

Internship position

Title:

Improving the reliability of building life cycle assessment tools by taking uncertainties into account

Hosting laboratory:

The Laboratory of Angers in Research of System Engineering (LARIS) is a multi-disciplinary research unit at the University of Angers, combining skills in the fields of Information Sciences and Technologies and Engineering Sciences. The unit is structured into three teams within which high quality theoretical research is developed, with a strong emphasis on collaborative research with industry and business. For many years, LARIS has been developing skills in assessing and guaranteeing the performance of complex systems such as built systems.

<https://laris.univ-angers.fr/en/homepage.html>

Internship subject:

Context: The environmental impact of buildings can be reduced by applying eco-design tools to new-build projects and for the renovation of existing buildings. Life Cycle Assessment (LCA) is a holistic method for assessing the environmental impact of a product throughout its life cycle, and is particularly well suited to this purpose. However, there are many sources of uncertainty in the environmental modelling of buildings, which could affect the choice of design alternatives. Statistical methods exist for dealing with these uncertainties and quantifying their impact (uncertainty and sensitivity analyses). Applying these methods can increase the confidence in LCA and improve the decision-making support provided by eco-design tools. However, they are still very little used, and the effect of uncertainties is almost never taken into account in construction projects. In this context, the aim of the STUBE (towards Systematic Treatment of Uncertainties in Building Ecodesign) project is to facilitate and make operational the treatment of uncertainties in LCA of buildings.

Tasks:

- As part of this internship, the first step will be to assess the environmental impacts of the buildings used as case studies in the project (detached house, small apartment block, office, school), without taking uncertainties into account. To do this, LCAs will be carried out: the buildings' energy consumption will be assessed using the dynamic building energy simulation (DBES) tool Pl iades and the environmental performance will be assessed in Pl iades LCA.
- Secondly, a database of uncertainties in LCA of buildings will be created. The sources of uncertainty will be listed: they will be identified by carrying out a bibliographical study (scientific and technical literature). For each source of uncertainty, the probability distribution observed in the literature will be listed with the context of the study (design assistance, renovation assistance, certification, commissioning, etc.).
- Finally, the project will involve helping to update a platform for managing LCA and DBES simulations. The platform is coupled with Pl iades and developed using the Python programming language. It incorporates uncertainty and sensitivity analysis methods that enable uncertainties to be quantified. Based on the LCAs carried out in stage 1, and on the database of uncertainties obtained in stage 2, new building simulations will be carried out to assess the effect of uncertainties on the results.

Profile:

Student preparing for a 5-year degree in engineering or a Master, with knowledge of building energy or life cycle analysis. Programming skills (in Python if possible) would be a plus.

You are curious, rigorous and take initiative. You are at ease with the English language (reading scientific articles in English).

Internship conditions:

- Duration: about 6 months
- Starting date: 1^{er} quarter 2025
- Location: LARIS laboratory offices, 62 avenue Notre Dame du Lac, 49 000 ANGERS, France
- Gratification: legal amount for internship (hourly rate: 4.35 €/h)

Application:

Please send your CV and cover letter to Marie-Lise Pannier marie-lise.pannier@univ-angers.fr

