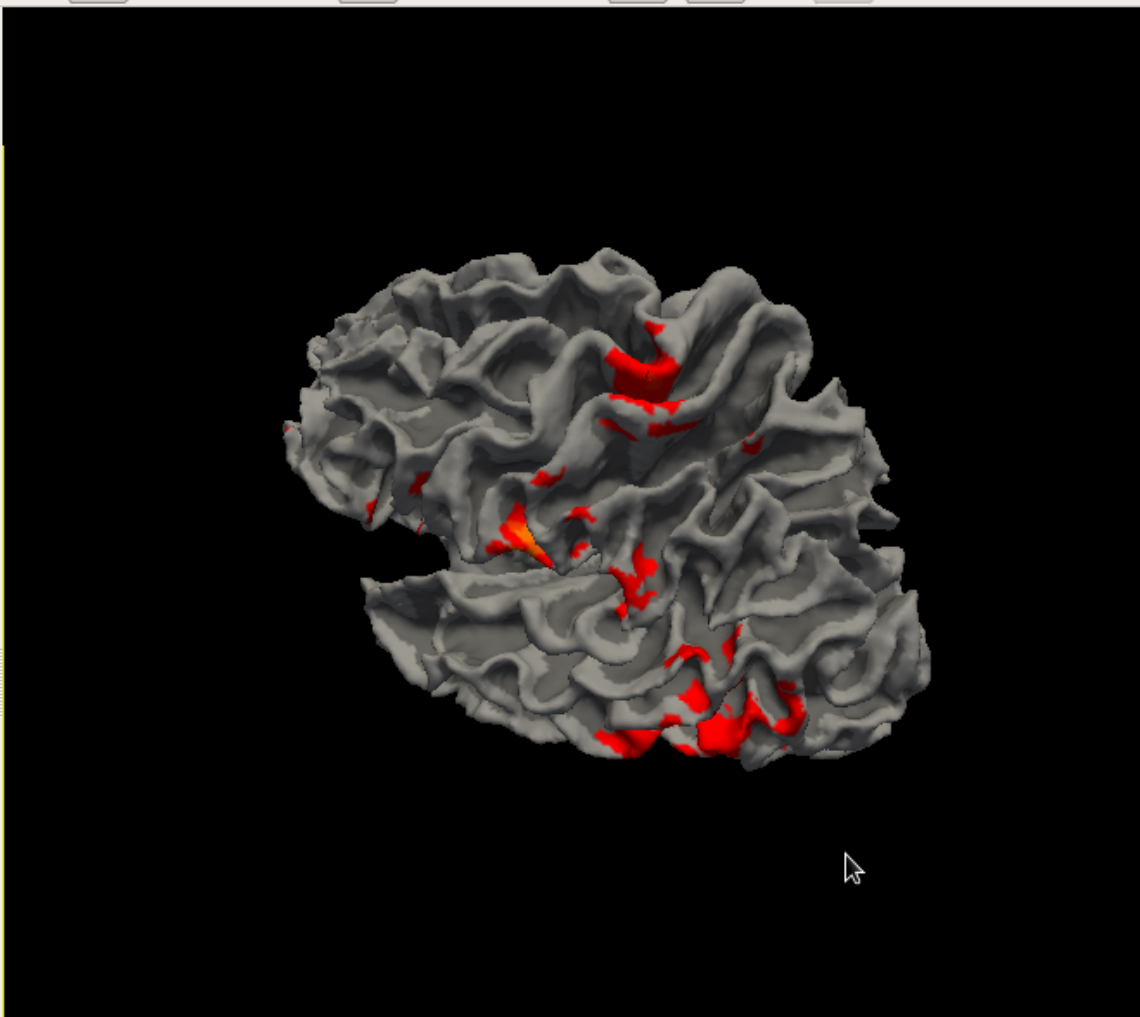
Edge thickness:

Vector display: Off

Spline display: Off

Position offset: 0 0 0

Show in Info Panel

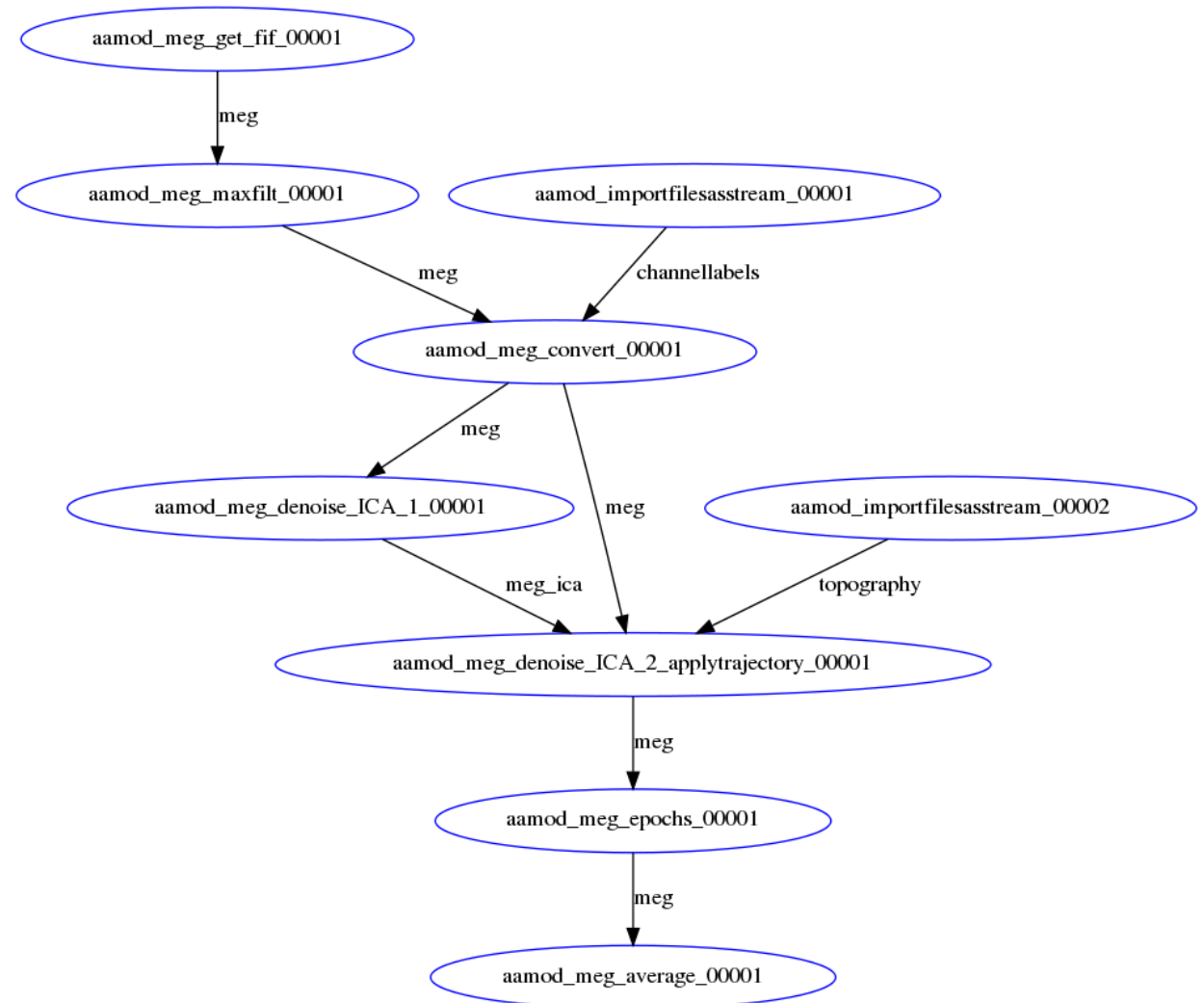


Cursor		Mouse	
RAS	-39.37, -19.51, 60.83	RAS	-37.46, 47.09, 1.99
TkReg...0002)	-38.87, 42.33, 2.01	TkReg...0002)	-36.96, -16.51, -64.59
rthrT_0002	4.462 [129, 106, 133]	rthrT_0002	0 [127, 173, 74]
nu	83 [161, 104, 125]	nu	84 [159, 163, 191]
lh.orig	SurfaceRAS [-33.05, -3.14, 23.62]	lh.orig	SurfaceRAS [-31.14, 63.46, -35.21]
	Vertex 56709 [-33.12, -3.10, 23.42]		Vertex 107729 [-31.10, 63.40, -35.39]
	rthrT_00022FS_lh.mgh 4.37578		rthrT_00022FS_lh.mgh 0

New features

- **MEG:**

- Maxfilter
- ICA Denoising
- Epoching
- Averaging



Info/Support

Website: <http://automaticanalysis.org>

GitHub: <https://github.com/rhodricusack/automaticanalysis/blob/v5-stable/README.md>

GitWiki: <https://github.com/rhodricusack/automaticanalysis/wiki>

Our Wiki: <http://imaging.mrc-cbu.cam.ac.uk/imaging/AA>

Maasters

