**Category:** Deep Learning, Artificial Intelligence, Cognitive Science, Machine Learning

**Job title:** Deep learning methods for sustainable development applications: decarbonization of the building sector

**Contract:** Post-doctorat  
**Contract duration:** 24 months

**Subject:**
Heat pumps (HPs) are playing an increasing role in energy systems and have the potential to make a significant contribution to the decarbonization of the building sector. However, current HPs do not sufficiently take into account the variability of external disturbances such as weather conditions or user requirements.

The two main objectives of the project are the development of Artificial Intelligence (AI) methods based on the incremental learning of Artificial Neural Networks (ANNs) to achieve adaptive regulation and supervision of HPs. Indeed, ANNs can improve the energy performance of HPs by learning about their different modes of operation and allowing them to adapt their heat production in anticipation of future events, as well as by adaptive detection of operational anomalies. However, both ANNs and other machine learning methods often generate significant errors when confronted with significantly different or new data. For real-time use in HP regulators, the ANN system must constantly learn new knowledge, while keeping in mind the old ones.

Thus, this work will cover the development of the end-to-end AI pipeline for time series data based on incremental learning for adaptive HP control and supervision, with the development of AI pipeline based on incremental learning for numerical and event sequence data (generated by successive operational states of an underlying unknown state machine):

- Pre-process datasets
- Develop the classification and the forecast models
- Develop the anomaly and novelty detection model for the use cases
- Develop the incremental model to the defined datasets

**Applicant Profile**
The candidate should have completed a PhD in Computer Science, Cognitive Sciences, Machine Learning, or Signal Processing. The main requirement of the candidate is to have strong skills in Neural Network modelling and be able to program a Convolutional Neural Network (CNN), Recurrent Neural Network (RNN) and Long-Short Term Memory (LSTM) Network.

Knowledges and experiences in some or all of the following fields will be an asset during the position:

- Deep learning / Machine Learning
- Applied mathematics (probability / statistics)

Good programming practice in Python (Tensorflow, with some basic GPU environment knowledge). Applicants should master written and spoken English. A brief description of the PhD thesis, a publication list and some recommendations should be included to your application.

**Job location:** France, Grenoble

**Position start date:** 01/10/2021

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