Master Internship — 5 to 6 months, starting between January and March 2026

REACT: exploring what is the Role of End-users towArds energy effiCient sofTware systems

Denisse Muñante (1) and Sophie Chabridon (2) in collaboration with Freddy Paz (3)
(1) ensIIE, SAMOVAR Lab, Évry, France
(2) SAMOVAR Lab, Télécom SudParis, Institut Polytechnique de Paris, Évry, France
(3) Pontificia Universidad Católica del Perú (PUCP), Lima, Perú
Contacts: denisse.munantearzapalo [at] ensiie.fr, Sophie.Chabridon [at] telecom-sudparis.eu

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Context and motivation Georgiou et al. [1] pointed out that the most explored stage in the software development life cycle, in which energy efficiency is studied as main goal, is the implementation stage. Other stages of the software development lifecycle such as requirements engineering, validation and maintenance are mostly still left unexplored. Moreover, despite the efforts made by the research community in integrating mechanisms to reduce the energy consumed by software, **usage conditions vary a lot at run-time provoking undesired scenarios such as rebound effects**. In order to explore the reasons of these undesired scenarios, it is necessary to study the interaction between software systems and end-users. Thus, it will be important to understand **what is the role of end-users to improve the energy efficiency of software** [2].

Principal idea We conduct exploratory studies for understanding end-users perception/behaviour on the strategies for software energy efficiency, and for understanding what are the means that can help to change end-users attitudes to adopt more energy efficient software solutions.

Internship objectives. A **first objective** of this intership is to understand the perception and behaviour of end-users on strategies for increasing the energy efficiency of software. Then, a **second objective** of the intership is to explore through human computer interaction (HCI) methods how end-user attitudes can change to promote the presence of energy efficiency in software products.

To answer this question, concretely the tasks that will be carried by the selected candidate are:

1. Investigate state of the art strategies for improving software energy efficiency and their effects on user experience.
2. Build how these strategies can be applied to a case study such as TeaStore application [1].
3. Design an experiment to evaluate user experience through users' perception.
4. Design a method based on HCI to encourage positive users' attitudes that support software energy efficiency.

In this internship, benchmarking will be performed using Grid'5000 infrastructure [2]. In addition, the entire process for the experiments must be reproducible, e.g. the benchmarking campaign is based on the construction of Jupyter NoteBooks [3].

Terms and conditions

— Production of open source documentation and code (licenses: GFDL and LGPL).
— Preference for using open source software.
— Version control with the GitLab platform of Télécom SudParis.

References

[1] Stefanos Georgiou, Stamatia Rizou, and Diomidis Spinellis. Software development lifecycle for energy efficiency: Techniques and tools. *ACM Comput. Surv.*, 52(4):81:1–81:33, 2019.

[2] Thomas Zaragoza, Thibault Soulancé, Adel Noureddine, and Ernesto Exposito. Understanding and influencing end-user behavior in software energy consumption. In *EASE'25: 29th International Conference on Evaluation and Assessment in Software Engineering (*, 2025.

1. https://github.com/DescartesResearch/TeaStore
2. https://www.grid5000.fr
3. https://www.fun-mooc.fr/en/courses/reproducible-research-methodological-principles-transparent-scie/