G-SCOP
SCIENCES POUR LA CONCEPTION, L'OPTIMISATION ET LA PRODUCTION

- Centre National de la Recherche Scientifique
- Grenoble INP
- Université Grenoble Alpes

PhD offer at G-SCOP Laboratory

Sustainable manufacturing and Artificial Intelligence

Expected start date: October 1st 2026
Application deadline: June 15th 2026

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Title: Decarbonization decision-aiding in discrete manufacturing processes through a Human-Centered Artificial Intelligence (HCAI)

Laboratory: G-SCOP

Supervisors: Abdourahim Sylla, Leah Rifi, Maria Di Mascolo

Description:

This PhD program is part of the French national research project "PEPR SPLEEN DCarbo" which aims to develop a new approach and innovative tools in order to support the decarbonization of industries. It focuses on discrete manufacturing systems.

Reducing the carbon emission of modern production lines via operations management requires multiple coordinated tasks ranging from detection, diagnosis, prediction, solution recommendation, and efficient monitoring. State-of-the-art approaches mainly rely on optimization and data-driven approaches, underexploiting the important asset of domain knowledge and expert experience.

Knowledge-driven approaches, which primarily exploit domain knowledge and expert experience, are often more sustainable as they generally require fewer computational resources and provide reliable, safe, transparent, explainable, and trustworthy decision-support systems. They generally perform well in diagnosis and solution recommendation. However, they often struggle with prediction and detection tasks, especially with complex data, and suffer from the knowledge acquisition bottleneck and the lack of strong collaboration between researchers and industry experts.

Effectively combining frugal and explainable data-driven models with knowledge-driven models is a promising direction for building a Human-Centered Artificial Intelligence (HCAI) multi-task decision-support system for carbon emission reduction in complex industrial processes. This thesis aims to explore this direction using two industrial use cases: the first one will consider the specificities of machining operations, while the second one will consider both machining and assembly operations.

Keywords: Discrete manufacturing processes, Carbon emission reduction, Energy consumption reduction, Decarbonization decision-aiding, Multi-task decision-support systems, Human-Centered Artificial Intelligence (HCAI)

Prerequisites:

- ✓ Knowledge of industrial engineering principles and tools, as well as an interest in manufacturing processes are essential.
- ✓ Good communication skills and the ability to analyse and synthesize information are required.
- ✓ Knowledge and skills in statistics, data analysis, machine learning, conceptual modelling, knowledge engineering, and programming are also required.
- ✓ A first experience with Human-Centered Artificial Intelligence (HCAI) or Explainable Artificial Intelligence (XAI) is appreciated.

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