Tutorial on fMRI data analysis

Description

Goals: Functional Magnetic Resonance Imaging (fMRI) data analysis is evolving quickly in a fast growing community, because of the excellent temporal and spatial resolution of these data and the innocuous aspect of their acquisition in humans.

In this tutorial, we will present the basis of fMRI data analysis as well as some more advanced concepts regarding group of subject analyses and estimation of brain responses to experimental conditions. Talks will be divided into 1) the theoretical aspects of data analysis and 2) a practical illustration on how to use different toolboxes in the SPM or in the BrainVisa environments.

Provisional schedule

- **A road map of fMRI data analysis : from acquisition to publication**, Jean-Baptiste Poline (MADIC-UNAF-CEA Orsay)

- **Robust analysis of several subjects**, Alexis Roche (MADIC-UNAF-CEA Orsay)

- **Estimating the hemodynamic brain response**, Philippe Ciuciu (MADIC-UNAF-CEA Orsay)

Responsible organiser

Jean-Baptiste POLINE, `poline@shfj.cea.fr`

Detailed schedule

- **A road map of fMRI data analysis : from acquisition to publication**, Jean-Baptiste Poline (MADIC-UNAF-CEA Orsay)

  In this talk, we will present the standard data analysis stream, explaining the usual techniques for data pre-processing and for statistical data analysis, focussing on intra subject analysis (General Linear Models, Statistical Parametric Maps, Multiple Comparison problem). We will also point to some problems that are yet not satisfactorily solved with current packages.

  http://www.madic.org/people/poline/

- **Robust analysis of several subjects**, Alexis Roche (MADIC-UNAF-CEA Orsay)

  The analysis of several subjects poses both theoretical and practical problems. These will be reviewed and a series of robust statistics will be presented and compared to solve for the group analysis statistical problem without necessarily assuming normal distribution across subjects. Examples of group of subjects exhibiting outlier data and the results obtained with different analyses will be shown.

  http://www.madic.org/people/roche/

- **Estimating the hemodynamic brain response**, Philippe Ciuciu (MADIC-UNAF-CEA Orsay)

fMRI has a time sampling that allows for a precise estimation of the hemodynamic response to various experimental conditions. While the standard analysis assumes a known response (or at least a known basis in which the response can be estimated), powerful Bayesian techniques can be used to obtain a precise estimate of the brain response with little a priori. These techniques will be illustrated for the analysis of the responses in regions of interest and at the voxel level on several datasets.

http://www.madic.org/people/ciuciu/