

NOVA I4H – Thesis Proposal

Title:

Psychophysiology of Human Attention in Real World Scenarios

Objectives (recommended length: 2000-3000 char):

Human attention is a mature topic of study in psychology lab settings. With the advances on wearable devices, we can monitor biosignals in out-of-the-lab environments and create applications for continuous monitoring the attention level, in many scenarios.

The extraction of information about the attention level, reaction capabilities, focus and tiredness can be studied by understanding both the context of the user and the physiology expressed in the several biosignals. The attention should be studied based on stimuli reaction measured against multimodal biosignals such as electromyography, electroencephalography, functional near-infrared spectroscopy, accelerometry, electrodermal activity, respiration, electrocardiography, eye movement, among other signals.

The continuous characteristics of attention in a subject will be relevant to study in contexts, like autonomous driving, where the driver will be requested to take back the control of the car. The attention level needs to be checked in diverse scenarios and population types. The study may have impact on the design of interaction between the vehicles and the driver. The case of older drivers will be one of the focus, to be able to detect what level of capability to react under distraction (such as, looking at the mobile phone or to the car infotainment). In a learning activity, either in teacher-student scenario or in an elearning environment, the attention level will be a relevant input to adapt the content and session duration for the learner.

The main goal of this thesis is to review the state of the art on human attention, evaluate the different biosignals and develop novel research experiments for concrete world applications. The student should develop novel experiments and disseminate both by creating training materials and research output on relevant scientific venues.

Framework (recommended length: 500-2000 char):

Established in 2007, PLUX creates innovative products for industry, clinicians and researchers, by developing advanced biosignals monitoring platforms that integrates wearable body sensors combined with wireless connectivity,

algorithms and software applications. PLUX has a strong background on research collaboration with Universidade Nova de Lisboa. In the context of this thesis, the research on novel applications of sensors for real world monitoring of attention and the respective data analysis will enable the extraction of useful knowledge about the human attention enabling the creation of application in automotive and training environments.

This project will be developed in collaboration with the laboratory of Biomedical Instrumentation Lab – LIBPhys of Universidade Nova de Lisboa and will be supported by a company/faculty PhD grant assigned by FCT.

Tasks (recommended length: 1000-3000 char):

The candidate should investigate the current state of the art attention monitoring based on a multitude of biosignals. The candidate should produce training materials about attention monitoring and psychology testing. The student should become proficient on biosignals analysis and psychology experiments design. The intermediate results of the PhD should be presented in conferences and published in journals with known impact factor, on the areas of biomedical engineering, psychology or human. During the innovation process, careful attention should be given to identify ideas that can be part of intellectual property protection.

Venue:

This project will take place in the Biomedical Instrumentation Lab of FCT/UNL, as well as in PLUX Wireless Biosignals.

Candidate profile:

Considering that this project focuses heavily in psychology and physiology, the candidate should have expertise on biomedical engineering (or similar) with strong interest on cognitive psychology, or should be a psychologist with interest on engineering and specifically, data analysis and human physiology.

The capacity to innovate and develop new research ideas for sensing systems and attention experiments.

In addition, since this collaboration is between a faculty and an enterprise, the candidate must be prepared to develop his/her activity in a business environment, when necessary.

Supervisor

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