



Hands-On Data Analysis



- Data from safety training
 - 9 subjects
 - Finger-tapping task (12s tapping, 12s rest)
 - 188 scans acquired over 6:16 (TR = 2)
 - Hi-res structural image
- Single-subject analysis in SPM8



Finding the Data

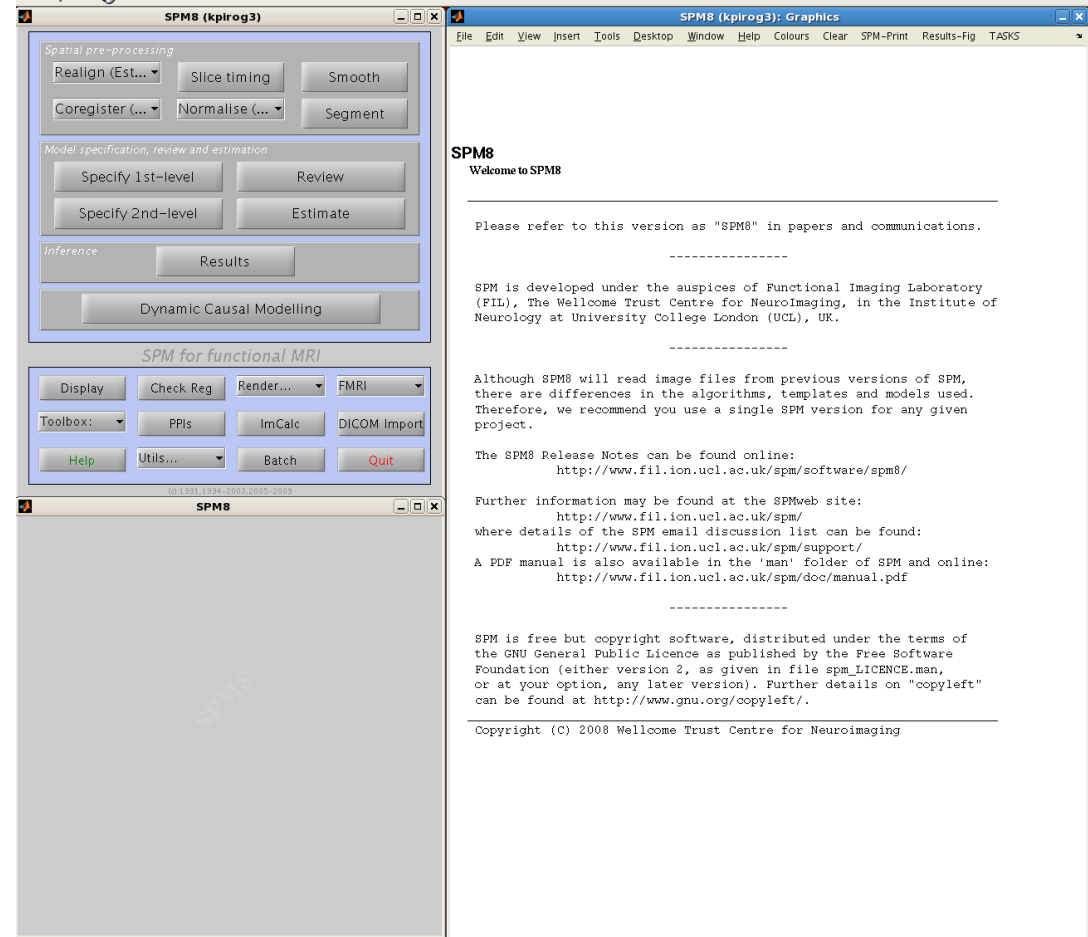
- Open terminal window
 - Navigate to directory
(type: `cd /home/public/coursedemo/spm`)
 - Choose subject
(type: `cd subj1` (or another subj 2-9))
- Data already converted from dicom format
 - Hi-res structural: `T1mprages002a1001...`
 - Functional: `fmri12secon12secoff...`



SPM: Single Subject



- Make sure you're in the proper directory:
/home/public/coursedemo/spm/subj#
- Launch MATLAB (type matlab)
- At prompt, type spm8 to launch SPM

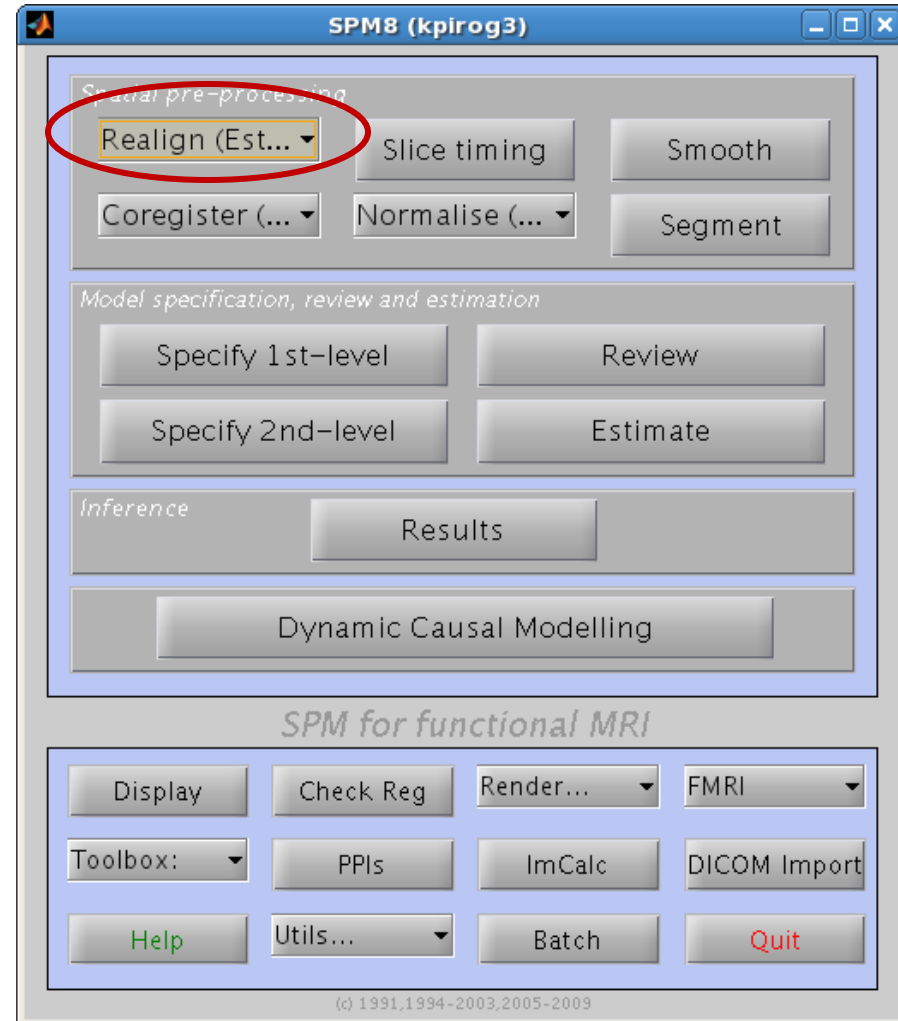




SPM: Single Subject



- Select Realign:
Estimate & Reslice
from spatial
preprocessing bar

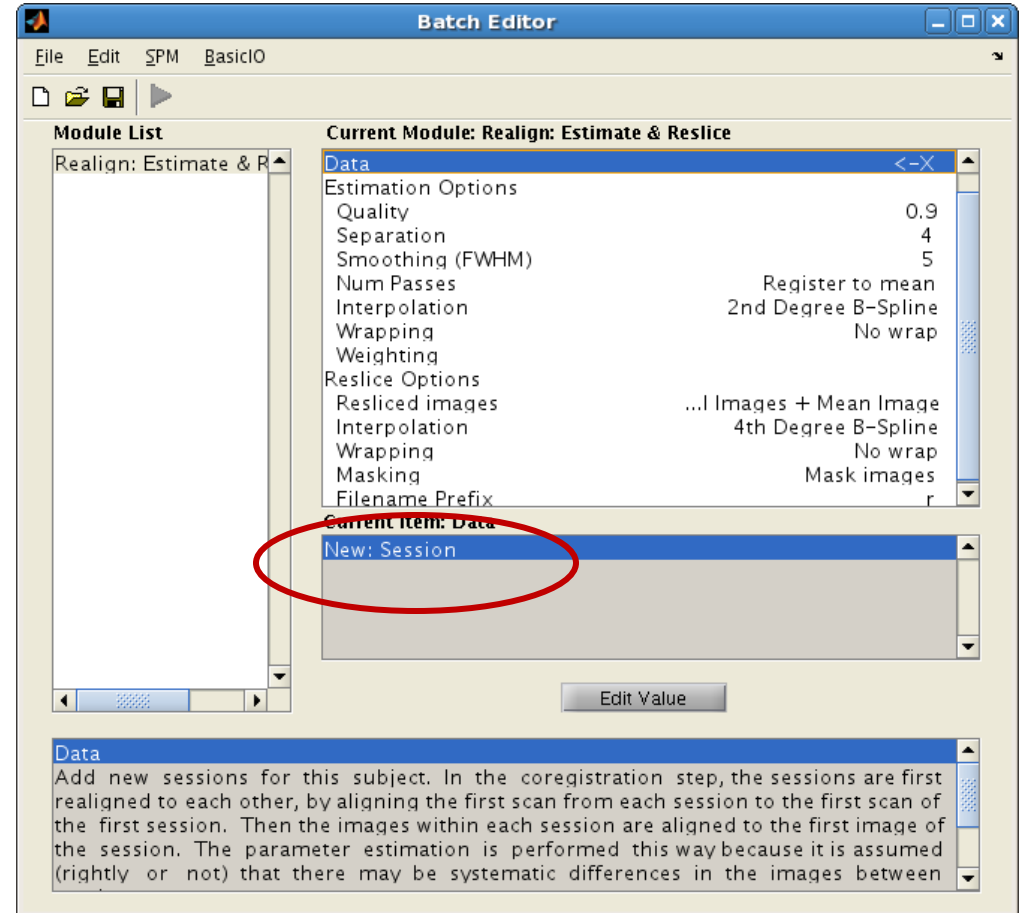




SPM: Single Subject



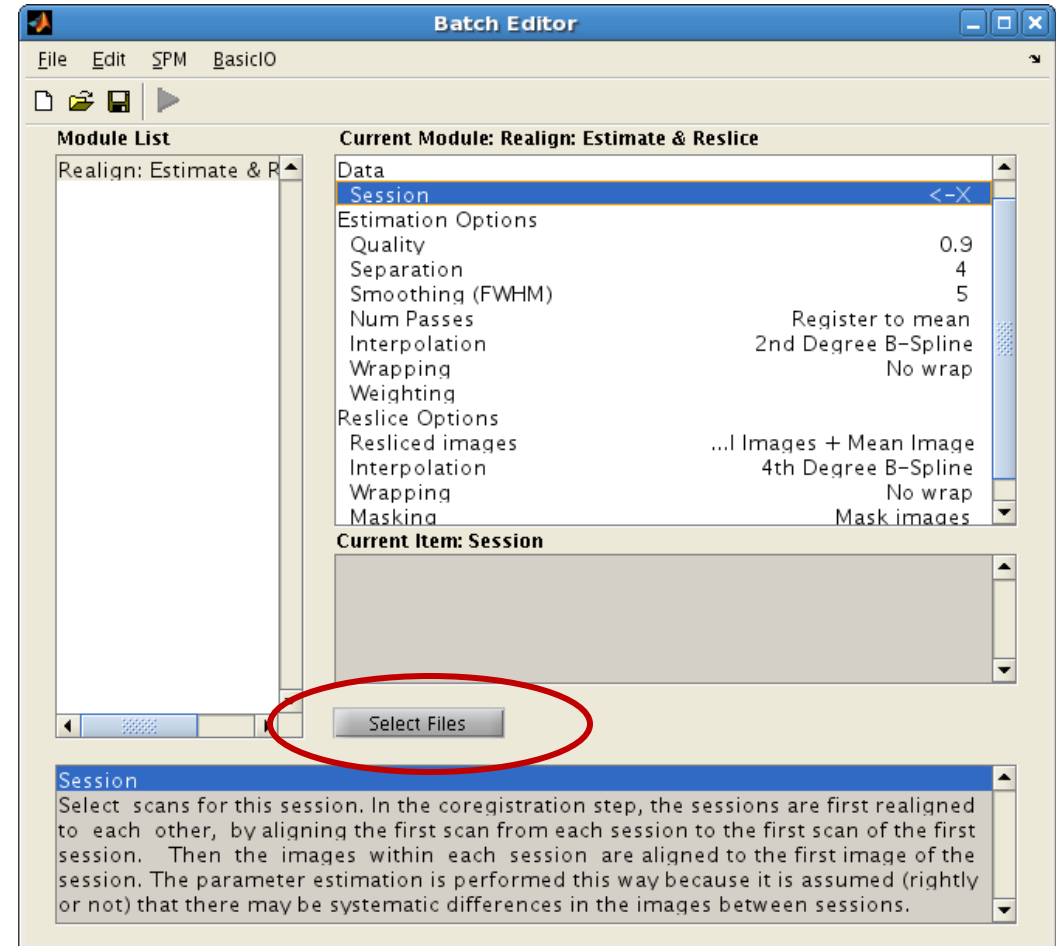
- Realign: Estimate & Reslice
 - Click New:Session





SPM: Single Subject

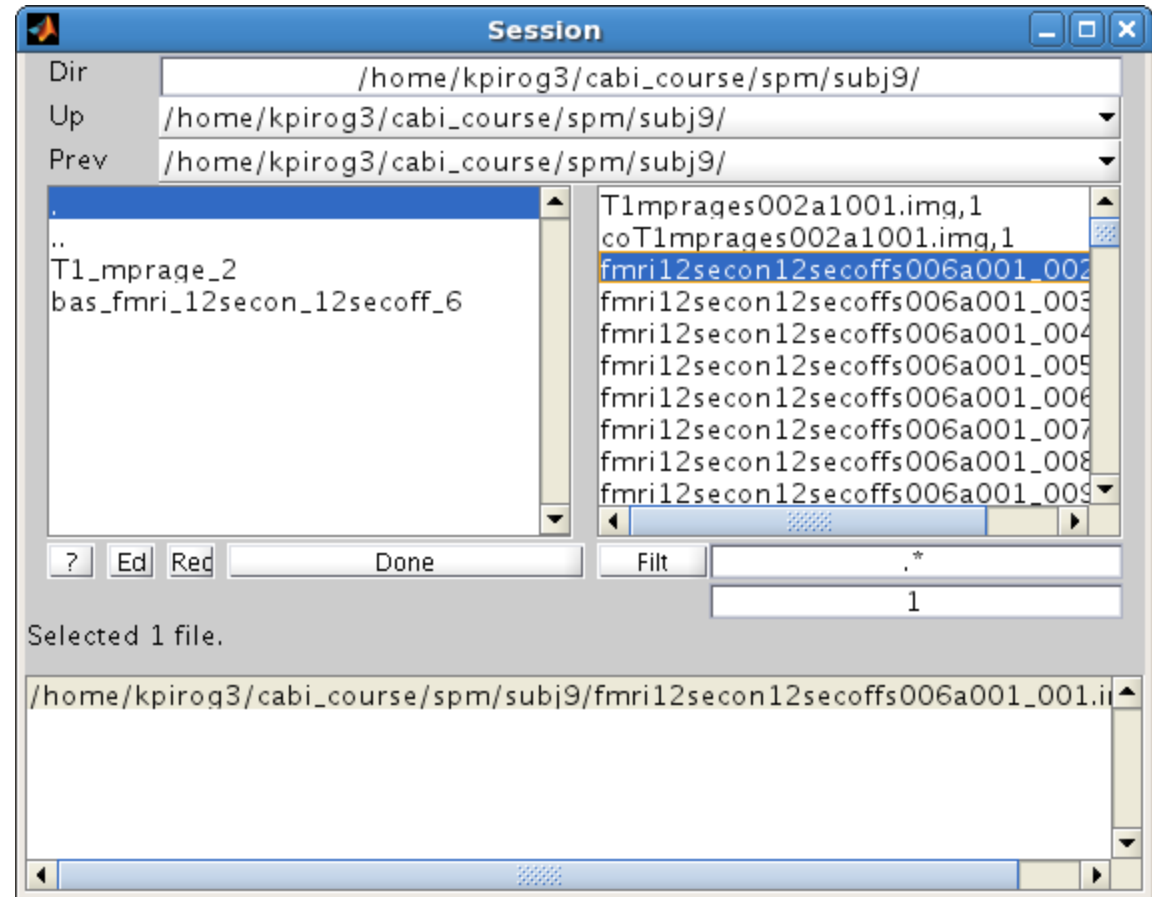
- Realign: Estimate & Reslice
 - Highlight Session and click on Select Files to open dialog box





SPM: Single Subject

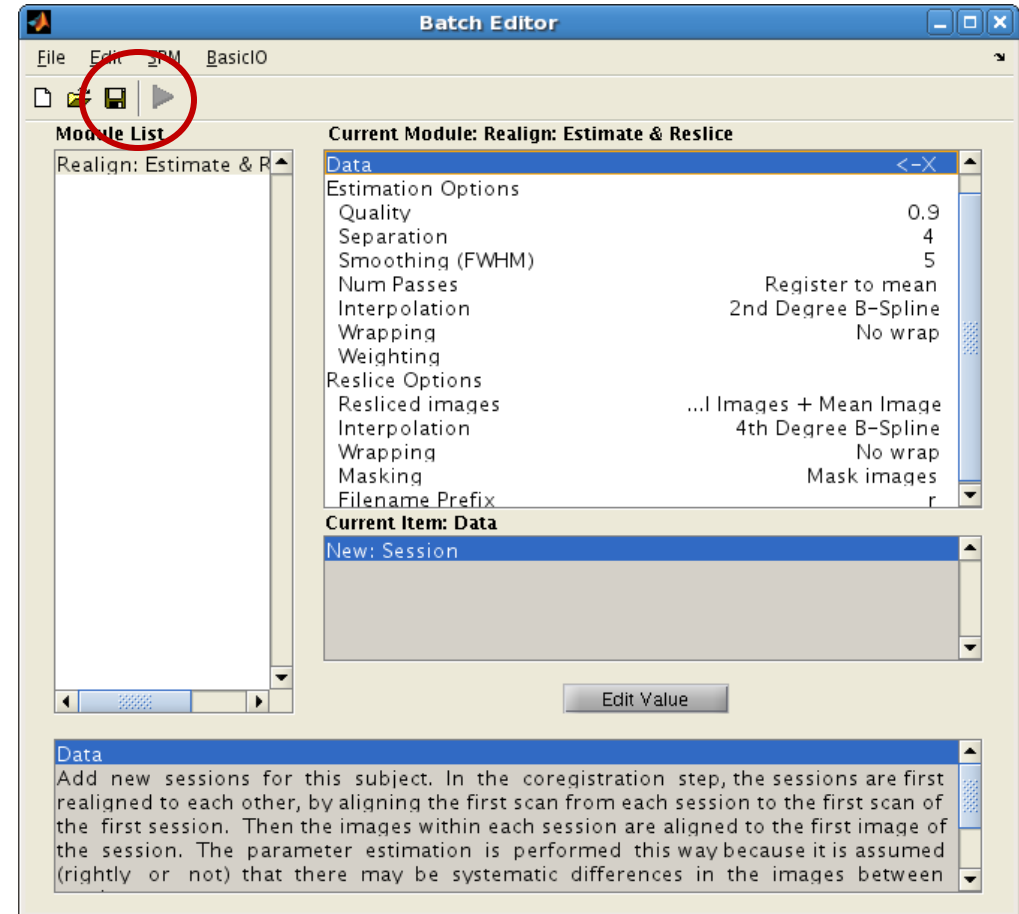
- Select all fmri12sec... images (hold down shift)
 - Hint: type ^f.* in filter box to only show files starting with f
 - 188 files selected
 - Click Done





SPM: Single Subject

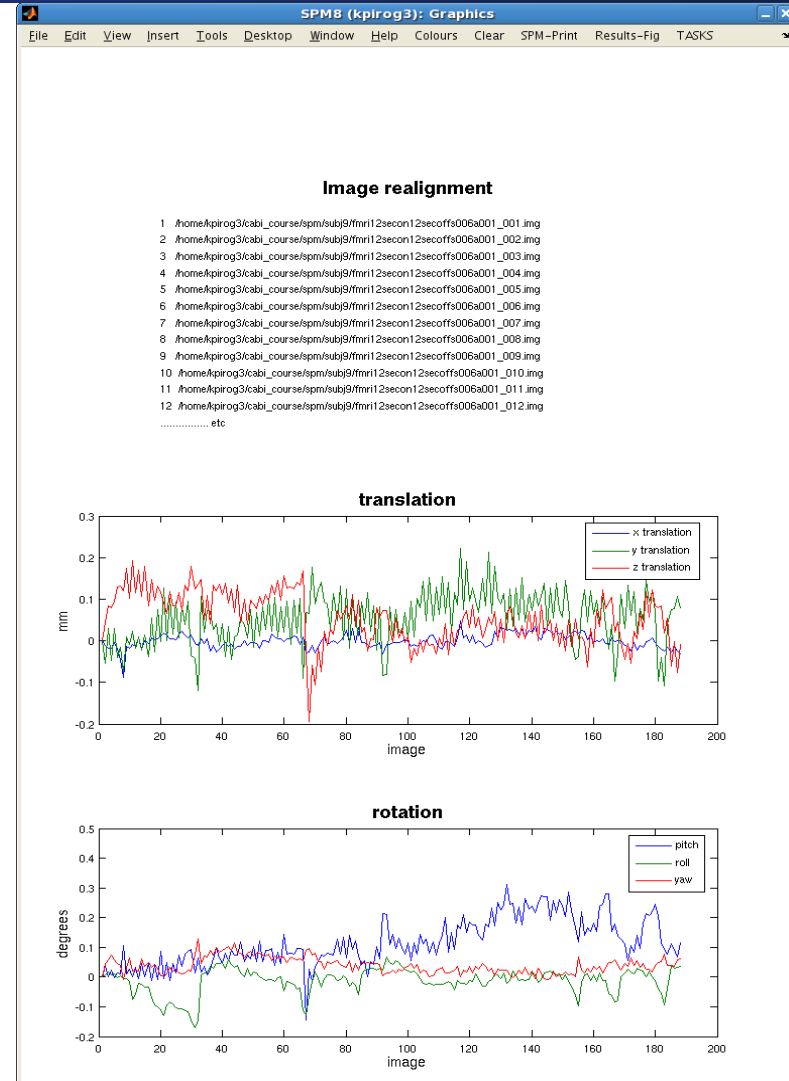
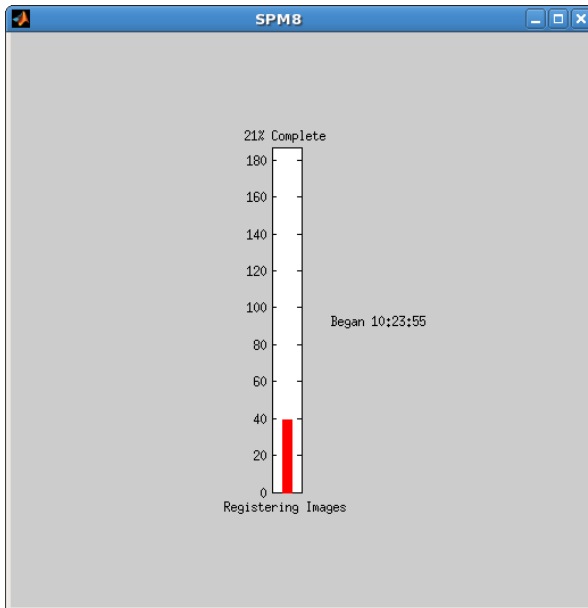
- Realign: Estimate & Reslice
 - Leave all options as defaults
 - Save as realign.mat
 - Press green arrow to run (2 min)
 - Close batch editor





SPM: Single Subject

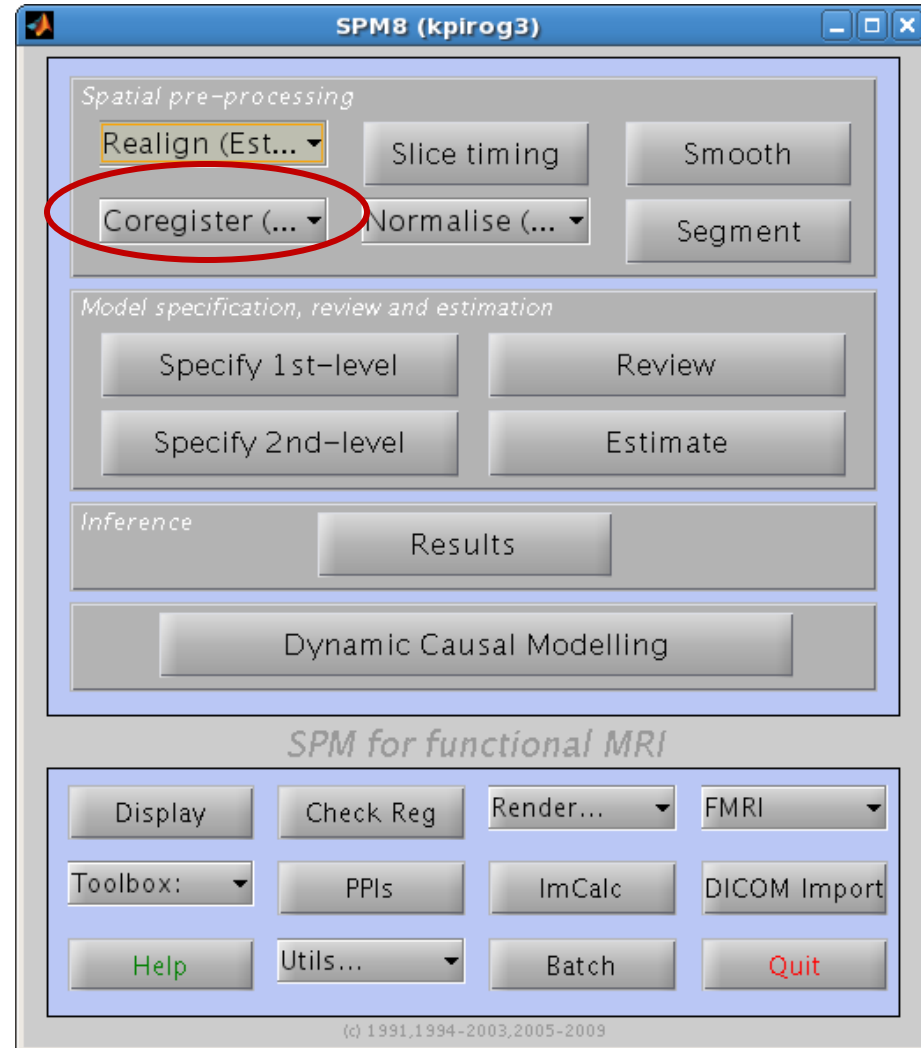
- Progress shown in lower left window
- Results of each step generally displayed in Graphics window





SPM: Single Subject

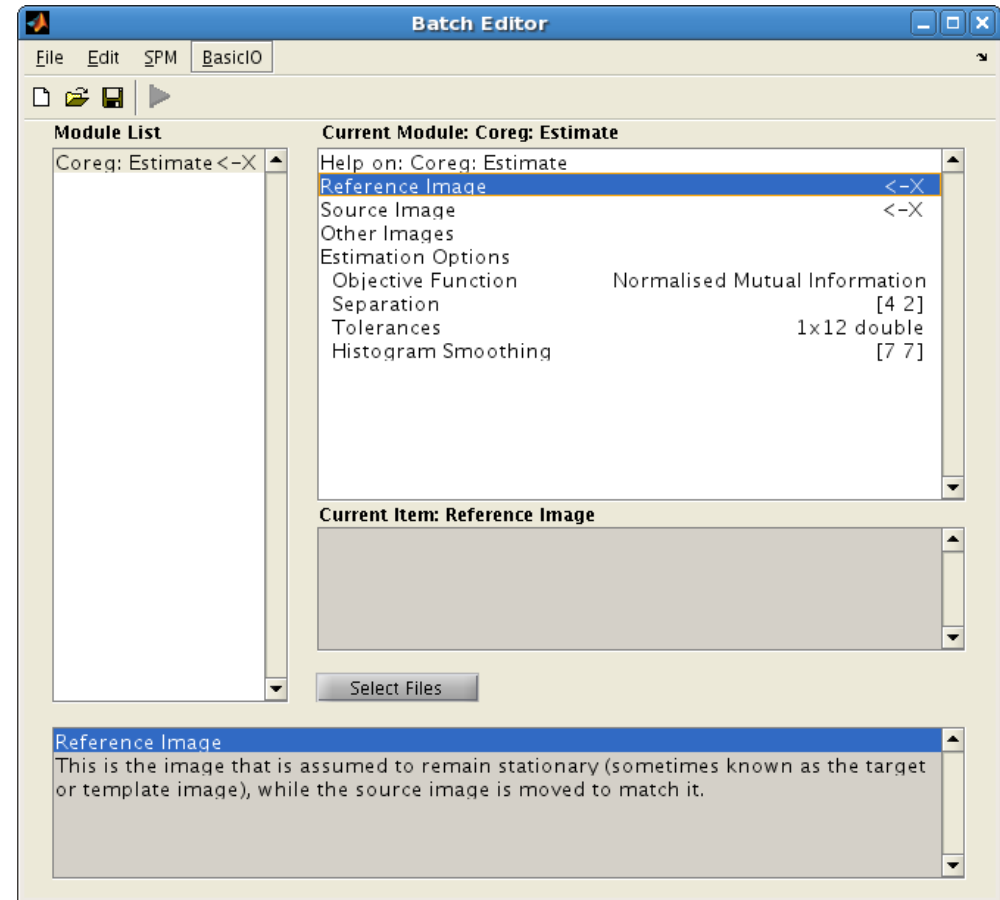
- Coregistration (structural & functional)
 - Select Coregister: Estimate





SPM: Single Subject

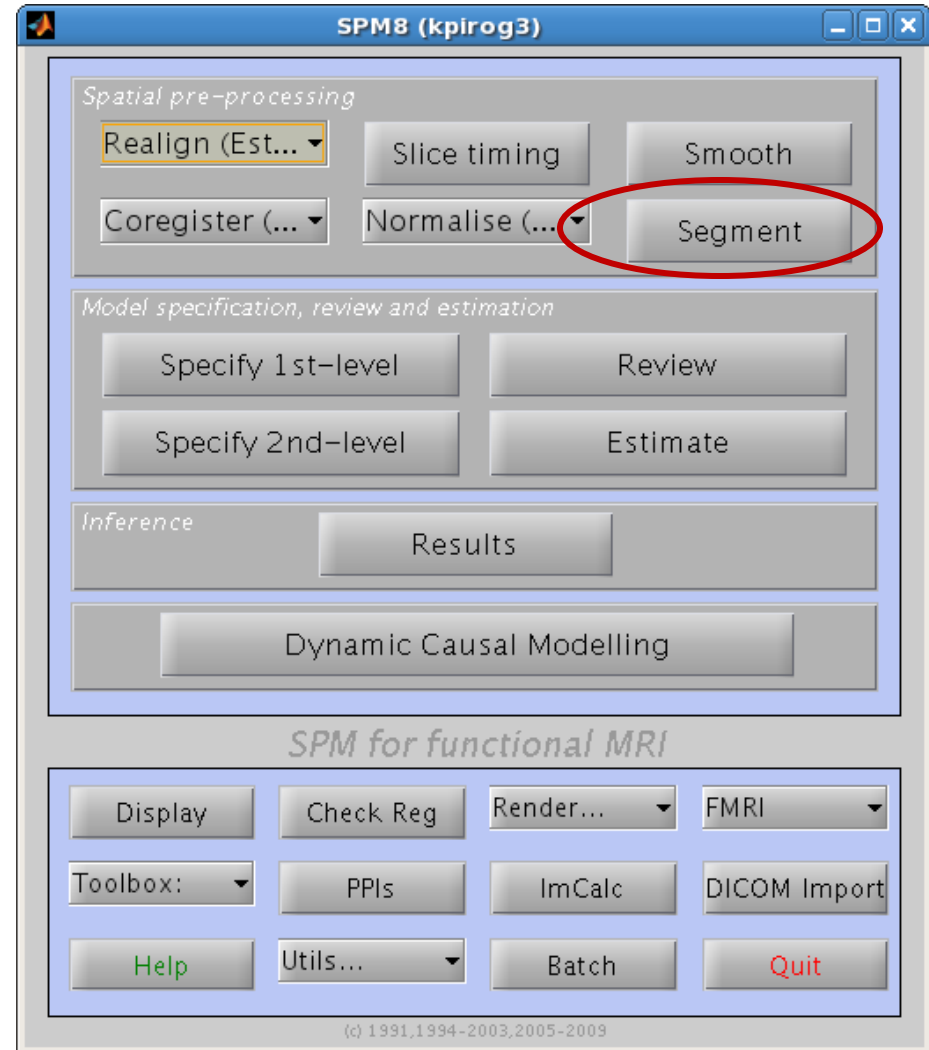
- Coregistration
 - Choose reference image:
meanfmri12secon...
 - Choose source image: T1mprages...
 - Save as coreg.mat
 - Click green arrow to run (2 min)
 - Click around results to check alignment





SPM: Single Subject

- Segmentation: find grey and white matter in hi-res structural image (improves normalization)



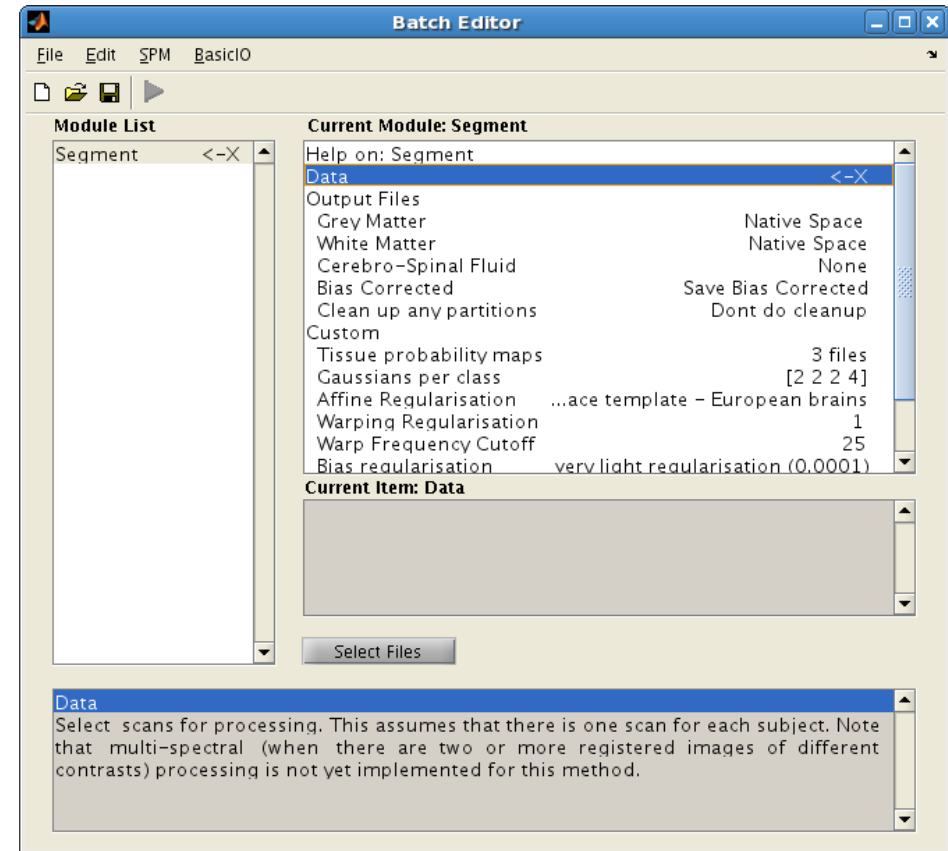


SPM: Single Subject



● Segment

- Highlight Data and select file
T1mprages...
- Save as segment.mat
- Run (~ 5 minutes)



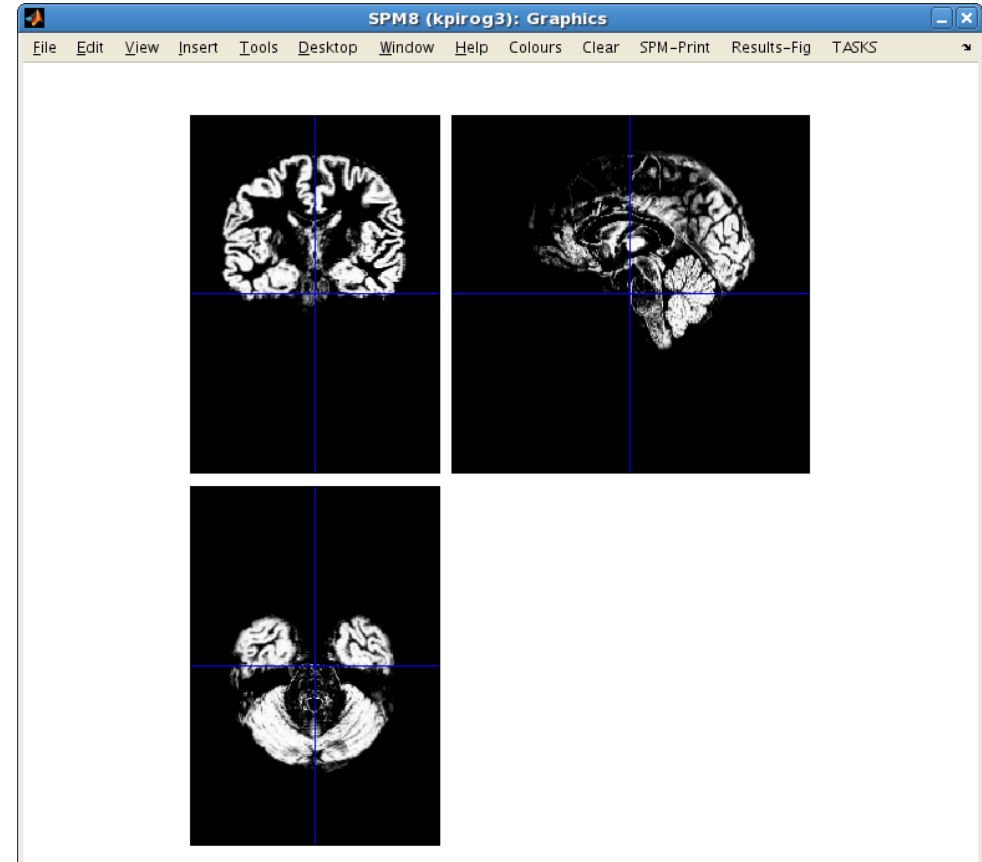


SPM: Single Subject

- Segment

- To view results, click Display

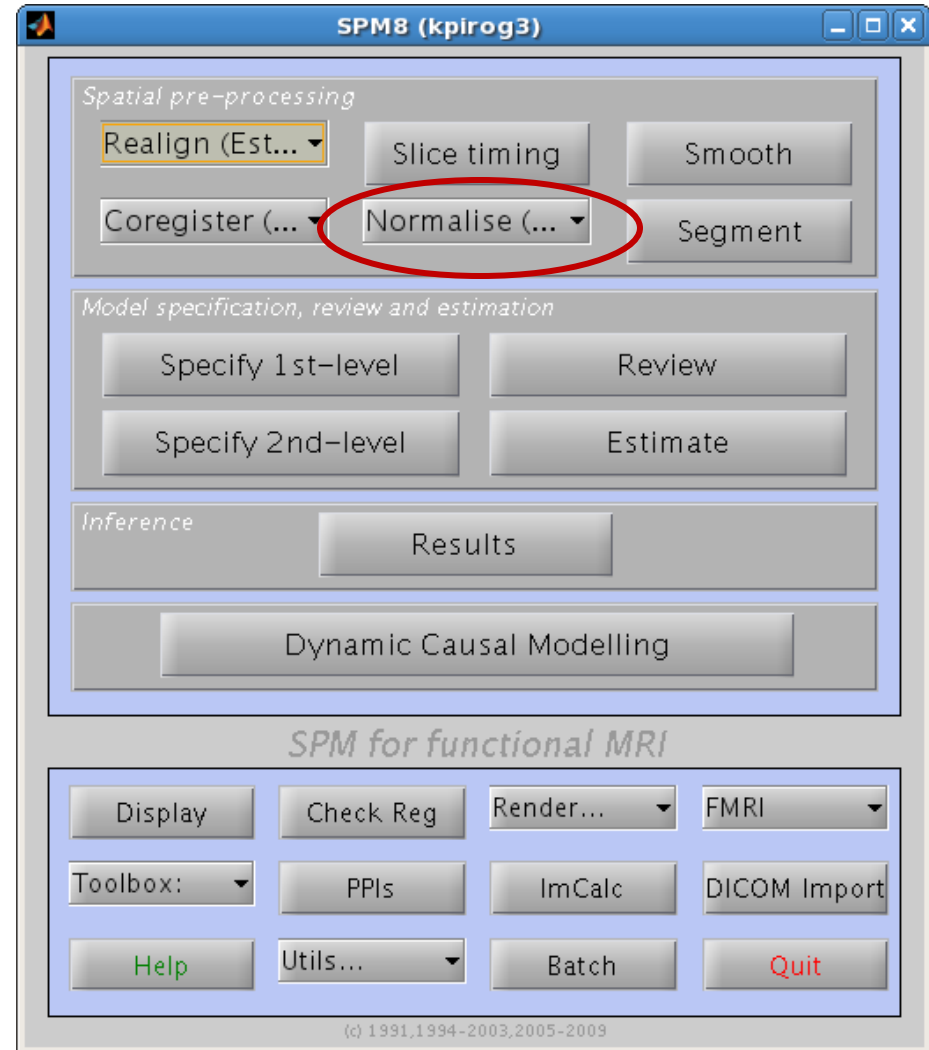
- Select file
c1T1mprages... or
c2T1mprages to see
grey matter or white
matter image





SPM: Single Subject

- Normalize: warp images to standard space (functionals and structural)
- Choose Normalize: Write

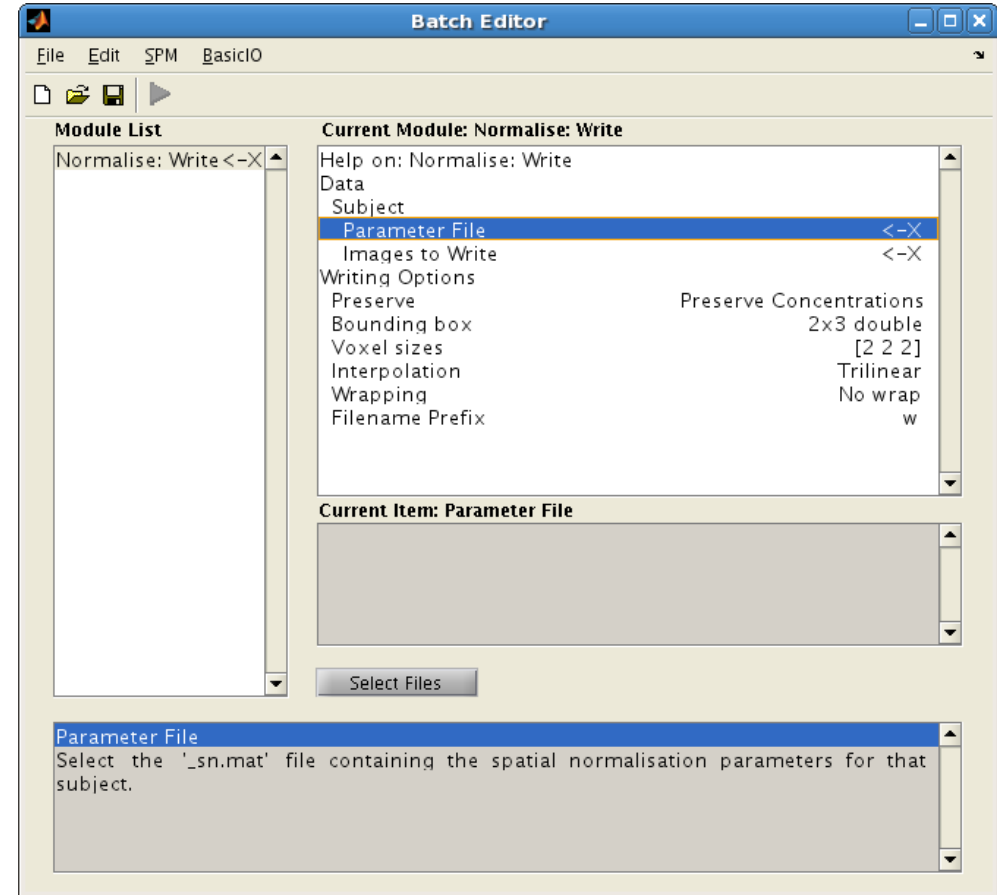




SPM: Single Subject

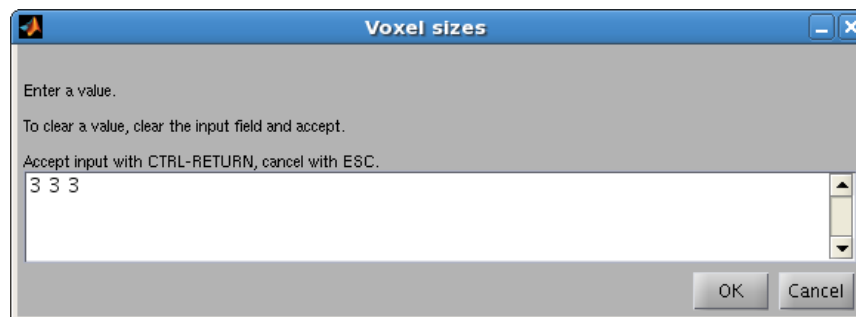
- Normalize

- Click on New:Subject
- Choose parameter file:
 - T1mpr..._seg_sn.mat
- Choose Images to Write:
 - all 188 rfMRI... files





SPM: Single Subject



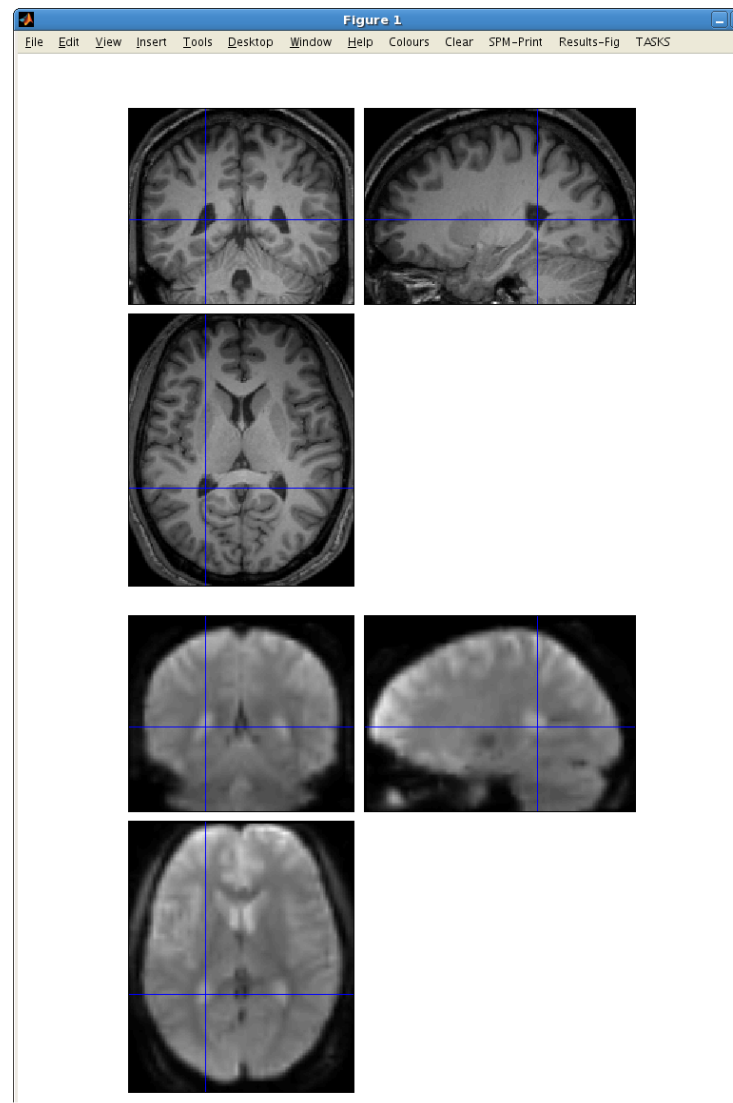
- Normalize
 - Set Voxel Sizes to 3 3 3
 - Save as func_norm.mat
 - Run (~ 1 min)

- Also normalize structural image
 - Same procedure except
 - Images to Write = T1mprages
 - Voxel Sizes = 1 1 1



SPM: Single Subject

- To check results of normalization, choose Check Reg, then select wT1mprage... and one of the wrfmri... images and see if they match up well

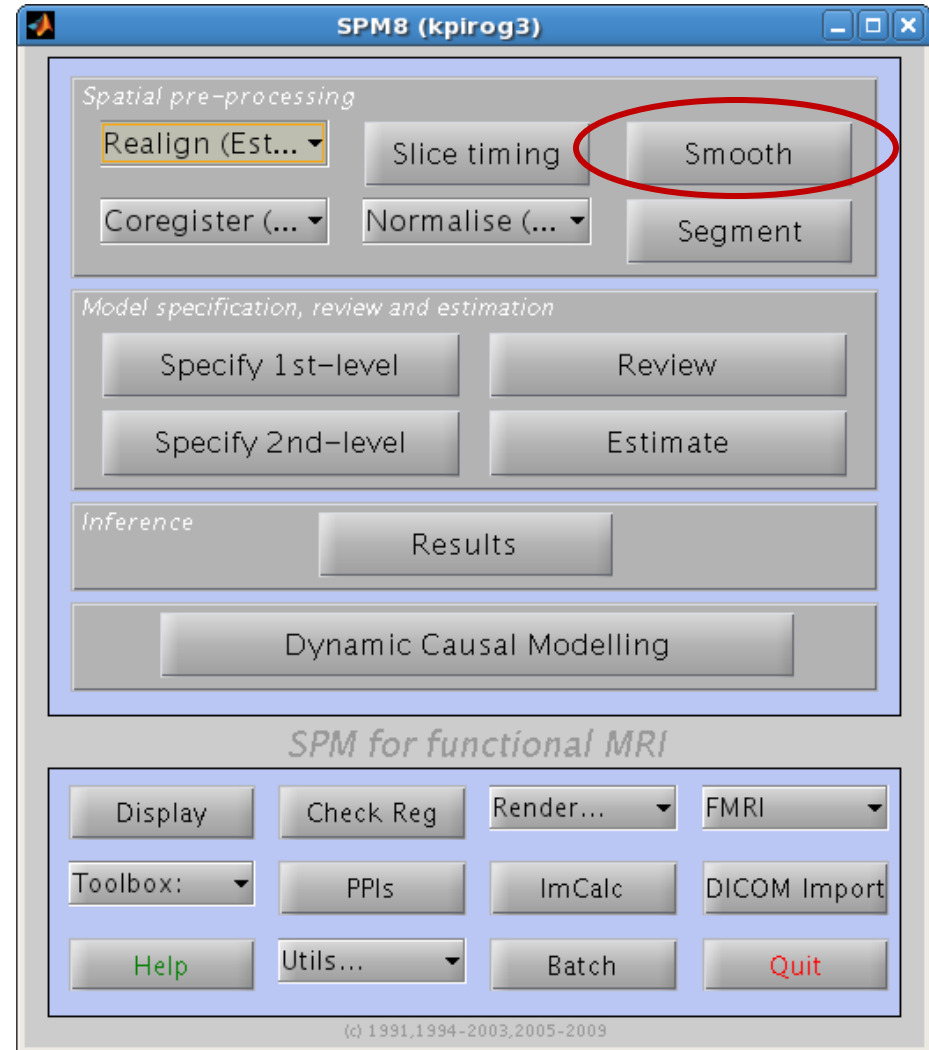




SPM: Single Subject

- Smoothing

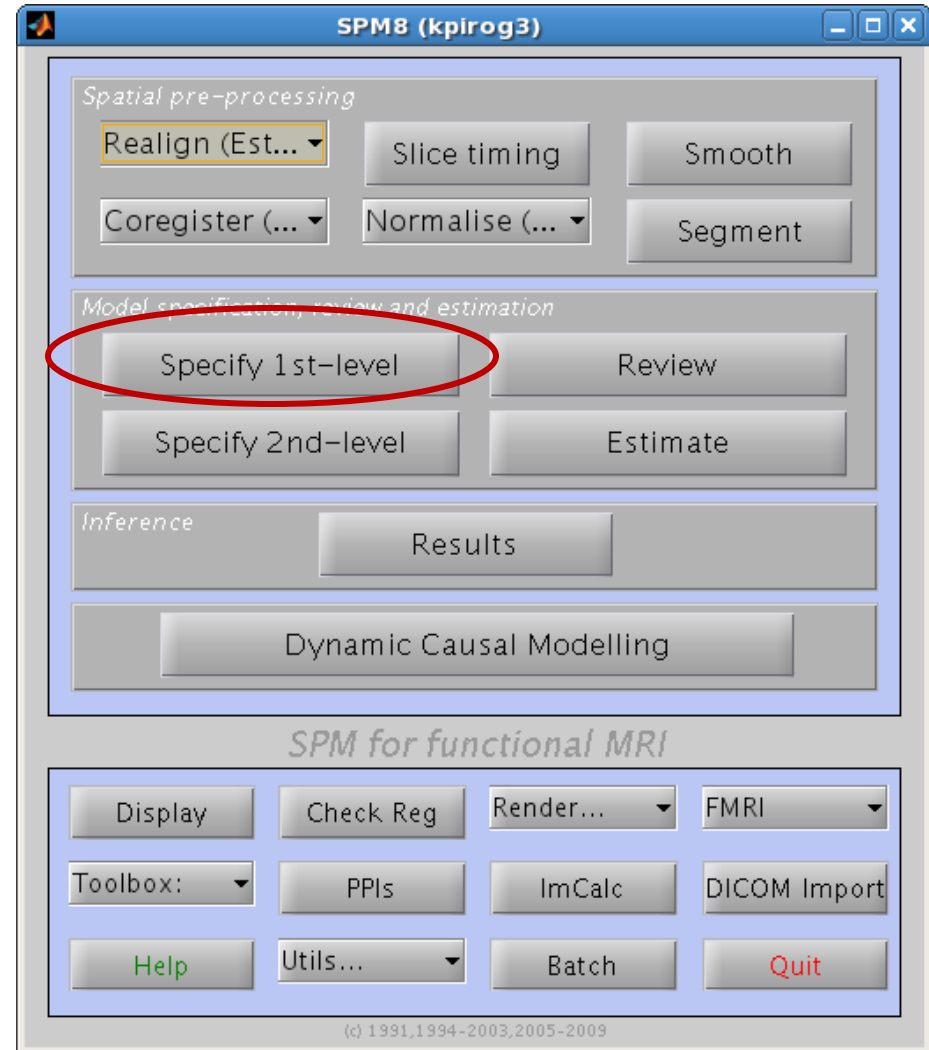
- Highlight Images to Smooth and select all 188 wrfmri... files
- Check that FWHM = [8 8 8]
- Save as smooth.mat
- Run (~ 3 min)
 - No display





SPM: Single Subject

- Set up task design
 - Choose Specify 1st-level from Model Specifications bar

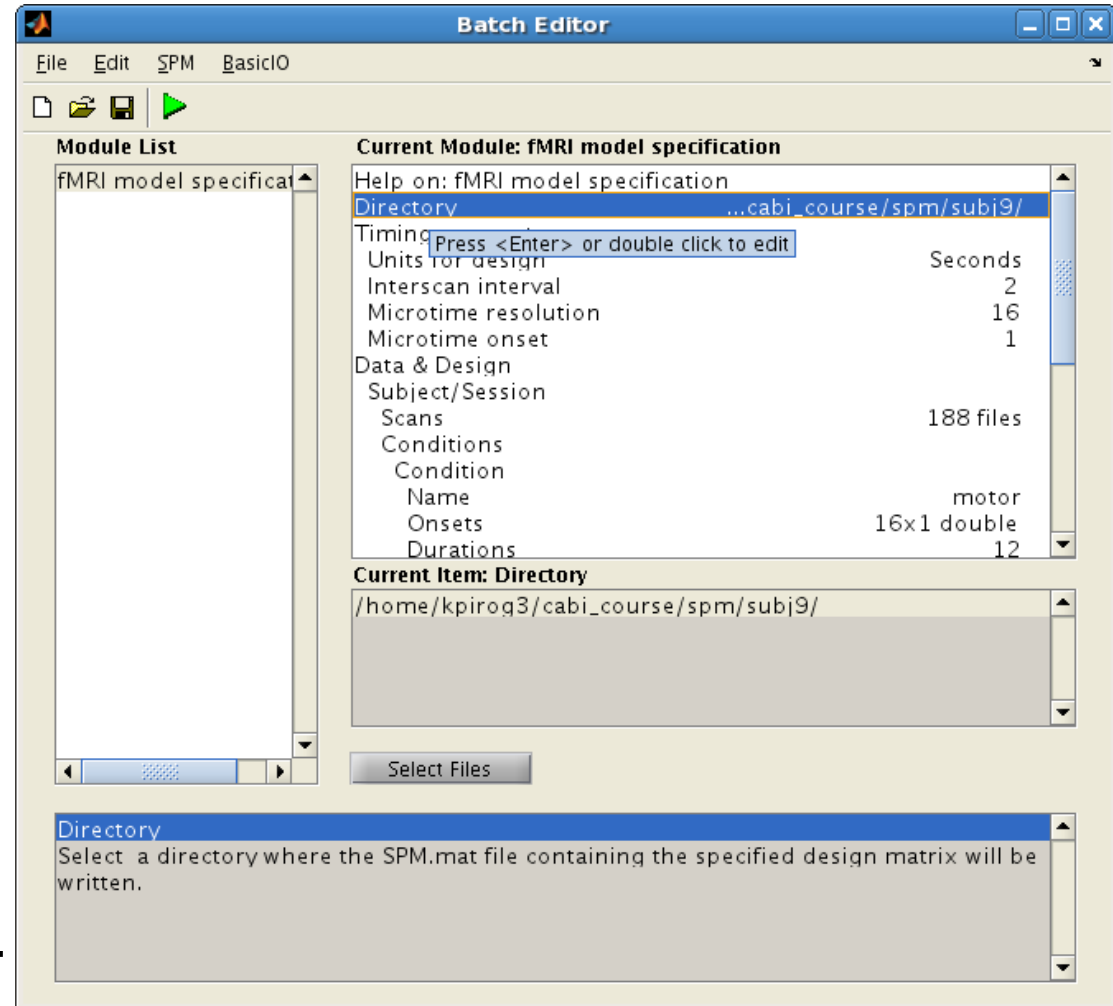




SPM: Single Subject



- 1st-level
 - Highlight Directory and select ./ (current directory) for saving SPM.mat file
 - Timing Parameters
 - Units: Seconds
 - Interscan interval: 2
 - Data and Design: New Subject/Session
 - Highlight Scans and choose all 188 swrfmri... files

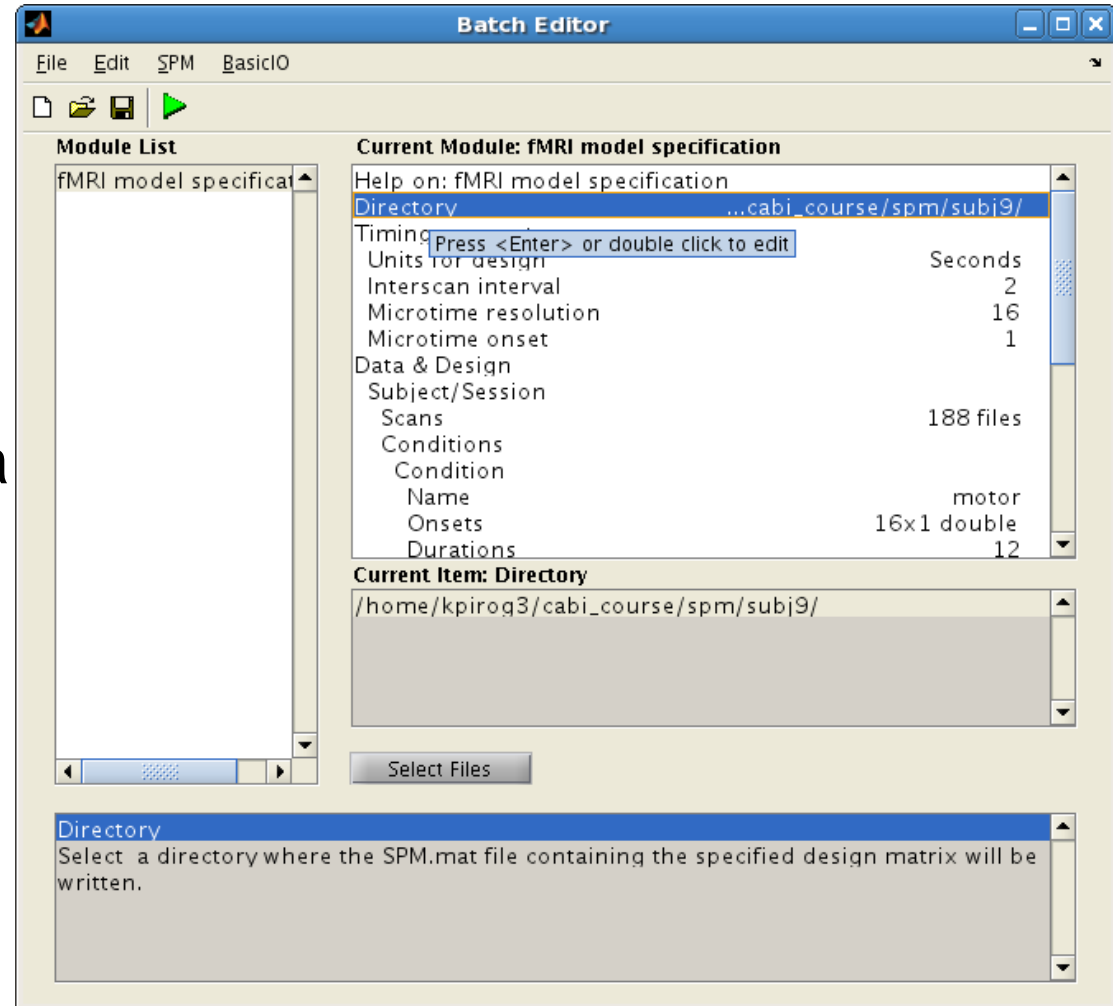
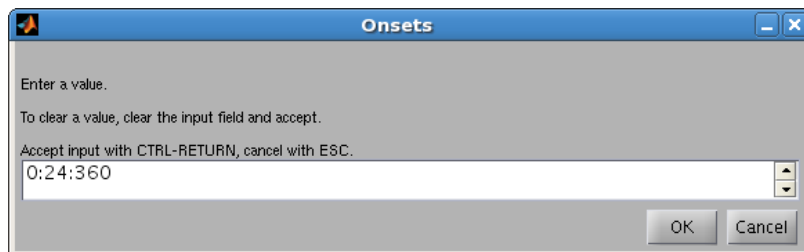




SPM: Single Subject



- 1st-level
 - Conditions: New Condition
 - Name: motor
 - Onsets: can enter as a list of start times but can also use MATLAB notation → 0:24:360

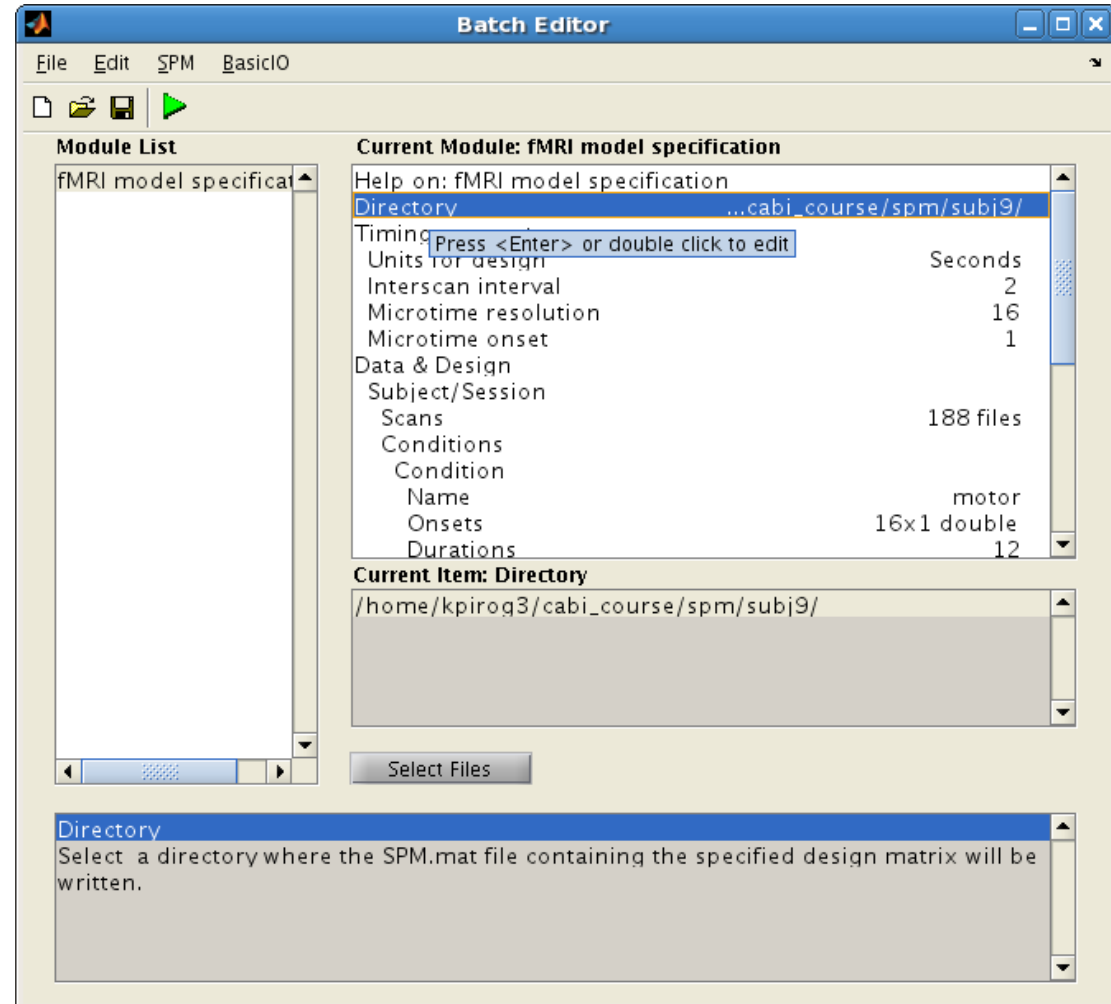




SPM: Single Subject

- 1st-level

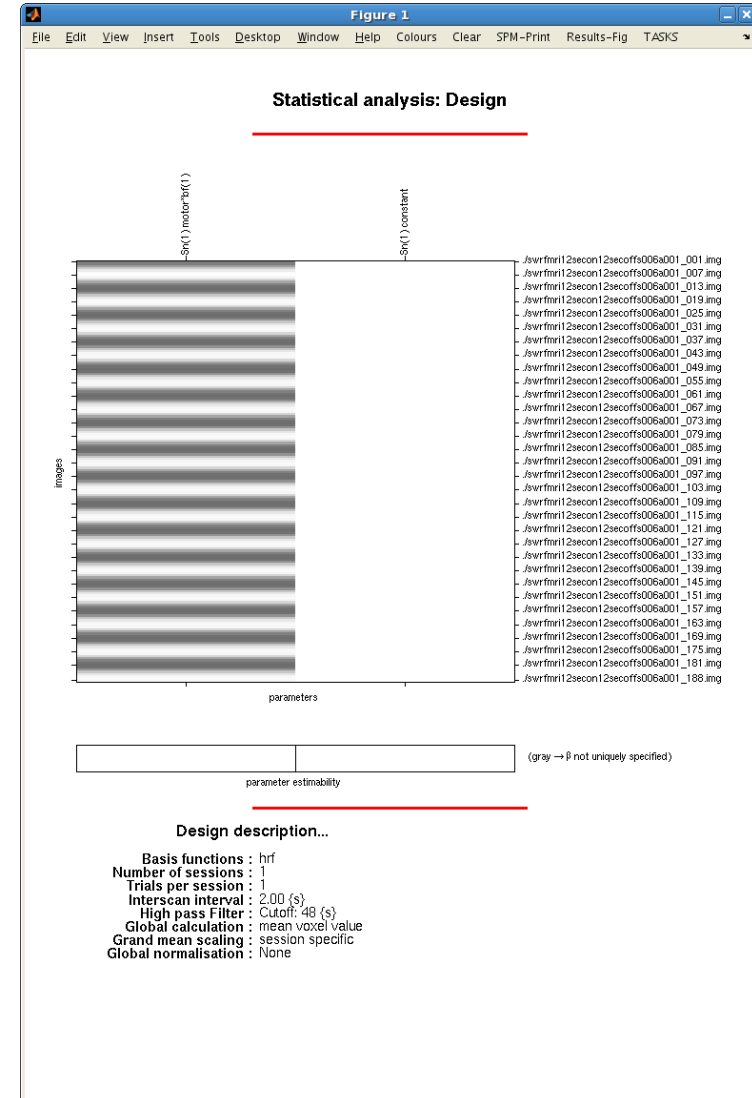
- Durations: 12 (all blocks are 12s long, so only one value needed)
- High Pass Filter: 48
- Save as design.mat
- Run (1min)





SPM: Single Subject

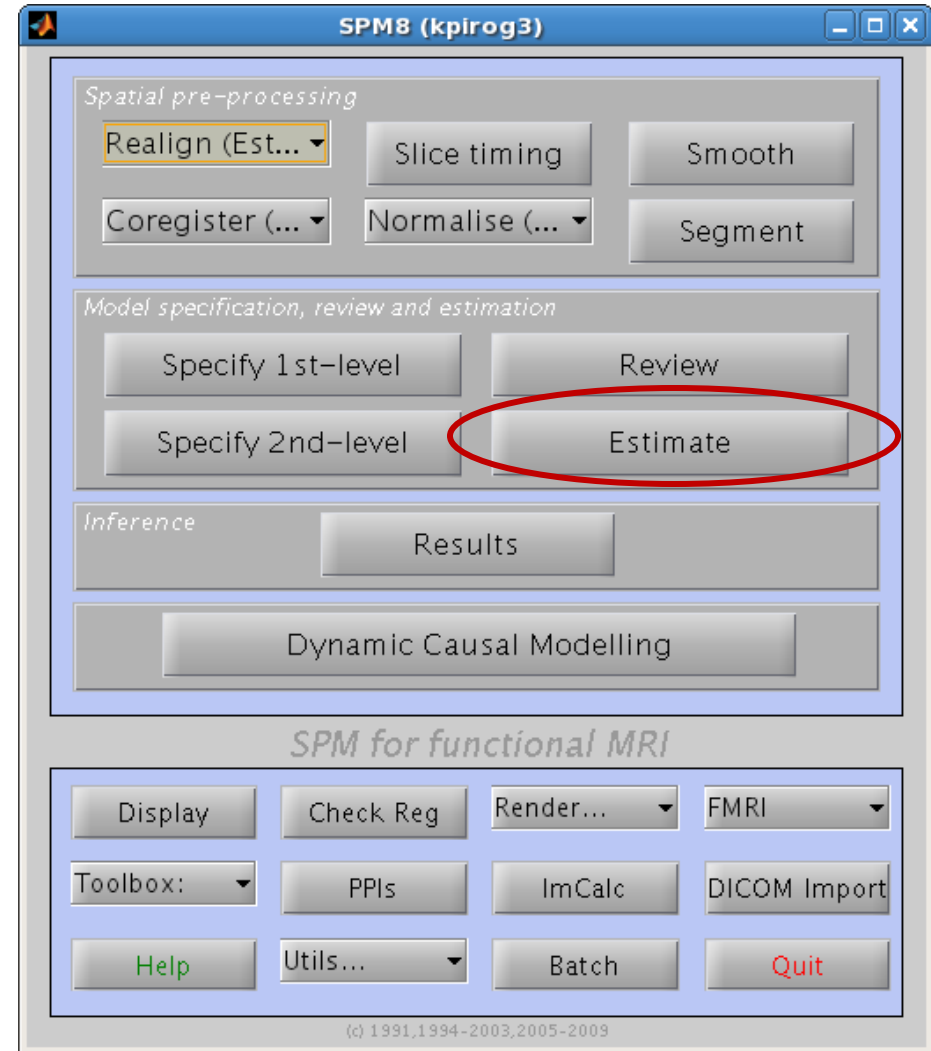
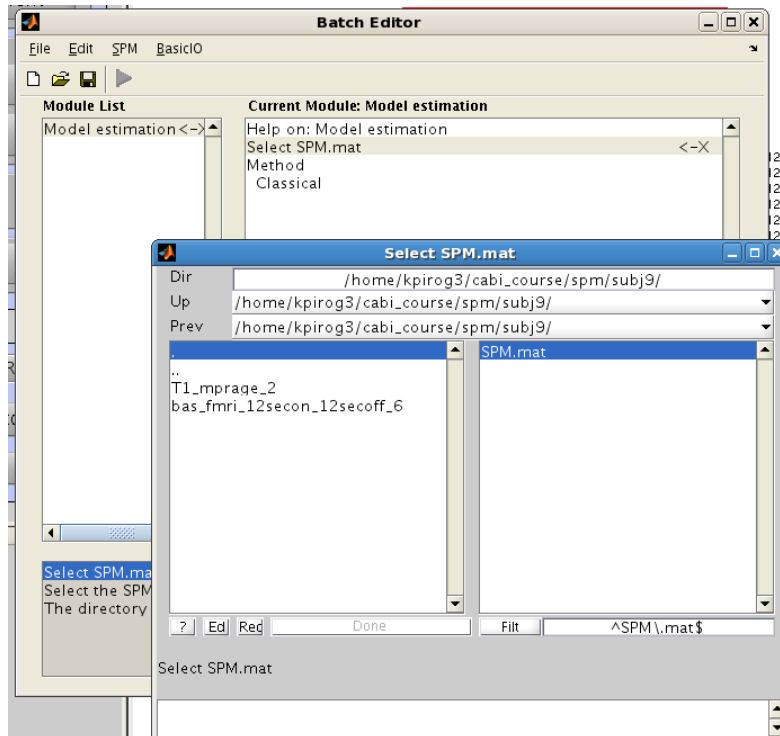
- 1st-level
 - Check design matrix- does it make sense?





SPM: Single Subject

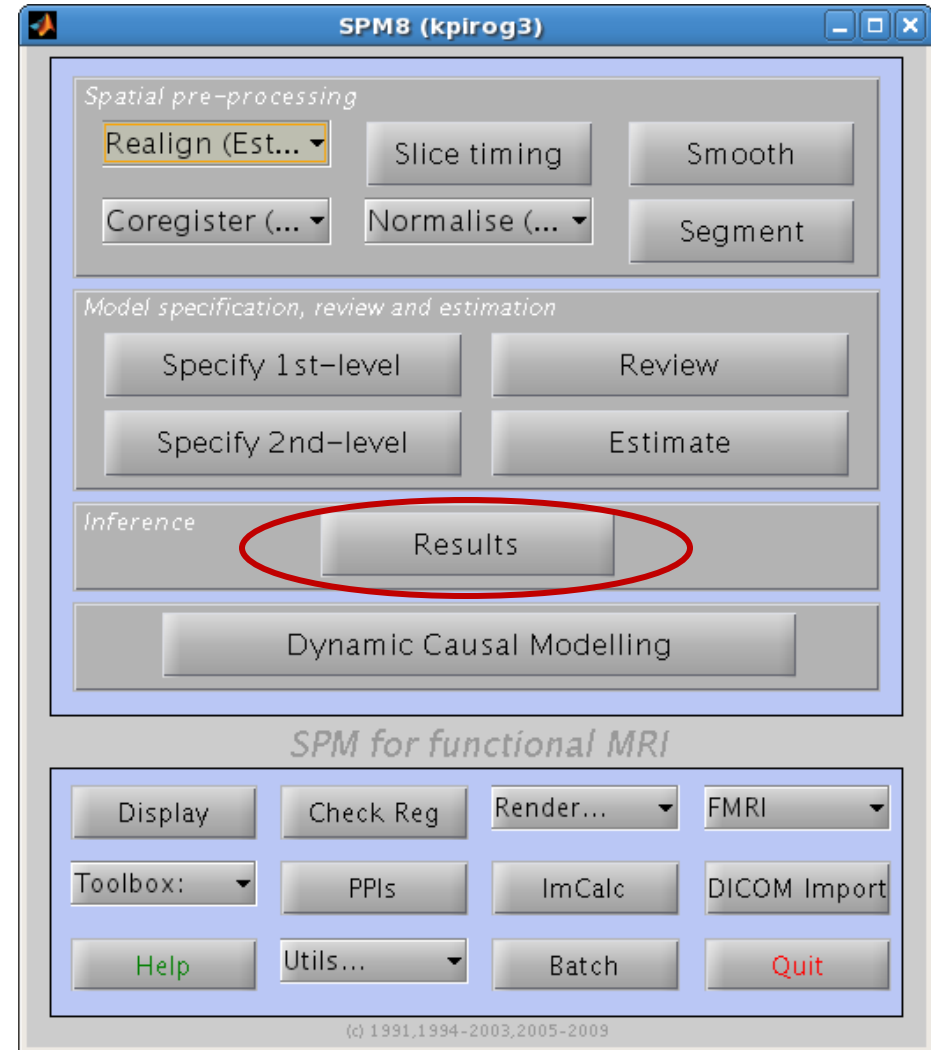
- Estimate
 - Choose SPM.mat file
 - Run (~ 2 minutes)





SPM: Single Subject

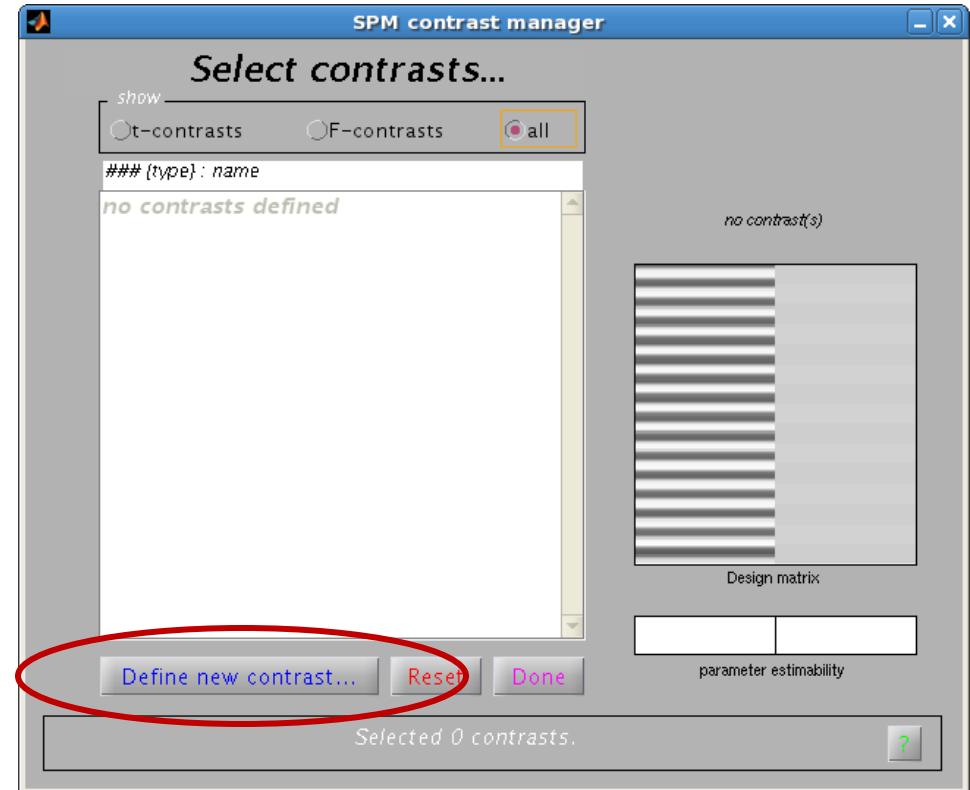
- Results
 - Click on Results button in Inference bar





SPM: Single Subject

- Results
 - Select SPM.mat
 - Choose Define new contrast...





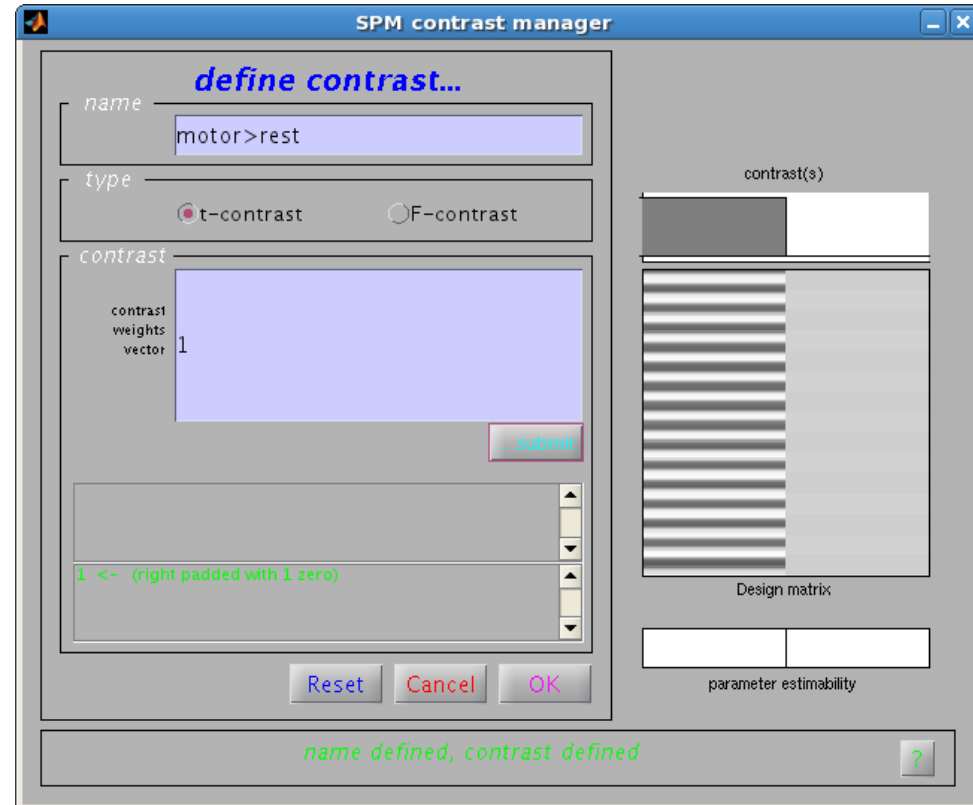
SPM: Single Subject



● Results

– Define contrast:

- Name: motor>rest
- Type: t-contrast
- Contrast: enter 1 and press Submit
- Hit OK.
- Then hit Done in previous window

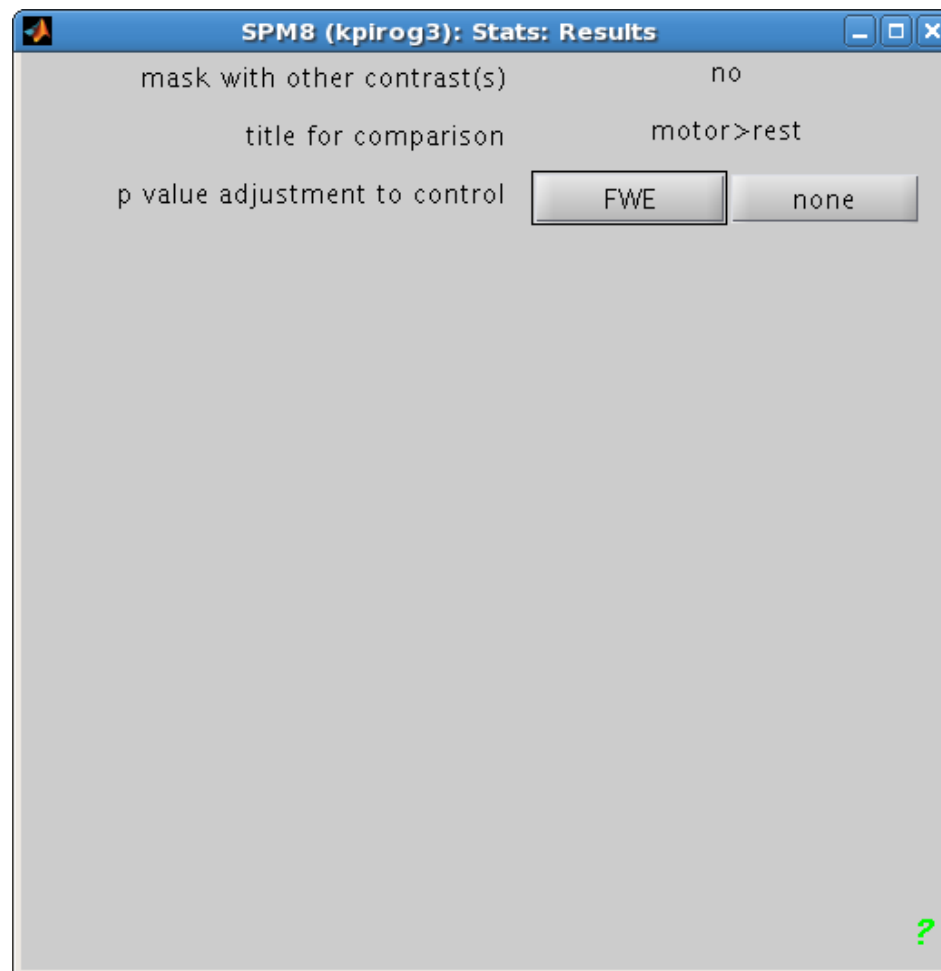




SPM: Single Subject

● Results

- Mask with other contrasts: no
- Title: motor>rest
- P value adjustment: FWE
- P value: 0.05
- Extent threshold: 0
- Will run for < 1 min...

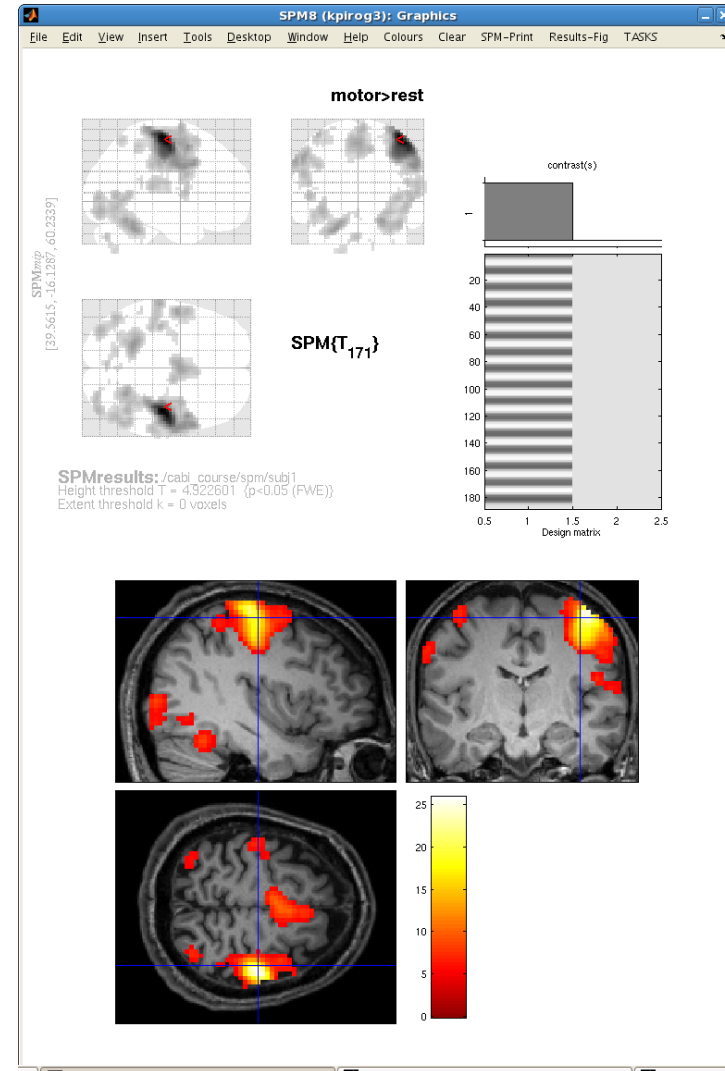




SPM: Single Subject



- View Results
 - Right-click on glass brain to find global maximum voxel





SPM: Single Subject

- Things to try
 - Overlay activation on structural image:
 - Overlays: sections
 - Select wT1mprage.. file
 - Select max voxel and plot timecourse:
 - Plot: Plot... Fitted Responses
 - Predicted
 - Against scan or time

