



SUPERVISOR INFORMATION	
First and Last name	Mohammad Sadegh Javadi Estahbanati
URL of supervisor webpage	https://sigarra.up.pt/feup/pt/func_geral.formview?p_codigo=742430
Department	DEEC
Field(s) of research	Energy Management System; Smart Buildings; Home Automation; Collective Self-Consumption
PROJECT PROPOSAL	
Title (optional)	Developing an Agentic AI Tool based on the Large Language Model Framework for Home Energy Management System
Brief project description	
<p>Achieving a sustainable transition towards a modern energy system depends on significantly engaging residential demand response capabilities. However, the uptake of Home Energy Management Systems (HEMS) remains limited due to user-interaction and adaptation level, particularly the need to translate everyday household preferences into technical system parameters. In this era, Large Language Models (LLMs) are expected to be implemented in residential energy applications. Employment of LLMs as a fully autonomous coordinator with supervisory control and assessment of human-in-the-loop is expected to be able to handle the entire workflow from Natural Language Processing (NLP) and consumer preferences input to multi-appliance scheduling and device control.</p> <p>The main responsibility of the applicant is to test and verify the existing models for HEMS application as a benchmark and then develop the Agentic Artificial Intelligence (Agentic AI) tools to automate the process using open-source tools and optimization packages embedded in the model. The functionality of the model will be tested using proper benchmarks and real-world case studies. Special efforts should also be on develop and integrate a specific Application Programming Interface (API) for the functionality assessment and data exchange between the user schedule, for example, Google Calendar, and the specifications of the home appliances.</p> <p>The outcomes of this research work will be incorporated into the INNO-TREC project, which is an EU-funded project, and the application of the models should be compatible with the pilots in the Portuguese Demo Site. The control strategy should be organized to enhance the performance of the end-user's contribution in the cost reduction and engage the consumers and prosumers in the energy community and collective self-consumption activities.</p>	