

Post-Doc or Software Engineer Position

Application Deadline : 10 January 2012
Position available from 01 February 2012
Duration : 3+9 months

Building Brain Computer Interface Engines with the OpenViBE platform.

SUPERVISORS :

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CONTEXT :

Typical computer-user interfaces include a keyboard and a mouse. Research in Human-Computer Interface strives to improve and to simplify the control of electronic devices. A Brain-Computer Interface (BCI) aims to use a new communication channel offered by the activity of the brain. A typical BCI system consists of a Electroencephalography (EEG) acquisition device and a device that processes the brain signals to generate commands.

In the context of the RoBIK project granted by the AFM (Association Française contre les Myopathies), we aim at building an adaptive BCI system with the openViBE platform (<http://openvibe.inria.fr/http://openvibe.inria.fr/>).

DESCRIPTION :

The BCI system to be developed in the context of the AFM project RoBIK will be composed of three main modules:

1. *an acquisition server,*
2. *a BCI engine*
3. *an application (user interface).*

The position primarily concerns the development of the second module (BCI engine), in connection with parallel research carried out on this module at GIPSA-lab and developments carried out on the third module by a partner of the project:

The BCI engine. This unit sends to the application the requested command. Two of such engines should be implemented, one based on P300 and one based on SSVEP. Current technology developed at the GIPSA-lab for signal filtering and classification (see "Related Publication" section here below) will provide the basic algorithms for the engines. Parallel research carried out at



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GIPSA-lab to achieve fully adaptive BCI engines (that is, working without user training) shall be exploited and implemented. This is the core of the work required.

The post-doc or engineer will work collaboratively in a multi-center team.

RELATED PUBLICATIONS :

Congedo M, Phlypo R, Pham D-T (2011) Approximate Joint Singular Value Decomposition of an Asymmetric Rectangular Matrix Set. *IEEE Transactions on Signal Processing* 59(1), 415-424.

Barachant A, Bonnet S, Congedo M, Jutten C (2011) Multi-Class Brain Computer Interface Classification by Riemannian Geometry. *IEEE Transactions on Biomedical Engineering*, in press.

Jrad N, Congedo M, Phlypo R, Rousseau S, Flamary R, Yger F, Rakotomamonjy A (2011) sw-SVM : sensor weighting support vector machines for EEG-based Brain-Computer Interfaces. *Journal of Neural Engineering* 8(5), 056004.

Cecotti H, Rivet B, Congedo M, Jutten C, Bertrand O, Maby E, Mattout J (2011) A robust sensor-selection method for P300 brain-computer interfaces. *Journal of Neural Engineering* 8(1), 016001

Renard Y, Lotte F, Gibert G, Congedo M, Maby E, Delannoy V, Bertrand O, Lécuyer A (2010) OpenViBE: An Open-Source Software Platform to Design, Test and Use Brain-Computer Interfaces in Real and Virtual Environments. *PRESENCE : Teleoperators and Virtual Environments* 19(1), 35-53.

Gouy-Pailler C, Congedo M, Brunner C, Jutten C, Pfurtscheller G (2010) Nonstationary brain source separation for multiclass motor imagery. *IEEE Transactions on Biomedical Engineering* 57(2), 469-78.

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* 119, 2677-2686.

Lotte F, Congedo M, Lécuyer A, Lamarche F, Arnaldi B (2007) A Review of Classification Algorithms for EEG-based Brain-Computer Interfaces. *Journal of Neural Engineering* 4(2), R1-R13.

Congedo M, Lotte F, Lécuyer A (2006) Classification of Movement Intention by Spatially Filtered Electromagnetic Inverse Solutions. *Physics in Medicine and Biology* 51, 1971-1989.

KEYWORDS :

Brain-Computer Interface (BCI), machine learning, signal processing, adaptation, OpenViBE.

PROFILE OF THE CANDIDATE :

The candidate should have a PhD in Software Engineering, Physics, Mathematics, Computer Science, Statistics or Neuroscience. Alternatively, the candidate may have an undergraduate degree in one of those fields and at least three years of relevant working experience. In all cases the candidate should have a strong record of computer programming (very good knowledge of C++ is essential), specific experience with EEG and excellent communication skills. *Candidates with knowledge and previous experience with OpenViBE will be preferred.* Good knowledge of spoken and written English is necessary.

SALARY :

About 2000 Euros per month net for a Post-doc. In between 1800 and 2200 Euros per month net, depending on experience, for an informatics engineer.

APPLICATION :

Please send a CV and a motivation letter before the deadline shortly describing your relevant previous experiences to the e-mail given at the top of this document. Recommendation letters may be requested later, upon application pre-selection.

GIPSA-lab

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