A word on fMRI analyses

Beginner course: *functional segregation*

- fMRI can be used for studying both, *functional segregation* and *functional integration*.
- ➢ Functional localization corresponds to localize in the brain a function. This was the approach advocated by the phrenologists and long discarded.
- ➢ 'Traditional' mass-univariate fMRI analyses allow investigating functional segregation, that is the specialization of brain regions for some aspect(s) of a function.

Friston 2011 *Functional and Effective Connectivity: A Review*. Brain Connectivity, 1, 13-36

Advanced users: more segregation (MVPA) + i*ntegration*

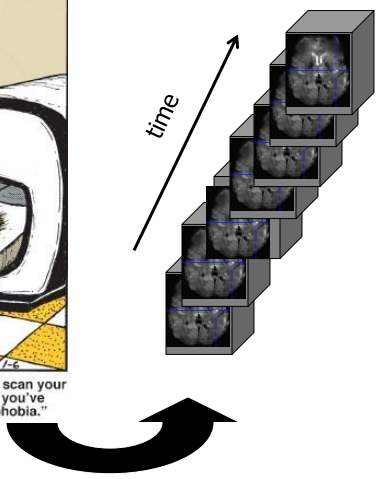
- fMRI can be used for studying both, *functional segregation* and *functional integration*
- ➢ Functional integration is the study of connected processes.
- ➢ Methods for functional integration can be broadly divided into functional connectivity (~ finding statistical patterns) and effective connectivity (~ model how regions interacts).

Friston 2011 *Functional and Effective Connectivity: A Review*. Brain Connectivity, 1, 13-36

Before data processing

- Keys to good experiment and good data
- Understanding the steps involved in the analysis allows knowing what is going to make bad data → allows acquiring data in the best conditions
- Understanding the statistical analysis and issues related to it allows designing good experiments.

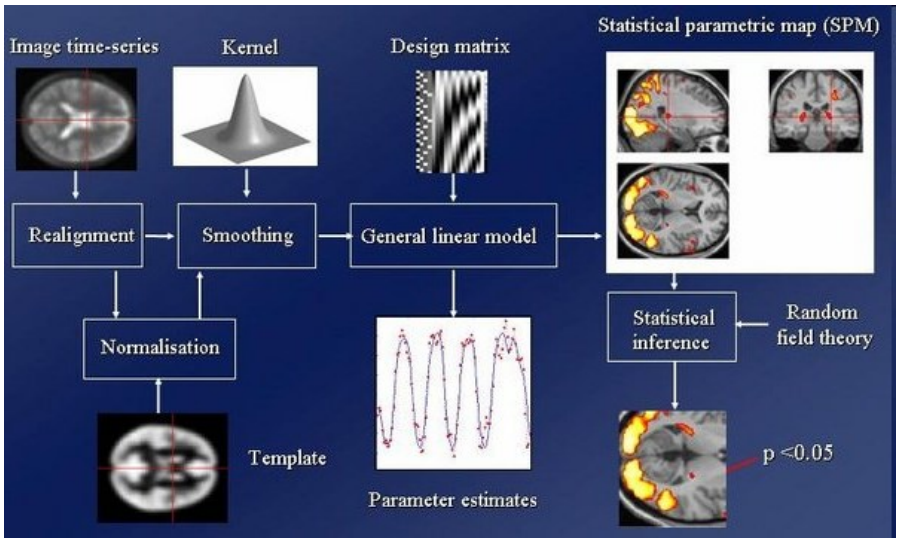
Data have been acquired, what's next?



No matter the design, multiple volumes (made from multiple slices) have been acquired in time. Before getting results out, we need to make sure the signal from each voxel contains the right temporal and spatial information.

Picture credit: http://home.kpn.nl/raema005/functional_magnetic_resonance_imaging_fmri.html

Data processing



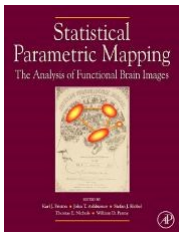
SPM: the software

http://www.fil.ion.ucl.ac.uk/Research/methods.html

Statistical Parametric Mapping

- SPM 'Classic' 1991 ! 24 years of work and counting
- The SPM software package has been designed for the **analysis of brain imaging data sequences**. The sequences can be a series of images from different cohorts, or time-series from the same subject. The current release is designed for the analysis of fMRI, PET, SPECT, EEG and MEG.

The bible *Statistical Parametric Mapping: The Analysis of Functional Brain Images* (2007)



Statistical Parametric Mapping

- SPM website

  http://www.fil.ion.ucl.ac.uk/spm/

- SPM wiki

  http://en.wikibooks.org/wiki/SPM

Software, data, literature
Manual + in-line details
Email list for support