ASL

USC Neuroimaging Workshop
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Outline (aka FAQs)

- What is ASL and how does it work?
- How does ASL compare to fMRI?
- ASL & Special populations
- How do you process ASL data?
  - Resting State
  - Functional ASL
- What can we do at DNI?
- Where can I learn more?

ASL & Special Populations

- ASL is used for a growing number of clinical applications
  - Spiral FSE ASL in a patient with surgical staples, can see tumor despite staples with no distortion (unlike spin echo)
  - Progression in gliomas; can use for follow-up, look for recurrence due to high reliability
  - Development in pediatric populations; differences in brain across time points (also developments in aging)
  - Stroke: detects ultralow CBF regions, maybe indicates hemorrhages
  - Quantify differences in perfusion related to outcomes in disease
  - Can be creative…resting state in chronic back pain
  - Etc!

PASL at the DNI

- Pulsed ASL – PICORE QUIPPS II
- FOV = 224 mm, matrix = 64× 64, slice thickness = 4mm, TR = 4 sec, TE = 30 ms, flip angle = 90°, and 20 axial slices
- Can acquire QUIPPS II and use Fabber (dual EPI + ASL)
- We also have CASL, and maybe PCASL, but our license is currently expired….

Functional ASL

- Can functional neural activation be confirmed by another method, like single run of a pulsed ASL for a fast-event related social cognition task in one subject…?

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- Pulsed ASL interleaves tagged and control sequences
- Parameters: PICORE Q2T, TR = 4000 ms, TE = 18 ms, 171 volumes collected (incl' M0), 11 min
- Generates 4 output volumes

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- Original EPI
- Motion-corrected EPI sequence*
- Perfusion Weighted Image
- Relative Cerebral Blood Flow

- Other considerations
- Tag or control first?
- M0?
- Use a low TE (10-15 ms) to avoid BOLD contamination

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- FSL FEAT / MELODIC (from FSL site)
- SPM – ASLtbx (download from Ze Wang's site)

- In FSL, can do:
  - Full perfusion model (includes c-t, BOLD, c-t*BOLD interaction)
  - Perfusion subtraction (use button, only model BOLD EV)

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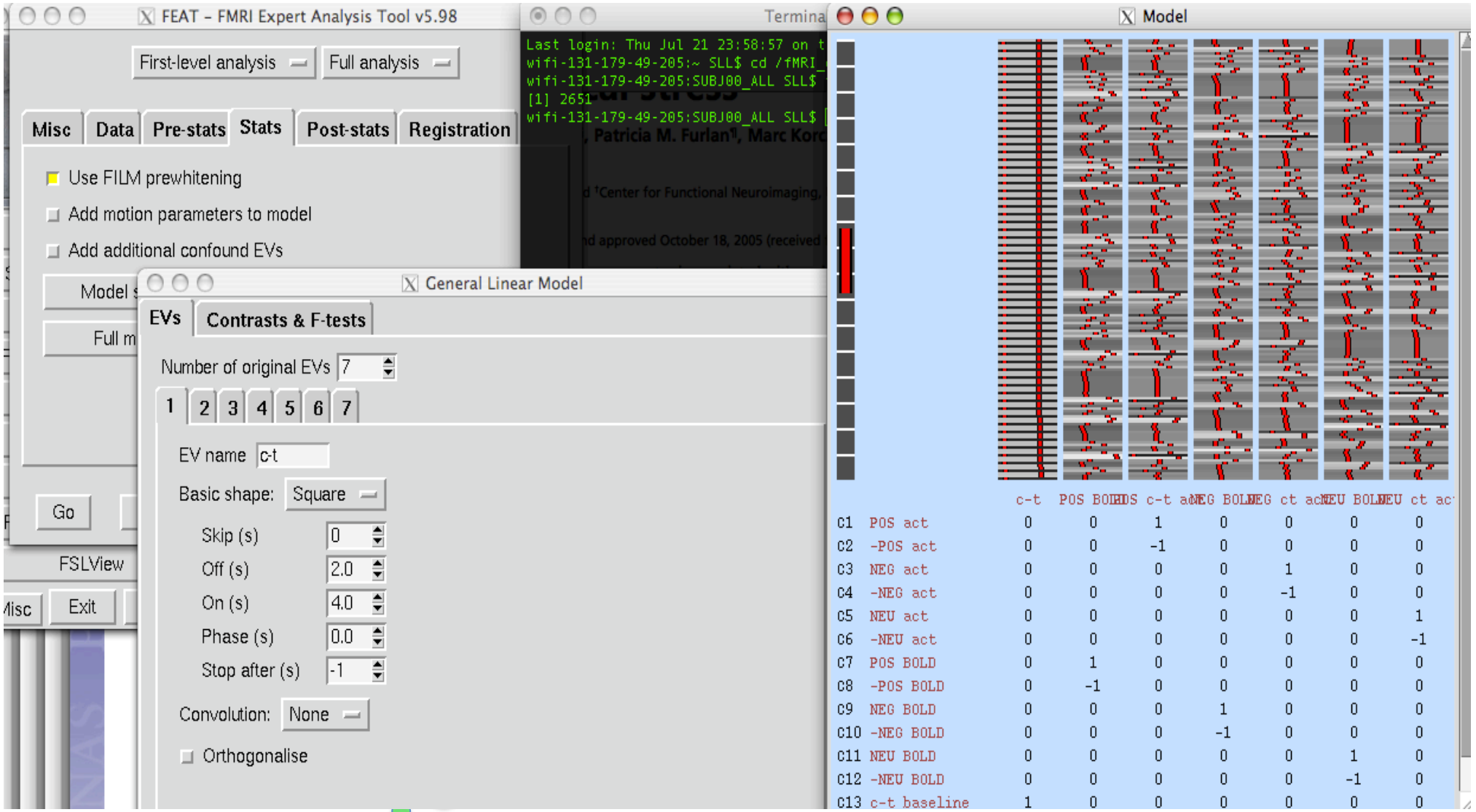
FEAT - FMRI Expert Analysis Tool v5.98
First-level analysis
Full analysis
Misc
Data
Pre-stats
Stats
Post-stats
Registration
Use FILM prewhitening
Add motion parameters to model
Add additional confound EVs
Model s
Full m
Go
FSLView
Misc
Exit
Termina
Last login: Thu Jul 21 23:58:57 on t
wifi-131-179-49-205:~ SLL$ cd /fMRI_
wifi-131-179-49-205:SUBJ00_ALL SLL$
[1] 2651
wifi-131-179-49-205:SUBJ00_ALL SLL$
Patricia M. Furlan¶, Marc Kord
Center for Functional Neuroimaging,
d approved October 18, 2005 (received
General Linear Model
EVs
Contrasts & F-tests
Number of original EVs 7
1 2 3 4 5 6 7
EV name c-t
Basic shape: Square
Skip (s) 0
Off (s) 2.0
On (s) 4.0
Phase (s) 0.0
Stop after (s) -1
Convolution: None
Orthogonalise
Model
c-t POS BOLD c-t aNEG BOLD NEG ct acNEU BOLD NEU ct ac
C1 POS act 0 0 1 0 0 0 0
C2 -POS act 0 0 -1 0 0 0 0
C3 NEG act 0 0 0 0 1 0 0
C4 -NEG act 0 0 0 0 -1 0 0
C5 NEU act 0 0 0 0 0 0 1
C6 -NEU act 0 0 0 0 0 0 -1
C7 POS BOLD 0 1 0 0 0 0 0
C8 -POS BOLD 0 -1 0 0 0 0 0
C9 NEG BOLD 0 0 0 1 0 0 0
C10 -NEG BOLD 0 0 0 -1 0 0 0
C11 NEU BOLD 0 0 0 0 0 1 0
C12 -NEU BOLD 0 0 0 0 0 -1 0
C13 c-t baseline 1 0 0 0 0 0 0

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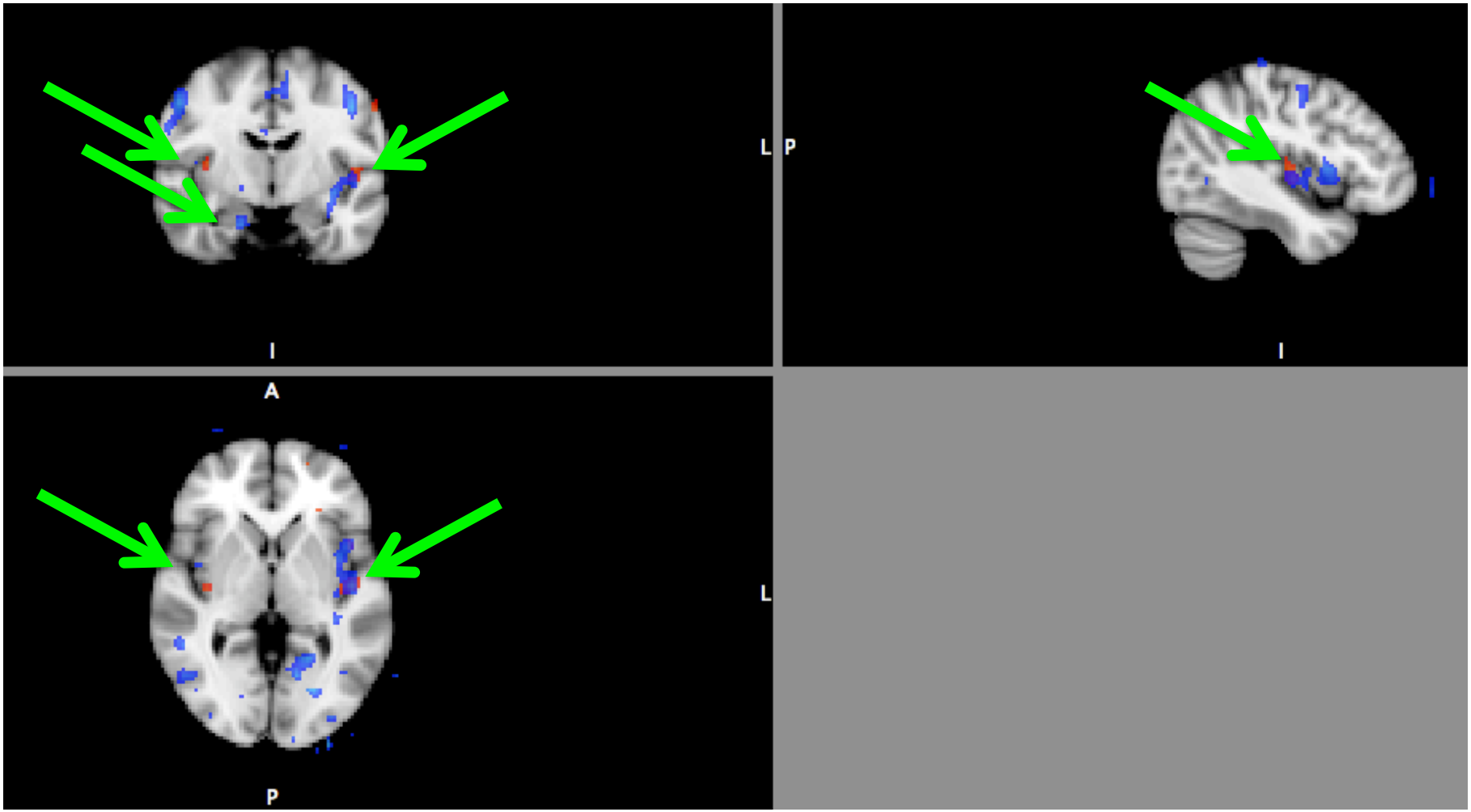

Resources

- FSL FEAT / MELODIC (from FSL site)
- SPM – ASLtbx (download from Ze Wang's site)
- Detre, J.A., et al., *Perfusion imaging.* Magn Reson Med, 1992. **23**(1): p. 37-45.
- Measurement of cerebral perfusion with arterial spin labeling: Part 2. Applications GREGORY G. BROWN,1,2 CAMELLIA CLARK,2 and THOMAS T. LIU3, 2007