*LECI – Proposta de Projeto Eng.a de Computadores e Informática*

## PROJECT TITLE

**Gesture-based Natural Interaction with Smart Environments**

## KEYWORKS

human-machine interaction, natural user interfaces, gestures, smart environments, ambient sensors

## WORK COORDINATION

Co-supervisors: Ana Patrícia Rocha (aprocha@ua.pt), Samuel Silva (sss@ua.pt)

Collaborators: António J. S. Teixeira (ajst@ua.pt), Nuno Almeida (nunoalmeida@ua.pt), Ilídio Castro Oliveira (ico@ua.pt)

## CONTEXT AND MOTIVATION

The environments we live in are becoming increasingly smarter, due to the integration of sensors and actuators in our homes, workplaces, public spaces, etc. This leads to a great amount of available information, not only related to those environments, but also the people living in them. Access to that information can be achieved through interaction between humans and smart environments, involving for example natural user interfaces that enable interaction through natural and intuitive behaviors and actions, such a touch, speech and gestures.

Gestures are quite versatile in the sense that they can be used even in more difficult contexts, such as very noisy environments, and can make use of the surrounding environment (e.g., table or bed while sitting or lying down) or even the user's body (e.g., tapping on the leg).

Gesture input usually relies on sensors and machine learning for recognizing the gestures carried out by the user. The used sensors range from wearable sensors (e.g., smartwatch) to sensors placed in the environment (e.g., cameras, radars). Sensors such as radars and low-resolution thermal cameras have the advantage of being minimally intrusive, since they do not need to be worn by the users and do not acquire RGB images/videos of the users.

## PROPOSED OBJECTIVES

This proposal aims at developing a solution for gesture-based interaction with smart environments, using minimally intrusive sensors, extending early R&D work developed at UA in the context of the APH-ALARM project[1].

While a further analysis of target scenarios is due in the scope of this work, the students' group is expected to work on these major topics:

- Develop a gesture input modality for enabling interaction with a smart environment using arm/hand gestures;
- Build a model for gesture recognition based on data provided by radar(s) or low-resolution thermal camera(s), and AI/machine learning;
- Participate in the preparation of datasets (data collection and labeling) to evaluate and train the gesture recognition model.

[1] https://aph-alarm-project.com/

## RELATION WITH PROJECTS

Gesture-based interaction with smart environments is a R&D field of interest in different projects involving the University of Aveiro (UA), namely the ongoing international APH-ALARM project and the “Casa da Saúde” project funded in its initial phase (2022) by OLI.