



PhD student call :

We are currently recruiting a graduate student at the PhD level to pursue research on machine learning methods for modelling and operating renewable power systems. We invite applications for a PhD position at Polytechnique Montréal, located in Montréal, Canada.

Title : Machine learning-aided methods for Power Systems Stability

Keywords : machine learning, voltage-sourced converter, renewable power systems, electromagnetic transient.

Project description : Measurement-based frequency scan method is proposed and implemented for the modelling of power systems incorporating different types of voltage-sourced converter (VSC)-based apparatus. The proposed method employs the measurements obtained from offline and real-time electromagnetic transient (EMT) time-domain simulations to estimate the impedance models of the VSCs and of the grid in a wide range of operating conditions. A machine learning (ML)-based approach will be developed to establish an optimal set of operating conditions due to different VSC set points and changes in grid topology. The proposed ML-based method helps accelerate the modelling process. At each operating point, the scanned impedances of the VSCs and of the power grid are aggregated to obtain a proper model for stability studies.

The project will focus on the acceleration of the stability analysis process. The project will define a family of models as a system whose dynamics depend on the operating points, system parametric uncertainties, and grid topology variations. Then, the student will design an ML-based algorithm to identify those candidates for which the stability analysis using the developed scanning techniques ensures the stability of the whole family. Subsequently, the ML model will infer a set of critical members of the family that should be analyzed using the proposed scanning and stability analysis methods. The stability analysis of these critical members will guarantee the stability of the whole system considering all operating points, parameter uncertainties, and topology variations.

Research group : The candidate will join a research group consisting of students and researchers at all levels (bachelor, master, PhD and postdoctoral fellows) who are working on the design of mathematical methods using a blend of optimization and machine learning for decision-making in renewable power systems. The research group is affiliated with international research centres focused on operational research and artificial intelligence, the [GERAD](#) and [Mila](#), respectively, in addition to the [NSERC/Hydro-Québec/RTE/EDF/OPAL-RT Industrial Research Chair on Multi Time-Frame Simulation of Transients for Large-Scale Power Systems](#)

Program : PhD (4 year-program).

Academic units : Department of Electrical Engineering, Polytechnique Montréal.

Supervisors : [Prof. Antoine Lesage-Landry](#) and [Prof. Jean Mahseredjian](#).

Required background : The candidate should have an undergraduate and a Master's degree and in Electrical Engineering, applied mathematics or any other relevant field and have strong expertise in mathematical modelling, machine learning, optimization, and programming (e.g., MATLAB, Python, C++, Julia) in addition to in power systems.

Funding : \$24,000/year stipend.

Starting date : As soon as possible (Winter 2024, Summer 2024, Fall 2024).

Application : If interested in this position, please send your CV, cover letter, and recent transcripts to Professors A. Lesage-Landry and J. Mahseredjian to : antoine.lesage-landry@polymtl.ca and jean.mahseredjian@polymtl.ca. Please indicate *Polytechnique : ML for Power Systems Dynamics* in the subject line of your e-mail.