# Internship MASTER 2012

## Joint estimation of primary brain functional territories from BOLD functional MRI and Arterial Spin Labelling

Supervision: Christian Barillot, Unité/Projet VisAGeS, IRISA (Christian.Barillot@irisa.fr)
Isabelle Corouge, Unité/Projet VisAGeS, IRISA (Isabelle.Corouge@irisa.fr)
Elise Bannier, Unité/Projet VisAGeS, IRISA (Elise.Bannier@irisa.fr)
Jan Warnking, GIN, Grenoble (Jan.Warnking@ujf-grenoble.fr)

Location: Unité/Projet VisAGeS, IRISA, Campus de Beaulieu, 35042 Rennes Cedex, France
https://www.irisa.fr/visages

Duration: 4 to 6 months

**Context**
This project gathers three partners INRIA, CEA NeuroSpin and Inserm/GIN (Grenoble Institute of Neuroscience) with complementary and multidisciplinary expertise. The project focus is the combination of two brain MRI modalities. The goal is to provide a joint determination of neural activity and brain vascularization by combining BOLD contrast images obtained from functional MRI and quantitative parametric images obtained from Arterial Spin Labelling (ASL). Based on this combined information for a small group of healthy subjects, the ultimate goal will be to use these derived functional and vascular information in order to characterize the different brain territories addressed by either both MRI sequences. Ultimately, these results will be used as a reference to quantify vascular deviance for patients with abnormal hemodynamics (e.g. stroke) or perfusion characteristic (e.g. dementia, tumors, epilepsy).

**Internship focus**
The internship work will make use of an already existing paradigm, which is a fast event-related design comprising sixty auditory, visual and motor stimuli, defined in ten experimental conditions (auditory and visual sentences, auditory and visual calculations, left/right auditory and visual clicks, horizontal and vertical checkerboards) [1]. This original sequence will be translated in order to allow replication to functional ASL. The internship work will be dedicated to adapt different image processing workflows, provided by the different partners of this project, and to i) provide the detection of functional patterns from both BOLD fMRI and fASL, ii) compare the different brain territories exhibiting signal changes in both functional sequences and iii) compare the impact of different processing workflows on the results.

**Location of the Internship** This internship will be located at INRIA Rennes (both at the INRIA center and the Neurinfo MRI platform at the university Hospital). It will be conducted in tight collaboration with J. Warnking from GIN lab in Grenoble.

**Keywords**: Functional MRI, Arterial Spin Labelling, Brain perfusion, Image processing, Statistical detection, Brain imaging , Cerveau, IRM, Traitements d'images.

**Requirements**: Matlab, C/C++, good knowledge in statistics. Prior experience with medical imaging data will be of advantage.

**References** [1] Pinel, P., Thirion, B., M{\'e}riaux, S., Jobert, A., Serres, J., {Le Bihan} D., Poline, J.B., Dehaene, S.: Fast reproducible identification and large-scale databasing of individual functional cognitive networks. BMC Neurosci. 8(1), ~91 (2007)

CENTRE DE RECHERCHE
RENNES - BRETAGNE ATLANTIQUE
Campus universitaire de Beaulieu
35042 Rennes Cedex
Tél. : +33 (0)2 99 84 71 00
Fax : +33 (0)2 99 84 71 71

www.inria.fr