

Weekend Educational Course Syllabus

Session: **fMRI: From Basic to Intermediate Brain Connectivity, Part 1**

Title of Talk: **Data Analysis Basics**

Date/Time: Saturday, **20 April 2013, 1430-1500**

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“Who will benefit from this information?”

The target audience includes grad students, postdocs, and staff scientists who are familiar with MRI but have little to no experience processing and analyzing BOLD fMRI data.

“How was a problem determined?”

The previous two talks described the BOLD effect and how to acquire fMRI data. Now that you have successfully acquired high-quality fMRI data, how do you convert these data into statistical maps that easily convey information of brain function or connectivity? The answer is not trivial, and depends upon whether the analysis will be at the single subject or group level, and whether the data are task-based or resting state. Furthermore, fMRI papers often present abbreviated data analysis methods, which makes it challenging (or impossible) for novice and expert readers alike to follow the preprocessing and analysis pipelines. This prevalence of opaque fMRI data analysis methods thus perpetuates the challenges of developing truly ‘standard’ methods for a given application and permitting investigations of reproducibility across studies or sites.

“Examples of how this issue has been addressed.”

Data analysis is extremely important – it starts at the scanner and usually (but not always) ends when a manuscript has been published. This lecture will cover aspects of the following:

- Real-time data quality assurance
- Visual inspection of raw fMRI data and “voxel surfing”
- Physiological noise and “regressors of no interest”
- Rigid-body motion correction
- Interactions between preprocessing steps
- Spatial smoothing for single-subject and group analyses
- Affine transformations between functional and anatomical images
- General linear model approach to detecting brain activation
- Conundrum of “analysis paralysis”

“What will learners be able to do differently because of this information?”

Attendees will become more familiar with the myriad of challenges and considerations for basic analyses of fMRI data. In particular, they will be able to:

- Perform fMRI data quality assurance tests
- Identify preprocessing and analysis methods most relevant to their fMRI studies
- Consider possible interactions between preprocessing steps
- Recognize when some ‘standard’ fMRI methods may not be appropriate
- Critically read, write, and review methods for fMRI data analysis
- Perform basic analyses of task-based fMRI data to generate statistical parametric maps