

At the University of Grenoble, France, within the framework of the scientific project “GAZE&EEG” funded by the National Research Agency (ANR), two positions are open :

- **Post-doc in EEG signal processing** (12-18 months, beginning about October 09)
- **Software or Electrical Engineer** (12 months, beginning about October 09)

### **Project description:**

The core of this project is the **joint processing of electroencephalogram (EEG) and eye tracking (ET) signals**, using the advanced methods of stochastic signal processing to better understanding the simultaneity between eye movements and neural activities. Synchronizing these two sources of data is essential

(1) for better **denoising EEG** signals which are contaminated by the electric activity generated by eye movements,

(2) for exploring the **functional role of eye movements** (at the saccades and the microsaccades level) by directly associating them to neural markers and

The context of the project is highly interdisciplinary: it involves researchers in stochastic signal processing, statistics, biomedical EEG signals, oculometry, visual and textual processing, visual perception, neuro-cognition and psycho-cognition. Several results are expected: (1) a technical platform for the acquisition and analysis of joint EEG/ET recordings to be implemented in the **Open-ViBE platform** (<http://openvibe.inria.fr>), (2) new techniques for removing EOG artifacts in EEG, (2) new method for extracting eye micro-saccade contributions in EEG -which is actually a very challenging issue-, (3) scientific results on the functional role of saccades and micro-saccades and (4) a cognitive model able to predict an average user scanpath on a complex document composed of text and image, in information searching domain.

The partners of this project are :

Grenoble , GIPSA-lab (<http://www.gipsa-lab.inpg.fr/>), Signal Processing and Visual perception

Grenoble, LPNC: (<http://webu2.upmf-grenoble.fr/LPNC/>), Cognitive Psychology

Grenoble, TIMC : (<http://www-timc.imag.fr/> ), Computer Science

LUTIN, Paris : (<http://www.lutin-userlab.fr/accueil/>), Cognitive Psychology

### **Post Doctoral position in EEG Signal Processing**

Salary: starting 2,100€ net / month depending on experience

Starting date: October 1er 2009

Duration: 12 months, renewable to 18 months

Location: GIPSA-lab, Campus Universitaire, Grenoble, FRANCE.

Contact information: Marco Congedo, Senior Scientist cnrs, GIPSA-lab,  
[marco.congedo@ATgmail.com](mailto:marco.congedo@ATgmail.com)

The EEG signals are contaminated with extra-cerebral artifacts of biological origin, and the most energetic artifact come from eye-movements. To remove these artifacts, the most popular approach is the “Blind Source Separation” (BSS) based on “Second-Order Statistics” (SOS) or based on “Higher-Order Statistics” (HOS). These methods are in fact sub-optimal for the separation of eye-movements (linear model, no double dipole modeling, etc).

Moreover, the question of the possibility to separate the miniature eye movements (microsaccades) has never been addressed so far. The simultaneous and synchronous EEG/ET recording provides an unique opportunity to remove efficiently eye-related artefacts

exploiting the additional information provided by ET (exact position in time with high temporal position). The post-doc will conduct research on innovative digital signal processing algorithms for on-line separation and elimination of eye-movements artefact from the EEG based on EEG/ET recording. The developed algorithms will be implemented in the OpenVibe software environment (**Open-ViBE: Open platform for Virtual Brain Environment** <http://openvibe.inria.fr/>) with the aid of software engineers working within the Open-ViBE project. The candidate should have a strong background in theoretical digital signal processing and good programming experience for coding and testing the new algorithms. Previous experience with biomedical data and particularly with EEG or MEG and/or ET is sought and would be a plus. Previous experience with and knowledge of blind source separation will also be a plus. The candidate should be keen to work in a team. The candidate should possess good knowledge of spoken and written English. The position will be filled between October 1, 2009 and January 1, 2010. Please forward CV and names of three recommending colleagues to the contact person (here above).

Congedo M., Gouy-Pailler, C., Jutten C. (2008) On the Blind Source Separation of Human Electroencephalogram by Approximate Joint Diagonalization of Second Order Statistics.

Clinical Neurophysiology. doi: 10.1016/j.clinph.2008.09.007

Jutten C., Hérault H. (1991) Blind separation of sources, part i: an adaptative algorithm based on neuromimetic architecture, Signal Processing, vol. 24, pp. 1–10.

### **Software or Electrical Engineer position**

Salary: starting 2,100€ net / month depending on experience

Starting date: October 1er 2009

Duration: 12 months

Location: GIPSA-lab, Campus Universitaire, Grenoble, FRANCE.

Contact information: Gelu Ionescu, Research Engineer cnrs, GIPSA-lab, [gelu.ionescu@gipsa-lab.inpg.fr](mailto:gelu.ionescu@gipsa-lab.inpg.fr)

The engineer will be responsible of developing the platform for joint EEG/ET recordings and to deploy it to the other partners of the project. This platform will be developed using the OpenVibe environment (Open-ViBE: Open platform for Virtual Brain Environment: <http://openvibe.inria.fr/>). OpenViBE is free and open source (under the term of the L-GPL v2+ licence). The whole software is developed in C++. It consists of a set of software modules that can be integrated easily and efficiently to design applications for Brain Computer Interfaces, neurofeedback and any other real-time EEG application and/or for interaction with virtual environments. Key features of the platform are modularity reusability and portability. The candidate should have excellent skills in C++ programming/software development and should be keen to work in a team. Experience with EEG and/or eye-tracking data is a plus but not necessary. The candidate should possess good knowledge of spoken and written English. Position is available and should be filled October 1, 2009, however a short delay for starting date is possible. Please forward CV and names of three recommending colleagues to the contact person (here above).