Post-doctoral position offer :

ADRESSE project: Application for Detection and REgulation of the StresS and Emotions on space missions

General information

Offer title : Application for Detection and REgulation of the StresS and Emotions
Location : Laboratoire Lorrain of Psychology and Neuroscience of the Behaviour Dynamics (2LPN), EA 7489, http://2lpn.univ-lorraine.fr/
Workplace : UFR SciFa – Campus of Bridoux, Metz - France
Date of publication : 8 July 2024
Type of contract : FTC scientist
Contract period : 12/24 months
Expected date of employment : 7 October 2024
Proposition of work : Full time
Funding : National Center for Space Studies (CNES; French: Centre National d'Études Spatiales)
Remuneration : The gross monthly salary is between 2300€ et 3000€ depending of experience
Desired level of education : Level 8 - PhD
Experience required : 2 to 8 years
Scientific fields : Applied Mathematics, Data Science, Computer Science, Electronics, Automatics, Neuroscience, Cognitive Science, Physiology, Measurement Systems, Signal Processing, Imaging
Application: Send detailed CV and covering letter to bolmont.benoit@univ-lorraine.fr
Contact : Benoit Bolmont, 2LPN, university of Lorraine, phone 03 72 74 90 13, e-mail above.

Context

An individual's psychological functioning is based on cognitive and affective dimensions. These affective states are characterized by psychological, physiological, cognitive, biological, behavioural and expressive responses. These responses are reciprocally influenced by the nature and intensity of the affective state experienced. In weightlessness, affective states and the various associated responses would be modified. It is therefore crucial to examine the discrepancy between "terrestrial" and "space" states. The aim of ADRESSE project is to model individual mental states, particularly astronauts, in microgravity conditions and on the ground, basis of different characteristics (psychological, physiological, cognitive, biological, behavioural, expressive, etc.). This modelling will eventually form the main operating element of a future application to detect and evaluate mental states, while proposing regulations for microgravity.

Mission and activities

The overall aim is to identify a method for building a personalized model of mental states, including machine learning methods, adaptable to different contexts (e.g., gravitational differences, different input signals) on the basis of heterogeneous measurements. With the help of the team, the person recruited will record different types of sensor data, with and without contact, in

different situations (standardized laboratory, ecological and weightless). Modelling will make it possible to detect, from identified and valued features, mental states and their evolution over time (short and long term).

The tasks to be carried out will be:

- Identification and use of measuring systems and various variables to be measured;
- Protocol implements for standardized acquisitions;
- Data acquisitions in ecological and standardized situations, both on land and in space context;
- Signal quality analysis;
- Data/signal pre-processing and processing;
- Modelling, in particular through automatic, classical and/or deep learning;
- Tests and selections of models, both on land and in space context;
- Database development and management;
- Development of a suitable application with the support of CNES partners.

Profile and skills

With a PhD in applied mathematics, automatics, electronics, computer science or related fields, you have experience in acquiring and analysing physiological, mental and behavioural data. In addition:

- You are able to design experimental protocols on humans;
- You have skills in data science: acquisition, storage, processing, modelling, prediction, testing, evaluation and visualization; in particular in the various machine learning concepts (federated, continuous, transfer learning etc.) and their application. You also have knowledge of statistics and applied mathematics.
- You have knowledge and skills in analysing and processing of various type signals. These temporal or discrete signals may come from physiological, cognitive, biomechanical or video sensors;
- You master the principles and concepts of computer development and programming, in various low and high-level languages, in order to develop software: design, unit and functional testing, integration, maintenance etc.;
- You are familiar with and have already used portable and web application development technologies;
- You are familiar with database creation and management tools (SQL, MySQL, MongoDB, InfluxDB, Prometheus or even Blockchain);
- You are familiar with versioning (git, svn...) and continuous integration (IC) tools;

- You have a taste for innovation and original solutions;
- You are able to work both as part of a team and independently in a multidisciplinary environment. You have good interpersonal skills and you are adaptable.

Benefits

- 75% reimbursement of Lorraine public transport subscription;
- Mutual insurance contribution of €15/month;
- Leisure, sports and cultural activities for all employees;
- "Sustainable mobility" package for commuting;
- Welcome and training courses.

References

[1] Collado A., Monfort V., Hainaut JP., Rosnet E., Bolmont B. (2013) Personality traits of people attracted by parabolic flight. Aviation, Space and Environmental Medicine. 84: p1-5.

[2] Collado A., Langlet C., Tzanova T., Hainaut J.-P., Monfort V., Bolmont B. (2017) Affective states and adaptation to parabolic flights. Acta Astronautica.134: p98-105.

[3] Collado A, Hainaut JP, Monfort V, Bolmont B. (2018) Sensation Seeking and Adaptation in Parabonauts. Frontiers in Psychology (9) 296.

[4] Nicolas M, Bolmont B. (2020). Les défis psychologiques ; sous la direction de Custaud M.-A., Blanc S., Gauquelin-Koch G., Gharib C. L'humain & l'espace – ses adaptations physiologiques, pp 223-238.

[5] Zhang B., Sieler L., Morere Y., Bolmont B., Bourhis G., (2018). A modified algorithm for QRS complex detection for FPGA implementation. Circuits, Systems, and Signal Processing, 37:7 (3070-3092).

[6] Zhang B., Morere Y., Sieler L., Langlet C., Bolmont B., Bourhis G. (2016) Stress recognition from heterogeneous data. Journal of Image and Graphics, 4(2):116-121.

[7] Zhang B., Morere Y., Sieler L., Langlet C., Bolmont B., Bourhis G. (2017) Reaction Time and Physiological Signals for Stress Recognition. Journal of Biomedical Signal Processing and Control. 38: p100-107.