Marina Micari, Ph.D.
SNSF Ambizione Group Leader

2 Master projects in "Machine Learning Modelling of Carbon Capture Processes"

Climate change is one of the main challenges of our time. One of the key measures to counteract climate change is ***carbon capture***. To make carbon capture more broadly feasible, we need state-of-the-art tools to evaluate multiple technologies and materials used to capture CO_2 from different sources. In this project we will resort to modern **simulation** and **machine learning** technologies to do so.

Description of activities:

The two master projects we offer will focus on the development of efficient ***data-driven models*** to design (project I) membrane and (project II) adsorption processes for carbon capture.

Both students will assemble a core dataset by running rigorous process models with different operating conditions and material properties. Starting from the dataset, they will tailor specific machine learning (artificial neural network and symbolic regression) to work as fast data-driven models in real-time.

These models will be coupled with economic and life cycle assessment models to allow for a fast evaluation of the costs and the environmental impact.

Expected learning outcomes:

Students will gain knowledge on capture technologies, expertise in mathematical modelling and optimization of separation processes and experience in using machine learning algorithms to develop data-driven models. ***These skills are in high demand both in industry and academia.***

Required skills:

Students with a background in ***computer science or in chemical engineering*** with a strong interest in computational methods are encouraged to apply.

The projects will be carried out within the research group led by **Dr. Marina Micari** (SNSF Ambizione Group Leader, hosted by the Laboratory of Advanced Separations at ISIC).
The research group works on the design and optimization of gas separation processes for sustainable industrial applications. The main research focus is on carbon capture processes for several applications, from direct air capture to concentrated point sources. We are particularly interested in understanding the impact of novel materials (membranes and sorbents) currently developed at the laboratory scale, when applied to large-scale separation processes. For this, we use advanced mathematical modelling tools and multi-objective optimization algorithms.

Please apply directly via email (marina.micari@epfl.ch) including a brief statement of motivation, CV, and transcript of records.

Project available from **September 2024.**