2021-04206 - PhD Position F/M: Designing passive hybrid Brain-Computer Interfaces to estimate user eXperience in virtual galleries

Type de contrat : CDD
Niveau de diplôme exigé : Bac + 5 ou équivalent
Fonction : Doctorant

A propos du centre ou de la direction fonctionnelle
Potioc designs, develops and evaluates new approaches that exploit multimodal interaction to promote a stimulating user experience. In particular, we explore approaches based on mixed reality (AR, RV), tangible interaction, brain-computer interfaces, and physiological interfaces. The main areas of application we are targeting are education, well-being, art, and accessibility.

Contexte et atouts du poste
The hired PhD student will join European project BITSCOPE (2022-2024) – a CHIST-ERA type project which stands for “Brain Integrated Tagger for Socially Curated Online Personalised Experiences”. This is a project led by Pr. Tomas Ward (from Dublin City University, Ireland), in collaboration with France (Inria Bordeaux Sud-Ouest, team Potioc), Spain (Nicolas Copernicus University). The BITSCOPE project presents a vision for brain computer interfaces (BCI) which can enhance social relationships in the context of sharing virtual experiences. We envisage a future in which attention, memorability and curiosity elicited in virtual worlds will be measured without the requirement of “likes” and other explicit forms of feedback. Instead, users of our improved BCI technology can explore online experiences leaving behind an invisible trail of neural data-derived signatures of interest. This data, passively collected without interrupting the user, and refined in quality through machine learning, can be used by standard social sharing algorithms such as recommender systems to create better experiences. Technically the work concerns the development of a passive hybrid BCI (phBCI). It is hybrid because it augments electroencephalography (EEG) with eye tracking data, galvanic skin response (GSR), heart rate (HR) and movement in order to better estimate the mental state of the user. It is passive because it operates covertly without distracting the user from their immersion in their online experience and uses this information to adapt the application. It represents a significant improvement in BCI due to the emphasis on improved denoising facilitating operation in home environments and the development of robust classifiers capable of taking inter- and intra-subject variations into account.

We leverage our preliminary work in the use of deep learning and geometrical approaches to achieve development of robust classifiers capable of taking inter- and intra-subject variations into account. We formulate our preliminary work in the use of deep learning and geometrical approaches to achieve development of robust classifiers capable of taking inter- and intra-subject variations into account.

As part of this research, the goal of this PhD thesis would be to design the passive hybrid BCI which can be used to create a metric which relates to Users’ experience (UX), such as attention, memorability and curiosity with a given artwork. This PhD work will involve protocol design, data collection and experiments in which explicit measures of UX, e.g., self-report will be collected to support supervised learning approaches. Then it will involve the design of machine learning algorithms to estimate such UX (e.g., attention or curiosity levels) from both EEG and physiological signals (e.g., GSR and HR). Finally, it will involve designing an online phBCI to estimate online such states when users are viewing various artworks.

It is envisioned that the PhD work will have to solve the following tasks:

- Designing a controlled protocol to manipulate UX in a virtual exhibition
- Collecting data with such a controlled UX protocol
- Designing participant specific EEG-based UX classifiers
- Designing participant specific physiology-based UX classifiers
- Building a Multimodal participant specific UX classifier
- Building a Multimodal generic UX classifier
- Evaluation and optimization of the proposed UX-BCI classifier in ecological conditions

EEG signal processing (temporal/spatial filtering, subspace identification, source reconstruction, etc)
Machine Learning & Pattern Recognition for EEG classification
Python / Matlab programming
Skills in rigorous protocol design and running, including data collection
Able to speak, write and work in an English speaking environment
Experience with Electroencephalography (EEG) and/or BCI experiments is a strong plus
Experience and/or skills in cognitive science (in particular psychology and neuroscience) is a strong plus

Informations générales
- Thème/Domaine : Interaction et visualisation
- Instrumentation et expérimentation (BAP C)
- Ville : Talence
- Centre Inria : CRI Bordeaux - Sud-Ouest
- Date de prise de fonction souhaitée : 2022-01-01
- Durée de contrat : 3 ans
- Date limite pour postuler : 2021-11-26

Contacts
- Equipe Inria : POTIOC
- Directeur de thèse : Lotte Fabien / Fabien.Lotte@inria.fr

A propos d’Inria
Inria est l’institut national de recherche dédié aux sciences et technologies du numérique. Il emploie 2600 personnes. Ses 200 équipes projet agiles, en général communes avec des partenaires académiques, impliquent plus de 3500 scientifiques pour relever les défis du numérique, souvent à l’interface d’autres disciplines. L’institut fait appel à de nombreux talents dans plus d’une quarantaine de métiers différents. 900 personnels d’appui à la recherche et à l’innovation contribuent à faire émerger et grandir des projets scientifiques ou entrepreneuriaux qui impactent le monde.

Inria travaille avec de nombreuses entreprises et a accompagné la création de plus de 180 start-up. L’institut s’efforce ainsi de répondre aux enjeux de la transformation numérique de la science, de la société et de l’économie.

L’essentiel pour réussir

There you can provide a "broad outline" of the collaborator you are looking for what you consider to be necessary and sufficient, and which may combine:

- tastes and appetencies,
- a sense of excellence,
- personality or character traits,
- cross-disciplinary knowledge and expertise.

This section enables the more formal list of skills to be completed and "lightened" (reduced)

- "Essential qualities in order to fulfill this assignment are feeling at ease in an environment of scientific dynamics and wanting to learn and listen."
- "Passionate about innovation, with expertise in Ruby on Rails development and strong influencing skills. A thesis in the field of "*** is a real asset."

Consignes pour postuler

Thank you to send:
- CV
- Cover letter
- Master Degree

Sécurité défense
Ce poste est susceptible d’être affecté dans une zone à régime restrictif (ZRR), telle que définie dans le décret n°2011-1425 relatif à la protection du potentiel scientifique et technique de la nation (PPST). L’autorisation d’accès à cette zone est délivrée par le chef d’établissement, après avis ministériel favorable, tel que défini dans l’arrêté du 03 juillet 2012, relatif à la PPST. Un avis ministériel
- Possibility of teleworking and flexible organization of working hours
- Professional equipment available (videoconferencing, loan of computer equipment, etc.)
- Social, cultural and sports events and activities
- Access to vocational training
- Social security coverage

**Rémunération**

1982€ / month (before taxes) during the first 2 years, 2085€ / month (before taxes) during the third year.

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**Défavorable pour un poste affecté dans une ZRR aurait pour conséquence l’annulation du recrutement.**

**Politique de recrutement :**

Dans le cadre de sa politique diversité, tous les postes Inria sont accessibles aux personnes en situation de handicap.

**Attention :** Les candidatures doivent être déposées en ligne sur le site Inria. Le traitement des candidatures adressées par d'autres canaux n'est pas garanti.