MARIE SKŁODOWSKA-CURIE POSTDOCTORAL FELLOWSHIPS 2021

EXPRESSION OF INTEREST FOR HOSTING MARIE CURIE FELLOWS

HOST INSTITUTION

Universidade Nova de Lisboa, Nova School of Science and Technology, Physics Department.

RESEARCH GROUP AND URL

LIBPHYS – Biosignals Group - http://biosi.gnals.org/

SUPERVISOR (NAME AND E-MAIL)

Hugo Gamboa – hgamboa@fct.unl.pt

SHORT CV OF THE SUPERVISOR

Hugo Gamboa is an Associate professor at Universidade Nova de Lisboa, Nova School of Science and Technology at the Physics Department. Hugo Gamboa is a researcher at LIBPHYS and Senior Researcher at Fraunhofer Portugal at the AICOS research center. He also serves as PLUX Wireless Biosignals President. Hugo Gamboa concluded his PhD in Electrotechnical and Computer Engineering at the Lisbon University in 2008 and the Degree (5 years Licenciatura) in Electrotechnical and Computer Engineering in the same University. His research focus is on Medical Instrumentation and Biomedical Engineering. Successfully supervised 6 PhD students and more than 50 MSc students. Founded and has served as co-chair of BIOSTEC conference in its 15th edition. He is a Senior member of IEEE. He is the PI of the projects PREVOCUPAI (DSAIPA/AI/0105/2019) e OPERATOR (NORTE-01-0247-FEDER-045910). Published 66 peer reviewed works in the last 5 years (29 journal papers and 37 conference papers). He coordinates the biosignals lab at LIBPHYS with 2 post-doc researchers and 12 PhD Students, that includes instrumentation equipment for biosignals acquisition in the lab and out of the lab for acquisitions at scale with a large variety of biosignals. The lab includes a set of algorithms toolboxes developed in-house for biosignals processing, and in-house collections of datasets of biosignals acquisitions.

Complete CV: https://www.cienciavitae.pt//en/841F-7D22-F80E

5 SELECTED PUBLICATIONS

Automatic Cognitive Fatigue Detection Using Wearable fNIRS and Machine Learning
R Varandas, R Lima, SBI Badia, H Silva, H Gamboa, Sensors 22 (11), 4010 10.3390/s22114010

Surface electromyography for testing motor dysfunction in amyotrophic lateral sclerosis
Carla Quintão, Ricardo Vigário, Maria Marta Santos, Ana Luísa Gomes, Mamede de Carvalho, Susana Pinto, Hugo Gamboa, 2021. Neurophysiologie Clinique 10.1016/j.neucli.2021.06.001

Human Activity Recognition for Indoor Localization Using Smartphone Inertial Sensors
D Moreira, M Barandas, T Rocha, P Alves, R Santos, R Leonardo, H Gamboa
Sensors 21 (18), 6316 10.3390/s21186316

Crowdsourcing-Based Fingerprinting for Indoor Location in Multi-Storey Buildings
R Santos, R Leonardo, M Barandas, D Moreira, T Rocha, P Alves, H Gamboa,
IEEE Access 9, 2021 10.1109/ACCESS.2021.3060123

Biosensing and Actuation—Platforms Coupling Body Input-Output Modalities for Affective

Technologies Miquel Alfaras, William Primett, Muhammad Umair, Charles Windlin, Pavel Karpashevich, Niaz Chalabianloo, Dionne Bowie, Corina Sas, Pedro Sanches, Kristina Höök, Cem Ersoy and Hugo Gamboa, Sensors 2020, 20(21), 5968 10.3390/s20215968

PROJECT TITLE AND SHORT DESCRIPTION

Wearable Biosignals for Early Diagnosis

Solving the challenge of early detection of pathologies would create a preventive context by being able to intervene soon in the disease onset where the prognostic can be improved. For this purpose, the possibility of continuously monitoring information from the human body would be a potential path or the early detection of changes related to clinical conditions.

In this project the key questions are:

What biosignals are the most relevant for clinical early diagnosis of the 20 most age-standardized rates non-communicable diseases that cause disability?
What diseases prove to be more prone to be continuously monitored by wearable technology in its early stage?
What signals processing and classification algorithms prove to be efficient to detect these in an early state change?
Is it possible to introduce explanations to the algorithms prognosis that can support preventive recommendation actions?

The project will implement advanced multimodal algorithms based on biosignals processing and classification to detect changes on biosignals parameters that are related to a disease onset.

A first implementation is related to early detection of low back pain (lifetime prevalence of 75 to 84%) by monitoring posture change dynamics that are proven to be related to movement fear under the low back pain condition, It can be detected via non-invasive techniques such as Electromyography (EMG) activation patterns associated to specific movement strategies measures by inertial units (accelerometers and gyroscopes).

The research fellow will have freedom to methodically select other clinical conditions and sets of biosignals conditions to be monitored via wearable devices and develop algorithms for relevant feature extraction to find early signs of disease. The challenge of generating explanations for the detections should be possible to trigger protective measures to prevent or delay the consequences of the disease. The research fellow will have a large set of biosignals measuring devices, algorithms development expertise and already collected datasets, with the potential support of one or two PhD students with co-tutoring.

SCIENTIFIC AREA WHERE THE PROJECT FITS BEST*

Information Science and Engineering (ENG)